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Quality and Utilization of Timber Species for Building Construction in Minna, Nigeria

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----------ABSTRACT----------
Lack of quality timber utilization for building construction in Minna formed the basis for this study. The specific objectives were to identify the timber species utilized in Minna; to determine the most quality timber species used in Minna metropolis and factors that influence the choice of a particular quality timber species. Information was obtained through interviewing of traders and observing timber yards and construction sites. Quality control measures in place were also investigated and ranking wise method was used to obtain the nineteen (19) most quality timber species utilized in Minna metropolis.

It was observed that there are over 18 timber species on market without quality control measures; where timber grading methods in Minna are mainly subjective with visual grading technique as the predominant method of assessing timber quality. Timber intended for purpose should be based on subjective prescriptive approaches. It was concluded that, the absent of quality timber standards has impended efficient utilization of timber and has affected the market value and building construction industry. This is due to the poverty and rapid population growth resulting to indecent cutting of trees in use for firewood and other domestic purposes, deforestation, over cultivation, poor irrigation practices, resulting to the loss of biological and economic productivity of the land.

KEYWORDS: *Timber, Construction, Standard, Species, Deforestation, Irrigation.*

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I. INTRODUCTION

Timber is the most useful and important material for construction in building without which entire process is incomplete. Selecting timber is not an easy task as it seems to be, because timber has different type and selecting the right material is an important key. Timber is again an expensive material to be incorporated in a building for different purpose for which it should be necessarily be strong and tough. There are many useful needs of timber during the construction of building such as in doors, windows, cupboards, cabinet and railings which contribute a lot in the beautification and overall look of interiors. Timber has many other uses but which type of timber should be used for right purpose is important to know because if timber used in construction comes out to be of low quality then one may need replacement again and again. Timber while selecting should be considered for its quality aspect which must be free from any decay like rotten, warp, knot, fungi and mold or termite so that it would not give problem afterward. Before purchasing timber material for the construction, one must be well informed regarding timber types and forms to select as a single knot can bring down the show of whole wood work.

With wood utilization one should therefore, recognize the fact that properties of wood vary with species age, site and environmental conditions. (Bowyer et al. 2003; Ishengoma et al. 2004) reported that Minna and its surroundings are endowed with a variety of tree species in her natural forest and in recent there has been an increase in the importation of tree species from southern part of the country and exotic trees species such as Gmelina (Gmelina arborea), Neem tree (Azadiarata indica), Teak (Tectona grandis) etc. With a boom in the construction sector resulting in over-exploitation and scarcity of well-known trees such as khaya senegalensis, khaya grandifaliola etc. there is a shift to a diversity of species comprising unpopular species (Zzwa et. al. 2006b). In Minna, systematic approaches for predicting timber strength have not yet been employed. Yet these

would assist timber dealers and consumer to have rough idea of timber quality at the outlet with proven track record, a practice which unfortunately exerts pressure on well-known timber species leading to their scarcity and abnormal prices. The dynamic nature of the building environment couple with population growth dwindling wood resources globally that necessitate research into optimal use of multiple tree species with quality control procedures (Leicester, 2002; Mackenzre et al.2005).

Ozden, (2008) revealed that, the relatively low priority given to environmental protection often leads to poor land management decisions, which may result from specific economic conditions or inappropriate land laws or customs. In many cases unregulated access to land resources may lead some individuals to maximize their own gain by over exploiting the land at the expense of the community as whole. Human factors such as over-cultivation, overgrazing and over fuel wood consumption are some of the causes of desertification that lead to the unavailability of quality timber species in Minna and its surrounding. Odokonyero, (2005) attributed inaccurate dimension of sawn timber to poor condition of saws and poor workmanship. Bill et al. (2004) and Zziwa et al. (2006c) stressed the economic importance of sorting timber according to its strength quality at the time of merchandising and construction. Ishengoma et al. (1994) argue that in order to efficiently and economically utilize various timber species detailed knowledge of their properties was necessary. This is in agreement with Winandy (2002) who noted that users will increase their demand with more reliable and durable building materials available.

II. METHODOLOGY

Minna, the state capital of Niger State was chosen as a result of high concentration of construction activities targeting various categories of people including low, medium and high income earners with differences preferences and hence high likelihood of obtaining representative information on quality and utilization of timber species for building construction. Interview of stake holders namely site engineers, saw miller, timber dealer, and on site observation of timber yard and building sites were carried out. Three timber yards were selected for studied; namely Shango, Maikunkele and Sayeko respectively. Emphasis was on identification of quality timber species, most utilized timber and reason for preference of particular timber species. Quality control measures in place were also investigated and Ranking wise method was used to obtain the nineteen (19) most quality timber species utilized in Minna metropolis.

III. RESULTS AND DISCUSSION

The data collected was analyzed using pier wise ranking, deviation and Spearman statistical tool. Table 1 and 2 shows different timber species available and most commonly utilized quality timber species for building construction in Minna metropolis. While basis for choice of timber species for building construction is presented in Figure 1 respectively.

$$r_s = 1 - \frac{6\sum D^2}{N(N-1)} \qquad (1)$$

Where,

$\Sigma =$ Summation

$r_s =$ Spearman

$D =$ Deviation

$N =$ Number of occurrence

It was observed that various timber species are utilized in the construction industry as shown in Table 2 but the general trend was application of similar nominal dimension of different timber species for different structural applications. Timber species such as Khaya Senegalensis (Africa mahogany Madachi), Berlina Grandiflora, (Berlina, Dokar Rafi), Afzelia Africana (West Africa Albizza, Kawo) were being utilized as roofing timber, ceiling material, lintel, columns, and beams.

Market survey revealed that timber on market were characterize by variable dimension, non-uniformity in thickness, width, length; non parallel edges and merchandise on the basis of appearance. An interview with engineer in one of the construction site in Minna showed that timber for construction is classed as soft wood and hard woods or structural timbers. Timber design is based on adopted or adapted foreign standards such as BS 5268:1999 on structural use of timber. Building contractors had limited knowledge on timber as a unique construction material and customers were not keen on quality assurances, few indicated awareness of its impact on structural integrity. At commercial outlets timber grading was mainly subjective, base on negotiations between buyer and seller and also depending on the general quality supplied, which varied with the sources and duration of stork. An interview with timber traders shows that there are no standard procedures governing quality control measures in Minna; no strict rules and regulation regarding timber classification, grading and pricing. It is further noted that in some cases timber design was based on experience rather than superiority in term of strength base.

Selection of timber species for structural application was generally based on availability, cost, customers' preference, strength and appearance, a procedure which were adequately used to assess the potential quality of timber species. Majority (29%) of respondents revealed that choice of timber species was mainly influenced by availability and cost (Figure 1). Customers preference perceived by majority timber dealers as a strength indicator was one of the considerations in selection of timber species for construction purposes. More so, utilization of diverse species for building construction was inappropriate since various species are not necessarily of the same strength.

The declining demand for quality timber has led to a shift to lesser known species (Table 1 and 2), not knowing that strength properties might differ from those well-known species given the biological and anisotropic nature of wood. This in agreement with Winandy (2002) who observed that forest resources issues would increasingly affect the building materials used worldwide to an extent that usage will shift toward new species and composite rather than solid-sawn lumber. However, this poses a threat to structural stability, especially when there is no strength of the newly introduced materials at the design and construction stages. The lack of quality assurance mechanism in Minna's timber utilization sector is partly responsible for material wastage, unsafe construction and low market value of some timbers.

Table 1 Different Timber species available in Minna's market

S/N	BOTANICAL NAME	HAUSA NAME	NUPE NAME	GWARI NKWA NAME	STANDARD NAME
1	Berlina Grandiflora	Dokar Ra Fi	Wuchi/ shichi		Berlina
2	Piptadniastrum	Dorowan Kurmi	Lonchi	Kari	Dawadawa
3	Aubrevillea Kerstingi	Dorowan Mahalba	Lonchi		
4	Antiaris Africana	Farin Loko		Lokoyi	
5	Mitragyna Stipulosa	Gayan Goro	Fininbi		
6	Triplochiton Seleroxylon	Hannun Biyar	Egwa gutsu		
7	Afzelia Africana	Kawo		Pasan kori	West Africa Albizza
8	Sterculia Oblonga	Kunkun Rafi			Yellow sterculia
9	Chlorophora Excele	Loko	Kochi		Iroko
10	Khaya Senegalensis	Madaci	Pkache	Guyi	Africa Mahogani
11	Ptegota Macrocarpa	Marken Kurmi	Danchi boggi	Darin	
12	Khaya Grandifaliola	Male		Guyi	
13	Tectona Grandis	Tik (Poles)			
14	Nauchlea Diderrichir	Tafashiyar Kurmi	Epuko	Kutingbare	
15	Terminalia Superba	Baushen Kurmi	Pkache batta		Afra limba
16	Blighia Sapida	Allele			
17	Pterocarpus All Spp	Madobiya	Zanchi		Modobia
18	Canarium Schweinfurthii	Atile	Stedia/ neem		
19	Dalbergia Sisso	Dalbijiya	Goriba		
20	Borassus Arethiopum	Giginya		Bagoyi	
21	Vitex Doniana	Daniya			
22	Irvingia Gabonensis	Hakokari			
23	Diospyros Mespilformis	Kanya			Africa ebony
24	Albizia Zygia	Tsintsiyar Kurmi	Sokun		
25	Daniellia Ogoa	Maje Kurmi	Danchi/ Sanchi		Ogea
26	Danielilia Oliveri	Maje	Danchi		Ogea
27	Sysygium Guineense	Malmo		Gori	
28	Allanblackia All Sp	Mangoro Kurmi	Mungoro		
29	Prosopis Africana	Kirya	Pkache		
30	Vetellaria Paradoxum	Kade	Ekochi	Koli	Sheer butter
31	Acacia Abida	Gawo		Pakuri	
32	Anona Senegatensis	Gwandan Daji	Nungberechi	Jauri	
33	Bomax Costatum	Rimi	Kochi		
34	Anogeissus Leieo	Marke (Iron Wood)	Marke		
35	Gmelina Arborea		Malahina		
36	Azadirata indica	Dogon yaro	Neemu		Neem tree
37	Crocodylusn Cataphractus	Kada		Nakaraba	

Table 2: Most commonly utilized quality timber species for building construction in Minna metropolis.

S/N	BOTANICAL NAME	STANDARD NAME	HAUSA NAME	NUPE NAME	GWARI NKWA NAME	SOURCE OF SUPPLY
1	Berlina Grandiflora	Berlinia	Dokar Rafi	Wuchi/ shichi		Indigenous
2	Piptadniastrum		Dorowan Kurmi	Lonchi	Kari	Indigenous
3	Mitragyna Stipulosa		Gayan Goro	Fininbi		Indigenous
4	Afzelia Africana	West Africa Albizza	Kawo		Pasan kori	Indigenous
5	Chlorophora Excele	Iroko	Loko	Wuchi		Indigenous
6	Khaya Senegalensis	Africa mahogany	Madaci	Pkache	Guyi	Indigenous
7	Ptegota Macrocarpa		Marken Kurmi	Danchi boggi	Darin	Indigenous
8	Tectona Grandis		Tik (Poles)			Exotic (India, Burma, Thailaand, Java)
9	Blighia Sapida		Allele			Indigenous
10	Pterocarpus All Spp	Madobia	Madobiya	Zanchi		Indigenous
11	Diospyros Mespilformis	Africa ebony	Kanya			Indigenous
12	Daniellia Ogoa	Ogea	Maje Kurmi	Danchi/ Sanchi		Indigenous
13	Danielilia Oliveri	Ogea	Maje	Danchi		Indigenous
14	Allanblackia All Sp		Mangoro Kurmi	Mungoro		Indigenous
15	Prosopis Africana		Kirya	Pkache		Indigenous
16	Vetellaria Paradoxum	Sheer butter	Kade	Ekochi	Koli	Indigenous
17	Acacia Abida		Gawo		Pakuri	Indigenous
18	Bomax Costatum		Rimi	Kochi		Indigenous
19	Anogeissus Leieo		Marke (Iron Wood)	Marke		Indigenous
20	Gmelina Arborea			Malahina		Exotic (India)

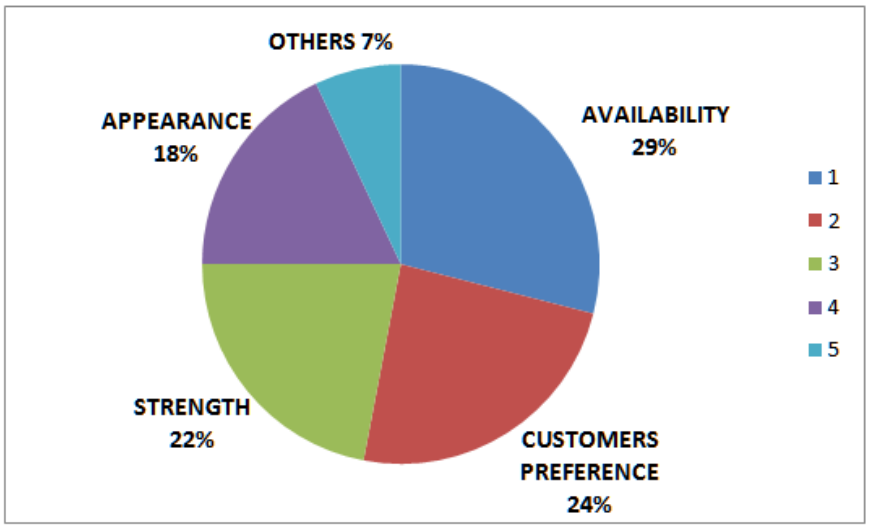

Figure 1: Basis for choice of timber species for building construction

IV. CONCLUSION

The chances of timber engineering and the use of timber as load-bearing material depend on the quality criteria. The most important factor is the economical use of timber in order to increase its utilization in construction and make it competitive in comparison to other constructional materials. Timber as a material for supporting systems is an indicative orientation for the use of wood in further constructions. Therefore, all kinds of wood and timber, from round wood to squared timber through composite sections made of boards and squared timber, as well as glue-laminated timber, plywood, etc., especially when combined with other materials, must be developed and employed. In order to take advantage of better qualities, one needs only to build in the best pieces of timber in the most solicited construction elements. This requires the admission of non-destructive testing equipment's which can, like the Sylva test ultrasound method, determine single resistances much more precisely; this goes for the elasticity modulus as well as for the modulus of rupture.

The study shows that there are limited numbers of quality timber species in Minna. Timber grading methods in Minna are mainly subjective with visual grading technique as the predominant method of assessing timber quality. Timber intended for purpose is based on subjective prescriptive approaches. The study also revealed that due to the poverty and rapid population growth it lead to extension of farmland, overgrazing, bush burning, cutting of trees to use for firewood and other domestic purposes, deforestation, over cultivation, poor irrigation practices, inappropriate land use by the rural dwellers and these result to loss of biological and economic productivity of the land. Therefore, there is need for Federal government to strengthen the capacity of state government institutions and involvement of local people in collective decision making for effective management of grazing land and trees as common pool resources. An initiative of poverty reduction strategies with aim of diversification among the rural dwellers to reduce pressures on the dry land should be encouraged. Equally, more effort to fuse agencies like National policy on the Environment 1999 under the supervision of Federal Environmental Protection Agency (FEPA), National Environmental Standard and Regulations Enforcement Agencies (NESREA) to combat desertification should be carried out.

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