Forestry Outlook Studies in Africa (FOSA)

NIGERIA
MINISTRY OF NATURAL RESOURCES
AND TOURISM

Please note that the views expressed in this paper reflect those of the authors and should not be attributed to any of the institutions.

This paper has been minimally edited for clarity and style.

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SUMMARY
A Brief on the Forestry Outlook Study

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MICRO-ENVIRONMENTAL FORCES

Forest Management
Forest reserves (The Federal vs. The States): The Forest Act (1937) gave each Governor or Local Government Authority, the authority to constitute its own forest reserves. De-reservation instead is frequent. The management and control of forest reserves is thus vested in the State Governments. The Federal Department of Forestry has only monitoring functions and holds no executive authority in the management of forest reserves and other forest lands. The overall control in the reserves is consequently not effective.

Forest degradation/depletion
The forest estate of Nigeria has been very highly depleted. Illegal felling of logs remains a serious problem (insecurity of tenure of concessions). It was estimated that under the current exploitation trend, the natural forest could get completely depleted between 2004 and 2005 especially if the projected demand was to be satisfied.

Wildlife management: The main problems facing wildlife conservation in Nigeria include poaching, over exploitation, lack of accurate data, bush burning that destroys wildlife habitat. There is inadequate reliable database to facilitate forestry planning and development.

Weak Forest Policy and Implementation
Forest tariffs are relatively low and are not revised frequently. Penalties under most laws are low and seldom enforced.

Proliferation of agencies and lack of intra/inter-sector coordination: Overlapping responsibilities of the Federal and State Government, Local Councils and the various multi-purpose parastatals for forest resources. There are also several Non-Governmental Organisations (NGOs) that contribute to the elaboration of the general land use plan and the sustainable management of forestry resources. Amongst some of the notable ones are Nigerian Conservation Foundation (NCF), NEST, NRCC, etc.

Poor Funding of the Forestry Sector
Funding: Poor State and Federal funding of forestry programmes, including forest management and forestry research.

1 FOSA website available at: http://www.fao.org/forestry/FON/FONS/outlook/Africa/AFRhom-e.stm
Forest Industry
There is a critical shortage of raw material for the industry. Plantation wood will become more important as the large diameter trees become increasingly scarce. But the industry lacks the capacity to process small diameter logs from forest plantations.

MACRO-ENVIRONMENTAL FORCES

Land Tenure
Land use is un-coordinated. The Land Use Decree No. 6 of 1978 vests all land in each state of Nigeria in the Governor of the State. The impact is mixed and abuses have been reported.

Energy
Fuel wood and charcoal account for about 50% of the national primary energy consumption. The per capita consumption of fuel wood in the rural and the urban areas are estimated at 393 kg/annum 256 kg/per annum respectively. It is calculated that about 90% of the rural households in Southern Nigeria and up to 98% in the Northern Nigeria depend on fuel wood as their source of domestic energy. There are serious problems with electricity generation with a crippling effect on industrial production.

Deforestation
This is considered to be very critical and the main threat to the forest resource base.

- Agriculture/forest interface: There have been encroachments on as well as excisions and outright de-reservations of the forest estate. The government’s policy of food security and poverty alleviation puts pressure on the forest resource base due to the increased quest for agricultural land that is implied. These problems are further compounded by natural disasters such as drought (especially in the north) and flooding, forest fires due to bush burning, extensive arable farming, over grazing of forestlands and water management.

- Infrastructure development: It has been observed that the greatest impact of infrastructure development on deforestation in connection with the Construction sector followed by the Housing sector.

Economic factors
Economy is highly dependent on petroleum exports. It is also import dependent and the inflation rate is high. The continuous depreciation of the Naira presents grave problems for the economy.

The wealth of the country is mainly concentrated in the South-South while the North is relatively poverty-stricken but with a great potential for agriculture. Poverty at the rural levels is high and wages are low at the urban centres.

Demographic factors
Population is large without the commensurate investment to absorb the teeming population into gainful employment. The pressure on the land in particular and the environment in general is consequently high as a result.

Social factors
There has been long period of neglect of minority groups. Hence labour and social unrest have become serious issues. Unemployment rate is high. Corruption is a bane of economic development and progress. High crime rate and general insecurity to life, property and investment still poses grave problems. There is, however, high level of literacy.
**SCENARIO DEVELOPMENT**

Four scenarios were proposed. The first is a trend scenario while the other three are of the normative types. Their headings and characteristics of the scenarios are as follows:

- **Scenario 1 (Business as usual by 2020):** This is an extrapolation of the present situation.
- **Scenario 2 (Social conflict resolution and poverty alleviation):** This literally describes the current situation with a listing of conditions to ensure welfare or “Conflict Resolution and Poverty Alleviation”.
- **Scenario 3 (Complete diversification of the economy by 2020):** This is presented as a listing of the necessary events to encourage foreign and private sector investment in the economy including the divestiture of certain utilities. Deforestation is assumed to continue unabated. It appears that complete divestiture of the economy is not possible as the title of the scenario may imply. For instance increase investment in education/health and reduction in crime wave are advocated. It is not certain that the private sector can take over all of these.
- **Scenario 4 (Complete privatisation by 2020):** This scenario appears to be a variation of scenario 3. The feasibility/plausibility of this scenario as the heading suggests is doubtful. Even if it could, one does not see the how in a situation of the indicated high inflation, labour unrest as well as weak technological and infrastructure bases.
- **Scenario 5 (Scenario 5: full fledged developed Nigerian economy by 2020):** This is an utopian scenario that include the visions in scenarios 3 and 4. It is a combination of increased welfare delivery and economic development and improvements.

The general pattern in the construction of the scenarios in this country paper is that the general economy is given a high profile in the body of the scenario narrative. With the exception of scenario 5 where investment in natural resources development and management was indicated, the other four scenarios assumed a continuation of deforestation. The “strong/weak signals” part of the scenario was where issues related to forestry were dealt with.

It appears that the FP misunderstood the strong signals to mean the assessment of the implications of the scenarios. What a weak signal is was also not clear to him. As he puts it in the country report “it appears your strong/weak signals are proposal of what is required to minimise the effects or ensure the achievement of the envisaged scenario”.

What is also missing in the development of the scenarios is a logical sequence of events between today and the advent of the vision that has been identified for the year 2020. Events have been indicated in the scenarios with respect to the achievement of the visions but the FP does neither state how these events could take place nor justify them. There is just as much need to explain why a trend may continue as there is to explain why one thinks that it may not.

In the conclusion of the report, the FP lists a number issues that may affect or upset the explanation of the alternative futures proposed. These include:

- Level of potential investments;
- Degree of planning and management of conflict applied to the overall economy;
- Government policies that are still largely conflicting;
- Research and development in natural resources.
1. INTRODUCTION

1.1. Objective

Forestry Outlook Study for Africa (FOSA) is an initiative led by FAO and carried out in partnership with all African nations, the African Development Bank, the European Commission, regional and sub-regional inter-governmental organisations, the World Bank and others.

It is a process for analysing the future potential of the forestry sector to contribute to the well being of African citizens through its economic, social and environmental functions. FOSA will analyse the status, trends and driving forces shaping African Forestry, provide a region-wide vision of the sector to the year 2020 and identify policies, programmes and investment options that will help move the sector forward.

The components of FOSA include:

- **Thematic Studies**: Consultants in the sub-regions to cover both the humid and dry forest zones will carry out a series of thematic studies. These thematic studies will rely heavily on information from the various countries that constitute the sub-region and will form the bases of the regional report.

- **Country Outlook Paper**: Each country is expected to produce a country outlook paper by September, 2000. This paper will be a critical input into the regional outlook study. Like the regional Outlook Study the Country Paper will analyse the status, trends and driving forces shaping forestry in the country. The basic principle should involve an inter-sectoral/inter-disciplinary approach involving all stake-holders and should be process oriented and country driven.

This paper, the Nigerian Forestry Outlook Study was prepared by the Focal Point, Dr. R.O. Aruofor (Chief Forest Officer) and has been reviewed by the Senior Management Committee of the Federal Department of Forestry, headed by the Director of Forestry Mr. Z. O. Adesiyan.

1.2. Background

The Federal Republic of Nigeria occupies a total area of 923,768 km\(^2\) between latitudes 4\(^\circ\)15'N (the Southern tip of the Niger delta on the Atlantic Ocean) and 13\(^\circ\)55’N (the North-Western frontier with Niger) and between longitudes 2\(^\circ\)45’E (the Southern frontier with Benin) and 14\(^\circ\)40’E (the Northern frontier with Cameroon).

Most of Nigeria has a tropical climate with warm temperatures throughout the year. The North is generally hotter and drier than the South. The average annual temperature in the north is about 29°C, (daily temperatures may rise above 38°C). The average annual temperature in the South is about 27°C.

Precipitation is greatest in the South. The coastal areas average about 3800 mm per year, while parts of the north receive only about 650mm. The rainy season lasts from April to October in most parts of Nigeria, though the duration may be longer in the South.

Nigeria supports a wide range of vegetation, which is determined by climate, in particular by the rainfall, and the severity of the dry season. Farming, fires and soil also profoundly affect it. Basically, the vegetation is comprised of:
• The Forest zone (mangrove forest and coastal vegetation, freshwater swamp forest, and lowland rain forest), occupying a belt of 50 to 250 km wide along the coast corresponding to rainfall generally higher than 1600 mm, exceeding 2500 mm in the delta and along the eastern coast;
• The derived Savannah zone with a rainfall 1150 to 1500 mm and a dry season of some 3 month, bordering the forest zone in the north.
• The semi-deciduous Guinea Savannah zones including:
  • The Southern Guinea zone (1150 to 1500 mm, 4 to 5 months dry season);
  • The Northern Guinea zone (1000 to 1250 mm, 5 to 6 months dry seasons);
  • The Sudan zone (500 to 1500 mm, 5 to 7 months dry season); and
  • The dry Sahel zone (250 to 500 mm, 7 to 8 months dry season).

Nigeria is Africa’s largest wood producer with an annual harvest estimated in 1998, of more than 100 million cubic meters. In order to prevent the total depletion of Nigeria’s forest resources, the Government of Nigeria has set aside 96,000 km$^2$ of forest, about 10% of Nigeria’s total land area as forest reserves. Of these reserves which are held in trust for the Local communities by the state Governments, about 76,000 km$^2$ i.e. 75% are located in the Savannah zone and 20,000 km$^2$ i.e. 25%, in the High Forest zone. The Savannah forests produce fuel-wood and poles mainly and contribute very little to the supply of saw logs which is solely produced by the High Forest zone.

Nigeria used to be a major exporter of timber resources with industrial round wood export in 1964 at 781,200 m$^3$ and a corresponding value of US$ 36.10 million. This dropped to 26,900 m$^3$ in 1976. This declining performance of the Forest Sector and the observed expansion of domestic production eventually signalled the need to curtail export and led to a ban on export of wood and wood products in 1976.

At present Nigeria does not export wood and wood products due to high supply and demand gap being experienced at home. The Timber Export Promotion Decree No 1 of 1998 prohibits the export of timber (whether processed or not) and wood in the rough form, excluding furniture, furniture components and species of Gmelina arborea in any form.

The picture as experienced in 1976 has not improved and the vegetation had continued to deteriorate. Today, Nigeria is not only a net importer of wood, but the situation of the forest estate and the environment is very precarious, as can be inferred below.

The present state of the Nigerian environment may be summarized as follows:
• The forest estate which is only about 10 million hectares (10% of total land area of Nigeria) is declining at a rate of 3.5% annually due to encroachments, excisions and outright de-reservations. The Forestry component of the National Agricultural policy prescribes an increase from its present level of 10% of total land area to 20% but this has been elusive.
• It is estimated that the Sahara desert is encroaching southwards at a rate of about 1 km per year.
• The most important factor contributing to environmental degradation of the country is our un-coordinated land use policy.
• It is evident that forests are being displaced and depleted by other forms of land-use such as agriculture, grazing and water management leading to formation of deserts, bare surfaces and general environmental degradation.
• Land under agricultural cultivation is increasing at an average rate of 554,657 ha per annum while land under high forest is diminishing at a rate of 105,865 hectares per annum. This land use pattern is exacerbated by drought, forest fires, overgrazing and flooding which lead to severe environmental degradation, loss of biodiversity, diminished forest productivity etc.

2. PRESENT STATUS OF THE FORESTRY SECTOR OF NIGERIA

A recent forest resources study carried out by the Federal Department of Forestry, revealed that the forest estate of Nigeria has been very highly depleted. It was estimated that only about 974,674 hectares of the forest reserves is productive while another 2,342,147 hectares of free areas is partially productive.

The total growing stock in terms of timber volumes is as shown in Table 1.

Table 1. High forest gross timber volumes, excluding bark by forest designation and forest types

<table>
<thead>
<tr>
<th>Forest Land Designation</th>
<th>Forest Type</th>
<th>Area (ha)</th>
<th>Gross Volume (m³)</th>
</tr>
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<tr>
<td>Forest Reserve</td>
<td>Lowland Rainforest</td>
<td>788,053</td>
<td>140,682,489.73</td>
</tr>
<tr>
<td></td>
<td>Freshwater swamp</td>
<td>186,621</td>
<td>24,397,003.35</td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td>974,674</td>
<td>165,079,493.08</td>
</tr>
<tr>
<td>Free Area</td>
<td>Lowland Rain Forest</td>
<td>905,930</td>
<td>120,742,644.93</td>
</tr>
<tr>
<td></td>
<td>Freshwater swamp</td>
<td>1,424,995</td>
<td>187,474,508.28</td>
</tr>
<tr>
<td></td>
<td>Mangrove Forest</td>
<td>948,430</td>
<td>212,613.14</td>
</tr>
<tr>
<td></td>
<td>Sub Total</td>
<td>2,342,147</td>
<td>308,429,366.35</td>
</tr>
<tr>
<td>Sum total</td>
<td>Gross Total</td>
<td>3,316,821</td>
<td>473,509,259.43</td>
</tr>
</tbody>
</table>

*Source FDF (1988): Forest Resources Study, Nigeria*

In view of this dismal trend in the forest resources of the country, the need to manage the forests of Nigeria on a sustained yield basis has never been more felt in recent times. The growth rate of the natural forest is quite low; about 1 to 1.5 m³ of round wood per hectare per annum and this is a serious constraint. Afforestation in the past has not responded with the required vigour as the area under forest plantations of all types by 1998 was only 184,611 hectares with a growing stock of 78,600,160 m³.

2.1. Forest Industries of Nigeria

The Nigerian Forests supports a wide range of forest industries, which include both the formal and informal sub-sectors. A vast majority of the Nigerian populace depend on these industries thus placing a lot of pressure on the forest resources of the nation. The formal sector is essentially wood based and is fairly well developed and comprise mechanical wood industries, including sawmills, veneer and plywood manufactures, particle board, paper and paper board manufactures. Furniture manufacturing is also carried out at a secondary level.
The informal forest sector comprises an informal wood based sector which is the country’s largest user of wood, (most of which are burnt as fuel) and the non wood forest products sector. Forest industry is essentially controlled by the private sector in Nigeria.

2.1.1. Industrial Round wood

Round wood production in Nigeria comes mostly from the natural high forest zone of the country, in particular from the Southern states of Cross River, Edo, Ogun, Ondo and Oyo states of Nigeria. Round wood is no longer exported from Nigeria since this has been placed on ban since 1976. Round wood includes industrial round wood, fuel wood and poles. Harvesting of industrial woods is carried out by mill operators, by independent registered loggers and by poachers. The mill operators are generally awarded five or twenty year concessions by the States and they either operate directly or subcontract to independent loggers. Illegal felling of logs remains a serious problem. The States are the custodians of the forest reserves and records of exploitation are not faithfully kept which makes sustainable management pretty difficult. Generally all round wood produced in Nigeria by 1997 is estimated at 117.694 million m$^3$ (Aruofor, 2000).

There is a general shortage of round wood and face veneers. The recent forest resource study puts the volume of industrial wood in 1998 at 268.7 million m$^3$ for all forest types. The continued and sustained levels of round wood consumption in Nigeria is indeed a threat to the forest estate and a source of deforestation which is now a serious problem. This also stresses the need to embark on an aggressive afforestation programme.

2.1.2. Sawn wood

Sawn wood is produced by sawmills in Nigeria whose capacity is estimated at 11,684,000 m$^3$ per year in log equivalent (Alviar, 1980). The estimated capacity and production in 1993 is shown in Table 2.

Table 2. Sawmills estimated capacity and production in 1993

<table>
<thead>
<tr>
<th>TYPE</th>
<th>NUMBER</th>
<th>CAPACITY (m$^3$)</th>
<th>PRODUCTION (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDs &amp; Carriages</td>
<td>1,600</td>
<td>5,500,000</td>
<td>2,531,000</td>
</tr>
<tr>
<td>Portables</td>
<td>100</td>
<td>57,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Pit Sawing</td>
<td>1,000</td>
<td>285,000</td>
<td>150,000</td>
</tr>
<tr>
<td>Total</td>
<td>2,700</td>
<td>5,842,000</td>
<td>2,711,000</td>
</tr>
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</table>

Source: FDF(1988) Forest Resource Study

The industry has a few large integrated mills among which are the African Timber and Plywood Ltd. Sapele, Piedmont at Ologbo, Premier Timber Industry Akure, Seromwood Industry Calabar, Iyayi Brothers, Benin City and others.

Most of the sawmills have been fully depreciated and are suffering from obsolescence. The estimated total output of sawnwood by 1997 was 2,000,000 m$^3$ (Aruofor, 2000). Most of the production occurs in the coastal states and Cross River state. The major challenge facing the industry is that it lacks the capacity to process small diameter logs from forest plantations. Plantation wood will become more important as the large diameter trees become increasingly scarce. At present, the recovery rate of the sawmills is put at less than 53%. The major immediate problems facing the sawmill industry include:

- Old equipment and severe shortage of spare parts
- Frequent disruption of electricity supply
- A timber supply declining in volume, size of logs and quality
• Illegal felling and insecurity of tenure with respect to timber concession.

It should be noted that even though production is declining, it remains still substantial and thus a source of deforestation.

2.1.3. Wood Based Panels
There are eight veneer and plywood plants in the country using approximately 170,000 m$^3$ of logs per annum. Veneer slicing operations are all integrated within plywood mills. Plywood requirements for the country were estimated at 179,000 m$^3$ in 1990 and this was expected to increase to 285,000 m$^3$ in 2000 and 450,000 m$^3$ in 2010 (Gen. Wood, 1994). At the same time wood availability is expected to decrease from 170,000 m$^3$ in 1990 to an expected 119,000 m$^3$ in 2010. It is evident that demand for veneer logs outstrips supply. The total capacity of eight mills is 126,000 m$^3$/year and capacity utilization by 1993 was 57.3%. Production in 1992 was 111,7400 m$^3$ and this has dropped to about 94,625 m$^3$ by 1997 (Aruofor, 2000). Veneer mills are already experiencing difficulties in acquiring log supplies.

2.1.4. Particle Board
Particle board requirements for the country are estimated at 108,000 m$^3$ in 1990, 199,000 m$^3$ in 2000 (Gen. Wood 1994). Existing capacity is estimated at 70,000 m$^3$ comprising four mills. Production in 1993 was approximately 39,500 m$^3$ which is 44% of capacity utilization. Production had remained about 39,500 m$^3$ in 1997. Current production is hampered by high cost of foreign exchange for new equipment, spare parts and glue acquisition. The particle board production lines in Nigeria are integrated with sawmills and plywood mills, the residues of which they recycle.

2.1.5. Pulp and Paper
These products have been the largest traditional forest products import in Nigeria. In the peak years of 1980 – 81, over 160,000 M.T. were imported which represented nearly 95% of total consumption of printing and writing papers as well as kraft paper and board at that time. Today importation is still relatively as high as 45,000 M.T. of printing and writing paper alone was imported into the country in 1994 (Aruofor, 2000). The two pulp and paper mills operating in Nigeria are the Nigerian Paper Mill Limited (NPM) at Jebba with a pulp capacity of 32,000 M.T./year and a paper production capacity of 70,000 M.T./year, and the Nigerian Newsprint Manufacturing Company (NNMC) at Oku Iboku. This mill has a pulp capacity of 70,000 M.T./year and a newsprint capacity of 100,000 M.T./year. However, a third mill, Nigerian National Paper Manufacturing Company with a capacity of 100,000 M.T./year of pulp and writing paper is only partially completed and barely operating on imported pulp. In 1990 the total domestic production of paper was 43,498 M.T. which declined to barely 5,314 tons in 1993 due to long fibre shortages which constrained domestic production. There are in addition eight operative small size tissue-paper mills with a capacity of around 40 M.T./day. The total existing paper capacity in the country is estimated at 50,000 M.T./year for both newsprint and printing and writing paper and 70,000 M.T./year for other papers.
2.2. Other forestry products

2.2.1. Fuel wood and Charcoal

The predominantly rural population depends mainly on fuel wood to meet basic energy needs for cooking and heating. Recent studies revealed that Nigeria produces about 1 million tons of charcoal annually of which 80% is consumed in the cities (FDF, 1986). **Fuel wood and charcoal account for about 50% of the national primary energy consumption.** Fuel wood is demanded by both household and industrial sectors in all ecological zones of the country. It is estimated that about 90% of the rural households in Southern Nigeria and up-to 98% in the Northern Nigeria depend on fuel wood as their source of domestic energy. Industrial uses include those by institutions, food and craft industries. Fuel wood is very important in local restaurant, bakeries, local breweries, pottery, blacksmith and burnt brick factories. Institutions such as hospitals, prisons and schools also demand fuel wood for cooking. The per capita consumption of fuel wood in rural area is 393.43 kg/annum while the urban households consume 255.75 kg/ annum.

2.2.2. Non Timber Products:

These are all other material other than round wood and derived sawn timber, wood chips, wood-based panels and pulp, that may be extracted from forest ecosystems and are utilized within household or are marketed or have social, religious and cultural significance. The list of non timber forest products in Nigeria is inexhaustible and include such broad classes as leaves, fruits, barks, nuts, resins, honey, mushrooms, wildlife, cane, chewing sticks, medicinal plants to mention a few. The collection, processing and marketing of these products is realised informally by members of the family in various communities. They constitute a major source of household income in Nigeria. **Studies carried out by the Federal Department of Forestry revealed that the estimated annual income accruing to these products is about N 177.63 billion on a conservative note.** The department of Forestry is placing emphasis on non-timber forestry products as part of a national campaign to mobilize the public. Such programmes include Rural and Communal Forestry, Bee Keeping, Indigenous Forest Fruit trees Production, Fruit Orchards establishments and wildlife multiplication and domestication.

2.2.3. Wildlife and Tourism

The wildlife of Nigeria is particularly varied because of the country’s location, size and the ecological zones. The lowland Rain Forest Ecological Zone is the richest zone in Nigeria in terms of biodiversity and the most valuable forest resources (FDF, 1998). There are about 129 large mammal species in the rainforest and include African Elephants (*Loxodonta africana*), African buffalo (*Syncerus caffer*) and hippopotamus (*Hippopotamus amphibius*). Other large species include the large duikers (for example, *cephabphus nigger*) the Chimpanzee (*Pan troglodytes*), and the red river-hog (*Potamachorhus porcus*). In the savannas, they include the hartebeest (*Alcephalus buselaphus*) and warthog (*Phacochoerus aethiopicus*). In areas of derived savannah, forest species such as elephants and chimpanzees may be observed foraging on food crops adjacent to the forest. There are also a wide variety of small mammals including the grass cutter (*Thryonomys swinderiannus*), giant rats (*Cricetomys spp.*), tree squirrels (*Funisciurus spp.*) and a range of primates. Indeed there are 123 species in the Guinea savannas while 35 species of bats, 23 species of rodents and 20 species of carnivores among others are represented in the country. The lowland rain forest zone also provides habitat for about 200 species of birds. The effect of population pressures on these wildlife is
very profound as they are indiscriminately hunted for food and trophy. Over 22 species are on the endangered list of animals in Nigeria.

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

<table>
<thead>
<tr>
<th>National Park</th>
<th>Area (ha)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chad Basin</td>
<td>45,696</td>
<td>1991</td>
</tr>
<tr>
<td>Cross River</td>
<td>422,688</td>
<td>1991</td>
</tr>
<tr>
<td>Gashaka/Gumti</td>
<td>636,300</td>
<td>1991</td>
</tr>
<tr>
<td>Kainji Lake</td>
<td>534,082</td>
<td>1975</td>
</tr>
<tr>
<td>Old Oyo</td>
<td>251,230</td>
<td>1991</td>
</tr>
<tr>
<td>Yankari</td>
<td>224,400</td>
<td>1991</td>
</tr>
<tr>
<td>Kamuku</td>
<td>112,700</td>
<td>1999</td>
</tr>
<tr>
<td>Okomu</td>
<td>11,200</td>
<td>1999</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,238,296</strong></td>
<td></td>
</tr>
</tbody>
</table>

Thus the Local Governments in Nigeria are responsible for the administration of Communal Forest Areas (CFA), the State Governments control and manage Forest Reserves, Game Reserves and Game Sanctuaries. The Federal Government under the exclusive legislation list is responsible for the control, protection and management of National Parks. There are about 1,129 forest reserves, 29 game reserves and 4 game sanctuaries and 8 National Parks.

2.3. Forestry policy, legislation and institutions

2.3.1. Institutional Structure

The Federal Ministry of Agriculture and Natural Resources (FMA & NR) had hitherto played a very important role in land use planning and forestry development through the Federal Department of Forestry which was one of its departments until recently. The Federal Ministry of Environment (FME) has been created and the Federal Department of Forestry has now been transferred to this new Ministry as a Presidential directive. Under the present arrangement, the FME operates through several Departments whose activities are coordinated at the National Council on Environment (NCE). The National Council on Environment (NCE) is the highest environmental policy formulating organ in the country and is chaired by the Honourable Minister of Environment. At Forestry level however, the National Forestry Development Committee (NFDC) is the highest organ and is responsible for policy initiation and co-ordination in the forestry sector of Nigeria. The membership comprises the Federal Director of Forestry who is the Chairman, the State Directors of Forestry and Heads of Research Organisations in both Governments and Universities with Forestry Departments. The Forestry Association of Nigeria (FAN) is the forum where forestry professionals and practitioner both in the public and private sector all over the country meet yearly to discuss forestry issues. It must be noted that under the current dispensation separate department exist in the ministry of Environment for conservation as well as drought and desertification control.

2.3.2. The Federal Department Of Forestry

The Federal Department of Forestry (FDF) was created in 1970 and co-ordinates forestry activities throughout the country. Its functions are to initiate and to formulate national forest
policy and land use planning, foster forestry and environmental development, promote and fund projects of national interest, co-ordinate and monitor State Forestry activities of Federal – foreign-funded projects and institutional development. Specifically, the main functions of FDF include:

- Advising the Federal Government on forestry development as well as liaising with the States’ forestry services of the country.
- Ensuring the application of sound and efficient management of the forest for sustainable production of goods and services throughout the country.
- Co-ordination of all matters pertaining to conservation, protection, utilisation and renewal of the forest resources of Nigeria.
- Co-ordinating Nigerian collaboration with International Organisations.
- Disseminating technical and professional information and organising national and international technical assistance.
- Directing the formulation of National Forestry Policy.
- Promoting and enhancing the development of forestry management capability.
- Providing extension and advisory services to the States for the improvement and promotion of forestry ideals.
- Assisting to monitor, evaluate and appraise forestry projects throughout the country.

The Department has 3 tiers of administration, at the Headquarters, Zonal Office and State-based Field Office level. In order to facilitate the execution of the programmes of the Department as enunciated in the National Forestry Policy, the Department is structured along the line stipulated by the new Civil Service Reform Guidelines of 1988. Three professional Divisions were approved for the Department namely: Forestry Management, Forest Resource Survey and Utilization, and Agro-forestry, Support Services and Extension.

The Forest Management Division deals with internal, that is, ad-hoc departmental planning, co-ordinates field activities and oversees orderly development and execution of departmental projects. The Forest Resources Survey and Utilization Division is broadly concerned with ensuring and promoting improved and efficient use of wood products and non-wood products. The Division also deals with forest inventories and the development and management of forestry data bank. The Agro-forestry, Support Services and Extension Division carry out forestry extension and supervise manpower development.

In order to facilitate field operations under forest projects either by the Department or in collaboration with the State Forestry Services, a field office exists in all the 36 States including the FCT. The field offices liaise with the State Forestry Services on behalf of the Department and ensure judicious use of funds and other inputs for the successful implementation of departmental programmes. In order to further facilitate communication between headquarters and the field officers, six zones were created, each comprising a number of group of the State field offices. The Zonal officers coordinate the activities of the various field officers under them and ensure speedy communication between the field and headquarters. FDF has a specialised unit, Forestry Management, Evaluating and Coordinating Unit (FORMECU). FORMECU was created in response to a need for implementation of World Bank Assisted Forestry Project in Nigeria but now it virtually coordinates all Federal foreign assisted forestry projects in Nigeria. Under the present arrangement FORMECU is now subsumed under the Agro-forestry, Support Services and Extension Division.
2.3.3. State Forestry Departments

The Federal Republic of Nigeria consists of 36 states and Abuja, Federal Capital Territory (FCT). Each of the states and the FCT has an established forestry services as division under the appropriate Ministry. Each State Forest Service (SFS) is responsible for setting and administering policies for its forests. Each SFS Department is headed by a Director reporting to the Permanent Secretary, who reports to the Commissioner i.e. the Chief Executive Officer of the Ministry in the state.

2.3.4. Other Organisations

There are several Non-Governmental Organisations (NGOs) which contribute to the elaboration of the general land use plan and the sustainable management of forestry resources. Amongst some of the notable ones are Nigerian Conservation Foundation (NCF), NEST, NRCC, etc.

2.3.5. Forestry Policy

Nigeria is at present a wood deficit nation. In order to ameliorate the situation, the policy on forest resources management and sustainable use is aimed at achieving self-sufficiency in all aspects of forest production through the use of sound forest management techniques as well as the mobilization of human and material resources. The overall objectives of forest policy are to prevent further deforestation and to recreate forest cover, either for productive or for protective purposes, on already deforested fragile land. Specifically, the National Agricultural Policy of 1988 in which the Forestry Policy is subsumed, provides for:

- Consolidation and expansion of the forest estate in Nigeria and its management for sustained yield.
- Regeneration of the forests at rates higher than exploitation.
- Conservation and protection of the environment viz: Forest, soil, water, flora, fauna and the protection of the forest resources from fires, cattle grazers and illegal encroachment.
- Development of Forestry industry through the harvesting and utilization of timber its derivatives and the reduction of wastes.
- Wildlife conservation, management and development through the creation and effective management of national parks, game reserves, tourist and recreational facilities, etc.

These policy objectives have been well enunciated and appear well meant and the means for achieving them have been well articulated. Indeed one of the strategies for achieving the consolidation and expansion of the forest estate was the expansion of the forest estate from 10% to 20%. This so far has remained elusive. For the above policy or objectives to be achieved, significant legal and policy changes are needed. In addition the institutional framework and may be the constitutional changes in respect of forest ownership and development planning, as well as programme implementation must need be revisited and strengthened. The challenges call for private sector and public participation, the evolution of an appropriate national forestry legislation, aggressive and scientific forest management, capacity building and adequate financing of forestry development in Nigeria. Indeed the creation of the Federal Ministry of Environment and the transfer of the FDF to it is a start in the right direction.
2.3.6. Legislative Changes

Among some of the legislative changes that have so far occurred but do not seem to have a profound effect of enhancing forestry development in Nigeria are:

- The Land Use Decree No. 6 of 1978 which vests all land in each state of Nigeria in the Governor of the State. The impact is mixed and there have been abuses.
- The Nigeria Forestry Act, 1937:
  - Most land use, forestry and natural resources conservation laws were established early in this century. The act gave each Governor or Local Government Authority, the authority to constitute its own forest reserves. Some states have enacted specific regulations to monitor and control the reserves, but overall control is not effective.
  - Dereservation instead is frequent and penalties under most laws are uniformly low and seldomly enforced.

National Park Decree:
This has led to the creation of the National Parks Governing Board and the creation of the Department of National Parks. Other laws which have provision for affecting nature conservation include: The Wild Animals Preservation Act of 1916; the Endangered Species Decree of 1985; the Public Lands Act of 1970 and the various National parks Decree, for example Kainji Lake National Park Decree, 1979.

Each National Park is administered by a Park Management Committee chaired by an eminent professional who is appointed by the Minister, under the recommendation of State Government and managed by a General Manager.

A variety of deficiencies exists in the existing State laws and legislation. There are the growing economic, social and legal complexities of the contemporary setting on the one hand and the increasing demand for diverse forestry goods and services on the other. It will appear that there is need to review and modify existing forest laws as well as evolve new legislation to harmonize the overlapping responsibilities of the Federal and State Government, Local Councils and the various multi-purpose parastatals for forest resources.

2.3.7. Forest Management

Forest Management in Nigeria started with the establishment of regional forestry authorities whose main function was the constitution of forest reserves. The total area of forest reserve today is put at 96,000 km². The term ‘forest reserve’ today is only a nomenclature used generally to indicate a land use designation and does not indicate that they actually contain forests or vegetation. A lot of it has been highly deforested. Generally the forest reserves are managed for the production of forest resources, which include timber and non-timber forest products.

Initially the forest resources in the high forest zone were managed for timber production on a felling cycle of 100 years. Minimum girth limits were set between the equivalent of 60 – 90 d.b.h depending on the species (FDF, 1996). Forests in the Southern and South Central were sub-divided into numbered miles-square compartments and forest under exploitation were managed under working plans prepared by the Forestry Department. In response to exploitation pressures the felling cycle for natural forests was reduced to 50 years and even less.
Natural regeneration of the exploited forests was stimulated by the Tropical Shelterwood System (TSS). Owing to the increased demand for forest land, slow and low growth rates of the natural forest and the consequent conversion of forests reserves to other land use, the TSS was abandoned in favour of artificial regeneration via Taungya System. The Taungya plantations while forming protective belts around the accessible parts of forest reserves, also provided the pilot phase for subsequent major plantation schemes in the high forest zone.

The management and control of forest reserves is vested in the State Governments. The Federal Department of Forestry has only monitoring functions and holds no executive authority in the management of forest reserves and other forest lands. The creation of the National Parks Board gave the Federal Government some measure of executive powers over the protection of the constituted National Parks.

Generally management of the forest reserves has been inadequate and forest management seem to have been replaced by the project syndrome. The paradigm shift was the conversion of a large portion of the forest reserves particularly in the Guinea Savannah and the High Forest Zone to forest plantations of exotic and indigenous species.

The level to which this has been successful is debatable. Indeed State Forestry Departments have been unable to protect the forest estate adequately, even the usual boundary maintenance was impossible (may be due to poor funding of forestry development), thus leading to a period of extensive encroachment in the form of vast farm lands, settlements and excision for other purposes. The private sector is not particularly involved in the management of forest reserves in the country. Their major interest has been in the conversion of forest resources; an approach that have proved singularly inappropriate so far. In recent times, international initiatives to assist some State Governments in the management of forest reserves have been taken by NCF, WWF and DFID.

The main obstacles to forestry development and sustainable management in Nigeria may be summarized to include:

- Forest ownership that inhibits Federal intervention for sustainability.
- Unlimited powers of State Chief Executives to de-reserve or exploit the forests.
- Forest policy lacks legal backing and so cannot be enforced.
- Poor State funding of forestry programmes and forest management.
- Inadequate financing by Federal Government for forestry development.
- Poor funding of forestry research and training.
- Proliferation of agencies and duplication of duties resulting in cross-sectoral policies and lack of sectoral dialogue.
- Absence of a reliable data base on which to base forestry planning and development.
- Obsolete and unenforceable State Forestry legislation.
- Forest tariffs, which are ridiculously low and are not revised frequently.
- These problems are further compounded by natural disasters such as drought and flooding; forest fires due to bush burning, extensive arable farming and over grazing of forest lands.
3. **DEMAND AND SUPPLY OF FOREST PRODUCTS**

This section begins with a review of some of the past outlook studies for Nigeria, so that a comparison can be made between past and present findings.

The first major outlook study was carried out by FAO in 1979 based on the work of O. Baykal. A simulation model was used to examine thirteen development alternatives of the forest in the light of which projections were made for the sector to the year 1995. The conclusion reached was that demand would continue to increase for all types of forest products. In addition the report revealed that the natural forest resource was rapidly diminishing and predicted that it will be unable to supply the requirement of the industrial round wood by about the year 1995. This prediction appeared bleak at the time but recent developments in the forestry sector appear to have confirmed the fears expressed.

Two other sector studies were carried out simultaneously in 1983 by the World Bank and the National Committee on Green revolution. While that of the World Bank is project oriented, that of the Green revolution was more general in nature and largely based on the works of O. Baykal (1979) and G.O. Alviar 1983. The general findings were in consonance with FAO (1979). Annual sawn wood consumption was expected to grow at an annual rate of 8.9% from an initial level of 2,080,000 m³ round wood equivalent in 1975 to 11,476,000 m³ in 1995. Consumption of plywood was expected at an annual rate of 11.5% from 126,000 m³ i.e. round wood equivalent to 1,120,000 m³ in 1995. Paper and paper boards at 13.6% from 563,000 m³ i.e. round wood equivalent to 7,200,000 m³ by 1995. Poles at 1.8% from 1,600,000 m³ i.e. round wood equivalent in 1975 to 2,300,000 m³ in 1995, while fuel wood on the other hand was expected to grow at a rate of 1.2% annually from 42,000,000 m³ round wood equivalent in 1975 to 54,000,000 m³ in 1995. Generally the yields from the forests and plantations were not commensurate with demand. More recent outlook studies were made by Aruofor (1990 and by World Bank (1992). The first study employed three planning models (i.e. an econometric model, an input-output model and a linear programming model) on the forestry sector of Nigeria. The primary production was linked to the industry and their markets and was analysed and used to predict the sectoral development to the year 2010. The predictions were detailed for both wood, wood products and industry but the general findings seems to be that Nigerian forests lacked the capacity to continue to support the growing demand for wood and wood products. It was estimated that under the current exploitation trend, the natural forest could get completely depleted between 2004 and 2005 especially if we strive to satisfy projected demand.

The later study by the World Bank was based on the work of Bournguno (1992). The study relied on a transportation model and like most other studies was demand driven. Domestic demands were estimated and assumptions made about foreign trade in wood and wood products. The model (regional in structure) was used to determine the demand and supply gap. The study revealed that significant demand and supply gap do exist between sawn wood requirement and saw log supply and also between plywood requirement and log capacity. The same holds for poles, pilings and posts. The situation was different for industrial residues and pulpwood.
3.1. Demand for Forest Products

Unlike the predictions by most past studies, the demand for most forest wood products have stabilized, except for round wood, fuel wood and saw log and veneer logs. With 95% certainly we are accurate in predicting that the following wood products will stabilize at the corresponding levels in Table 3.

Table 3. Demand for some wood products.

<table>
<thead>
<tr>
<th>Wood Products</th>
<th>Annual Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Round wood (m³)</td>
<td>7,523,772</td>
</tr>
<tr>
<td>Sawn wood (m³)</td>
<td>2,429,870</td>
</tr>
<tr>
<td>Particle board (m³)</td>
<td>30,948</td>
</tr>
<tr>
<td>Paper and Paper Board Imports (M.T.)</td>
<td>108,451</td>
</tr>
</tbody>
</table>

**Round wood** demand on the other hand will continue to increase at a yearly average of 2,657,079 m³ so that by 2020, consumption of round wood would have reached 180,028,975 m³. The fact that the gross volume or growing stock as at 1998 is 473,509,259.43 m³ and the growth rate is only 1.0 to 1.5 m³/ha/year is a deep source of concern.

**Fuel wood** demand will also continue to increase into the foreseeable future at annual average rate of 2,140,017 m³ so that by year 2020, fuel wood demand will be 147,044,425 m³.

**Saw log and veneer logs** are already in short supply but demand for them will continue to rise in the foreseeable future at an average of 95,004 m³/annum so that by 2020, demand would have reached 2,973,500 m³.

The demand for plywood is likely to go on increasing in the foreseeable future but domestic production is likely to fall on the average by 1337 m³ per annum. This is due to scarcity of veneer and saw logs. By 2020 domestic production is likely to have fallen to 53,950 m³.

The prospect for wood products in Nigeria is bleak and Nigeria will of necessity become import dependent in respect of wood products. The details of the demand forecast are presented in Fig. 3.1a and 3.1b.

The demand estimate for the current study has been based on simple projection of trends of the form \( Y_t = a \Delta t + Y_{t-1} \).

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

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

Table 4. A comparison of demand forecasts for round wood (in 1000 m³).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FDF (2000) Round wood</td>
<td>113,602</td>
<td>126,887</td>
<td>153,458</td>
<td>180,008</td>
<td></td>
</tr>
<tr>
<td>Fuel wood</td>
<td>93,544</td>
<td>104,244</td>
<td>125,644</td>
<td>147,044</td>
<td></td>
</tr>
</tbody>
</table>

18
### Table 5. A comparison between demand forecasts for wood products (units in 1000)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FDF (2000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sawn wood (m³)</td>
<td>2,430</td>
<td>2,430</td>
<td>2,430</td>
<td>2,430</td>
<td>2,430</td>
</tr>
<tr>
<td>Particle Board (m³)</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Paper &amp; Paper bd.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impots (M.T.)</td>
<td>108</td>
<td>108</td>
<td>108</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td>IBRD (1992)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sawn wood (m³)</td>
<td>4,199</td>
<td>6,432</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plywood (m³)</td>
<td>286</td>
<td>453</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particle board (m³)</td>
<td>111</td>
<td>230</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newsprint (M.T.)</td>
<td>93</td>
<td>166</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printing &amp; Writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>paper (M.T.)</td>
<td>11</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other paper &amp; Paper board (M.T.)</td>
<td>50</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### 4. ANTICIPATED CHANGES IN THE FORESTRY SECTOR TO YEAR 2020

Forestry development is being driven by a host of factors most of which are not immediately apparent and so not obvious. However, the major and singular factor that is likely to shape forestry development in the future is **land use**. Most of the macro economic variables do not impact directly on wood products output but indirectly through round wood production. This is made possible through their effects on land use pattern.

#### 4.1. Land Use Dynamics

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

### Table 6. Land use trends in Nigeria
Agricultural cropland is consuming the largest chunk of 554,657.10 ha annually while dominant category of trees/woodlands and shrubs is loosing the largest chunk of 858,720.40 ha annually. A transition matrix was derived from the land use changes from 1978 to 1995 and was analysed by Markor Chains Analysis. The result was very revealing and the land use changes were predicted to the year 2020. The long run or steady state situation was also derived. The land use dynamics is summarized in Table 7.

The detailed analysis of the land use dynamics of Nigeria shows that while Agricultural crop land will increase from its present level of 61,900,000 ha in 1995 to 70,652,157 ha by 2020, forest land will decrease from 2,650,000 ha in 1995 to 938,066 ha by 2020.

It is easy to see that forestland and indeed all woodlands will be heavily depleted and converted to Agricultural crop land. At steady state situation even the land use such as flood plain agriculture and water resources development that enjoyed short-term advantage will eventually be depleted. This finding is consistent with general prediction of Conservation and Environmental Sciences.

### Table 7. Comparative land use pattern 1995 to 2020 (ha)

<table>
<thead>
<tr>
<th>Landuse category</th>
<th>Base Year 1995</th>
<th>Year 2010</th>
<th>Year 2020</th>
<th>Steady State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Agric. Crop land</td>
<td>61,900,000</td>
<td>68,063,519.12</td>
<td>70,652,157.4</td>
<td>87,408,772.80</td>
</tr>
<tr>
<td>2. Flood plain Agriculture</td>
<td>2,400,000</td>
<td>3,141,000.30</td>
<td>3,390,061.50</td>
<td>479,782.74</td>
</tr>
<tr>
<td>3. Grassland</td>
<td>3,150,000</td>
<td>4,398,237.70</td>
<td>4,765,522.33</td>
<td>1,071,156.36</td>
</tr>
<tr>
<td>4. Dominantly trees/woodland and shrub</td>
<td>9,000,000</td>
<td>3,866,595.70</td>
<td>2,276,169.60</td>
<td>7309.53</td>
</tr>
<tr>
<td>5. Dominant shrubs &amp; grass</td>
<td>7,100,000</td>
<td>4,290,518.19</td>
<td>3,017,151.27</td>
<td>102,582.79</td>
</tr>
<tr>
<td>6. Dominantly grasses</td>
<td>1,100,000</td>
<td>1,065,057.36</td>
<td>1,040,003.02</td>
<td>227,529.66</td>
</tr>
<tr>
<td>7. Forest</td>
<td>2,650,000</td>
<td>1,436,848.03</td>
<td>938,066.41</td>
<td>928.69</td>
</tr>
<tr>
<td>8. Freshwater marsh/swamp</td>
<td>620,000</td>
<td>181,072.05</td>
<td>100,943.30</td>
<td>3534.37</td>
</tr>
<tr>
<td>9. Forested freshwater swamp</td>
<td>1,800,000</td>
<td>1,820,088.57</td>
<td>1,834,929.55</td>
<td>3,134,485.64</td>
</tr>
<tr>
<td>10. Mangrove forest</td>
<td>1,190,000</td>
<td>978,706.18</td>
<td>845,074.30</td>
<td>701.26</td>
</tr>
<tr>
<td>11. Water</td>
<td>680,000</td>
<td>1,065,985.97</td>
<td>1,144,629.79</td>
<td>172,307.77</td>
</tr>
<tr>
<td>12. Bare surface</td>
<td>1,892,000</td>
<td>3,174,370.71</td>
<td>3,477,292.00</td>
<td>872,908.43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>93,482,000</strong></td>
<td><strong>93,482,000.00</strong></td>
<td><strong>93,482,000</strong></td>
<td><strong>93,482,000</strong></td>
</tr>
</tbody>
</table>
The consequences of the present land use trend on forestry development need no further elaboration. It will be catastrophic to say the least. The impact on biodiversity will be profound as most of the habitat for wildlife could be destroyed. This would also naturally imply that Nigeria would become a wood import dependent country. Fig. 4.1(a) and 4.1 (b) show the details of the use land use dynamics. Fig. 4.1(b) is a magnified version of the lower part of fig. 4.1(a). It is easy to see the trends very clearly.

We cannot afford this to happen because analysis carried out in this study revealed that an increase of N 1.0 million in Forestry output will induce N 76.226 million in the Agricultural crop sector; while the same increase in the Agricultural crop sector will only increase forestry output by N 13,000. This is a cause of grave concern because under the present paradigm, Agricultural crop production is calculated to defeat itself by systematically destroying the forest on which it depends. In addition the analysis also revealed that forestry has a propensity to induce investments in Nigeria compared to other sectors. While an output of N 1.0 million in construction will induce N 9.7 million of investment; Agricultural crop N 0.23 million, Petroleum N 0.16 million, Housing N 2.54 million, forestry on the other hand will induce N 17 million of investment. The forest needs to be saved!

4.2. Interpreting the observed changes

Econometrics and its extensions were used in this study to reveal the actual driving forces shaping forestry development in Nigeria. The model linked the forestry sub-sector to major macro economic variables which were together linked to land use. The data set used in the analysis consists of time series ranging from 1978 to 1995. They were assembled from Federal Office of Statistics (FOS), Central Bank of Nigeria (CBN), Food and Agricultural Organisation (FAO), Petroleum and Forestry Data Bases. These were also complemented by field surveys. Some of the series were disjointed and have had to be interpolated based on available information. For example, the labour force and unemployment rate were interpolated from available FOS statistics and CBN statistics between 1963 and 1998. Productivity and average wage rates were then derived accordingly.

The structural parameters were estimated by regression analysis and the model comprised thirty-seven endogenous variables including one identity for GDP.

The major causes of deforestation have been traced to the bid to satisfy the demand for wood and wood products in Nigeria from domestic sources. Large areas of forest are cut down in the States in the bid to satisfy the demand for wood and wood products. These lands are either not regenerated naturally or replanted artificially for one reason or the other (inadequate funding is a possible reason) with the result that they are eventually converted into agricultural croplands, grasslands or just bushes and bare surfaces. This is evident in the following analysis

4.2.1. Roundwood Production

The production of 1,000 m³ of round wood will also produce 795 m³ of fuel wood and 34 m³ of saw log and veneer logs. However, this will involve the depletion of 36.8 ha of high forest, 310.8 ha of dominantly trees, woodlands and shrub lands, 43.7 ha of dominantly shrub and grasslands as well as 25.7 ha of fresh water marsh and swamps. The above will then give rise to 217 ha of agricultural croplands, 24 ha of flood plain agriculture, 48 ha of grasslands and 48 ha of bare surfaces. In addition water bodies will expand by 16 ha.
Given government’s policy of *food security and poverty alleviation* this cannot be considered all together bad for the economy in the short run. This is because Agricultural output will increase by N 7.5 million, Petroleum by N 9.7 million and all other sectors combined by about N 9 million. About N 2 million of investment and N 22 million of private consumption will also be induced though forestry output will increase minimally by only N 0.103 million.

4.2.2. Fuelwood Production

To produce 1,000 m$^3$ of fuel wood on the other hand will require 1,245 m$^3$ of round wood output. Only 43 m$^3$ of saw log and veneer logs will be produced. This will affect 46.6 ha of high forest, 399 ha of dominantly trees and woodlands, 52 ha of shrub lands and 32 ha of fresh water marsh and swamps. The above will induce 267.97 ha of agricultural crop lands, 31 ha of flood plain agriculture, 61 ha of grass lands, 60 ha of undesirable bare surfaces and 20 ha of water bodies.

The effect on the rest of the economy is equally beneficial in the short run especially as agricultural output will increase by as much as N 9.2 million while petroleum GDP by N 12.3 million. Other sectors combined will increase by as much as N 11 million. Capital formation will increase by N 2.4 million while private consumption will increase by N 27.5 million. Forestry GDP will increase by only N 0.127 million.

4.2.3. Saw log and Veneer logs

There is a *scarcity of saw log and veneer logs* in the country. This is because in order to produce 1,000 m$^3$ of saw logs and veneer logs will require the exploitation of 704 ha of high forest, 4,027.6 ha of dominantly trees and woodlands and 364.8 ha of fresh water marsh and swamps. The production of 1,000 m$^3$ of saw log and veneer logs will also generate demand for 14,000 m$^3$ of round wood, 11,130 m$^3$ of fuel wood and 878 m$^3$ of industrial round wood.

Under the present situation, this will induce 2,496 ha of agricultural cropland, 384 ha of flood plain agriculture, 694 ha of grass lands and 594 ha of undesirable bare surfaces. Water bodies will increase by 221.5 ha.

These trends become clearer when we examine sawn wood and ply wood production respectively.

4.2.4. Sawn wood

In order to produce 1,000 m$^3$ of sawn wood, 1,960 m$^3$ of industrial round wood and 1,676 m$^3$ of saw logs and veneer logs will be required and this will entail the exploitation of 1,083.5 ha of high forest which in turn induces 340.6 ha of dominantly shrubs and grass lands.

4.2.5. Plywood

To produce 1,000 m$^3$ of plywood on the other hand under the present circumstances reveals a supply gap of 1,110,849 m$^3$ of round wood. For this gap to be bridged will require an increase of 33,975 ha of high forest, 390,551 ha of dominantly trees and woodlands, 50,601 ha of dominantly shrub lands and 27,929 ha of fresh water marsh and swamps. This will also imply that 226,919.5 ha of agricultural crop land, 25,839 ha of flood plain agriculture, 54,604 ha of grass lands, 58,915 ha of bare surfaces and 21, 929 ha of water bodies be given up and
reclaimed for forestry. However, to satisfy the above immediate need for ply wood will require N 9.73 billion in import bills with the result that all sectoral GDP’s or output will be depressed considerably.

The need for conservation becomes more evident when the analysis revealed that in order to increase forestry GDP by N 1.0 million will require the production of 6,863 m$^3$ of round wood and 5,391 m$^3$ of fuel wood. These will in turn require the exploitation of 201.86 ha of high forest, 1,881 ha of dominantly trees and shrub lands, 466 ha of dominantly shrub land and grasses and 164 ha of fresh water swamp and marsh. Under the present paradigm, this will give rise to 1,785 ha of agricultural crop land, 155 ha of flood plain agriculture, 343 ha of grass lands, 328.9 ha of bare surfaces and 90 ha of water bodies.

Though agricultural output will increase by as much as N 76 million, Petroleum by N 102 million and all other sectors combined by N 83 million in the short run. The long run effect will not be self-sustaining and could be detrimental.

4.3. Other Sectoral Effects on Forestry

Agricultural crop production actually induces demand for round wood and fuel wood production and actually consumes forested lands and wood lands. The greatest impact however in this direction is made by the Construction sector followed by the Housing sector.

An increase of N 1.0 million in agricultural crop production will induce demand for 85 m$^3$ of round wood and 67 m$^3$ of fuel wood. This will only produce N 13,000 of value added in forestry but will consume 23 ha of dominantly trees, wood lands and shrub lands, 6 ha of dominantly shrub lands, 2.5 ha of high forest and 2 ha of fresh water marsh and swamps.

A N 1.0 million increase in Construction output on the other hand will induce demand for 3,559 m$^3$ of round wood and 2,782 m$^3$ of fuel wood. In addition a supply gap of 2 m$^3$ in plywood production will exist. Though forestry GDP will increase by as much as N 513,000. Agriculture and Petroleum by N 39 million and N 53 million respectively, about 1,042 ha of dominantly trees, woodlands and shrub lands, 239 ha of dominantly shrub and grasses as well as 90 ha of fresh water marsh and swamps will be devastated. Housing development has similar but milder effect on forestry.

4.4. Effects of Macro-economic Variables on Forestry

Most macro-economic variables affect forestry but the most profound effects are caused by kerosene price and domestic fuel price increases, interest rate, inflation rate and growth in labour force.

Indeed an increase of N 1.0/litre of kerosene price will induce demand for 5.46 million m$^3$ of round wood and 4.13 million m$^3$ of fuel wood and will create a supply gap of 2,869 m$^3$ in plywood production. Though forestry GDP will increase by as much as N 479.5 million with all other sectoral outputs increasing substantially, the result is that 1.3 million ha of dominantly trees, wood lands and shrub lands, 426,983 ha of dominantly grasses, 119,959 ha of fresh water marsh and swamps and 41,442 ha of forested fresh water swamps will be required and subsequently converted into agriculture, bare surfaces and water bodies in the process. The effects of the other variables that is, domestic fuel price increases, interest rate
increases, labour force increases (related to population increases), inflation rate and exchange rate increases are similar.

Population pressure on the other hand, is felt directly on the high forest where it results in deforestation and transfer of forestlands into agriculture. Indeed a million increase in population will create a demand for 183,427 ha of agricultural crop land, 9,120 ha of pasture lands, 5,892 ha of forested fresh water swamps and 9,809 ha of inland fisheries or water bodies. However, this will result in the deforestation of 19,726 ha of high forest.

It is now obvious that forestland is the receptacle on which agriculture and rural development generally rests. However, care must be taken to ensure that trend is not counter productive.

5. SCENARIO ANALYSIS

The aim of scenario analysis is to project the forest economy into possible future states by the year 2020 and to determine the degree and direction of change that is, the intervention that must be adopted in forestry. This is so as to be in a position to deal effectively with anticipated changes in the rest of the economy by the year 2020.

FOSA is a process for analysing the future potential of the forestry sector to contribute to the well being of African citizens through its economic, social and environmental functions. FOSA will analyse the status, trends and driving forces shaping African forestry; provide a region-wide vision of the sector to the year 2020; and identify policies, programme and investment options that will help move the sector in desirable directions.

5.1. The Present State of the Nigerian Economy in Year 2000

- The country is experiencing a new democratic process.
- Gross domestic products is growing only minimally
- The economy is still largely dependent on petroleum with the non oil sectors contributing only minimally to GDP
- The economy is import dependent
- Unemployment rate is high
- The economy is modern with a fairly high level of literacy
- Infrastructures are modern but serious problems are still being experienced in power (electricity) generation with a crippling effect on industrial production;
- Population is large and investment is not high enough to absorb the teeming population into gainful employment.
- Poverty at the rural levels is high and wages are low at the urban centres.
- The continuous depreciation of the Naira presents grave problems for the economy.
- The inflation rate is still high.
- Labour unrest is a strong trend.
- Social unrest is still a problem for the new democracy due to long period of neglect of minority groups.
- The wealth of the country is mainly from the South-South and the North is very poverty stricken but with a great potential for agriculture.
- The land and environment is very highly devastated by climate??, farming, fires, erosion and population pressures.
• Deforestation is a heavy trend.
• Corruption is still a bane of economic development and progress.
• High crime rate and general insecurity to life and property/investment still poses grave problems.

5.2. **Scenario 1: Business As Usual by 2020**

The economy continues as in the past. No improvement in the investment climate. Unemployment rate continues to rise, the Naira continues to depreciate against the major International currencies, labour unrest and social dis-equilibrium allowed to thrive and corruption continues to flourish. Deforestation continues as observed.

5.2.1. **Required Intervention by the Forestry Sector**

- **Strong Signals**
  - Public Awareness Campaign
  - Conservation Drive
  - Aggressive National Tree Planting Campaign
  - Private Sector Participation
  - Agro-forestry

- **Weak Signals**
  - National Forestry Law
  - Participatory Approach
  - NGOs

5.3. **Scenario 2: Social Conflict Resolution and Poverty Alleviation**

The economy is still largely driven by the public sector and is petroleum dependent. The value of the Naira continues to depreciate with attendant problems of inflation and high demand for wood and wood products. Drought problems persist in the North with erosion and deforestation problems in the South. Energy problems persist generally.

- Government pays decent wages to workers.
- Resolves ethnic, religious, and other social crises through:
  - Social justice
  - Investment in the agriculture to alleviate poverty in the North
  - Investment in road and infrastructure in the Niger Delta
  - Religious tolerance
  - Investment in industries for greater job opportunities
  - Population and birth control
  - Investment in Natural Resources Development
  - Investment in Health and Education
  - Investment in electricity and communication

5.3.1. **Intervention by Forestry**

**Strong signals**

- Research and development in conservation, natural resources and sustainable management
- Afforestation Drive
• for industrial wood production in the South
• fuel wood production in the North

**Reforestation**
• Shelter belts and village woodlots for environmental protection against drought and desertification.
• Green belts to protect water sheds and to prevent erosion of land especially in the South East
• Agro-forestry drives to mitigate land use shift from Forestry to Agricultural crop cultivation.

**Extension and Publicity**
• Training of Forestry personnel in Extension Education
• Public awareness campaign
• Community participation in Forest Management
• Seminars and Workshops

**Inter-sectoral Dialogue on Land use and Land use Planning**
• Conferences and Lectures

**Private Forestry**
• Incentives for afforestation

**Promotion of efficient wood utilization and alternative energy campaign**
• Production of sawdust briquettes.

**Weak Signals**
• Funding
• Local funding
• NGOs
• Private Forestry
• Community participation

### 5.4. Scenario 3: Complete Diversification of the Economy by 2020

The country adopts a trade liberalization policy
• Carries out a vigorous export drive
• The export processing zones are fully operational
• Foreign capital and investment are attracted to the country
• Quality control instituted in domestic manufacturing
• There is price stability
• The Naira appreciates in value and stabilizes
• Foreign debt burden minimized and external reserves appreciates
• Economy less import dependent

Government creates conducive environment for foreign and private sector investments in the country.
Electricity generation and telecommunication deregulated.

Increase investment in Health and Education

**Investment in rural infrastructure and rural employment**
- Schools and hospitals established at Local Government Levels
- Investment in rural cottage industries
- Investment in agricultural crop processing and storage
- Investment in food processing industries
- Increased productivity and decent wages
- Investment in local technology development
- Crime wave reduced and level of insecurity minimized
- Kerosene and domestic fuel prices stabilize

A measure of development is attained in the macro-economy but deforestation is still a problem.

5.4.1. Strategy for Intervention by the Forestry Sector

**Heavy signals**
- Production and promotion of non wood forestry products
- Promotion of participatory approach in forestry
- Research in non wood processing and marketing
- Forest resources management and conservation
- Afforestation for industrial wood; for export; for fuel wood
- Development of National parks for game, recreation and tourism
- Agro-forestry
- Public awareness campaign
- National Forestry Law and Enforcement of forestry policy
- Sectoral dialogue on Land use and Land use planning
- Domestication and multiplication of non wood forestry products
- Wood waste reduction and establishment of pilot small diameter log mills for demonstration purposes.

**Weak Signals**
- Community participation
- NGOs
- CBOs
- Tourism
- Export
- forest villages
- community wood lots
- of non wood forest products

5.5. Scenario 4: Complete Privatisation by 2020
- Divest all government owned companies and investments
- Adopt a trade liberalization policy
- Private sector led economy
- Effective taxation policy
- Investment in Health care and Education
• Forest industries expand with attendant deforestation
• Increasing kerosene and domestic fuel prices
• High inflation rate
• Labour and industrial unrest
• Weak technological base and decline in the level of infrastructure

5.5.1. Strategy for Intervention by the Forestry Sector

Strong signals
• Divest forest plantations
• Evolve a commensurate pricing policy for forest products
• Promote afforestation and private ownership
• Afforestation for export market e.g. Teak plantations
• Conservation education
• Research and Training

Weak Signals
• Private sector investment and funding
• NGOs
• Foreign capital

5.6. Scenario 5: Full Fledged Developed Nigerian Economy by 2020

The Nigerian economy is fully developed by 2020 as a result of:
• A well planned economy
• Appropriate monetary and fiscal policies
• Discovery of a mechanism for economic conflict management and resolution
• Introduction and enforcement of a population and birth control policy
• Investment in renewable natural resources development and management
• Investment in Health care, Housing and Education
• Investment in infrastructure especially in the Niger Delta
• Investment in agricultural storage and food processing
• Development of rural cottage industries
• Iron and Steel Industries fully operational with functional machine tools and parts factories
• Deregulation of electricity supply
• Deregulation of telecommunication industry
• Establishment of the rule of law and social justice
• Investment in crime detection and law enforcement
• Evolution of a national ideology
• Fight against corruption and indiscipline
• Minimize crime and insecurity to life and property

Investment in industry and mass mobilization for employment and productivity
• creating conducive environment for private sector investment
• provision of decent wages
• enhancement of labour productivity
• Investment in research and development and facilitation of local innovations and technologies

Modernization of agriculture
• improve seeds
• intensive cultivation
• mechanization
• enhanced farm inputs
• fertilizer
• insecticides, pesticides etc.
• Irrigation

**Introduction of fully dynamic wages and pricing policy**

- Adoption of an aggressive export drive with fully operational export processing zones and quality control
- External debt burden minimized, import dependence minimized and external reserves maximized.
- Modernization of the Public Service especially the Civil Service
- revival of professionalism and ethics
- introduction of national reorientation
- establishment of effective planning outfits and culture at National, State and Local

**Government Levels**

- to manage the activities of the Private Sector
- to resolve conflicts arising from policy implementation

The economy is developed by 2020 and the level of enlightenment is high. Religious, ethnic, labour and other social unrest including crime rate are minimized. The economy is fully deregulated and diversified. There is a supportive technological base. The level of literacy is high and there are supportive infrastructure in terms of good roads, water, electricity, housing and hospitals. Oil is de-emphasized and the demand for renewable natural resources including wood and non-wood forest products is on the increase. Though the standard of living is high, the problems associated with climate and industry are of serious concerns. In this respect, drought continues to pose grave problems in the North while erosion is serious in the South especially the South East. Industrial emissions from factories also pose grave problems. There is generally land hunger.

5.6.1. **Strategy for Intervention by the Forestry Sector**

**Strong signals**

- Aggressive afforestation and reforestation
- Development of non wood forest products
- Conservation for biodiversity
- Promotion of Private Forestry
- incentives
- progressive land tenure policies
- introduction of a commensurate pricing policy
- private ownership of forest produce
- Agro-forestry
- introduction of forest villages
- Research and Development
- Publicity and enlightenment campaign
- Development of industrial plantations
- Sectoral dialogue
- Wildlife Husbandry
- Regional/International cooperation and collaboration
- Forestry Education and training
• Data collection and Forestry Planning

Weak Signals
• Participatory approach
• Forestry Trust Fund
• Private Forestry
• Global warming and climate change
• Small diameter log mills
• Integrated Land use planning
• National Forestry Legislation
• NGOs

6. CONCLUSIONS

Nigeria will be requiring wood and non-wood products for her development up to the year 2020 and beyond. If business were to continue as usual the prospects are bleak and most of the land remaining under forests and woodlands will likely be absorbed into arable agriculture. However, given the present situation of the Nigerian economy five scenarios are possible by the year 2020 and these will depend on the level of investments, degree of planning and management of conflict applied to the overall economy.

However, Government policies are still largely conflicting and there is the need to evolve ways and means of managing these conflicts. The various scenarios point to afforestation and reforestation as very strong signals for forestry in Nigeria. There is therefore need to move from a ceremonial paradigm of afforestation and reforestation to assume a more aggressive posture. Government must as a necessity invest more in afforestation and reforestation especially at State and Local Government Levels. In addition the Private Sector must be encouraged and induced to take greater interest in Forestry. Forestry Department must engage in the enlightenment of the public about the consequences of deforestation and government must invest more funds. The issue of research and development in Conservation techniques, Natural regeneration and Domestication and Multiplication of non-wood forest products including wildlife is very important based on the possible scenarios by 2020.

At present there are many weak signals in Nigeria and these may become very important factors that will drive forestry in the next ten to twenty years. Forestry funding for afforestation and development may have to shift from government to the Private Sector and therefore the participatory approach may become very important in the future. In view of the continuous demands that will be made on the Nigerian forests, integrated land use planning and management may become very important in the near future.

The issue of global warming and climate change may assume greater dimensions in Nigeria as deforestation continues unabated. In this regard, Non Governmental Organizations (NGOs) and Community Based Organizations (CBOs) may assume more important roles as being the vehicles for mobilizing the rural communities and attracting foreign funds for the conservation and development of forest resources and the environment.

National Forest Law and its enforcements may assume higher dimensions in the near future.
REFERENCES


FOS (*.*): Nigerian Trade Summary (various issues) Federal Office of Statistics, Abuja


