

# STATUS OF WOOD PROCESSING AND STORAGE IN NIGERIA

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## Abstract

*The work showcases wood processing and storage operations in Nigeria. The importance of wood as a multipurpose biomaterial were discussed as well as its nature, characteristics, lumbering pattern and other product derived from wood. The available wood/timber in Nigeria as well as the unit operations in wood processing, and storage were also highlighted. Finally, some constraints of timber/wood research in Nigeria were articulated with suggestive recommendations.*

**Keywords:** wood, review, processing, storage, Nigeria

## 1. Introduction

Wood processing involves peeling, slicing, sawing, and chemically altering hardwoods and softwoods to form finished products such as boards or veneer; particles or chips for making paper, particle, or fibre products; and fuel. A high percentage of the weight of freshly cut or green wood is water. Green wood contains free water in the cell cavities and bound water in the cell walls. When all the free water has been extracted and before any of the bound water has been removed, the wood is said to be at the fibre saturation point. As the moisture content falls below the fibre saturation point, the bound water leaves the cell walls and the wood shrinks. During the drying process, differential shrinkage can cause internal stresses in the wood. If not controlled, this can result in defects such as cracks, splits, and warp. Below the fibre saturation point, wood takes on and gives off water molecules depending on the relative humidity of the air around it and swells and

shrinks accordingly. Wood is machined to bring it to a specific size and shape for fastening, gluing, or finishing. With the exception of lasers, which have a limited application at this time, all machining is based on a sharpened wedge that is used to sever wood fibres. Tools for sawing, boring holes, planing, and shaping, as well as the particles in sandpaper, use some version of the sharpened wedge. Wood is ground to fibres for hardboard, medium-density fibreboard, and paper products. It is sliced and flaked for particle-board products, including wafer boards and oriented strand boards. Whether made from waste products (sawdust, planer shavings, slabs, edgings) or roundwood, the individual particles generally exhibit the anisotropy and hygroscopicity of larger pieces of wood.[14] The negative effects of these properties are minimized to the degree that the three wood directions (longitudinal, tangential, and radial) are distributed more or less randomly.[15]

Throughout history, the unique characteris-

tics and comparative abundance of wood have made it a natural material for home, other structures, furniture, tools, vehicles, and decorative objects.[17] Today, for the same reasons, wood is prized for a multitude of uses. Variations in the characteristics of woods, its volume and differences in cellular structure make woods heavy or light, stiff or flexible, and hard or soft. The properties of a single species are relatively constant within limits; therefore, selection of wood by species alone may sometimes be inadequate. [20] However, to use wood to its best advantage and most effectively in engineering applications, specific characteristics or physical properties must be considered. Historically, some species filled many purposes, while other less available or less desirable species served only one or two needs. For example, because white oak is tough, strong, and durable, it was highly prized for shipbuilding, bridges, cooerage, barn timbers, farm implements, railroad crossties, fence posts, and flooring.[21] Woods such as black walnut and cherry were used primarily for furniture and cabinets. Hickory was manufactured into tough, hard, and resilient striking-tool handles, and black locust was prized for barn timbers. What the early builder or craftsman learned by trial and error became the basis for deciding which species were appropriate for a given use in terms of their characteristics. It was commonly accepted that wood from trees grown in certain locations under certain conditions was stronger, more durable, more easily worked with tools, or finer grained than wood from trees in other locations.[18] Wood is a valuable engineering material as ever, and in many cases, technological advances have made it even more useful. In Nigeria, wood uses and applications toe the same concept of purpose to the extent that the demands have been so high resulting in export and domestic uses. These have resulted to rapid depletion on the forest resources. The inherent factors that keep wood in the forefront of raw materials are many and varied, but a chief at-

tribute is its availability in many species, sizes, shapes, and conditions to suit almost every demand. Wood has a high ratio of strength to weight and a remarkable record for durability and performance as a structural material.[5] Dry wood has good insulating properties against heat, sound, and electricity. It tends to absorb and dissipate vibrations under some conditions of use, and yet it is an incomparable material for such musical instruments as the violin, also component part of drums, wooden gong and ekwe. The grain patterns and colours of wood make it an aesthetically pleasing material, and its appearance may be silky enhanced by stains, varnishes, lacquers, and other finishes. It is easily shaped with tools and fastened with adhesives, nails, screws, bolts, and dowels. Damaged wood is easily repaired, and wood structures are easily remodeled or altered. In addition, wood resists oxidation, acid, saltwater, and other corrosive agents, has high salvage value, has good shock resistance, can be treated with preservatives and fire retardants, and can be combined with almost any other material for both functional and aesthetic uses.

Most of the construction works carried out with woods as a raw material usually experience failures as a result of the nature of wood, environmental factors, loads, deformations, characteristic decay and termite attacks etc. These factors twiddle in synergy to the extent of observable engineering structural failures and raw material wastages. These are the features of experiences of a developing countries like Nigeria. This work showcases the need to know some available woods that are gotten locally, their local names, processing and storage techniques of these woods. The objectives of the work cover the following: To review the wood lumbering and processing in Nigeria, appraise the wood available in Nigeria, to know the storage pattern and techniques adopted in Nigeria.

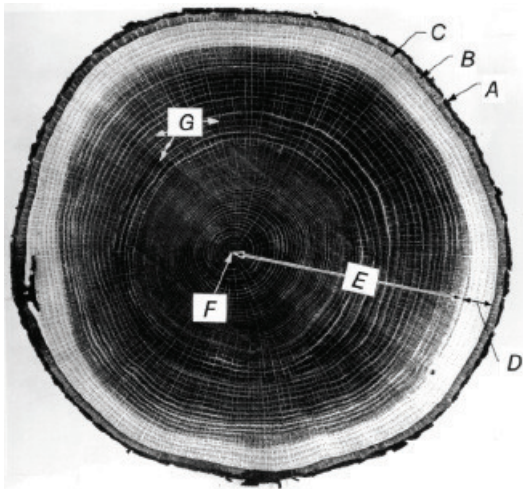


Figure 1: Cross section of white oak tree trunk Source: Ref.[8]. (A) Outer bark (dry dead tissue), (B) inner bark (living tissue), (C) cambium, (D) sapwood,(E)heartwood,(F)pith, and (G) wood rays.Circuit Diagram of a three phase n-level DCC.

## 2. Literature Review

### 2.1. Composition and feature of wood.

The fibrous nature of wood strongly influences how it is used. Wood is primarily composed of hollow, elongate, spindle-shaped cells that are arranged parallel to each other along the trunk of a tree. When lumber and other products are cut from the tree, the characteristics of these fibrous cells and their arrangement affect such properties as strength and shrinkage as well as the grain pattern of the wood.[4]

A cross section of a tree in (Fig 1) shows the following well defined features (from outside to centre): bark, which may be divided into an outer corky dead part (A), whose thickness varies greatly with species and age of trees, and an inner thin living part (B), which carries food from the leaves to growing parts of the tree; wood, which in merchantable trees of most species is clearly differentiated into sapwood (D) and heartwood (E); and pith (F), a small core of tissue located at the centre of tree stems, branches, and twigs about

which initial wood growth takes place. Sapwood contains both living and dead tissue and carries sap from the roots to the leaves. Heartwood is formed by a gradual change in the sapwood and is inactive. The wood rays (G), horizontally oriented tissue through the radial plane of the tree, vary in size from one cell wide and a few cells high to more than 15 cells wide and several centimetres high. The rays connect various layers from pith to bark for storage and transfer of food. The cambium layer (C), which is inside the inner bark and forms wood and bark cells, can be seen only with a microscope. As the tree grows in height, branching is initiated by lateral bud development. The lateral branches are intergrown with the wood of the trunk as long as they are alive. After a branch dies, the trunk continues to increase in diameter and surrounds that portion of the branch projecting from the trunk when the branch died. If the dead branches drop from the tree, the dead stubs become overgrown and clear wood is formed.

Wood cells – the structural elements of wood tissue are of various sizes and shapes and are quite firmly cemented together. Dry wood cells may be empty or partly filled with deposits, such as gums and resins, or with tyloses. The majority of wood cells are considerably elongated and pointed at the ends; these cells are customarily called fibres or tracheids. The length of wood fibres is highly variable within a tree and among species. Hardwood fibres average about 1 mm (1/25 in.) in length; softwood fibres range from 3 to 8 mm (1/8 to 1/3 in.) in length.

#### 2.1.1. Chemical composition of woods

Dry wood is primarily composed of cellulose, lignin, hemicelluloses, and minor amounts (5% to 10%) of extraneous materials. Cellulose, the major component, constitutes approximately 50% of wood substance by weight. It is a high-molecular-weight linear polymer consisting of chains of 1 to more than 4-linked glucose monomers. During growth of

the tree, the cellulose molecules are arranged into ordered strands called fibrils, which in turn are organized into the larger structural elements that make up the cell wall of wood fibres. Most of the cell wall cellulose is crystalline.[9]

Delignified wood fibres, which consist mostly of cellulose, have great commercial value when formed into paper. Delignified fibres may also be chemically altered to form textiles, films, lacquers, and explosives. Lignin constitutes 23% to 33% of the wood substance in softwoods and 16% to 25% in hardwoods. Although lignin occurs in wood throughout the cell wall, it is concentrated toward the outside of the cells and between cells. Lignin is often called the cementing agent that binds individual cells together. Lignin is a three-dimensional phenylpropanol polymer, and its structure and distribution in wood are still not fully understood.

### *2.1.2. Hardwoods and Softwoods*

Trees are divided into two broad classes, usually referred to as hardwoods and softwoods. These names can be confusing since some softwoods are actually harder than some hardwoods, and conversely some hardwoods are softer than some softwoods. For example, softwoods such as longleaf pine and Douglas-fir are typically harder than the hardwoods basswood and aspen. Botanically, hardwoods are Angiosperms; the seeds are enclosed in the ovary of the flower. Anatomically, hardwoods are porous; that is, they contain vessel elements.[1] A vessel element is a wood cell with open ends; when vessel elements are set one above another, they form a continuous tube (vessel), which serves as a conduit for transporting water or sap in the tree. Typically, hardwoods are plants with broad leaves that, with few exceptions in the temperate region, lose their leaves in autumn or winter. Most imported tropical woods are hardwoods. Botanically, softwoods are Gymnosperms or conifers; the seeds are naked (not enclosed in the ovary of the flower). Anatomically,

softwoods are nonporous and do not contain vessels. Softwoods are usually cone-bearing plants with needle- or scale-like evergreen leaves. Some softwoods, such as larches and baldcypress, lose their needles during autumn or winter.[1]

### *2.2. Commercial lumber and quality varieties*

On a larger capacity, commercial lumber is any lumber that is bought or sold in the normal channels of commerce. Commercial lumber may be found in a variety of forms, species, and types, and in various commercial establishments, both wholesale and retail. Most commercial lumber is graded by standardized rules that make purchasing more or less uniform throughout the United States.[2] But in Nigeria, it toes the same line, the only difference is that there are no standardized grading. When sawn, a log yields lumber of varying quality. To enable users to buy the quality that best suits their purposes, lumber is graded into use categories, each having an appropriate range in quality. Generally, the grade of a piece of lumber is based on the number, character, and location of features that may lower the strength, durability, or utility value of the lumber. Among the more common visual features are knots, checks, pitch pockets, shake, and stain, some of which are a natural part of the tree. Some grades are free or practically free from these features. Other grades, which constitute the great bulk of lumber, contain fairly numerous knots and other features. With proper grading, lumber containing these features is entirely satisfactory for many uses. The grading operation for most lumber takes place at the sawmill. Establishment of grading procedures is largely the responsibility of manufacturers associations. Because of the wide variety of wood species, industrial practices, and customer needs, different lumber grading practices coexist. The grading practices of most interest are considered in the sections that follow, under the major categories of hardwood

lumber and softwood lumber.[3]

### **2.3. Wood processing and storage techniques**

Wood is processed by wood processing machine, single sawing machines-sawmill usually saw into sizes for multipurpose functions basically the respective wood usage namely for furniture, roofing, carpentry, etc. The processing of wood involves the conversion of wood into pulp, plywood, particleboards, paper, etc. The area of concern is wood lumbering as means of wood processing. it involves sawing of woods in different sizes namely log (4 x 6 x 12ft), (2in x 6 x 12ft) and so on as the market demand. This size may be for immediate use or for drying for those who have dryer chambers or kiln. After drying to remove moisture content, this is usually done to retain its original shape. The dried wood is further processed into finished product like floor tiles and ceiling board. There are two means of storing/ removing the excess moisture from wood namely: air seasoning (natural) and artificial (kiln seasoning).[17]

**Air seasoning:** This is done by piling the converted timber into stacks, separating the boards by using skids or stickers, so that the moisture is evaporated by the free circulation of air by natural convection. A good dry site with a firm foundation is necessary. This is the prevalent situation in Nigeria. The seasoning processes are usually joined with wood storage to the tune of common practices like piling, stacking under a roof cover, piling, stacking and covering with cellophane, piling, stacking and left open, soaking in water, and treated with chemical, piling, stacking under a cover roof.

**Kiln seasoning:** A kiln is a drying room with heating pipes arranged in the floor and ceiling, fans to circulate the hot air and jets to allow the introduction of steam. Most kilns in Nigeria are of the compartment type in which the load of timber remains in the kiln throughout the drying and the air conditions are regulated in accordance with a suitable schedule.

Kiln-dried timber will normally be of a lower moisture content than air-dried material and may be between 6 and 15% depending on the set objectives of kiln drying. For proper kiln operation, the kiln environmental conditions must be known-that is temperature and humidity of the circulating air. A careful record should be kept for the progress of every run so as to provide information when undertaking drying of a similar wood type or as a sort of validation of the drying processes. Other drying methods includes:

**Radio-frequency heating:** In this method, the wood is placed between two metal plates to which is applied an electric current oscillating at a very high frequency. The high frequency current causes the moistures in the wood to heat up at a more or less uniform rate throughout. Eventually boiling point is reached and, if the steam that then forms can escape freely, the drying rates may become very great indeed depending upon the power input.[13]

**Temperature gradient method:** In this method of drying, the core of the wood is heated by radio-frequency and the surface deliberately cooled by moist air, thereby inducing moisture movement from the hotter centre to the colder surfaces. This method is very expensive.

**Chemical drying:** In this method, the surface of the timber are caused to absorb, when in the green state, certain hygroscopic salts such as urea or even common eating salt. The presence of such a salt in the surface tends to keep these damp and inhibit shrinkage while moisture from within is able to diffuse outwards into and out of the surface layers into the atmosphere. The main difficulty in this method is to know the amount of chemical that should be introduced and to what depth, also in ensuring that the timber is not badly discoloured.[14] Fig. 2 below is a typical flow diagram of wood processing unit operations.

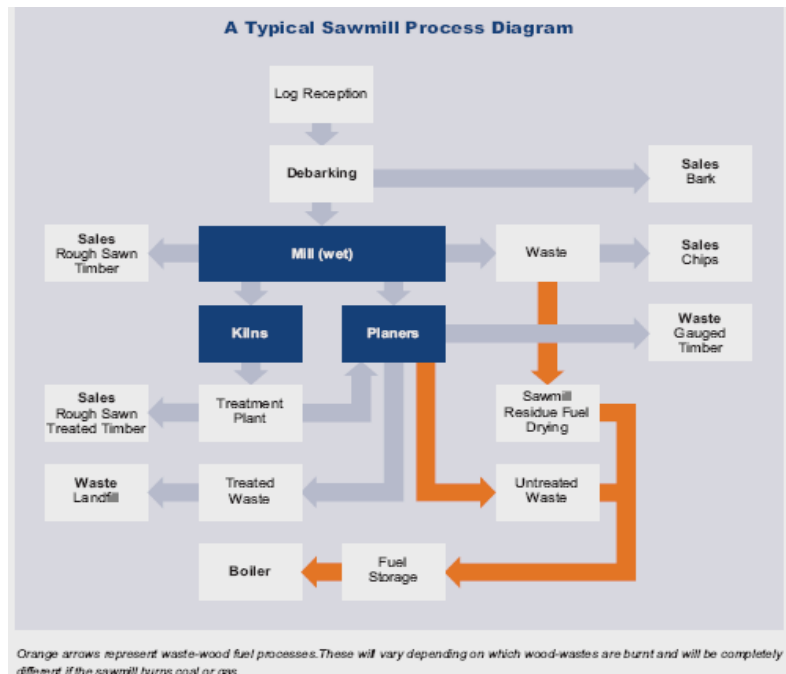


Figure 2: A typical unit operation for wood sawing process.

**Unit Operation of a Typical Timber Saw Mill**

- Extraction – The log will be extracted from the forest.
- ↓
- Log Yard – Here all logs are measured and calibrated in three dimensional measuring system.
- ↓
- Here the log are cut into different size that is 12 to 80cm in diameter and 3 to 5m in length.
- ↓
- Drying Chamber – Here energy is required for the drying of wood- drying process.
- ↓
- Planner mill – Here, timber can be further processed in a high-performance planer - that is further cut the wood to a desire size.
- ↓
- Storage or Delivery Execution – Here the finished produced will be stored until it is sold.

**3.**

**3.1. Some Wood Available in Nigeria and their Local Names**

There are different kinds of wood available in Nigeria, irrespective of their location and usage. They include: Apa, Black

Afara, White Afara, Afromosia, Gmelina, Idigbo, Canarium, Okan, Antiaria, Lagos Mahogany, Berlinia, Ekki, Scented Guarea, Dry zone Mahogany, Camwood, Pterygote, Albizia, Alstonia, Makore, White sterculia, Owewe, Dist, Okwen, Obeche, Opepe, African Walnut, Mansonia, Teak, Ebony, Guarea, Iroko, Abura, Ogea, Pterocarpus, Erimado, Agba, Akpu, Danta, Celtis, walnut, etc.

Traditionally, timbers have been used to a significant extent in construction purposes and particularly building constructions. Over 80% of the timber and timber products in Nigeria are utilized for different purposes. The major purpose of timber in building construction are roofing members, doors, frames, staircases, They are also used for scaffolding and shuttering during construction. Others include: construction of fishing boats, poles and piles and rail sleepers etc.. In road construction, large quantities of woods are also used for frameworks, pilling materials, road signboards, temporary shades, road paving plants in temporary construction site. They are also used at petroleum exploitation sites

Table 1: Shows the general code used for wood. \*

Used code	Item
1	Plywood and veneers
2	Furniture and high class joinery
3	Heavy construction
4	Utility timber (that is general purpose woodwork)
5	Pulp and matches
6	Specialized uses (tools and carving)

\* Source: [17]

and in furniture industries. The general properties have been codified as follows:

**Density coding:** runs from 1 for very light to 10 for very heavy.

**Strength coding:** run from S1 for very strong to S7 for weak.

**Durability coding:** run from 1 for extremely durable to 10 for least durable.

**Permeability coding:** run from 1 for very permeable (can be penetrated with wood preservation under pressure treatment) to 7 for least permeable.

**Colour of heartwood:** the appearance has an important effect on the end use.[10]

Table 1.0 above shows different codes for different wood and its products that turn out to be used for production of finished products. For code 1 such woods are usually used plywood and veneers production, code 2 is also used to classify woods used furniture and high class joinery. For heavy constructions, it is classified as code 3 while code 4, 5, and 6 are meant for utility timber (general purpose wood), pulp and matches and specialized uses (tools and carving woods) respectively.

Table 2, further take into consideration the wood types (species) and their corresponding colour, density codes, strength code, durability code, use code and permeability code. This makes wood selection easy and accessible for users.

### 3.2. Wood products and industry in Nigeria

Wood products in Nigeria include sawn-wood, wood based panels, i.e. plywood and particleboards, and paper and paperboard i.e. Newsprints, Printing and writing paper and other paper and paper boards i.e. Kraft paper. Nigeria does not presently produce fibreboard. The nature of statistics on these products is disjointed because there are no systematised methodologies for their regular collection either at the Federal, State or at Local Government Levels. What exist are ad-hoc studies, which are rather periodic in Nature. The review in this section is based on the last series of studies specifically the wood-based Industrial sector review of 1994 and the Forest Resources Study of 1998 undertaken by the Federal Department of Forestry and a quick field survey by [17]. From available evidence, the number of wood based industries in Nigeria has been increasing except for sawmills, which declined from 1700 in 1993 to 1349 in 1997. As at 1993, the General Wood and Veneer Consultant Ltd, Canada who was employed by the Federal Department of Forestry to carry out studies on the wood based industries revealed that there were altogether 1715 wood industries in Nigeria consisting of 1700 sawmills, 8 plymills, 4 particle board mills and 3 paper mills. However, by 1997, the Beak Constants Ltd in collaboration with Geomatics international Canada who was employed by the Federal Department of Forestry to carry out a Forest Resource Study, revealed that the number of wood based industry had declined from the level of 1715 in 1993 to 1373. These consist of 1349 sawmills, 10 Plymills, 4 ParticleBoard mills, 3 Paper mills and 7 Match and splints factories. The major wood processing industries in Nigeria are typically large capacity facilities such as large sawmills, plywood mill, pulp and paper plants etc. In particular, the sawmills are designed to handle large diameter logs. The sawmills are essentially distributed between small, medium and large scale in the

Table 2: A group of few Nigerian woods according to general properties and end use performance. \*

Species	Group	Colour of heartwood	Density code	Strength group	Natural durability code	Use code	Permeability code
<i>Azelia africana</i>	2	Yellow brown	0	S3	1	1,2,3	
<i>Acacia albida</i>	4	yellow	7	S5	4	2	2
<i>Baillonella toxisperma</i>	3	Red brown	8+	S3	1	1,2,3,6	
<i>Berlina</i> spp	3	Purple brown	10+	S1	1	3,6	
<i>Coula edulis</i>	2	Red brown	9	S1	1	2,3,6	1
<i>Cola gigantean</i>	4	Grey brown	7	S6	4	2,4	
<i>Corynanthe paclyceras</i>	3	Yellow brown	8	S3	3	2,3,6	
<i>Diospyrosmani</i>	6	Black	0+	S2	4	2,6	3
<i>Damiellaogea</i>	3	Red brown	7	S6	2	2,4	2
<i>Eucalyptus robusta</i> (p)	2	Red brown	9	S3	2	2,3	
<i>Khaya ivorensis</i>	3	Red brown	7	S5	3	1,2	3
<i>Ficus mucuso</i>	5	Yellow	6	S7	4	1,2,4	
<i>Gmelina arborea</i>	4	White	7	S6	3	1,2,4,5	3
<i>Hannoa klameana</i>	5	White	4	S7	4	1,2,4,5	3
<i>Lophira alata</i>	1	Park brain	10	S1	1	3	3
<i>Morus mesozyga</i>	2	Yellow brown	9	S1	3	1,2,3	
<i>Newtonian</i> spp	2	Brown	8	S3	3	1,2,3	
<i>Xylopia rubescens</i>	3	Yellow	8	S3	4	1,2,4	

\* Source: [17]

proportion of 81%: 13%: 6%. Though the number of sawmills decreased, production has not decreased commensurately. This is because even though wood industries are finding it increasingly difficult to obtain desirable sizes of popular tree species, like *Mansonia ultissima*, *Milicia exclesa* and *Khaya* species from Nigerian forests, they have been forced to expand the range of exploited species to species which hitherto were regarded as uneconomic. By 1990, the Nigerian sawmill capacity was estimated at 11,684,000m<sup>3</sup>/year in log equivalent and capacity utilisation was 46% i.e. 5,422,000 m<sup>3</sup>/year. It was estimated that by 1993 capacity had dropped to 5,842,000 m<sup>3</sup> while production was 2,711,000 m<sup>3</sup>. However based on the findings of Beak International and the field survey carried out by [17], it was estimated that by 1997, the capacity would have dropped to 4,635,800 with a corresponding output of about 2,000,000 m<sup>3</sup>. Production also might have gradually declined. The 10 plymills are integrated complexes with sawmills and four particleboard plants. The capacity of the 10 mills was estimated at 158,000 m<sup>3</sup> by 1997 and capacity utilisation then was 35% generally bringing the total production to 55,125 m<sup>3</sup>. Import of wood based panels have continued to de-

clined from 70,000m<sup>3</sup> where it peaked in 1980 to 20,000m<sup>3</sup> in 1990 and 12,000m<sup>3</sup> in 1997. There are at present four particle board mills in the country but some of them are having problems. In 1993, the existing capacity was estimated at 85,500 m<sup>3</sup> with a capacity utilisation of 44% and an output of 39,500 m<sup>3</sup>. This situation has remained largely so. There are three pulp and paper mills in Nigeria with a total installed pulp capacity of 102,000 mt per annum and a paper capacity of 207,000 mt per annum. Since 1990, the production of newsprint had been declining from 31,000 mt out of an installed capacity of 100,000 mt per annum, to only 3,000 mt, in 1993. The Nigerian Newsprint Manufacturing Company (NNMC) had remained shut since 1994, due to problems of spare parts and other logistic problems. The Nigerian Paper Mill (NPM) at Jebba produces industrial grade paper, specifically kraft and kraft linerboard. The old paper machine had a capacity of 12,000 mt but since 1994, a new machine with capacity of 65,000 mt has gone on stream. Production of paperboard in 1990 was 12,498 mt and declined progressively to 2313 mt in 1992 from where a gradual up turn began. Paperboard production by 1996 was 19,744 mt and production had remained at this level. The third



mill is the Nigerian National Paper Manufacturing Company Ltd (NNPMC) Iwopin with a proposed installed capacity of 100,000 mt/yr of printing and writing paper. After a protracted history of delays only 30,000 mt/yr of printing and writing paper was installed by 1995. Test production with imported pulp resulted in 2,500 mt of printing and writing paper in 1995 and 966 mt in 1996. Production has not increased appreciably from this mill ever since. The production in the pulp and paper industry has been constrained by inadequate working capital, spare parts and long fibre unavailability.[12]

### ***3.3. Existing Methodologies for data collection.***

The most tested and viable method for wood product data collection in Nigeria is through investigations and enumeration. This essentially entail the design and administration of questionnaires by field workers. Usually, this is supported by personal visits and interviews of factory and management staff of the various factories essentially to clarify and validate reported data. Another method involves sending letters to State Forestry Departments through their Directors requesting them to furnish available information to the Federal Department of Forestry. Telephones and radio links are also adopted. Forestry statistics are also collected from progress reports from states and other institutions during National Forestry Development Committee (NFDC) meetings. Field offices in addition submit monthly, quarterly and annual reports and expenditure returns, which are essential sources of forestry statistics. Reliance is also placed on proceedings from seminars, workshop, symposium and conferences such as the Forestry Association of Nigeria. Other secondary data are collected from relevant publications.

#### ***3.3.1. Existing methods of data processing and validation***

Data processing includes data compilation, validation and dissemination. Data processing usually starts with editing and coding of survey results into appropriate data bases and this is either followed by manual or computer processing. Sorting them into various databases, ranging from statistical bulletins to computer based databases or output. Sorting is done first by industry and then by products. The mean production levels are computed for the various products based on the sample size and the method of sampling adopted. Once this has been achieved, the means are projected to aggregate levels depending on the sampling frame for the respective industries.

#### ***3.4. Constraints in Data Collection in Nigeria***

Many constraints still exist in Nigeria as far as forest sector statistics continue and they include the following:

- **Funding and Appropriate Infrastructure**

Funding is the singular problem facing forestry data collection in Nigeria. A lot of lip service is still being paid to this very important issue in Nigeria. Allocation is piece meal and not adequate. Means of transport which are very crucial to the successful collection of information are conspicuously absent while equipment (computers) necessary for data processing are yet to be provided.

- **Public Attitude**

Public attitude is also a constraint. As in most cases, the public views Government statisticians with suspicion and hostility. They are usually not receptive to the idea of furnishing information about their concerns because more often than not, such requests are misconstrued for taxation purposes. This general poor attitude on the part of the public needs to be improved if forest sector statistics

will be successfully collected and disseminated.

- **Dissipation of efforts**

Funding has been listed as the main constraints but perhaps if there had been greater co-ordination among the various institutions collecting forestry statistics may be more should have been achieved. Presently, a lot of effort is being dissipated by various interested organisations with very little results to show for it.[18]

#### 4. Conclusion and Recommendation

##### 4.1. Conclusion

Wood has been known for a multitude of uses. Variations in the characteristics of woods, its volume and differences in cellular structure make woods heavy or light, stiff or flexible, and hard or soft. The properties of a single species are relatively constant within limits; therefore, selection of wood by species alone may sometimes be inadequate. However, to use wood to its best advantage and most effectively in engineering applications, specific characteristics or physical properties must be considered. The wood varieties available in Nigeria were reviewed with their processing and storage techniques. The work also covers the wood product industries overview, what has happened, what is going on, in the wood industry with corresponding constraint and limitations.

##### 4.2. Recommendation

There should be a periodic review of wood processing and storage in Nigeria especially in decade interval to appraise the industry that feeds construction industry, furniture, paper mill industry etc. Also, there should be government intervention in terms of research and development and training in wood production and the industry to support private sector initiatives in wood production especially in particle board, ply wood, veneer production and other wood conversion strategies etc.

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