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An Assessment of Wood and wood-Waste Utilization in Nigeria

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Abstract
Wood is one of the produce of the forest that has been identified as raw material for a number of industries. Having realised the importance of wood among other competitors in the life-style of human beings, all wood either soft or hard in form of planks or residue must be utilized in the best way we could. The findings involved a group of selected wood-based companies and manufacturing industries in Ondo, Oyo, Lagos and Delta State of Nigeria. Questionnaires were constructed and personally administered. The result showed that both soft and hardwood species are very important in the daily life of all human beings, it also showed that wood is still preferred for some applications when compared with other competitors such as plastics, metal and concrete because of its inherent natural properties.
Keywords: Assessment, wood, wood-waste, utilization

Introduction

Wood from the time immemorial has established itself as a constructional material for variety of applications, such as construction of building, furniture items, bridges, boats, ships, lorries, tractors, wagons and aircraft carrier. Woods is also used in producing components of some musical instruments such as guitar, piano, violin and tambourine. Sports wares such as hockey sticks, tennis bats, tennis rackets and cricket bowls are also made from wood Seyi (2014) says that, the main problem in the use of wood as constructional material in Nigeria is that of inadequate supply of required timber species in some parts of the country. He was of the opinion that these problems can be solved by strict adherence to the policy of sustained yield forest management, efficient wood conversion and recycling of waste wood. He confirmed that the introduction of lesser wood species and fast growing plantation species into the timber market may also solve problem of timber scarcity

Wood is a fibrous rigid material of plant origin. It is broadly classified as hardwood and softwood. Hardwood is derived from angiosperm or broadleaved trees such as Iroko, Mahogany, Obeche and Danta. Hardwood timbers are mainly used for structural application because of their high strength and durability. Softwoods is also derived from Gymnosperm and obtained from coniferous trees, which have needle-like leaves. Example of softwood trees are scoot spine, Norway Spruce and DouglasFir.

In some cases, softwood is also used for constructional purpose, but it is preferred to hardwood in pulp and paper production. It is imperative that the forest should be managed on sustained yield basis for the production of the wood in perpetuity. The concept of sustainability in all its facets ecological, economic and social is vital to forest management in

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order not to jeopardize the other goods, services and benefits of the forest. These benefits include amelioration of weather pattern and climate, provision of clean air, protection of biological diversity, protection of soil and food crops, carbon sequestration, provision of employment opportunities (poverty alleviation) and provision recreational facilities.

In contemporary times wood is still widely used for constructional purposes. It is also a valuable industrial raw material for the production of pulp, Paper, paperboard, rayon, cellophane, photographic film, tannin, methanol, ethanol, wood adhesive and other chemical derivatives The major problem of the pulp paper mills was identified as that of ownership structure (Naanda, 2010).

The ubiquitous nature of wood has made it a valuable material in every stage of human development. At the early age, the baby rests in wooden court, plays with wood toys, and learns to write on wooden slate and paper when he is of school age. On graduating from school he receives a paper certificate. If he is lucky to secure employment, his salary is paid in paper currency. When he is old, he uses a wooden working stick, sleeps on wooden bed and when he dies; the body is laid in wooden coffin. Wood and wood products are important in the provision of shelter, energy, food and health services. They also contribute significantly to developments in education, communication, entertainment, sports and industrialisation. Wood remained virtually the most predominant material used for construction and energy generation until the last half of the 19th century (Kintu et al., 2019). Wood can be converted into pyrolitic products and chemicals. The slow pyrolysis method was used in producing different qualities of carbonized wood and charcoal (Peeters et al., 2017).

Wood has high basic strength-related properties, which make it adaptable for use to withstand static loads as well as vibration and fatigue conditions. It also has high strength to weight ratio, therefore it can be used in cases where the structure is large in relation to load to be carried. Wood has low coefficient of thermal and electrical conductivity. It is also easily fastened together by using nails, screws, metal, connectors and glues. It is compatible with other materials such as plastic, metal and concrete.

Wood can easily be converted into different shapes and sizes by using manual or simple machine tools. It is renewable and environmentally friendly and has low energy requirement during conversion when compared with concrete, plastic and metal. The poor log conversion technique adopted in most sawmills in Nigeria is partly responsible for inadequate supply of required lumber (Peeters et al., 2017). The lumber recovery factor in most sawmills varies between 45 and 50% (Thorpe 1993 and Fuwape, 1986). This implies that about 50 to 55% of log input into the sawmills are left as wood residues. Therefore, between 3.6 and 7.2 million cubic metres of wood processed in Nigeria is discarded as residue every year(Fraser et al., 2019).

Wood is a combustible carboxylic material that is made up of carbon, hydrogen and oxygen. The combustible characteristics of wood have made it a valuable source of heat energy wood and other forest biomass are used in various forms. They are used as firewood and charcoal for direct combustion and are also converted to pyro-gas and bio oil during fast pyrolyses. The pyro gas could be used in generating heat energy to power turbine for electricity generation while bio-oil may be used as substitute for diesel in many static applications, such as boilers, furnaces, engines and turbines for electricity generation (Diebold and Bridgewater, 1996, Bridgewater, 1999). Other chemicals that may be derived during fast pyrolyses of wood include resins, fertilizer and food flavouring. Until AD 1850, wood was the main source of energy in the world (Halden, 2010).

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Although there has been a tremendous change from fuel-wood to fossil fuel in industrial countries, fuel-wood is still the dominant source of energy throughout the developing countries(Rufus et al., 2020). About 13% of the world's primary energy was derived from forest biomass in 1987 (Hall and Groot, 1988) while two billion people in the rural communities of the developing countries depend on bio fuel for domestic cooking, steam raising, heat generation and crop raising(Agenda, 2016). Fuel - wood constitutes 30-84% of total energy consumption per annum in Latin America and 57-90% of total energy consumption per annum in Africa(K & S, 2004). The average consumption of fuel-wood per person in the developing countriesisestimatedas0.8m^3/year(K & S, 2004). Approximately 80% of the total energy used for domestic needs per annum in rural area in Nigeria, Kenya, Zambia, Zimbabwe, Senegal. Ivory Coast and Namibia are sourced from charcoal and firewood (Chalkley, 2013; Edokpolor & Owenvbiugie, 2017; NJCLD, 2016; SACCO, 1983; Ukit, 2016).

The purpose of this study is to examine all round utilization of wood and wood waste for human consumption.

This study will try to look into the possible solution to the following: Will the production of various items made of wood and wood waste solve, in any way, the problems of other less valuable competitors and wood waste in our various mills in Nigeria and encourage the full utilization of wood and production of some items made from wood waste such as cement bonded board, wood-wool excelsior boards, gypsums-bonded fibre boards, pyrolytic products and also reduce air pollution in our various mills.

Methodology

Research Design

Descriptive research design was chosen for the successful accomplishment of this study. Production of various items made of wood, wood waste products and conversion of wood into pyrolytic products are current and constant usage in this country. This involves sampling the opinions of workers in some wood-based companies such as African Timber and Plywood Company Limited, Sapele, Covenant Furniture Factory, Oke-jebu, Akure, Kanisuru Dola Sawmill, Ipele and Managers of Manufacturing Companies such as Alex Tiles Manufacturing Industry, Sapele, Kenny-Eddy Boards industry Limited, Lagos and Ogo Oluwa Manufacturing Industry Limited, Ibadan.

This was divided into the following steps-sample and sampling procedure. The first sample was drawn from major populations viz: Wood-based companies. The second sample was drawn from manufacturing companies. The two samples were drawn from Delta, Ondo, Lagos and Oyo States of Nigeria. Three wood-based companies and three manufacturing companies were selected from these states.

Instrumentation

Two different types of questionnaires were used, that is:

i. Wood-based companies questionnaires (W - B, C, Q) for workers; and
ii. Manufacturing Companies Questionnaire (M. C. Q) for categories of workers.

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These questionnaires were to examine the full realisation of human satisfaction from wood and wood waste products with possible effect of wood residue on the production of various wood items, cement bonded boards and wood conversion into pyrolytic products. The likert-type of ranking was adopted thus:

S.A. - Strongly Agree (5 points)
A - Agree (4 points)
N - Neutral (3 points)
D - Disagree (2 points)
S.D - Strongly disagree (1 point)

Administration and Method of Data Analysis

The questionnaire were self-administered with adequate monitoring, most of the questionnaires were got from the respondents.

A pure descriptive form of analysis was used in analysing the data. After collecting all the responses, each item on the questionnaire was tabulated on a code sheet. The grouping S. A and A scoring 5 and4 respectively was put together as agree; while that of D and S. D scoring 2 and 1 respectively, was put together as Disagree, Neutral was left as 3. Scores for each group i.e. Agreement, Neutral and Disagreement were examined and added together. On each item therefore, it was possible to know how many respondents agreed, disagreed or were neutral.

Each of the stages that are agreements, disagreements or neutral was added based on the problem in question.

For instance (W - B, C, Q) had 20 items while the (M. C. Q) had 15 items. The total number of agreements X, for each group was found, average X, based on the no of items of each group N_G were also found i.e.

Agreement/disagreement/neutral x = no of agreement / disagreement / neutral and N_G = no of items in that group.

In order to get the various percentages from which results could be deduced from the average X for each agreement/disagreement/neutral was divided by the total no of N_G of respondents and multiplies by 100.

Percentage for agreement for instance = $\frac{X}{N_G} \text{ X } \frac{100}{1}$

This exercise was done each for the group of the problem in question and for the group of respondents that is workers of Wood-Based Companies and Managers of Manufacturing Companies.

Results

The results are based on the group of respondents involved and the problem earlier stated in this study.

Effects of wood utilization on the full realization of human satisfaction over other competitors such as plastics, metal and concrete

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Table 1 showing% of responses from wood-based companies

S/N	Names of wood based companies	No samples	No of respondents	%
1.	African Timber and Plywood Company Limited, Sapele	100	90	90
2.	Covenant Furniture Factory	100	80	80
3.	Kanisuru-Dola and Sons Saw-Mill,Ipele	100	65	65
	Total	**300**	**235**	**X78.33**

In table I above, two hundred and thirty-five out of three hundred participants in the three wood-based companies in Delta and Ondo States representing 78.33% are of the opinion that wood played important roles in human survival and salvation

Table 2 showing the% of responses from manufacturing companies.

S/N	Names of Wood Based Companies	No Samples	No of Respondents	%
1.	Alex Tiles Manufacturing Industry Sapele	100	85	85
2	Kenny–Eddy Boards Industry,Limited Lagos	100	80	80
3	Ogo Oluwa Manufacturing Company Limited,Ibadan	100	50	50
	Total	**300**	**215**	**X71.66**

In table 2 above, two hundred and fifteen out of three hundred participants in the three manufacturing companies In Delta, Lagos and Oyo States Representing 71.66% are of the opinion that wood residues i.e. (Sawdust, wood chips and flakes) are essential for the production of various boards and encourage the use of pyrolytic products made of wood waste while only 28.34% disagreed.

Table 3 shows the view as expressed by the workers in the three wood based companies; 170 out of 200 representing 85% believe that maximum utilization of wood and wood products would solve the problems of less valuable industrial raw materials that are used for others competitors.

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Table 3 showing the summary of the effects of wood waste on the Availability of various indigenous products in Nigeria

Response	Average X	%
Agree	170	85
Neutral	30	15
Disagree	-	-
Total	200	100

Only 30 were undecided

Table 4 shows the views as expressed by various categories of manufacturing companies. An average of 280 out of every 300 participants representing 93.3% are the opinion that using wood wastes for the production of various categories of boards will reduce high cost of building materials, improve the living standard of every Nigerian and also reduce the problem of air pollution in our various mills while 9 and 11 out of 300 participant disagreed and were neutral respectively.

Table 4 showing the summary of the effect of wood and wood waste on the production of building materials and the reduction of air pollution in various mills

Response	Average X	%
Agree	280	93.33
Neutral	9	3
Disagree	11	3.67
Total	**300**	**100**

Table 5 showing the summary of the effects of wood and wood waste products on the reduction of foreign materials and air pollution in our Nigerian mills

Response	Average X	%
Agree	1,200	80
Neutral	100	6.67
Disagree	200	13.33
Total	**1,500**	**100**

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1200 out of 1500 Environmentalist, Saw-Millers, Researchers and Consumers of wood and wood waste representing 80% believe that maximum wood waste utilization will solve the problem of inadequate indigenous building materials in Nigeria and eradicate air pollution in our various mills while 100 were neutral and 200 disagreed.

Based on the issue of the problem earlier stated in this study, that is, will the production of building and house hold materials solve in any way the problems of importation and air pollution in our various mills and encourage the use of indigenous products made of wood and wood waste?

Discussion

With regards to maximum wood and wood waste utilization, this study has found solutions to problems in question which is the area of unavailability of wood and wood wastes made materials in Nigeria.

Now, what is the importance of maximum wood and wood wastes utilization in relation to the problems of unavailability of wood made materials? More funds should be made available for research in wood technology in order to develop efficient and environmental friendly techniques for extracting and converting wood raw materials to useful products.

Technology for efficient conversion of small diameter logs and plantation trees to lumber and value-added engineered wood products should be adopted. Again, seasoning and preservative treatment of timber members should be encouraged in order to ensure durability of wooden structures. Furthermore, the establishment of integrated wood industries should be encouraged while small sawmill holding should be effectively controlled to minimizes wastage of wood resources.

However, the high demand for wood products due to the increase in population has induced high pressure on forest resources to the extent that some favored timber species have become scarce while others have become extinct in certain ecological zones.

Now, one would be able to deduce from the finding of this investigation that should government owned wood-based industries and pulp/paper mills be privatised, should government ensure a stable macro – economic environment, there will be an encouragement in efficient management and shape the degree of confidence of both foreign and local investors in the economy respectively.

Conclusion

In spite of the efforts made to solve the issue raised in this study, any research carried out in order to gain more insight into the area of maximum wood and wood waste utilization in Nigeria cannot be a failure because a lot of implications are attached to it for further research.

In conclusion however, more work need to be done in the area of anthropometrics and household furniture.

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