WOOD SELECTION AND UTILIZATION EFFICIENCY BY SMALL SCALE FURNITURE INDUSTRIES IN BENIN METROPOLIS, EDO STATE, NIGERIA

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DOI No. 10.528 / zenodo 10558777

ABSTRACT

This study assessed the rate of wood selection and utilization efficiency by small scale furniture industries in Benin City with the view of identifying common tree species used in furniture making, the various lumber dimensions used in furniture making, the actual volume of wood used in furniture making and the waste management practice by small scale furniture industries. Thirty percent (30%) sampling intensity was applied to the thirty-two (32) wards in the Local Government Area and six (6) wards were selected. One hundred and eighteen (118) respondents were randomly selected for the study. Data were collected using structured questionnaires and interview of the respondents. The data were analyzed using descriptive statistics such as frequency, percentage and inferential statistics to test the variables which were summarized into tables and charts. The results indicated that 99% of the respondents were male, while 1% were female, it shows that Mansonia altissima and Gmelina arborea accounted for (100%) as the most commonly used woody species. The most commonly used dimension was the 1" × 12" × 18" (100%), with wood shavings accounting for (48%), off cuts (33%), sawdust (19%), respectively which were the most common wood wastes generated by the furniture makers in Benin City. Forestry extension services should intensify efforts to promote and commercialize underutilized local timber species through awareness campaigns and demonstration projects, thereby reducing pressure on overexploited species.

Keywords: *Wood Utilization, Mansonia altissima, industry, off cuts, furniture*

INTRODUCTION

Wood is regarded as one of the most popular material used in making beds, chairs dining tables cupboards which are all of great importance in the house hold of various individuals.it is also used in the constructions of houses barns fences bridges and even musical instruments. The most common used in the construction of furniture are mahoganies, *Mansonia altissima*, *Khaya ivorensis, Cordia millenii, Tectona grandis* (Apungu, J. W., Antwi, K., Appiah-Kubi, E., Bih, F. K., & Zakaria, J. (2025). The world is experiencing a remarkable increase in the desire for high quality facilities and goods such as high-class wooden furniture and as a result of this the volume of wood required for the production of wood based furniture has increased greatly at the expense of the tropical forest vegetation which provides the required timber products used to satisfy the various wood demands (Adedire, 2023).

Furniture industries have been identified as a veritable tool in poverty alleviation because of their potency in revenue generation, job creation, investment attraction and creation of market for local products (Ototo, 2023). Nigeria economic recession beginning from early 1980's did not have any significant negative effect on the proliferation of small-scale furniture industries in the country as noted by (Ototo, 2023). The largest concentration of sawmills in Nigeria are in Lagos, Ekiti , Cross River, Edo, Ondo, Ogun, Oyo and Delta States, together they accounted for over 90% of the

sawmills activities in the country (RMRDC, 2003). This indicated that guaranteed log supply is a major factor in the location of sawmills in the country and wooden furniture depends solely on lumber from sawmills (Fatunmibi, 2021).

The increasing number of small-scale furniture enterprises in the country coupled with the increasing scarcity of a good quality timber species has led to increase in demand of less quality timber species. This implies that most of the timber consumed by the furniture industry is used by small-scale furniture workshops, whose processing techniques and efficiencies are characteristically poor (Sambe, 2022).

The total volume of wood consumed in Nigeria is estimated at over 200,000m^3 per-annum, while the utilization and further processing of the wood provide employment to numerous people and thus contribute to the local and national economy. Furniture product made from crude tools causes a lot of wood waste during processing (Sambe *et al.,* 2021). In Nigeria however the only common unit of selling home grown hardwood is the 12ft length. Since prices are determined per cubic foot that is on the basis of a plank 1″ × 12″ × 12′, the local timber dealer need no calculation to compute his or her cubic content or price as he or she simply counts the number of inch plank due to his limited educational level. Pinho *et al.,* 2025 noted that "Challenges faced in wood utilization call for innovative design approach that minimized waste and ensure efficient and optimal use of the wood resource in order to meet the growing demand of furniture product, in other for the small scale furniture industries to derive greater income have more money, also there is need to emphasize on the desirability of applying advanced technologies to improve the production efficiency of wood and reduce the rate of wood waste produced". Therefore the focus of this work was to assess wood selection and the utilization efficiency of some selected small scale furniture industries within Benin City Metropolis with the goal of providing baseline information for policy makers, private owners and institutions.

METHODOLOGY

Study Area

The study was carried out in Benin Metropolis, Edo State, Nigeria. Benin metropolis. The state is located in the South-South Geo-political zone of Nigeria. Benin metropolis is situated in the south western part of the country. The state is dominated by the moist tropical forest with lowland rainforest representing 76.5% of the total land area (Aweh, 2023). There are three main forest types in Edo State namely: the low land rain forest, fresh water swamp, and the mangrove forest (Ikporukpo, 2018)

Geographically, the state is bounded by Latitude: 6°44′00″ N – 6°35′00″ N and Longitude 5°04' 00″ E and 5° 43' 52" E. Benin City, the capital of Edo State is located at latitudes 6°20′00″ N - 6°19'58.8″N and Longitudes 5°35′00″ E - 5°37′1.2″ E. The climate of the state is bimodal and has two distinct seasons the rainy and the dry seasons characterized by humid conditions in the south and sub-humid conditions in the north. The rainy season is between April and October with a two-week break in August, the average rainfall is between 150cm in the far north of the state to 250cm in the south. The dry season lasts from November to April, with a cold, humid and dusty harmattan period between December and January. Generally, the climate is humid tropical in the southern areas of the state and sub-humid in the north (Edo State Tourism, 2019). The mean monthly temperature of the state is about 27 °C with a range of 22-35 °C while the relative humidity range from 79 to 90% (Olanipon, 2025). The local government area in Benin Metropolis is further divided into 32 wards with Egor, Oredo and Ikopba-okha having 10, 12 and 10 wards respectively.

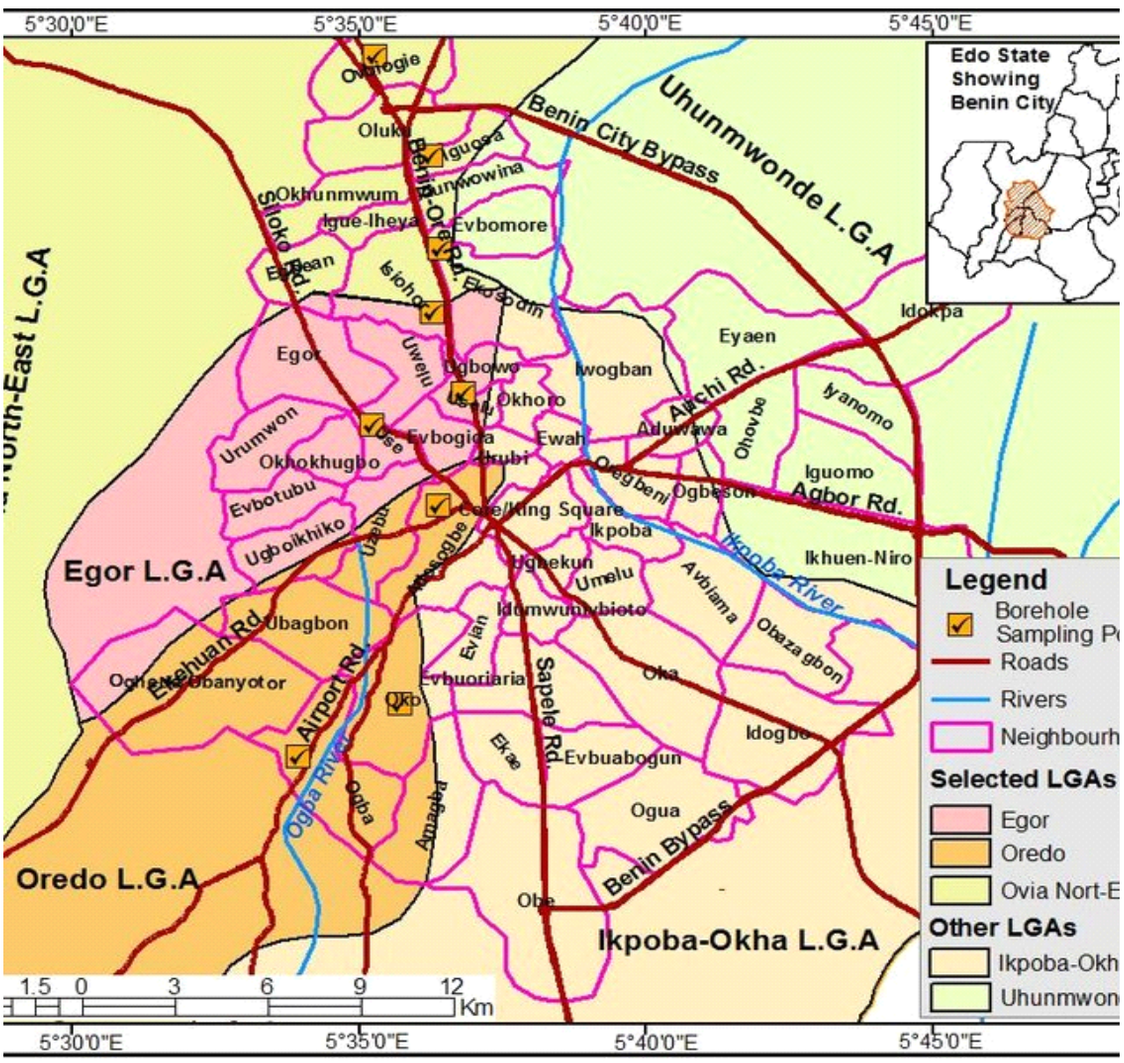

Fig. 1: Map Showing Benin Metropolis

Sampling Techniques

Preliminary visits were made to the Ministry of Environment and Sustainability as well as Edo State Revenue and tax office, both in Benin City in other to obtain information on the number of registered and functioning furniture industries as well as their names and location in the three local government areas under study. Further information on the number of the furniture industries was collected from the Association of furniture makers in Benin City. Thirty (30%) sampling intensity was applied in each of the local government areas that made up Benin metropolis to purposively select the respondents based on ease of accessibility (Table 1). The respondents comprise of furniture industries in the study area.

Table 1: Number of registered furniture industries in Benin metropolis and sampling population

L.G.A.	Number of Furniture Industries	30% Sampling
Oredo	135	43
Ikpoba-okha	130	39
Egor	121	36
Total	393	118

Source: Field Survey, 2022

A total of one hundred and eighteen copies of questionnaire were administered to the respondents in the study area and one hundred and fifteen copies were retrieved from the respondents.

Data Collection

Data were collected through primary and secondary sources. The primary data were collected through the administration of questionnaire to the respondents. The questionnaire was used to elicit information from the furniture makers about their production activities. Personal interview with the respondents was also carried out in other to get more information from the respondents. The secondary data were collected from articles, journals, prints and records.

Data Analysis

Data were collected and analyzed using descriptive statistics of frequency and percentage summarized in tables and inferential statistics using analysis of variance (ANOVA) at 5% level of significance. Mean separation was carried out using Duncan Muliple Range Test at 5% level of significance.

RESULTS

Demographic Characteristics of Respondents

The results of the demographic characteristics of the respondents are presented in Table 2. The result showed that 99% of the respondents were male, while 1% was female. Majority (60%) of the respondents were married, within the age ranges of 41-50 years (44%) which was followed by age ranges of 31-40 years (29%) (Table 2). The result from Table 2, also showed that majority of the respondents (71%) had secondary educational qualification, while 24% and 5% had primary and tertiary educational qualification respectively. The result further showed that 67% of the respondents were Christian, while 26% and 7% affirmed for traditional and Islamic religions respectively.

Table 2: Bio-data of the Respondents

Variables	Frequency	Percentage
77Sex		
Male	114	99
Female	1	1
Total	115	100
Marital Status		
Married	69	60
Single	37	32
Widow	6	5
Divorce	3	3
Total	115	100
Age Range (Years)		
<20	5	4
20-30	12	10
31-40	33	29
41-50	50	44
51-60	10	9
>60	5	4
Total	115	100
Educational Qualification		
Primary	27	24
Secondary	82	71
Tertiary	6	5
No formal	-	-
Total	115	100
Religion		
Christianity	77	67
Islam	8	7
Traditional	30	26
Total	115	100

Source: Field Survey, 2022

Respondents Experience in Furniture Making

The results of the experience of the respondents in furniture making are presented in Figure 2. The result showed that majority (40%) of the respondents had been into furniture for about 16 to 20 years period and 28% of them had over 20 years' experience. While 20, 8 and 5% of the respondents had 11-15, 6-10 and less than 5 years' experience respectively in furniture making.

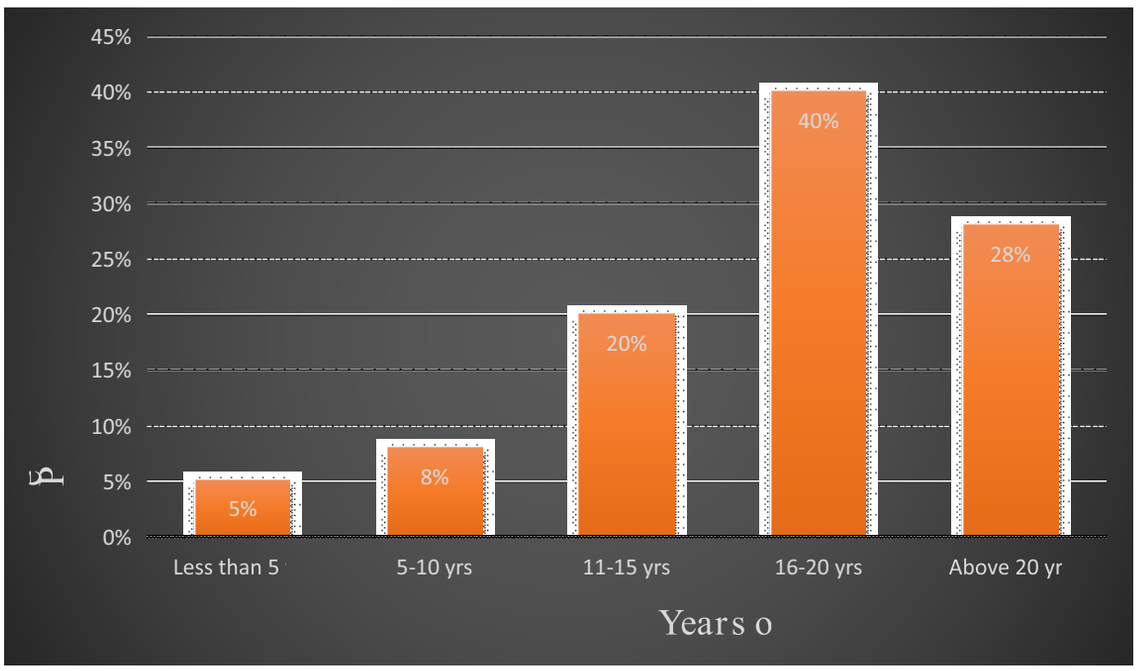

Fig 2: Respondents experience in furniture making

Volume of Wood Used by the Respondents in Furniture Making

The results of the percentage volume of wood used by the respondents in furniture making are presented in Table 3. The results showed that 52% of the respondents claimed that they used 61-80% of the volume of lumber for furniture making. While 37% and 11% of them used 81-100% and 41-60% of volume of the lumber for furniture making respectively.

Table 3: Percentage volume of lumber used by the respondents in furniture making

Variables	Frequency	Percentage
Less than 20%	-	-
20-40%	-	-
41-60%	13	11
61-80%	60	52
81-100%	42	37
Total	**115**	**100**

Source: Field Survey, 2022

This revealed that the volume of lumber used for producing the furniture is as high as 61-80% of the volume of the entire lumber; this indicates that the waste generated from the lumber during production is at a minimal lever.

Wood Waste Generated by Small Scale Furniture Industries

The result of the wood wastes generated by the furniture makers in the study area are presented in Table 4. The result showed that majority (48%) of the respondents affirmed that wood shavings was the major wood waste generated in the study area and this was followed by off-cuts, which accounted for 33%. While the least (19%) was sawdust.

Table 4: Wood waste generated by small scale furniture industries

Variables	Frequency	Percentage
Sawdust	22	19
Off-cuts	38	33
Wood shavings	55	48
Total	**115**	**100**

Source: Field Survey, 2022

Waste Management Practices by Small Scale Furniture Industries

The result of the waste management practices by the respondents in the study area are presented in Figure 3. The results showed that majority (42%) of the respondents affirmed that they give out the wood waste to the end users without paying for it. This was followed by those selling the waste representing (30%) of the respondents, while 22 and 6% of the respondents affirmed other utilization practices and sometimes burning were necessary.

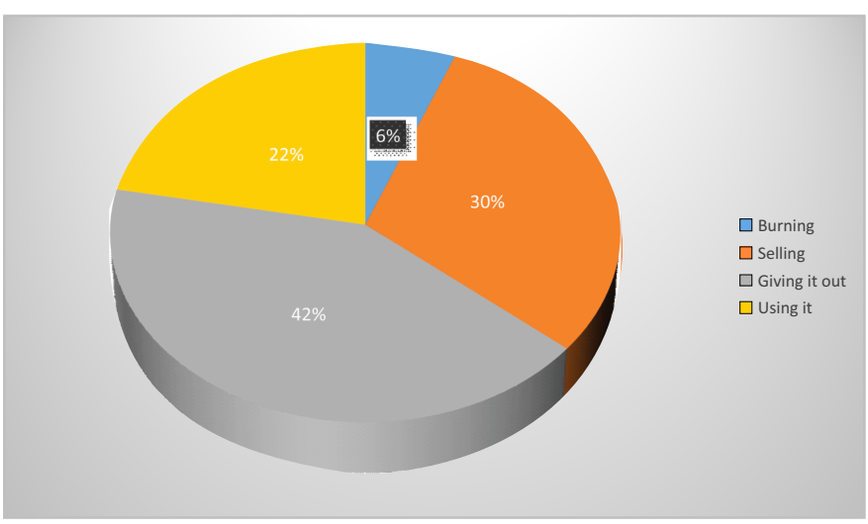

Figure 3: Waste management practices by the respondents in the study area

Health Challenges Faced by Small Scale Furniture Industries Workers

The results of health challenges caused by furniture making in the area are presented in Table 5. The results showed that 69% of the respondents affirmed that they had experienced health challenges associated with furniture making, coughing (35%) was the major health challenges experienced by the respondents due to furniture making. This is followed by those having chest pain (28%), nose congestion

Table 5: Health challenges faced by small scale furniture industries workers

Variables	Frequency	Percentage
Experienced Health Challenges		
Yes		
No	79	69
Total	36	31
	115	100
Health Challenges Experienced		
Eye irritation		
Nose congestion	13	16
Chest pain	17	21
Coughing	22	28
Total	28	35
	79	**100**

Source: Field Survey, 2022.

Materials Use in Joining off-cuts in Small Scale Furniture Industries

The results of the materials used in joining off-cuts in the study area are presented in Table 6. The results revealed significant difference ($P<0.05$) among the various materials used in joining off-cuts in the study area. Nails and Nails/adhesive differ significantly from every other materials used in joining off-cuts.

Table 6: Materials use in joining off-cuts in small scale furniture industries

Locations	Nails	Adhesive	Pin	Nail/adhesive
Egor	10	7	2	16
Ikpoba-Okha	12	9	4	12
Oredo	14	8	5	16
Mean	12.0 ± 2.0^{a}	8.0 ± 1.0^{b}	$3.7.0\pm1.5^{c}$	14.7 ± 2.3^{a}

Means with same letter are not significant at 0.05 level of significance
Source: Field Survey, 2022

Lumber Dimensions used in Furniture making by small scale Furniture Industries in the Study Area

The results of the lumber dimensions used in furniture making in the study area are presented in Table 7. The results revealed a total of eight (8) different dimensions commonly used for furniture making in the study area. The most commonly used dimension was $1'' \times 12'' \times 18'$ (100%). While the least dimension was $3'' \times 3'' \times 18'$ (42%).

Table 7: Common lumber dimensions used in furniture making by small scale furniture industries in the study area

Locations	Frequency	Percentages
1" × 12" × 18'	115	100
1" × 6" × 18'	80	70
2" × 12" × 18'	104	90
2" × 2" × 18'	72	63
1.5" × 12" × 18'	100	87
1.5" × 6" × 18'	75	65
2" × 3" × 18'	64	56
3" × 3" × 18'	48	42

Source: Field Survey, 2022

Common Wood Species used in Furniture making by small scale Furniture Industries in the Study Area

The results of the common wood species used for making furniture in the study area are presented in Fig 4. The results showed that 14 species were used for furniture as deposed by the respondents in the study area. Amongst the most commonly used wood speices, *Mansonia altissima* and *Gmelina arborea* accouted for (100%) while *MIlicia excela* was the least used species for furniture making representing only (10%) of total usage.

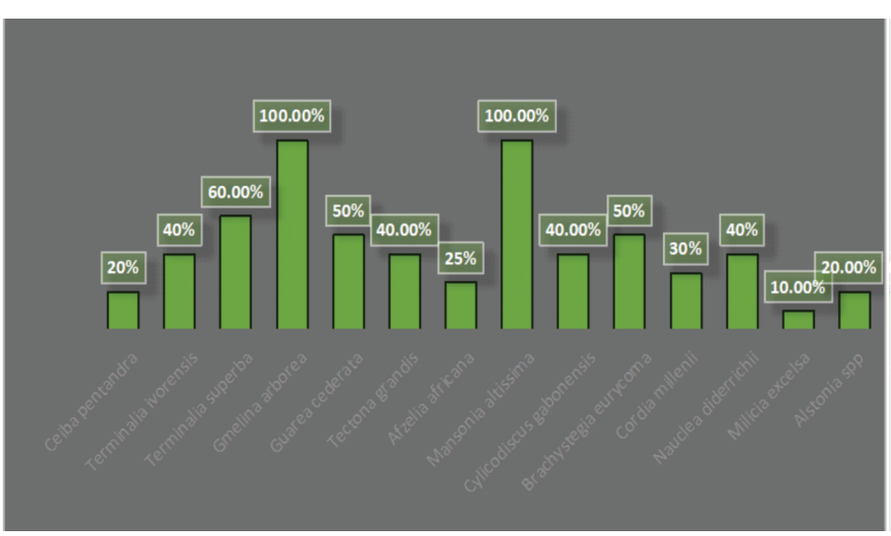

Figure 4: Common wood species used in furniture by small scale furniture industries in the study area

Lumber Dimensions used in Furniture making by small scale Furniture Industries in the Study Area

Lumber dimension often used for furniture production in the study area was observed to be 1″ × 12″ × 18′. However, the findings also revealed other common lumber dimensions such as 2″ × 12″ × 18′, 1.5″ × 12″ × 18′, 1″ × 6″ × 18′, 1.5″ × 12″ × 18′ and 2″ × 2″ × 18′. The rarely used dimensions were observed to be 2″ × 2″ × 18′ and 3″ × 3″ × 18′. The results corroborate the report of Boampong *et al.,* (2015) who noted 1″ × 12″ × 18′ as the most commonly used lumber dimension for furniture. The lumber dimension use for furniture work can be influence by the nature of work and type of furniture being produced.

Common Wood Species used in Furniture making by small scale Furniture Industries in the Study Area

The findings revealed 14 common species of wood used for furniture making in the study area. Amongst these species, *Mansonia altissima* and *Gmelina arborea* were the most often used species for furniture making (Figure 4). The number of species used by the respondents in the study area is lower than 33 and 28 recorded in Lagos and Ibadan respectively (Labode *et al.,* 2025), but similar to 18 and 15 wood species reported for Benin and Nigeria. Ogunjobi *et al.* (2018) noted *Gmelina arborea* as the most preferred species for furniture production in Abeokuta, Ogun state and followed by *Mansonia altissima*. Labode *et al*. (2025) reported that *Gmelina arborea* was found to be suitable for furniture making because of its strength properties and economic value. In another study, Olaniran *et al.* (2022) reported *Khaya ivorensis* as the highest preferred wood for furniture which increased for 4 years and later declined while *Gmelina arborea* increased yearly for the 6 years of the study. Abanikannda (2024) reported that much attention was not paid to strength properties of the tree species chosen for furniture production. He also observed that carpenters paid much attention to physical attributes of timber such as colour, workability and quality, probably because such attributes are more pronounced in furniture production.

CONCLUSION AND RECOMMENDATION

CONCLUSION

This study assessed wood selection and utilization efficiency among small-scale furniture industries in Benin Metropolis, Edo State, Nigeria. Furniture making in Benin metropolis is a predominantly male dominated enterprise. This has shown that operation and activities in forest industries are generally believed to be hectic, difficult and tedious, as such limiting, the involvement of women in the operation. Findings revealed that most operators depend on a narrow range of timber species, predominantly *Gmelina arborea*, *Khaya ivorensis* (mahogany), *Mansonia altisima,* and *Terminalia invorensis*, largely determined by market demand, availability, cost, and workability, while lesser known wood species like, *Cylicodiscus gabonensis, Ceiba pentandra, Afzelia africana, Prosopis africana* and *Cordia milleni, Alstonia spp etc.* are either fairly or rarely used in furniture making. However, wood utilization efficiency was generally low due to inadequate technical knowledge, poor processing equipment, sub-optimal conversion methods, and limited awareness of sustainable wood practices. High material wastage rates and improper seasoning techniques further exacerbate production costs and contribute to the depletion of preferred species, thereby threatening long-term raw material sustainability within the furniture sector.

RECOMMENDATION

The study recommends the urgent need for improved technical capacity and innovation among small-scale furniture manufacturers. Efficient wood use not only enhances productivity and profitability but also aligns with sustainable forest management objectives critical to Nigeria's environmental and economic development. There is also the need to strengthen the link between research institutions, forestry agencies. Local artisans could encourage to promote the adoption of alternative lesser-used wood species, waste minimization strategies, and modern processing technologies.

DISCUSSION

Demographic Characteristics of Respondents

The findings from the study showed that the people involved in furniture making are within the age range of 41-50 years. This denotes that the furniture makers are within the active age group which suite the enterprise because of the strength required during production. Ogunjobi *et al.* (2018) reported the age group of most furniture producers is within 50-59 years. The findings also showed that the respondent had secondary educational qualifications. The findings is similar with the report of Ogunjobi *et al.* (2018), who stated that majority of furniture makers has primary education. Furniture production and activities does not require that they acquire higher education, good educational level is important for skill and technology acquisition as well as capacity building which would reduce accident and enhance proper documentation towards profit making (Ogunjobi *et al.*, 2018). The findings also shown that the respondents in the study area are conversant with furniture production due to their high years of experience in the industry. The result revealed that respondent experience in furniture making range from 16 - 20 years in the business (Fig.1). The finding is in line with the report of Babalola (2018) who reported high years of experience of furniture makers in River State. The high years of experience coupled with the high age range of the furniture makers indicates that the respondents are well equipped with information relating to the furniture industry.

Wood Waste Generated by Small Scale Furniture Industries

The results from the study also revealed that, wood shavings is the most common wood waste generated by respondents in small scale furniture industries in the study area. There are several causes of wood wastes. Most of these depend on factors such as the logging methods employed during timber extraction, the debarking process employed; type of sawing machinery used during timber conversion and the skill of the band saw operators. As a result of these factors, quantities of wood residues generated at any particular time vary from sawmill to sawmill (Sambe, 2022; Babalola, 2018).

Waste Management Practices by Small Scale Furniture Industries

The findings from the study revealed that the wood waste generated by the furniture makers are being giving out to the end users as a way of disposing them (Figure 3). However, some of the respondents sell their wood waste to the end user to make more profit. Reuse/recycling of these wood residues in Nigeria will reduce the pressure on our ever-decreasing forests, reduce environmental pollution, create wealth and employment (Owoyemi 2016).

Health Challenges Faced by Small Scale Furniture Industries Workers

The health challenges faced by the respondents in the study area varied. The findings indicates that eye irritation, chest pain, nose congestion and coughing were the various health challenges the furniture makers are experiencing in the study area. Coughing was revealed as the major health challenges. This may be due to the particles of wood inhales during conversion process of the lumbers to its final uses (Alasia, 2020; Olujimi *et al.,* 2023). Job tasks of workers who work in sawmills or any other wood industry include the breakdown of logs into cants, slabs, processing the cants and slabs into functional lumber sizes, grading, sorting, drying and processing the lumber for industrial specific uses with preservatives, fire retardants or surface protection (Borz, 2021). During their work, sawmill workers may be exposed to multiple chemical, physical and biological hazards, for example wood dust, pesticides, fungicides, noise etc (Ibanga, *et al.,* 2025).

Materials Use in Joining off-cuts in Small Scale Furniture Industries

The findings also revealed nails, adhesive, pin, nails/adhesive as the materials used by the respondents in joining off-cuts during furniture making. Though there was significant difference ($P<0.05$) among the use of these materials in joining off-cuts. Nails and nails/adhesive were the most used materials amongst others. Borges *et al.*, (2022) reported that nails are the commonest connectors in use except in few cases, where Adhesive or glue is use in addition.

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