Journal of Forestry Research and Management. Vol. 23 (1). 24-33; 2026, ISSN 0189-8418

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WOOD RESIDUE MANAGEMENT PRACTICES IN KANO TIMBER MARKETS

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ABSTRACT

Managing the rising volume of sawmill residues in municipal waste systems requires a clear understanding of waste composition and current handling practices. This study identified common wood residues and their handling practices in some of the timber distribution markets in Kano State. Three timber markets were purposively selected, from which, 128 timber sheds were selected and assessed. Data were subjected to descriptive and regression analysis. Result indicated that the respondents were dominantly males in 35 – 44 age class, married (71.8%) with household size of between 1 – 6 (70.31%). Majority of the respondent (85.9%) received no formal training and have been in the trade between 15 – 21years (37.50%). Almost all the respondent interviewed used circular saws (63.28%) and only 4.69% used modern band saws. Most of the machines were old (48.44%) and majority (74.22%) of them are not properly sheltered. The common residues generated in the three markets were: sawdust and offcuts (51.18%), sawdust only (22.83%), shavings and sawdust (3.94%). The accumulated residues were mostly utilised as cooking fuel (46.88%) and poultry bedding (22.66%), the remaining are not properly stored. Regression analysis revealed marketers' gender, education and marriage status, as factors influencing the residue handling in the study area. Poor government support, inadequate capital and raw material costs, are the major challenges faced by the traders. There is need for proper training on efficient waste handling techniques, improved access to capitals and modern equipment, market development for wood residues, investment in power infrastructure and better organization of marketing unions.

Keywords: Wood wastes, Sawdust, Management, Timber markets, Machines

Introduction

Wood residues are described as discarded wood products from different sources, such as logging operation, left over from building construction, and demolished structures (Pandey, 2022). Common wood residues generated in timber marketing sheds include sawdust, wood chips and shavings, bark, offcuts and trimmings (Ogunwusi, 2014; Akhator *et al*., 2017; Sambe *et al*., 2021; Owoyemi *et al.*, 2024). Wood residues are potential source of energy production and many value-added lignocellulosic materials. Wood bark, for example contains lipophilic and hydrophilic extractives that can be turned into high value cosmetics and pharmaceutical products. Zhang *et al*. (2020) found wood residues bio oil as good extender and modifier for petroleum asphalt binders in asphalt pavements. Wood based panel production is among the important applications of wood wastes.

Proper handling and management of wood residues could assist in sustaining timber harvesting and their environmental impacts, and also reduce the demand for sawn wood without further harming the world's forests (Adhikari and Ozarska, 2018). Therefore, reducing, recovering and enhancing the utilisation of wood residues should be an

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important strategy in sustainable wood utilisation and municipal waste management. Saal *et al*. (2019) reported that for every 1000 board feet of lumber produced, 1 ton of sawdust, shavings, slabs and edgings are gathered in the timber marketing sheds; approximately 75% of these wastes is woody biomass content and 25% is bark, which can be used in energy and non-energy applications.

The rapid expansion of Kano timber markets has led to the generation of significant amount of wood residues in the region. It is becoming apparent that the incessant increase in population leads to rise in the demand for wood for different utilisation. This will mean more wood will be converted in the mills which in turn generate more waste. The urgent need for effective management of wood wastes has led stakeholders to begin advocating for sustainable solutions. Proper understanding of the current practices, challenges and possible strategies for wood wastes handling is essential for effective interventions (Batagarawa *et al*., 2024). The broad objective of this study was to assess the various handling methods for wood wastes in Kano timber markets. The study specifically identifies major wood wastes, wood traders/handlers demographic variables, some technical factors affecting wood wastes, identifies factors influencing waste management, and, the problems facing effective waste handling in the study area.

Materials and Methods

The study area

The study was carried out in Kano metropolis (Fig 1), the second largest industrial and commercial centre and second most populous city in Nigeria, after Lagos (Paden,2023). It consists of 8 local government areas with a population of 2, 982, 861 people and total area of 499 km^2 (NPC, 2006). The metropolis is geographically located between latitudes 11°50'N and 12°10'N, and longitudes 8°25'E and 8°40' E. The metropolis is characterized by semi-arid type of climate, and a Sudan Savannah vegetation type, with daily mean temperature of about 30°C. Lowest temperatures of about 20°C is recorded between December and February, and mean annual rainfall of 800 to 1000mm that usually lasts for 3 to 5 months (May to September (Ahmad, 2024).Furniture making, carpentry and small scale timber marketing are important engagements in Kano because the largest timber markets in the Northern region are located in Kano.

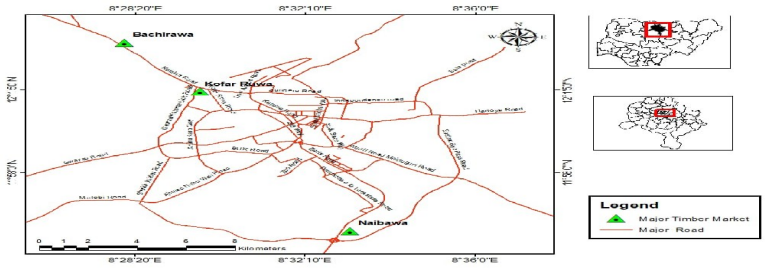


Figure 1: Map of Kano State showing the major timber distribution markets
Source: Geography Lab, Bayero University Kano (2024)

Method of Sampling

The study adopted a purposive multistage sampling method. The first stage involves a selection of the three (3) major commercial timber distribution markets in Kano State – 'Yanmata, Kofa ruwa and Nai'bawa timber markets (Fig 1). The second stage involve the selection of all (128) timber marketing sheds containing functioning wood working machines. The third stage is the selection of the leading timber traders in each marketing shed, to serve as the study respondents (waste manager). The sampling method was summarised in table 1.

Table 1: Method of Sampling

Study area with Timber marketer	**No. of shops with wood working machines N=128 shops**
'Yanmata	60
Kofar Ruwa	29
Na'ibawa	39
Total	128

Data collection

Data collection were preceded by a reconnaissance visit to the study area. Market leaders were interviewed on the history, development and organization of the markets, species of wood available and their sources, technical and social challenges and, problems faced in handling timber and its wastes. Semi - structured questionnaires were administered to 128 timber sheds across the major timber markets in the metropolis. Data collected include demographic characteristics of timber traders, wood residues types, and technical factors affecting wood residues handling and the challenges of wood residue handling in the study area.

Analytical tools

Collected data were analysed using descriptive statistical tools of frequency counts, percentages, means, and modal counts. A multiple linear regression analysis was used to identify the relationship between waste handling and demographic variables, that is, factors influencing waste management in the markets.

Result and Discussion

Demographic variables of timber marketers

Results in table 2 showed the demographic variables of timber traders in Kano timber markets. The table showed that majority (38.28%) of the timber traders were aged between 35 and 44 years, with an average age of 37 years, implying most respondents were young and active to explore business opportunities and withstand the stress of timber handling. The table also showed many (37.50%) timber traders have 15 – 21 years of experience in timber trading, with an average experience of 14 years. This implies traders have some marketing experience. Furthermore, the table showed an average household size of 6 persons, with majority (70.03%) having a household size of 1 – 6 persons. The table also showed that all traders were tax payers.

Table 2: Demographic variables of timber sellers

Variable	Frequency (N=128)	Percentage (%)
Age (Year)		
15 – 24	12	9.38
25 – 34	40	31.25
35 – 44	49	38.28
45 – 54	18	14.06
55 – 64	9	7.03
Size of Household		
1 – 6	90	70.31
7 – 12	21	16.41
13 – 18	7	5.47
19 – 24	10	7.81
Experience		
1 – 7	21	16.41
8 – 14	44	34.28
15 – 21	48	37.50
22 – 28	11	8.59
29 – 35	4	3.13
Tax Payment		
Yes	128	100
No	0	0

Results in figure 2 showed that 98% of the respondents were males, with only 2% females, implying timber marketing is male dominated in the study area. This is connected with the labour and physical exertion involved in timber handling. This finding is in line with Awe, *et al.* (2019) who observed 68.42% of timber sellers in Kogi to be males. Data observed in figure 3 showed that majority (71.8%) of the traders were married. This agrees with Adedokun *et al.* (2017) in which most timber marketers in Abeokuta were married.

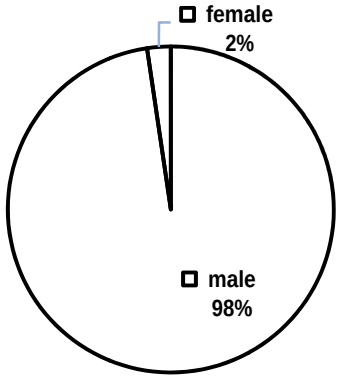


Figure 2: Gender of timber sellers

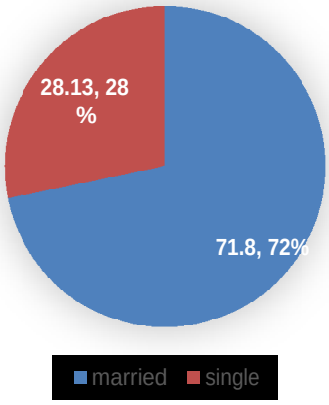


Figure 3: Timber seller's marital status

Most (57.91%) of the traders had secondary education (Fig. 4). This agrees with Adebanjo *et al*. (2021) where most Lagos plank sellers have secondary education. According to the result in figure 5, showed that 70% of timber sellers do not belong to marketing association. Only 30% were members. This may be because they did not derive any benefit from the association.

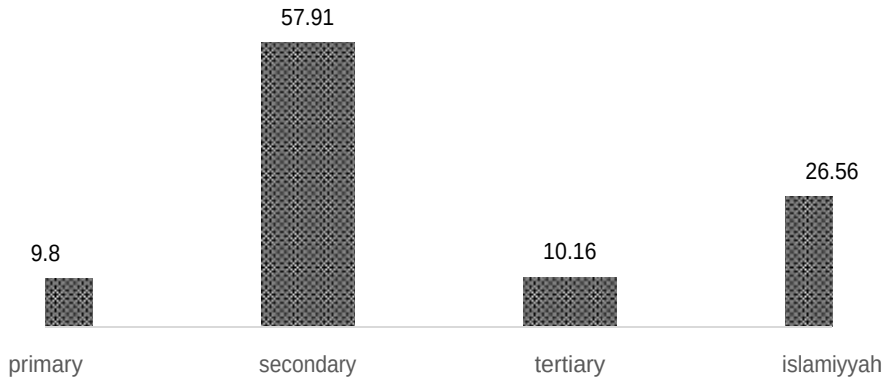


Figure 4: Marketers educational status

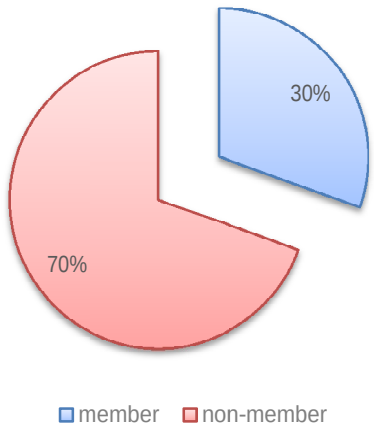


Figure 5: Membership of marketing association

Technical variables of wood waste management

Results in table 3 revealed technical variables of waste handling. It revealed that most (85.9%) of the traders lack technical training in timber or residues handling. A little percentage (7.03%) were trained by non – governmental organizations, and very few attended technical schools. Circular saws were the most common machines recorded in the markets (63.28%), followed by planning machines (12.50%) and local band saws (10.94%).

The table showed that most (48.44%) of the machines were old, with few (29.69%) new ones. The table also revealed that majority (85.94%) of the sellers protects their machines from the rains, 6.25% does not protect their machines very well and 5.47% have no machine sheds at all. Most of the sawmills in Nigeria operate with older machines and properly sheltered. This is because leaving the machines without proper sheds could expose them to weather elements which contributes to malfunction of the machines and as a result affect the productivity and significant safety hazard for the workers (Adeoye *et al.*, 2015; Yisa *et al.*, 2021)

Table 3: Technical variables of wood wastes handling

Variable	Frequency (N=128)	Percentage (%)
Form of Training		
Technical school	5	3.91
NGO	9	7.03
Others	4	3.1
No Training	110	85.9
Types of Machine Used		
Circular saws	81	63.28
Local band saws	14	10.94
Modern band saw	6	4.69
Planning machine	16	12.50
Turning lathe machine	11	8.59
Age of Machine		
Old	62	48.44
New	38	29.69
Manageable	23	17.97
Condemned	5	3.91
Condition of Machine		
Well protected	110	85.94
Not well protected	8	6.25
No machine shed	7	5.47
Protected only at Night	1	0.78
No response	2	1.56

Wood residues and handling methods in the markets

The results in tables 4 revealed that majority of the residues are sawdust (51.18%) only, while combination of sawdust and wood offcuts are 22.83% of the residues generated. Chips and off cuts are the least residue generated (3.15%) in the study area. Majority (46.8%) of the wastes are used as cooking fuel, followed by poultry bedding (22.66%). The table also showed majority (51.97%) do not store wood wastes, which may affect its quality for value-added and industrial applications.

One of the common features of sawmills in Nigeria is that they do not conventionally store sawdust, instead they generate poorly managed piles that are often disposed through open air burning or to a lesser extend sold or used for other purposes (Akhator *et al*., 2017; Nnaji and Udokpoh, 2022). Avenues should be provided for local sawmills to utilise the residues generated for energy generation and other value added products.

Table 4: Wood residues and its management methods

Variable	Frequency (N=128)	Percentage (%)
Types of Residue		
Chips and off cuts	4	3.15
Sawdust and off cuts	29	22.83
Sawdust	65	51.18
Scraps	8	6.30
Turning machine dust	8	6.30
Shaving dust with sawdust	5	3.94
Wood chips with offcuts	8	6.30
Use of sawdust		
Cooking fuel	60	46.88
Water heating	25	19.53
Poultry bedding	29	22.66
Composting	6	4.69
Industrial use	8	6.25
Storage		
Stored	61	48.03
No storage	65	51.18
No response	2	0.79
Condition of wood residue		
Poorly protected	95	74.22
Well protected	30	23.44
Waste stored outside	2	1.56
Waste dumped outside	1	0.78

Factors influencing wood residues handling in Kano timber markets

The relationship between demographic variables and wood waste handling is shown in table 5. The result showed that traders' gender, level of education and marital status were significant. The result showed a positive relationship between sex and monthly income of timber traders, and was statistically

significant at 1%. This showed monthly income will increase if more males are involved in the business. Level of education is positively related with monthly income, and statistically significant at 10%, which implies that the more educated the timber sellers were, the more income they make. Marital status showed a positive relationship with monthly income and was statistically significant at 10%, which implies that married timber sellers tends to make more income than their single counterparts because they have more responsibilities to cater for within the household. Studies have linked level of education and marital status to increased income and improved life style, as oppose to unmarried people largely because marriage creates opportunities, stability and pressure for married couple to work harder or more intensely (Mincy *et al.*, 2009; Ndayambaje *et al.*, 2020)

Table 5: Regression analysis, showing factors influencing wood wastes in the study areas

Y = Monthly income

Variables	Coefficient	Standard Error	T value	P value
Constant	143808.4	37727.33	1.64	0.104
Gender	153797.1	52746.19	2.92	0.004***
Level of Education	-16072.52	9019.045	1.78	0.077**
Marital Status	-37300.11	20137.11	1.85	0.066**
Membership of Cooperatives	27343.65	17444.42	-1.57	0.120
Age	-69.50223	1238.485	-0.06	0.955
Experience	526.546	1498.993	0.35	0.726
Household size	1294.068	2486.294	-1.32	0.188

Constraints facing timber marketing and its residue in the study area

Constraints faced in timber marketing and residue handling in the study area are expressed in table 6. The result showed that the greatest constraint facing the handling of timber and, consequently, its residues by the marketers is poor support from the government (70.31%), ranking 1st; followed by inadequate funding (45.31%), ranking 2nd; and high sawn timber costs (16.4%), ranking 3rd. Adedokun *et al.*, (2019) discovered that power failure, government policy and transportation were major constraints facing sawmilling in Ogun State. Adegbenjo *et al.*, (2021) reported power failure and transportation costs as major challenges facing plank marketers in Lagos state

Table 6: Challenges facing timber handling and its wastes in the study area

Challenges	Frequency (N=128)	Percentage (%)	Ranking
Power failure	11	8.59	4th
Poor market for residue	7	5.47	5th
High cost of timber	21	16.4	3rd
Poor government support	90	70.31	1st
Financial constraints	58	45.31	2nd
High cost of transportation	2	1.56	6th

Total	128	100

Conclusion and Recommendation

Sawdust is the commonest wood residue recorded in the whole study areas, resulting from the dominance of circular saws, which can be used in energy and composite panel products. Most timber workers were middle-aged, married and experienced, with average household size. All respondents were tax payers and non-members of business associations. Most respondents have secondary education, with no technical training. Most of the machines were old, implying a possible increase in waste generation. Wood wastes, especially sawdust, were mostly used as cooking fuel. Most timber sheds do not store wastes, and are left unprotected outside, thereby leading to reduction in waste quality for industrial use. Traders' gender, education and marriage were significant factors influencing residue in the study. Poor government support and financial constraints were major challenges faced by timber traders in the censured markets.

Based on the foregoing observations, the study recommends; provision of waste handling infrastructures to improve and sustain its quality for industrial applications, and technical supports on modern sustainable wood wastes handling. Facilitating the formation of timber workers'/ traders associations to facilitate knowledge sharing, collective bargaining for raw materials, and better access to government supports and advocacy for addressing timber workers' challenges. Facilitate the development of markets for wood wastes and connecting wood workers with potential users. Investing in sustainable power infrastructure to ensure reliable energy supply

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