

**AN ANALYSIS OF FORESTRY MANAGEMENT
PRACTICES IN NIGERIA: A CASE STUDY OF MAMU
FOREST RESERVE, ENUGU STATE.**

BY

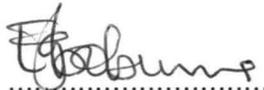
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M.TECH/SSSE/2007/1654**

**A THESIS SUBMITTED TO THE POSTGRADUATE
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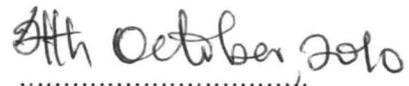
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DECLARATION

I EGBO OBINNA declare that this thesis was written by me and has not been presented either in whole or part for the award of post graduate degree anywhere else. All literature cited has been duly acknowledged in the reference.



Egbo Obinna

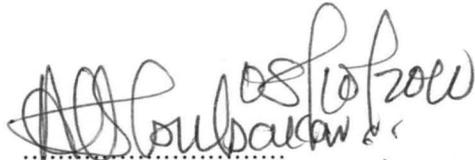


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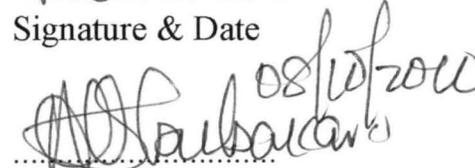
CERTIFICATION

This thesis titled: Analysis of forestry management practices in Nigeria: A case study of Mamu Forest Reserve, Enugu State by: Egbo, Obinna (M.Tech/SSSE/2007/1654) meets the regulations governing the award of the degree of Master of Technology (M.Tech) of Federal University of Technology Minna, and is approved for its contribution to scientific knowledge and literary presentation.

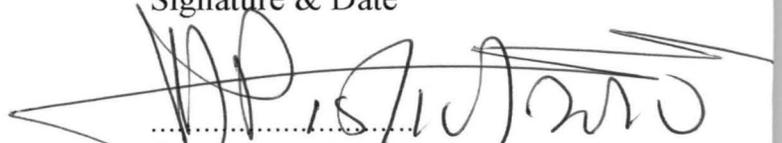
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DEDICATION

This work is whole heartedly dedicated to God Almighty, who in His infinite mercies saw me through. God is the author and giver of life and knowledge, without Him nothing would have been possible.

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I am a product of the influence and teachings of a lot of people. First, I want to acknowledge my parents Chief and (Princess) Mrs B.R Egbo, Bishop David Oyedepo and Chief Dan Ngerem for laying a solid foundation for me. I also recognize my siblings; Ifeoma, Amaka, Obum, Nnenna and Munachi for their love and affection. I will not forget my ally and friend, Jennifer Okonkwo for her support and encouragement. I also acknowledge my mentor Dr Jim Nwobodo and all my political fathers. Special to this dissertation I owe these bunch a lot; my HOD Dr Abubakar .S, Dr Akinyeye and Mr Tayo. Also the staff of NNPC towers Abuja and other fellow petroleum marketers and staff, Amb Aguyi Ironsi, Group Capt Opara, Mr Charles odoko, Mr Moses Omogui and Mrs Nneka Ezeugwa. I also will not forget my personal staff at Barok Nigeria Ltd, Engr Nnamoko, Mr Tony and Engr Emma. Thank you all for your numerous advice and support throughout this work.

ABSTRACT

This project dissertation is set out to study into analysis of Forest Management practice in Nigeria (Mamu Forest Reserve Oji River) and to establish the role of forest managers in effective Forest Resource Management. It also examines the problem and rationale of the Forest Reserve in Enugu State. Some of problems of the Forest Reserve are also highlighted. The project used various methods such as questionnaires, statistics, tables etc to arrive at reasonable findings. Such findings include human resources investment in the reserve should be improved, that effective management of forestry resources can be achieved through strategic forest management planning. It took cognizance of the management status of the forest estate, agencies involved in forest management, manpower situation, budgetary appropriation and revenue generation. As a result of the problem identified, appropriate recommendations were made in the following directions, provision of detailed Forest Resource plan indicating its economic importance. Administration of Mamu reserve should be improved and strengthened with professional. The reserve should be improved upon and expanded to attract tourist centre. Finally, Enugu State Government should provide adequate funds for the upkeep of the Mamu Forest Reserve (Oji River)

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The society of American foresters (1958), defines forest management as “the application of business methods and technical forestry principles to the operation of a forest property. The above definition of forest management shows its different aspects which consist of the acts, skills and knowledge of forestry in its many branches to achieve their full value if only as they are integrated and applied in terms of successfully operated forest business.

Every forest offers a real and living individuality. It differs from every other forest by its situation, its aspects, its soil configuration, its component crops (resources) and character. In addition to timber well- defined fields of wildlife, range, recreation and watershed management are recognized.

Recently, forest management was concerned only with timber production, which at its best strove to achieve a sustained yield of timber for forests. The current approach to forest management continues to focus on timber production, but it also considers the many other values of the forest and the management required to sustain them. Forest management by governments in Nigeria dates back to the nineteenth century. The colonial masters set 25% of Nigeria’s total

land area as a forest reservation target for their protection and control as well as removal of forest products.

The first forest department was established in 1899 in Southern Nigeria. Hence the northern part of Nigeria had no forest department because of the separate protectorate structure. The first forest ordinance was in 1908. The value of Nigerian's timber resources began to be widely recognized internationally in the 1930's to 1950's. This, however, resulted in the increase in domestic demand and the export market. The increased awareness of importance of forest products coupled with its attendant poor management resulted in the deforestation, loss of investment capital on forest reserve, total extinction of some animals and subsequently overall degradation of the natural environment.

Finally, wood exportation was banned in 1976. (Telger & Davies, 1998). Forestry policies came to streamline the system of forest management in Nigeria. Thus, the need for the current study with a view of evolving strategies for a more effective management of forest and its products vis-à-vis the role of Forest Officers and Managers.

1.2 Statement of the Problem

Forest resources both natural and plantation forests are quickly shrinking. The remaining forests are being degraded by excessive exploitative pressures

(deforestation) and improper management practices such as the use of fire (bush burning) in forest, clearing, intensive collection and destructive harvesting practices, etc.

The gap in professional practice has led to decline in the management of forest. Unless these professionals wake up to the challenge of forest resource management, the problem of deforestation will persist. The implication of this is global warming, ozone layer depletion, climate change among others. All these environmental problems have negative effects on man in particular and the environment in general.

In Nigeria, Forest Resources there are limited areas of undisturbed lowland rainforest available to contribute to conservation lands. For this reason, it was suggested that proposal be made to protect all undisturbed lowland rain forest. Rainforests are already disappearing, other forests are also disappearing, unless conscious steps are taken in the area of forest conservation and preservation, the little forests left will soon be lost.

This problem calls for experts to proffer solutions towards effective forest management practice. The Estate surveyor and valuer being an expert is important to the forest managers in striking a balance between the sustainable production of goods and services from forested areas and the conservation of

genetic biodiversity within the natural forest resources base which is under societal pressures.

Forest ignorance crises that weave around land ownership in Nigeria are endemic and could be traced to land use decree of 1978. Administration of forest reserve in Nigeria leaves much to be desired especially when one considers government decision and policies on utilization of forest reserves in meeting the needs and aspiration of citizens.

The administration of forestry had been monopolized by the state government within the federal and state structure in Nigeria. The exclusion of the stakeholders such as local country dwellers, hunters, farmers, timber contractors and non timber resources users in the administration of forest directly or indirectly has led to poor forest reserve in Nigeria.

Government should embark on Forest protection/management so as to preserve genetic resources and biological diversity so that its overall capacity to provide goods and services is not diminished. Encroachment into the reserve is a problem because most of the times farmer s are unaware that the farm they are farming is a land within the reserve due to poor demarcation.

1.3 Justification of The Study

Forestry resources are mostly needed because they are beneficial to the entire world for the growth of the economy and other purposes. This study will be a useful reference text to persons engaged in a specific research work. The study will be of immense benefit to investors in small-scale industries since they will be able to identify the various forestry resources and where they can be found or located. It is obvious that the demand and supply for timber will increase.

As civilization advanced, people recognized and realized the desire to conserve forest. Individuals and governments depend on the proper conservation and use of natural resources. The conservation of forest guarantee the satisfaction of personal comfort and guarantees the preservation of all organic resources which keep the soil in place and protects it from erosion.

Filizert (1925) defined forest management as “Sitting up, putting in order and keep in order a forest business”. Order can be maintained only by a well designed and carefully kept set of records, these records mean financial accounting and data of timber volumes and growth. This also includes addition of necessary maps. The purpose of the record keeping is to serve as a tool in management for profitable operation and continuous yield of timber. Finally, it will aid government at various levels in formulating purposeful policies towards the growth of the economy.

1.4 Scope and Limitation of the Study

A reasonable percentage of total land use area of Nigeria is made up of forest reserves from which timber is found. Although, the general field of forest management is extremely broad in scope, its treatment as a specific subject necessarily is limited. In addition to timber, well-defined fields of wildlife ranch recreation and watershed management are also recognized. Amongst the forest reserve is the Mamu Oji-River forest reserve in Enugu. Imbalance between wood supply and demand, deforestation issues forest disturbances, conflict between forest management and forest communities

Table 1: 1 Enugu State Forest Plantations

S/No	Name of Reserve	Size of Reserve (Ha)	Size of Plantation (Ha)	Species Composition
1	Iva-Valley	500	190	Gmelina Teak
2	Miliken Hill	94	90	Gmelina
3	Akpakume/Nze II	911.4	911.4	Pinus Eucalyptus
4	Akpakume/Nze II	21,000	870	Gmelina
5	Aguobu Owa	800	552	Pinus Gmelina Eucalyptus
6*	<i>Oji-River (Mamu)</i>	361.8	300	<i>Gmelina</i>
7	Ugwuoba Forestry Reserve, Nkwere Inyi Forestry Reserve, Akpugoeze forestry Reserve	4,618	1,110	Gmelina Teak
8	Anambra	850	650	Gmelina Teak
9	Ifite Amoli	50	40	Gmelina
10	Akwari Ani	220	50	Gmelina
11	Awlaw Isikwe Achi	415	25	Gmelina
12	Affa	150	70	Gmelina
13	Umuabi	1,166	20	Gmelina
14	Umabor 1&2	330	50	Gmelina
15	Akpugo	768	40	Gmelina
16	Agbogazi	848	20	Gmelina
Total		8428.4		

Table 1.1 shows the list of Enugu state's forest plantations which covers a total of eight thousand four hundred and twenty-eight (8,428 ha.) hectares but Mamu forest reserve covers 361.8 ha.

Source: Enugu State Ministry of Environment 2007

The problem first encountered in the course of data collection borders on the general paucity of information in Nigeria; some of the efforts were frustrated by constraints that were practically beyond the researcher's control. Such problems and constraints include lack of useful pre-existing information on the forest reserve, materials, lack of finance and time, etc. Despite these setbacks, however, adequate care was taken to ensure that data collected in the study area are representative and reliable.

1.5 Aim and Objectives

In Nigeria, some aspects of forest management problems has been raised and the need to look for solution towards sustainable forest management is deemed necessary. The Aim of the work therefore was to analyze the forestry management in Mamu Forest Reserve in Enugu State, Nigeria. The objectives of this study include to:

1. characterize the management system of the forest reserve.
2. access the capacity of the management in terms human resources.
3. determine the major management problems of the reserve

- 4 identify and assess the forest resource management policies and its implementation.
- 5 proffer solutions to forest resource management problem.

1.6 Description of the Study Area

The focus is on Mamu in Oji-River Local Government Area in Enugu State which covers about 361.8 hectares. Enugu, which is captioned “Coal City” is well known as a civil service city. Their natural vegetation is moist woodland savanna. Natural soil is Ferralitic red-yellow soil of humid tropical area. The derived savanna ecological zone of Enugu is found in a densely populated east-west trending band between the guinea savanna and the lowland rain forest ecological zones. During the dry season, there is always a deterioration of forest vegetation in the forest reserves.

Enugu State is one of the States in the Eastern part of Nigeria. The state shares borders with Abia and Imo States to the South, Ebonyi State to the East, Benue State to the Northeast, Kogi State to the northwest and Anambra State to the West. Though land-locked, Enugu is approximately 150 driving minutes away from Port Harcourt, Calabar and Warri, all coastal cities with major shipping ports. Enugu is also located within an hour’s drive from Onitsha and 2 hours’ drive from Aba, both of which are trading centers in Nigeria. The city is also

located within 5 driving hours from Abuja and 7 driving hours from Lagos, the administrative and commercial headquarters of Nigeria respectively.

Lying partly within the semi-tropical rain forest belt of the south, the State spreads towards the north through a land area of approximately 8,727.1 square kilometers (3,369.6 sq mi). Its physical features change gradually from tropical rain forest to open wood-land and then to Savannah. Apart from a chain of low hills, running through Abakaliki, Ebonyi State in the east to Nsukka in the north-west, and southwards through Enugu and Agwu, the rest of the state is made up of low land separated by numerous streams and rivulets, the major ones of which are the Adada River and the Oji River.

Enugu has good soil and climate, sitting at about 223 meters (730 ft) above sea level, and the soil is well drained. The mean temperature in Enugu State in the hottest month of February is about 97.16 °F (36.20 °C), while the lowest temperatures occur in the month of November, reaching 68.54 °F (20.30 °C). The lowest rainfall of about 0.16 cubic centimetres (0.0098 cu in) is normal in February, while the highest is about 35.7 cubic centimetres (2.18 cu in) in July.



Source: Encarta encyclopedia 2009

Fig 1.1 Map of Enugu State Including Study Area

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Forest reserves in Nigeria are losing their worth and value due to management. This chapter reviews literature on evolving techniques towards effective management of forest resources in Enugu State. As Nigeria's rich land was settled and cities began to grow, the demand for timber increased. Much timberland was publicly demanded and could be cheaply obtained. As there is more demand by the population, the logging operation equally developed.

According to forest resources study Piggy(1998) forest management must be based on sustainable management practice that balance the competing interests of land use to yield the greatest possible long-term benefit to society from forest lands. The United Nations Agency for food and Agricultural Organization (1993) gave a working definition of sustainable forest management as follows:

“Sustainable forest management involves planning for the production of wood for commercial purpose as well as meeting local needs for fuel, food, fodder and other purposes. It includes the protection, setting aside of areas to be managed as plant or wildlife reserves or for recreational or environmental purposes. It is concerned with ensuring that conservation of forested lands in agriculture and other uses is done in a properly planned and controlled way. It also covers the regeneration of wastelands and degraded forest, the integration of trees in the farming, landscaping and the promotion of agro forestry. It is a multi-

disciplinary task, requiring collaboration between government agencies, non-governmental organizations (NGOS) and above all, people, especially rural people. It is concerned at local, national and global levels”.

2.1 Valuations as a Major Tool in Forest Resource Management

One of the main responsibilities of the Estate surveyor and valuer is valuation. There was concretization of it with the promulgation of decree 24 (Now act) of 1975 which created the Estate Surveyors and valuers Registration Board of Nigeria. Thus, valuation is now an exclusive function of the Estate Surveyor and valuer. According to Davis (1966) valuation is an indispensable tool of management in seeking the best financial choice under existing conditions with particular reference to forestry.

Davis (1966) also observed that valuation is a major tool to forest managers as the search for an answer to the question of how balanced is the sustainable production of goods and services from forested areas and the conservation of biodiversity within the ever-spiking natural forest resource base under ever-increasing societal pressures. Around the world, especially in Nigeria, the degradation, fragmentation and simplification or conversion of forest ecosystems is progressing rapidly (Abramovitz, 1998).

Ensuring that these goods and services are maintained requires both intra- and inter-generational sustainability. In other words, a sustainable and productive forest-reserve resource base can ensure enduring food and environmental security. But even though forest resources are renewable (i.e. regenerative), forest reserve degradation and deforestation pose the most formidable threats to forest-reserve resource base (WCED, 1987). According to FAO (1997), Nigeria's total forest area in 1990 stood at 14,387,000 hectares. But in 1995, it stood at 13,780,000 hectares with a total change, 1990 – 1995, of –607,000 hectares at an annual change of –121,000 hectares (i.e. –0.9%). Adedoyin (1995) describes the current situation as deplorable.

After independence, the Nigerian government placed emphasis on the exploitation of forest resources for industrial development and increased foreign exchange earnings. The need to meet with these demands accentuated the unregulated exploitation of forest and forest-reserve resources. In Nigeria, the management of forest reserves is the responsibility of the state governments. How well or how far these state governments (with special focus on Enugu State) ensure the sustainability of these forest reserves, in the light of the threats enunciated above, is not known. Therefore, the sole objective of this study is to assess the level of involvement of estate surveyors and valuers in forest resource management.

2.2 Forest Conversions and Deforestation

Forest conversion is defined as the alteration of forest cover and forest condition through human intervention (NRC, 1993). Deforestation is a conversion extreme that reduces crown cover to less than 10 per cent, and this problem currently affects about 1.2 percent of the total tropical forest area (1.46 billion ha) annually; and forest degradation (changes in forest structure and function of sufficient magnitude to have long-term negative affects on the forest, productive potential) also affects a large area.

A network of forces operating at national and international levels drives agricultural expansion, as well as other immediate causes of forest conversion and degradation. Other leading direct causes of forest conversion and degradation, apart from the advancement of agricultural frontiers and subsequent use of land by subsistent farmers, include: (i) widespread poverty, unequal distribution of income, high population density and growth rates which serve as exacerbating factors; (ii) large-scale commercial logging and timber extraction; (iii) conversion of forests to perennial tree plantations and other cash crops; (iv) conversion to commercial livestock production; (v) land speculation; (vi) large-scale colonization and resettlement projects; and (vii) demand for land by shifting cultivators, small-scale farmers and landless migrants (Hecht and Cockburn, 1989; Myers, 1984; NRC, 1993; Offices of Technology Assessment, 1984; Ripetto and Gillis, 1988).

2.3 Consequences of Forest Conversion and Deforestation

Forest conversion can have far-reaching environmental, economic and social effects. Environmental consequences can include the disruption of natural hydrological processes, soil erosion and degradation, nutrient depletion, loss of biological diversity, increased susceptibility to fires, and changes in local distribution and amount of rainfall (Ehrlich and Wilson, 1991; Wilson 1988).

The social consequences of unsustainable conversion practices may include the decline of indigenous cultural groups and the loss of knowledge of local resources and resource management practices; dislocation of small communities of farmers or forest dwellers as forest lands are appropriated for more profitable land uses; continued poverty and rural migration as farmers abandon lands degraded through soil-depletion agricultural practices (Lynch, 1990; Sanchez, 1991; Lugo, 1991). The economic consequences include the loss of production potential as soil is degraded; the loss of biological resources such as food or pharmaceuticals from primary forests; the destabilization of watersheds with the attendant downstream effects of flooding and siltation; and at the global level, the long-term impacts of deforestation on global climate change (Norgaard, 1989; Randall, 1988; Repetto and Gillis, 1988).

2.4 Forest Conservation and Management

2.4.1 Policies, Strategies and Options

Forests are not expected to be inviolable, but forest reserves should be to a great extent. A number of recent developments both within and outside the forestry sector have influenced forest policies and their regulatory framework (FAO, 1997). Forest policy has incorporated the concept of sustainability for many years, but it was largely oriented to sustainable wood production. However, many nations have revised their policies to reflect a wider definition of sustainability which addresses both cultural and biological diversity in planning and changing views on 'trees and forests-for whom and for what?

Forestry policy development will equally take into consideration important national and regional demographic trends: population growth will continue to increase demand for forest products and result in increased competition for use of forest and forest land for other purposes. Forests play important role in soil protection, in maintaining soil fertility, in regulating water supplies, in influencing microclimates, and in contributing to various aspects of development. The pursuit of these many faceted and sometimes conflicting goals should be based on scientific analysis (NRC, 1993). In other words, the inherent capacity of land under forests to perform various functions should be ascertained, topographic surveys made and detailed climatic studies undertaken in order to formulate a land capacity classification.

Forests should be managed scientifically in such a way that their productivity is sustained. In addition, whenever possible, forests should be managed in an integrated manner. The objective of integrated management would be to maintain the ecosystem; to offer better socio-economic options that would lead to an adequate and acceptable quality of life for those who depend upon the ecosystem; and, at the same time, to maintain biological diversity. On the basis of land capability classification, the integrated management of forests might provide: a portion of land for annual crops under intensive cultivation, a portion for permanent crops, a portion for livestock, low quality land for agro forestry, and, where necessary, areas devoted exclusively to the provision of such forest services as water regulation. It must also be understood that many forests can be used to provide, at one and the same time, a multiplicity of both goods and services. Often, there is no need to manage forests on a single-purpose basis.

Forestry, agricultural and environmental Ministries in many countries are insufficiently integrated and often unable to enforce existing conservation policies, while officials lack opportunities for further education or professional training. In Nigeria, two main principles of forest policy were enunciated as a component of the 1946-1955 Development Plan published in 1945 (Kio *et al*, 1992). These were: (a) to preserve the climatic and physical conditions of the country, and to control, maintain or rehabilitate the vegetation; (b) to ensure the supply in perpetuity of all forms of forest produce to satisfy the wants of the

people. The most recent National Forest Policy was enshrined as chapter 5 of the Agricultural Policy for Nigeria, published in 1988 (Adedoyin, 1995). The contents were essentially an update and modification of the 1971 forest policy. The overall focus of the policy is to achieve self-sufficiency in wood products and to conserve wildlife with the help of the following policy guidelines.

- a) Consolidation and expansion of Nigeria's forest reserves to 20% of the total land.
- b) Sustained yield management of forests.
- c) Regeneration of forests, and the creation of plantation.
- d) Reduction in waste from wood processing.
- e) Promotion of private forest reserves.
- f) Promotion of private forestry.
- g) Provision of employment.
- h) Conservation of biodiversity through the establishment and management of National Parks and Game Reserves.
- i) Promotion of integrated forest industries and the development of secondary forest products.
- j) Encouragement of agro-forestry.
- k) Development of more efficient uses of fuel wood and the encouragement of alternative energy sources.
- l) Cooperation with other nations in forestry.

There are several legislations and policy statements relating to the conservation of flora and fauna in Nigeria. The Federal and/or State Governments enacted these with the aim of ensuring biodiversity conservation in the nation. They include forestry laws, national population policy, etc (Adedoyin, 1995). These legislations contain adequate provisions and penalties for violation.

2.4.2 Rationale for Forest Conservation and Management.

Despite the relatively scarce data available, Nigeria is a highly bio-diverse country: 500 viral species; 55 bacteria; a few protozoa's; 848 species of algae; 200 lower plants; 5,103 higher plants; 247 mammalian species; 839 avian species; 648 fish species; 109 amphibians species; 77 molluscs; 10 annelids; 304 insect species; 134 zooplankton and 135 reptilian species have been identified and documented (Adedoyin, 1995). About 205 plant species are endemic in Nigeria, with the highest degree of endemism in the lowland forests of the Southeast, which has 128 of these endemic species. But the rich biodiversity of Nigeria is being threatened by extensive farming, flooding, erosion, urbanization, industrialization, excessive oil exploration and exploitation, lack of relevant data base, inadequate manpower and equipment, poor law enforcement, and conversion of natural forests to tree plantations.

An attempt at stemming the ugly development led to the institution of forest reserves at the end of the 19th century. In Nigeria, there were 445 forest reserves, 7 strict nature reserves, 1 biosphere reserve, greater than 20 natural regeneration investigation plots, greater than 200 permanent sample plots, 32 Game reserves/sanctuaries, 3 fish parks, 6 national parks and 3 ramsar sites.

Forest management offers a promising alternative to depletion of forest resources within primary and secondary tropical moist forests. It involves controlled and regulated harvesting, combined with silvicultural and protective measures, to sustain or increase the commercial value of subsequent stands; and it relies on natural regeneration of native species (NRC, 1993). Although varied in their approaches and methods, forest management systems seek to protect forest cover, ensure the reproduction of commercially important species, and derive continuing economic, social and environmental benefits from the forests.

Unfortunately, only a small percentage of the world's forest resources are managed. For example, a survey of 76 countries possessing tropical forests found that out of 210 million hectares being logged, only 20% was being managed (Lanly, 1982; Moad, 1989). According to Poore *et al.* (1990), recent estimates show that only 0.2% of the world's moist tropical forests is being managed for sustained timber production. The lack of understanding of forest regeneration processes and ecological complexity of tropical moist forest places

special constraints on applying forest management practices, especially those developed in the temperate zone forests (Buttoud, 1991; Lugo, 1987).

2.4.3 Conservation vis-à-vis Sustainability.

Sustainability can mean different things to different people. It is not a fixed steady-state situation but changes with societies' needs and so varies over space and time (CIFOR 1996). Sustainability refers to the ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time (Dunster and Dunster, 1996). Bainbridge and Mitchell (1988) opine that conservation efforts can be said to be economically sustainable when supply matches demand of forest resources and products, and reasonable profits are made; ecologically sustainable when practices are environmentally sound and enhance rather than degrade the natural resource base; and culturally sustainable when farmers, families, communities, and fabric of rural life remain viable.

2.4.4 The Role of Federal, State and Local Governments in Forest Conservation and Management.

Forest conservation and management is administered in Nigeria at the three tiers of government, i.e. Federal, State and Local Governments. According to Adedoyin (1995), the federal government through the Federal Department of Forestry (FDF) formulates the National Forestry Policy. It equally supports the

execution of federally founded projects, exercises advisory function to the State Forestry Departments and is responsible for relations with international forest development agencies. Unfortunately, the FDF lacks adequate funds that can enable it play its roles. At the state level, the State Forestry Departments (SFDs) manage the forest and its resources. However, inadequate funds, shortage of manpower and inadequate training and exposure of the available personnel to modern forestry techniques hamper the ability of the state forestry department to carry out its roles.

The roles of the local governments differ from north to south. In the north, local governments have some responsibilities in the conservation and management of forests, while the reverse (virtually no responsibilities) is the case in the south. Local Government Areas, regrettably also, experience the lack of funds and personnel to perform their roles.

2.5 Measurement Framework - Criteria and Indicators (C&I) for Sustainable Forest Management.

Criteria and Indicators for sustainable forest management can be applied in different ways at different places for different purposes (Funston, 1994). C & I can refer to the design of forestry operations on a site or assessing the cumulative outcomes or impacts of forestry operations regionally or nationally. The UNCED has heightened awareness at all levels on the need and feasibility

to manage all kinds of forests sustainably, and of the role that forests can, and should, play in national development (COFO, 1997).

A criterion is characterized by a set of related indicators, which are monitored periodically to assess change. An indicator is an aspect of the criterion or a quantitative or qualitative variable, which can be measured or described, and which when observed periodically demonstrates trends. It is important to understand that no single criterion or indicator defines a sustainable condition. They must be looked at as a set and within the social and environmental context being considered.

The definition of criteria for sustainable forest management has led to a general agreement on the essential elements of forest management and on the principles against which the sustainability of forests can be assessed. The identification of agreed-upon indicators serves as the basis for periodic, national-level assessment and monitoring of the overall effects of forest management interventions and the consequences of non-interventions. Monitoring progress of sustainable forest management against agreed criteria and indicators will allow action to be adjusted over time to better meet stated overall aims and objectives in support of the various functions of forests recognized in Agenda 21 and the "Forest Principles" (COFO, 1997). FAO, WRI, CIFOR, UNCED, ITTO, etc. have been instrumental to the development of a number of

international processes to underpin the efforts of countries to comply with the above objectives. These include: (COFO 1997)

- 1) The ITTO Guidelines and Criteria, which aim at supporting improved management of tropical forests;
- 2) The Montreal and the Helsinki Processes, which have identified criteria and indicators for sustainable management of temperate and boreal zone forests outside of Europe and European forest respectively;
- 3) The Tarapoto Proposals for the sustainable management of the Amazon forests;
- 4) Various efforts by NGOs.

2.6 Forest Land Use Planning

Land, basic source of forest resources, is required to be planned and managed for by experts. The basic capital of any timber production enterprise is the land and the timber standing upon it. Forest resources study (1998) observed that forest land use planning will require planning exercises that are carried out at variety of scales in order to capture and assess all the information necessary for sustainable development. There is need to plan and use forest resources by integrated scale such as treating urban and rural problems of forest together, not in isolation. The levels involved in the planning and use are urban level (Economy) Rural level (regional Economy) and National level. At all levels,

there is need for the integration of knowledge in various segments of the economy and by so doing deal with under seen circumstances to avoid getting negative effects (Ochuba, 1996).

According to the Federal Ministry of Agriculture (1988), it is important that State land use designation must also consider the international and national recommended areas to be retained under forest cover in Nigeria. The Agricultural Policy outline is the forestry and wildlife sub-sector implantation guidelines that 25% of the total land area in Nigeria should be forested. However, the Forest Resources Study failed to recognize how important it is to involve some key stakeholders in land use planning in order to effect sustainable forest resources management. The key stakeholders could be enumerated as follows:

1. The Land Use and Allocation Committee and
2. The Land Allocation Advisory Committee

They have related function which is to advise the state and the local governments on all the matters related to the central and management of the land within its jurisdiction. Subsequently, in the land use Decree (now Act) (1978) section 2 which is captioned "control and management of land advisory bodies", sub-section 3 states that the committee shall consist of any number the Governor may determine and shall include in its membership. "Not less than

two persons possessing qualifications approved for appointment to the civil services as Estate surveyors or land officers and who have had such qualification for not less than five years”.

The Forest Resources Study (1998) added that the departments of forestry and local communities have the greatest role to play in choosing lands suitable for forest management. To achieve a long-term management planning, there is every need for these primary and secondary bodies to have a good communication network. It is the duty of the Department of forestry to act as the co-coordinating agency in this process”

Also, in calculating the area of land use for forest management, there are, however, a multitude of other important goods and services which forested land provide and these need to be considered.

Immediately the forest land use designations are understood and agreed to by all main bodies, the forested areas must have clearly visible boundaries on the ground. The appropriate map scale for the demarcation of land use designations is between 1:50,000 to 1:250,000. In some cases, demarcation will require a survey of forested land and demarcation of boundaries using concrete marked pillars and appropriate signage. In instances where the ownership is based on additional land ownership, the agreement to a particular land use designation among the communities may not have the need for filed demarcation.

Demarcation is, however, recommended wherever practical to avoid possible conflict. In either case, it is the agreement made by the main bodies that will lead to long term resources and environmental sustainability (Forest Resources study, 1998).

With completion of landscape planning, some areas of forest in each state got identified for wood production. The task now is to achieve sustainable management planning to meet current and future demands for timber production and other resources. According to Leslie (1994) the term “sustainable wood production” can be defined as “harvesting wood at an average annual rate that is not greater than that at which the forest in question can grow it and without harming the forests capacity to supply other goods and services”.

The implementation of strategic forest management planning is best suited to state sub-units called management units (MUS). In recognition of this, the forest resources study (FRS) terms of reference point out the need for the creation of management Units (MUS) within each state of Nigeria and the development of management unit plans for each. However, caution should be exercised in the subdivision of the land base into smaller units as this may unnecessarily lead to a more complex system of regulation and administration (Davis, 1966).

In the Nigerian context, Management Units should be used to designate primary and sizeable forest areas as management area where sustained resources management is the major consideration in forest organization with a goal of applying strategic forest. Management (S.F.M) principals and practices to the Nigerian forest land base, the following objectives must be considered in the subdivision of the government owned forest estate into mills. They should be:

- (a) Suitable for large-scale/high-level forest management planning.
- (b) Suitable for long-term SFM and application.
- (c) Stable in the extent of the forest resources land use.
- (d) Political Stable
- (e) Suitable for calculating, administration and implementation of the annual allowable cut.
- (f) Suitable for the development of forest management practices specific to the schedules (budgets) for specific forest management Practices.

2.7 Sustainable Forest Management

According to the forest resources study (1998), the practical application of sustainable forest management in Nigeria is extremely difficult due to the complex tropical forest ecosystem present and the lack of financial resources, political commitment and appropriately trained human personnel necessary to carry out sustainable forest management. Where attempts have been made in

other tropical countries to achieve sustainable forest management, it was found that the following four key elements were necessary to ensure success.

1. Ascertaining the annual increment of production forest and the appropriate harvest cycle and volume of timber to extract during each harvest cycle. The objective being to harvest an amount of timber which is no greater than increment and which does not cause an environmental impact that exceeds the capacity of the ecosystem to quickly recover.
2. Identifying the appropriate part of the forest to be felled during each harvest cycle considering such factors as minimum girth limits, selected species and groups of trees. The objective of this is to maintain species diversity and continued healthy natural regeneration.
3. The implementation of pre-harvest survey and post-harvest silvicultural techniques that ensure the replacement of the part of the forest to be felled. The objective is to ensure regeneration of valued timber species.
4. Utilizing harvesting techniques that minimize harvesting impact thus maintaining the forests capacity to supply timber and all other valued goods and services in the future.

Sustainable forest management may be classified into four broad types as follows: low intensity, natural forest management, plantation forest management and forest management for the restoration of degraded lands. All have positive and negative attributes, while all forest management types may be considered sustainable. Type 1 makes a strong contribution to forest biodiversity conservation, types 2 and 3 contribute more to timber production and type 4 contributes to both conservation and production. To achieve a sustainable forest resources management as set objective for a particular region, it will be by balancing these four forest management types to meet regional objectives of conservation, timber production, agricultural production and others. Regarding the ways to ensure sustainable forest management, the forest resources study (1998) identified the following:

Annual Allowable Cut: This is an estimate of the volume of timber, which may be sustainably harvested from the forest each year ($M^3/ha/year$). The Annual Allowable cut is based on the growth rate of trees and the ability of a forest to recover following the impact of logging. In order for the AAC to be sustainable, timber harvesting must work within the ecological limits to each site. When carefully implemented, the AAC preserves the ecological functioning of forests thereby maintaining natural self-regulating and self-sustaining mechanisms, which guarantee the continued regeneration and growth of trees for future harvest.

homes of both birds and mammals. So removing them will reduce their numbers.

2.8 Forest as a Wildlife Habitat

In observing the forest land as a basic re-sourcing, Trippensee (1948) captioned “wildlife a forest resources”. Consequently, vast numbers of wild animals were found in the virgin forest. These virgin forests were tremendously productive of animals’ life, particularly animals that depend on climax forest conditions, forest trees were used by these animals for food and in building houses and dams.

In another text written by straddled (1978), forest is seen as a home or habitat for many kinds of wildlife such as game animals, songbirds and many farms of tiny insects and animals life of which their homes are made under the forest canopy and could not exist without it. Continuing, he noted that well-planned forest management will create small openings such as these and leave a few hallow old wolf trees for animal dens, bird nests and for the nuts or acorns they may produce.

Accordingly, when a forest is well planned, wildlife comes into it because they tend to work along the edges between the woods and the openings as food lies on one side and the other side accords cover or protection. It is therefore

important that forest managers should do much to improve on the area under their control as a wildlife habitat in addition to creating openings and leaving den trees and assist nature by supplementary planting. By doing this, it will be beneficial to forest reserves as means of better protection against insects as they will be a source of food to some of the wild birds and animals. Although they can cause damages when ever populated and can be combed by harvesting during hunting season.

The primary objective of a large percentage of both private and publicly owned forestland is wood production. Wildlife returns are of sufficient importance however to help carry part of the over head costs and have the advantage of being an annual return, whereas the return from sawn timber which may be periodic over a long interval of time.

To know the effect of wildlife effect in the production of timber, Trippensee (1948) pointed out that the issue of whether a relationship is good or bad depends on the point of view of the property owner. The same animal under different conditions may be both injurious and beneficial.

2.9 Effect of Forest Practices on the Production of Wildlife

In order to manage the game in a forest, the forester must first determine whether timber or wildlife is his primary crops, then whether for his

expectations depend on returns from game or timber and finally whether the basis for revenue is the meat value, recreational value or some other fish or game value of each unit of wildlife produced.

2.9.1 Weeding

Weeding or cleanings are first cutting made in young stands that have not exceeded the sapping stage (trees 4 inches or less at breasts height) of desirable species or to remove trees of poor quality from where there are over topping or interference with individuals of better quality. This operation is very favorable to wildlife. Normally, cut-over for burned-over land will develop a heavy growth of hardwood sprouts or there will be reproduction after the burning. When the growth is tender, it is thick succulent and low enough to be ideal for food browsing animals such as deer and varying bare.

Hence, the growth of he animal increases unless decreased by hunters. Precisely, there are usually less damages to the tress remaining in the treated than in the untreated stand, the reason being that all the work by rabbits in the treated stand was done on stems that had been laid by the weeding operation.

If wildlife as practiced in a particular forest reserves is promiscuous cutting of virus and shrubs, it should be discouraged as it eliminates wildlife food. Stoddard (1978) noted that cleaning out small openings in the forest during

logging and planting of berry-bearing shrubs will supply food for birds and small mammals.

2.9.2 Establishment of Plantation

Trippensee (1948) noted that openings in the forests are essential to abundant crops of wildlife; therefore, it is good to live natural opening unplanted. Stoddard (1978) observed that planting of coniferous stands in hardwood forest areas or in open farming country will provide the best kind of protection for wildlife from highlands. A lot has been written about the harmful effects than the beneficial effect of wild animals on forests. As a rule damage is easier to see than benefit.

Constantly, the forester has termed damage animal activity that is a benefit to the forests as such shrubs that are of no value to the forest are mostly affected. Thus, any injury to them will reduce competition to valuable forest growth. Birds are destroyers of insects and in contrast distribute large quantities of seeds and tree species. On the other hand, mammals destroy large quantities of insects (Stoddard, 1978).

2.9.3 Detrimental Effects of Wildlife

Rabbits and hares often cut terminal shoots and chew the bark from stems that the forester intended for future crop trees. The effects can be reduced by sufficient number of hunters to remove the surplus or determine the forest-

management policies if he keeps his forest in the best possible condition for game as well as for wood production. There are damages and acceleration in order to satisfy or measure the demand of the country for different purposes. According to (stodard, 1978), the forest can be protected from fire, insects and diseases.

Forest Resources study (1998) explains that Nigeria's forest resources both natural and plantation forests represent considerable value to the country and individual states. The value can be seen in many angles such as economic, environmental protection, preservation of genetic and species bio-diversity and in the protection and maintenance of social, cultural and religious heritages. The provision of goods and services for many decades in Nigeria has been based on forest resources. As valuable as these resources are today, they will also be valuable to future generations. In fact, the health and welfare of the people now and in the future will depend partly upon the sustainable management and conservation of our forest resources base.

Since the resources are of great value it will be meaningful to protect them from various threats of degradation and destruction. It was noted by Stodard (1978) that majority of fire incidents are surface fire burning mostly in the duff or leaf littered on the forest floor, thus easy to control. A bad forest fire fanned by high winds will destroy nearly everything in its paths. The crown fire or combined

surface and crown fire causes the greatest timber, property damage and mostly in coniferous forests. There are always losses of purchasable timber and property. Other damage caused by fire is that it is responsible for a vast amount of flood damages and for aggravated problems of water supply and for the silting of reservoirs, stream channels and harbors with millions of tons of sediment eroded from the land.

Forest fires kill many animals and birds. Wood ashes washed into streams after fire sometimes kill large numbers of fish. It can also hurt tourists and recreation business. A fire control organization must be geared to meet any emergency situation. This is caused by human negligence, carelessness or ignorance. Preventive motive should involve awareness of importance, danger of fire in the woods and a sense of personal responsibility to safeguard the forest from danger.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Research Design and Methodology

This chapter deals with the method and procedures adopted for carrying out this study. This part describes the various statistics adopted for this study, this includes, Sample size, Sampling techniques, Description of instrument used, procedure for data collection.

3.2 Data Collection

The sample plan for the study comprises mainly a number of trips to the sample units for the study for the purposes of contacting the members of the sample units. Two sources of data were collected primary and secondary data using well structured questionnaire and interpersonal interview.

The primary data were collected from forestry officers at ministry of agriculture and natural resources Enugu, community people, displaced farmers .primary data collected include number of forest reserve and their status, land area, manpower position, status of artificial plantation development, budgetary allocation, revenue generation and various agencies involved in forest management in Enugu. While secondary data was on major use of the forest reserve. Other sources such as reference to Newspapers, Journals and books

written by scholars in area related to the issues in question, were also used for gathering information.

3.3 Research Design

The research design used in this study is survey and field research. It has been used to assess the level of involvement of forest officers, community people hunters, farmers and other government supervising agency in forest resource management, and an attempt is made to evolve the various parts forest officers and community people can play towards more effective forest management.

On the other hand, ground truthing has been used for direct observation of forest resources to evaluate their worth. This technique was adopted because it helps in identifying the problems militating against effective forest management practices.

3.3.1 Sample Survey

Sample survey gathers information from a percentage of the population to represent the entire population (Orjih, 1996). Sample survey can be statistically defined as the process of selecting a sample of elements from a target population. A surveyor may refer to different types of techniques of observation but in context of survey sampling, it must often refer to a questionnaire used to measure characteristics or attitudes of people.

For this project, (100) one hundred Estate Surveyors and Valuers were sampled. Forest officers were also randomly sampled. This figure is a representative of the population of the study area as can be seen in Table 3.1 below.

The statistics distribution of a sum of squares of k independent standard normal random variable. To test the hypothesis put forward for the study, chi-square (X^2) was used. Chi square is a non-parametric inferential statistics tool used to test hypothesis that show relationship between variables. The chi-square (X^2) is given by the formula:

$$X^2 (K)$$

K E N- degrees of freedom

$$X^2 = \sum \frac{(F_o - F_e)^2}{F_e}$$

$\epsilon = \text{sum of}$

F_o = observed frequency

F_e = expected frequency

Note = F_o was the data frequency obtained directly from the observation in the field. F_e was the data that occur under the null hypothesis. Using the contingency table constructed, F_e was obtained using the following formula (Orjih, 1996).

$$F_e = \frac{\text{TRF} \times \text{TCE}}{\text{TSS}}$$

Where Fe=Frequency Error

TRF=Total Row Frequency

TCF=Total Column Frequency

TSS=Total Sample Size

Total Sample Size

To apply chi – square test technique, the following basic assumptions were made:

- (i) Level of confidence (i.e. Limit of tolerable error = 25% or).25.
- (ii) Confidence Level = 95% or).95
- (iii) Degree of freedom = (R-1) (C-1) where

R = total number of rows

C = total number of columns

In applying the chi-square for the test, the following Decision rule applies:

1. Reject the null hypothesis (Ho) if the calculated value (CV) is greater than the table value (TV) at 25% level of significance. ($CV > TV$: Reject HO).
2. Accept the null hypothesis if the calculated value (CV) is less than the table value (TV) at 25% level of significance $CV < TV$, fail to reject HO.

3.4 Method of Data Analysis

Data collected in a research make sense or become useful only when they are subjected to statistical analysis. The following tools of statistics were used:

3.4.1 Percentage

Percentage is a way of expressing a number as a fraction of 100 (percent meaning per hundred). It is often denoted using %. Percentages and tables including contingency tables are used in hypothesis testing.

3.4.2 Chi Square

Chi square is used in probability theory and statistics distribution of a sum of squares of k independent standard normal random variable. To test the hypothesis put forward for the study, chi-square (X^2) was used. Chi square is a non-parametric inferential statistics tool used to test hypothesis that show relationship between variables. The chi-square (X^2) is given by the formula:

$$X^2 (K)$$

$K = N - \text{degrees of freedom}$

To test the hypothesis put forward for the study, chi-square (X^2) was used. Chi square is a non-parametric inferential statistics tool used to test hypothesis that show relationship between variables.

3.5 Data Collection and Analysis

Cross-sectional data were generated from primary sources. The primary data were obtained with the aid of interview schedules administered to zonal officers and forest guards/rangers in charge of these forest reserves. Data collected were information on the indicators of sustainability. The six, or at times, seven criteria defined by international processes are very similar, even though the indicators, which correspond to the identified criteria, should be closely linked to national conditions, needs and priorities. The following seven criteria and associated indicators (table 2) developed or defined for the Nigerian context by Eboh (2000) was used to measure the current sustainability status of forest reserves in Enugu State.

Table 3.1 Criteria and Indicator (C&I) Framework.

S/No	Criteria	Indicator	Measure/Unit
1	Ecosystem Diversity	(a) Percentage and extent of forest area (b) Level of Fragmentation (c) Distribution and abundance of aquatic fauna	(i)Percentage change in area relative to total initial forest area. (i)Percent physical split (parcelisation) of forest area into distinct parts. (i)Percentage change in incidence of aquatic fauna.
2	Species Diversity	(a) Species extinction and vulnerability (b) Species population level and changes over time	(i)Number of forest species classified as extinct. Number of forest species classified as threatened or endangered. (i)Percentage change in population of prime tree species. (ii)Percentage change in population of minor tree species. (iii)Percentage change in portion occupied by prime tree species relative to initial condition. (iv)Percentage change in portion occupied by minor tree species relative to initial condition.
3	Genetic Diversity	Implementation of genetic conservation strategy	(i)Practical action relating to genetic conservation of commercial and endangered species.
4	Incidence of disturbance and stress	(a) Area and severity of insect attack (b) Area and severity of disease infestation (c) Area and severity of fire damage	(i)Percentage change in incidence of insect attack. (i)Percentage change in incidence of disease infestation. (i)Percentage change in incidence of fire change.
5	Ecosystem Resilience	Natural and artificial regeneration	(i)Percentage area successfully naturally regenerated. (ii)Percentage area successfully artificially regenerated
6	Socio-Economic Integrity	(a) Forest land conversion (b) Forest Products harvesting	(i)Percentage forest area converted to farmland. (ii)Percentage change in incidence of forestland conversion to agriculture. (iii)Percentage forest area lost due to infrastructure, housing and other non-agricultural uses. (i)Percentage annual removal of forest products relative to the volume of removals determined to

			be sustainable.
7	Forest sector policy factors and management strategies	<p>(a) Enforcement of laws and regulations guiding the forest reserves.</p> <p>(b) Existence of forest management plans.</p> <p>(c) Forest inventerisation</p> <p>(d) Participatory strategies</p> <p>(d) Funding for forest reserves</p>	<p>(i)Incidence of compliance with forest reserve laws/regulations.</p> <p>(i)Incidence of implementation of forest management plans.</p> <p>(ii)Percentage of forest area under completed management plans.</p> <p>(i)Availability/existence of up-to-date forest inventory.</p> <p>(i)Number of communities with forest co-management status.</p> <p>(ii)Incidence of participation of communities in decision-making relating to forests.</p> <p>(iii)Incidence of participation by communities in the implementation of decision, monitoring of progress towards sustainable forest management.</p> <p>(i)Total budgetary expenditure on forest reserves. Percentage change in the forest sector share of total budget.</p>

Source: Eboh, E.C. (2000).

CHAPTER FOUR

RESULTS

Table 4.1 Proportion of Forest Reserve Currently Covered by Trees in Mamu

Total land area in 1927 (ha)	47.90
Total area covered with trees (ha)	35.925
Total area deforested (ha)	11.975
Average loss per annum (ha)	0.2 per annum

The extent of forest and its deforested area over a period time in Mamu Forest Reserve.

Table 4.2 Questionnaire Results

S/No	Name of Reserve	Size of Reserve in 1927 (Ha)	Size of Plantation deforested area	Land use
1	Iva-Valley	500	190	Agriculture
2	Miliken Hill	94	90	Farming
3	Akpakume/Nze II	911.4	0	Forestry
4	Akpakume/Nze II	21,000	870	Construction
5	Aguobu Owa	800	552	Agriculture
6*	Oji-River (Mamu)	361.8	300	Farming
7	Ugwuoba Forestry Reserve, Inyi Forestry Reserve, Akpugoeze forestry Reserve	4,618	1,110	Farming
8	Anambra	850	650	Construction
9	Ifite Amoli	50	40	Construction
10	Akwari Ani	220	50	Construction
11	Awlaw Isikwe Achi	415	25	Construction
12	Affa	150	70	Construction
13	Umuabi	1,166	20	Farming
14	Umabor 1&2	330	50	Farming
15	Akpugo	768	40	Farming
16	Agbogazi	848	20	Farming
Total		8428.4		

Table 4.3 Tree Species that have gone extinct

Mamu River	None
Akwari Ani	None

Table 4.4 Incidence of insect attacks

Mamu River	Nil
Akwari Ani	Nil

Table 4.5 Incidence of wild fire

Mamu River	Annually
Akwari Ani	Annually

Table 4.6 Percentage trees lost to wildfire

Mamu River	75%
Akwari-Ani	25%

Table 4.7 Law Enforcement and regulations

	Adequate %	Inadequate %
Mamu River	15	85
Akwari-Ani	20	80

Table 4.8 Village and community participation

	Involved %	Not Involved %
Village	0	100
Community	0	100

Table 4.9 Reforestation and Regeneration Programme

Mamu River	Natural Regeneration
Akwari-Ani	Natural Regeneration

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

The purpose of this final chapter is to present vividly the findings and give recommendations from the analysis carried out in chapter four of this work.

5.1.1 Proportion of Forest Reserve Currently Covered by Trees

Out of the total land area (47.90 ha) of Mamu-River forest reserve, 75.00% (35.925 ha) is presently covered by trees. This means that since its establishment in 1927, it has lost 11.975 ha of trees in 75 years. This gives an average loss of approximately 0.2 ha per annum. If this situation continues unchecked, Mamu-River forest reserve will last for only the next 180 years approximately. The situation is worse in Akwari-Ani forest reserve where only 25.00%, out of the initial 134.30 ha, are currently covered by trees. This means that as of today, only 33.575 ha of the initial forest reserve area are covered by trees. In other words, it has lost 100.725 ha of trees since its creation in 1974, with an average loss of 3.597 ha (approximately 4 ha) per annum. If this situation continues, the implication is that in the next 11-12yrs, years all the trees in Akwari-Ani forest reserve would be lost, if no reforestation takes place.

5.1.2 Proportion of Prime (Choice) and Minor Tree Species Remaining in Forest Reserve

On a happy note, the forest reserve managements of both Mamu-River and Akwari-Ani confirmed that none of the original tree species in these reserves is extinct. The prime tree species in Mamu-River forest reserve are *Gmelina spp*, *Tectona spp* and *Chlorophora excelsa*, while in Akwari-Ani they are *Gmelina spp*, and *Eucalyptus spp*. The minor tree species in Akwari-Ani is *Anacardium occidentale*, while in Mamu-River they are *Khaya spp* and *Eucalyptus spp*.

In Mamu-River forest reserve, the proportion of prime tree species remaining is estimated to be 50.00% of the original population, while that of Akwari-Ani is estimated to be 75.00% of the original population. Also, the proportion of minor tree species remaining in Mamu-River forest reserve is put at 50.00% of the original population, while the zonal forestry officer for Akwari-Ani could not estimate the current population of the minor tree species in this forest reserve.

Out of the 35.925 ha currently covered by trees in Mamu-River forest reserve, 50.00% (17.96 ha) are occupied by prime tree species. In Akwari-Ani also, 50.00% (16.79 ha) are occupied by prime tree species. Furthermore, the remaining 50.00% (17.96 ha) is occupied by minor tree species in Mamu-River

forest reserve, while 25.00% (8.39 ha) is occupied by minor tree species in Akwari-Ani forest reserve.

5.1.3 Experience of Insect Attack, Disease Infestation and Fire Damage

In both Mamu-River and Akwari-Ani forest reserves, there has never been any experience of insect attack on tree species. However, in Akwari-Ani 25.00% of *Gmelina spp* were lost due to the incidence of root knot, but in Mamu-River forest reserve there has not been any recorded case or experience of disease infestation.

On the other hand, wildfire is a major problem in both forest reserves. Even the forest guards/rangers assess the incidence of wildfire to be high. The source of this wildfire is usually illegal hunters. This problem is often experienced on yearly basis. In fact, 75.00% and 25.00% of tree species have been lost in Mamu-River and Akwari-Ani forest reserves respectively.

5.1.4 Forest Reserve Conversions and Volume of Forest Products Harvested

Majority (75.00%) of forest guards/rangers agree that the incidence of access to farmland within these forest reserves is high, while the remaining 25.00% say it is low. 25.00% (11.975 ha) of the total forest reserve area has been converted to farmland in Mamu-River forest reserve, while the proportion could not be

estimated in Akwari-Ani forest reserve. But, the zonal officers of both forest reserves confirmed that conversions could be up to 25.00% on annual basis for Mamu-River and minimal for Akwari-Ani. Equally, about 25.00% of total forest reserve area has been lost to infrastructure development (in terms of access roads) in Mamu-River forest reserve.

Besides, both zonal officers confirmed that the legal annual proportion of removal required for sustainability is 25.00%. But, in Mamu-River, the proportion harvested presently is 50.00% and 25.00% for Akwari-Ani. At this rate, the sustainability of Mamu-River forest reserve is in doubt. Then, if about 75.00% of forest cover has been lost in Akwari-Ani in the last 28 years, it means that even 25.00% annual removal may not be sustainable. Forest guards/rangers are of the view that adherence to sustained yield principle is low.

5.1.5 Enforcement of Laws/Regulations

The managements of both forest reserves were found to be unable to enforce properly the laws/rules/regulations guiding the utilization of forest reserve resources. The obstacles militating against the enforcement of rules/laws include lack of enough manpower, inadequate funding and inadequate logistics.

5.1.6 Availability of Management Plan and Up-to-date Inventory

In Mamu-River forest reserve, no management plan has been developed. But there is a claim of availability of a management plan in Akwari-Ani. Though the

date of development of such a plan could not be given, 25.00% of the forest reserve is claimed to be under completed management plan. Moreover, up-to-date inventory of forest reserve resources is not available in Akwari-Ani forest reserve. The reverse is the case in Mamu-River forest reserve where it is claimed to be available even though the researcher was not obliged the request to see it.

5.1.7 Village/Community Participation and Conflicts

Just as confirmed by the households, the zonal forestry officers of both forest reserves say that villages/communities are not involved in the management and decision-making concerning the forest reserves. Also, all the forest guards/rangers interviewed confirmed this fact. Actually, they insinuate that this may be one of the underlining factors that breed conflicts once in a while.

The forestry zonal officers of both forest reserves confirmed that these reserves have experienced the incidence of conflict(s) sometime in the past. They attributed this conflict(s) to the opposition of the local village/community to forest reserve laws/regulations and, most of the time, the inability of the government to pay royalties to these villages/communities. This situation is not favorable at all for sustainability of these forest reserves.

5.1.8 Reforestation Programme

Apart from natural regeneration of trees and deployment of forest reserve rangers, no other practical action has been taken by the government over the years to ensure genetic conservation of commercial or endangered tree species. In fact, researches that may aim at developing, for instance, tree species that can take little or less time to mature and can give yield of higher quality is not in the know.

On the other hand, the forestry zonal officers claim that they have successfully regenerated naturally and artificially some portions of the forest reserves. 25.00% and another 25.00% have been naturally and artificially regenerated respectively in Mamu-River forest reserve. In Akwari-Ani forest reserve, the zonal forestry officer could not estimate proportion naturally regenerated. However, he claims they have successfully artificially regenerated 25.00% of the forest reserve. About 75.00% of the forest guards/rangers can confirm awareness of a reforestation programme in these forest reserves.

But, even though 50.00% of forest guards/rangers say they are aware and have been involved in reforestation programmes in these forest reserves, another 50.00% of them claim the opposite view. This situation may raise doubts about the so-called reforestation programmes that have been embarked upon in these

forest reserves. In fact, the impact of such reforestation programme in terms of execution and success may be questionable

5.1.9 Annual Forest Reserve Budget

The state zonal forestry officers rated the average annual forest sector share of the State's total annual budget as insufficiently insignificant. This problem was confirmed as the most single factor responsible for most of the challenges facing forest reserves.

5.2 Summary

Having analyzed the data sourced through the distribution of questionnaires as contained in chapter four, the study observed that the forest managers as an expert in Land ,Land resources development and management had in the past been neglected in playing some role toward effective management of forest resources in Enugu State in particular and Nigeria in general. Here, the problem of non-effective as well as economically and environmentally sound forest management calls for experts to strike a balance between the sustainable production of goods and services from forested areas.

Also, the unavailability of fund to carryout actions/plans on sustainable forest management has been a cog in the wheel of smooth administration of the forest.

The study observed that almost the forest reserves in Enugu state are in State of

neglect and poorly maintained. From the analysis carried out, it was observed that strategic forest management planning is veritable tool for achieving effective management of forest resources which Forest Managers must be one of the key-stakeholders.

5.3 Conclusion

It is common knowledge in Enugu and Nigeria that the forest resources base in the country is quickly shrinking and the remaining forests are being degraded by excessive exploitative pressures and improper management practices. It attests to the fact that the demand for timber resources is greater than the supply.

Forest management demands consideration of both financial and non-financial factor. A non-financial factor which involves the stake-holders such as forest manager etc is the experts that will implement all those plans in action to attain sustainable development. Although forest practice was concentrated on the growing of trees and management of forests for production of timber and poles, the situation has now changed. It is realized that forests can be of much more use than its direct products. Management of forests this time around makes provision for the utilization of forests to achieve such objectives as stabilization of climates, water and cleaning, flood and erosion control.

Subsequently, with the recent trend of industrializations in the country coupled with the fast diminishing mineral oil and other resources on which the nation depends, the need has therefore arisen for an effective management of the forest resources in Enugu and to start exploitation of other areas through which industrial proposals could be met.

Finally, unless measures are taken immediately to counteract the current trends in Enugu and Nigeria as a whole, we will continue to experience a decline in the forest resource base and can expect to experience critical resources (timber in particular) shortages in the future.

5.4 Recommendations

The following recommendations are made based on the findings of this study.

1. A detailed survey of Nigerian forests is necessary to find out the extent of other resources of economic importance apart from timber. This should be carried out jointly by Federal and State forestry department.
2. The administration of the forestry department should be strengthened and more professionally trained staff should be recruited.
3. The adoption of community management approach for effective forest governance.

4. Revisiting of Land Use Act, it is imperative to design alternative means of acquiring land by the government without necessarily eroding the traditional ownership in land.
5. Recommends community management approach which pressurises the symbiotic relationship between government and the community people within a defined institutions and technical frame work.
6. The technical environment should provide the tools and knowledge which define how forest resources would be used as factor of production. The institutional environment should define who constitute the resources and how the technique would be applied.

In this, the process of forest perseverance would involve both the government and the people in planning utilization and management of forest resources. It should be pointed out that forest management is best coordinated at local level. Hence forest management program should be decentralized at local government level. The state should commit both financial and technical resources to such local government for effective operation. Forest management committee should be constituted and this should comprise forest officials, politicians, community leaders and representatives of all occupational groups (forest resources-users).

Recognition of all occupational groups that exist within each local government area is one of the important steps to be taken. Such groups include lumberers,

farmers etc. Leaders of these groups should be part of forest management committee. The first task before the committee is to share views and values of three major groups which include government representatives, landowners and resource users. Among the issues to be discussed are the importance of forest to all interest groups implication of forest depletion, the contribution of each group towards resources generation and afforestation and task and responsibilities that each group should carry out for the effective governance. The group representative would then pass decisions to their members and each group would have to use different methods (agreed among its members) in accomplishing tasks assigned to it.

The goal of the committee would be to decide on three main issues and they are;

- Area of forest forbidden to enter (reserved area) for a certain period (25-30 yrs).
- Area earmarked for cultivation for a certain period of years e.g. (25-30yrs).
- Areas of forest designated for hunting, lumbering, fishing etc for a period of time (25-30yrs). The reason for suggesting this period of years is because most of the cash crops like cocoa, kola nut etc have their gestation period within the range. After this period, most if not all would stop yielding fruits and may die off. At the same time, this period is also considered long enough for natural regeneration of forest.

After this expiration of the first period of 25-30yrs, cultivated land should be opened for cultivation and lumbering. The rotation will continue and by so

doing, it is hoped that the interest of all the groups would be taken care of. More importantly, measures to reduce the rate of deforestation in Nigeria should include acceleration of economic growth and income particularly in the rural areas, the integration of forestry with agriculture through agro forestry, improvement of farming systems with more capital inputs and education of the public on importance of preserving forest value. It is believed that if these suggestions are taken into consideration, a responsive policy in forest management practice would emerge and a shared community of understanding among stakeholders necessary for good governance would lay their foundation for subsistence forest management in Nigeria.

Finally, in Enugu State, realizing the importance of forestry development, the State government should provide adequate funds at all times and on time too for the realization of the states forest policy objectives. In Nigeria, general policy development should be addressed to develop appropriate policies governing the forest resources base forest management and the forest industry within the States, set the framework within which each of the states can develop state specific forest polices. They should set specific goals and objectives for nationwide forest resources estate. In accordance with the national goals and objectives, the forested estate must be zoned and designed for specific land practices i.e. National parks game reserves, zoning of these lands concerns conservation, limited non-destructive resources (NTFP) extraction, tourism,

research. Promotion for the establishment of Forestry Trust Fund in all states. Consequently, raw wood resources demands currently exceed supply in Nigeria placing heavy exploitation pressures in the forest resources base, particularly natural forest which calls for extra activity and plan for reforestation/afforestation. Other areas of activities that need to be looked into and planned for are Training and Educating the staff and general public, site specific planning and plan implementation which must be prepared by the stakeholder committee, monitoring of all the programme, more active in research to improve forest management. Practices, Forest Estate demarcation and protection must be addressed and acted upon to eliminate confusion over their location, thereby minimizing any encroachment by farmers, illegal felling and hunting.

These identified issues must be addressed and acted upon in order to achieve sustainable forest management. Forest reserves in Enugu State have been mined for too long without any visible signs of rehabilitation. These forest reserves need rehabilitation. Forest reserve resources are important to the society (government, concessionaires and the local communities). From the discussions so far, it should be easy to deduce that forest reserves in Enugu State suffer from government's apathy to resource management and conservation. There is the need for improved policy and legislative framework on forests, if the government hopes to reverse the current average forest reserve

tree loss of 2.01 ha per annum. This situation, in fact, reflects the view that forest policies in Nigeria as a whole are outdated and rarely fits into today's resource management needs. Specific changes and improvements should be geared towards local (community) participation in forest conservation and management; logistics, manpower and resources for forest reserve management; and support for reforestation and tree regeneration efforts. These sustainability-threatening signals should be taken serious if we must not lose all our forest reserves.

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APPENDIX 1
DEPARTMENT OF GEOGRAPHY
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.

QUESTIONNAIRE ON ANALYSIS OF FOREST MANAGEMENT PRACTICE IN NIGERIA, MAMU FOREST RESERVE IN ENUGU STATE .

1. Do you know of any reserve located in Enugu State/
Yes No
2. If yes, please mention them
3. Have you ever been involved in forest resources management?
Yes No
4. If yes, please mention the affected forest (s)
.....
5. List the forest resources that is known to you
.....
6. Do you agree that lack of finance is the main problem militating against the initiation of sustainable forest management for improved productivity? Yes No
7. Do you think that there is any benefit derivable from forest resources?
Yes No
8. Do you think that effective management of forestry resources can be achieved through strategic forest management planning?
Strongly Agree Agree Fairly Agree Dsiagree
9. Do you think forest resources in Enugu State are well managed?
Yes No
10. If No, what do you think should be done to better the situation.....
11. What do you think Enugu State stands to benefit from effective management of its forest resources?
12. What sanction(s) do you recommend for willful damage or abuse of forestry resources?
13. What is your impression for the future of the forest industry in Nigeria generally and Enugu State particular Bright Bleak Doubtful
14. Do you think there is general awareness on the value of Forest resources to the economic development of the country?
Yes No

15. Do you agree with the impression that the foresters have some significant role to play in forest resources management? Strongly Agree

Agree

Fairly Agree

Disagree

16. If they have any role to play from the above, what are they?

.....

17. Any other necessary comment