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ASSESSMENT OF WOOD CONVERSION EFFICIENCY IN SELECTED SMALL-SCALE FURNITURE WORKSHOPS WITHIN KANO METROPOLIS, KANO STATE NIGERIA

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ABSTRACT

Wood is very valuable and versatile material that we cannot afford to lose a substantial amount of it. This study was conducted to assess the efficiency of wood utilization in some furniture workshops within Kano metropolis, Nigeria. The workshops were purposively selected based on the concentration of furniture activities. Data were collected using semi structured questionnaire from 140 respondents among the furniture makers. Actual measurements of input wood were taken before production to calculate the input volume. The output volume was also taken. The two volumes were used to compute the efficiency of utilized wood using Nilson (Estonia model). The result indicated that Gwale Furniture Workshops had the highest wood utilization efficiency with 69.80%. This was followed by Kano municipal workshops with 57.38% and Dala had the least wood utilization efficiency with 56.87%. Regular refresher courses, workshops, seminar and sensitization are recommended to furniture makers to enhance their technical capacity in different furniture making and wood utilization efficiency. More research should be carried out in the areas of machine efficiency and labor efficiency which could further boost the capability of this sector to contribute to national development.

Keywords: Furniture workshops; wood conversion; wood utilization

INTRODUCTION

Wood has played a very important role in the life of man for centuries as a building material. It is known that the early man used wood to make shelters, cook food, construct tools and make weapons (Rowell, 2005). Wood remained an essential substance throughout history because of its unique and useful properties as well as its versatility (Rowell, 2005). Furniture is one of the most important home accessories because it adds style and elegance beside their primary function of providing comfort. Wooden Furniture is usually present in homes, offices, and social infrastructure building such as schools and hospitals. They

contribute to the beautification and aesthetics of the place. Furniture are moveable or free-standing objects such as doors, tables, chairs, decorations, cabinets, shelves, cupboard and beds normally for use or as ornament in a house or in offices to make it suitable for living and working condition (Adunpong, 2011).

Furniture workshops are faced with a problem of inadequate tools (equipment) during utilization of wood in furniture processing. In addition to these furniture makers generate a lot of wastes in the process which yield poor wood recoveries, inaccurate and poorly finished furniture products (Atuhe, 2005). The cause of these occurrences is probably due to the insufficient information on the volume of wood being utilized and the volume of waste generated during the furniture processing so as to guide them in effective utilization of the scarce raw materials. Wood is very valuable and versatile that we cannot afford to lose a substantial amount of it. This product, furniture, when completed helps us to assess the amount of waste generated. This information will allow us to classify and re-channel the waste as inputs/raw materials for other products in the form of lateral integration which will enhance the realization of integral utilization of the wood (Olufemi et al., 2012). Kano state is an area where wood as a material is scarce. Almost all wood for use is brought from other areas of the country at very high cost. It is very important that we document the efficiency of use so that the wood materials will be used more efficiently. The major objective of the study was to assess the wood conversion efficiency in selected small- scale furniture workshops in Kano Metropolis, Nigeria.

MATERIALS AND METHODS

Study Area

The study was conducted in some selected LGAs within Kano Metropolis (Kano Municipal, Dala and Gwale). Kano is geographically located between latitudes 11°23’26’’ to 11°58’11’’ N and longitudes 7 °15’0’’ to 8°11’59’’ E. Kano metropolis comprises of eight local government areas, with a population of 2,982,861 people and total area of 499km2 (NPC, 2006). The area has a mean annual rainfall of about 800 to 1000mm that last usually for three to five months (May –September), the mean temperature ranges from 26 °C to 33°C (KNSG, 2014). The Vegetation of the area is Sudan Savannah types which consist of a few scattered trees, shrubs and grasses that cover about 30 to 40% above the ground (Kabir, 2011).

Sampling Procedures and Sample Size

The target population for this study consists of selected furniture makers in the three (3) selected LGAs. They were purposively selected based on the concentration of furniture activities within the metropolis. A total of 219 workshops constituted the sampling frame of the study. The Raosoft sample size calculator was used to generate a recommended sample size of 140 respondents. In order to distribute the sample of 140 respondents proportionately across the three (3) selected LGAs, 63.9% of the Furniture makers in each of the LGAs were sampled. In each workshop, the workshop manager was chosen to fill in the questionnaire but, in his absence, other workshop employee that will be capable of attending to the questions was used.

Table 1: Sampling procedure

Local Government Areas	Registered Workshops	Sample Size (63.9%)
Kano Municipal	63	40
Dala	102	65
Gwale	54	36
Total	219	140

Source: Field survey, 2017

Data Collection

A reconnaissance survey was conducted in order to locate the furniture workshops in Kano Municipal, Dala and Gwale LGAs. The data for the study were collected personally by the researcher where, actual measurement on the sawn plank required for the construction of each piece of selected furniture (wardrobe and bed) was taken from spot assessment by measuring the dimension of wood used by the furniture makers. The dimensions of finished products were measured to give the output data.

Data Analysis

Data collected were subjected to descriptive statistics in form of frequency and percentage. Wood utilization efficiency of various furniture constructions were carried out to establish input and output volume of wood utilized in furniture making using the equation below:

Total volume of wood used for furniture making was determined using

$$VB = N (Lx B x H) \quad (1)$$

Where;

VB = Volume of planks (cm3)
L = length (cm)
B = Breath (cm)
H = Thickness (cm)
N = Total number of planks used for each furniture item.

Total volume of wood waste generated for construction of a piece of furniture item was determined using the equation below:

$$Vw = Vb - Va \quad (2)$$

Where;
Vw = Volume of Wood Waste (cm3)
Vb = Volume of Wood before Construction
Va = Volume of Wood products after Construction
Wood Utilization Efficiency of Each Furniture Items Was Calculated Using:

Efficiency (%) = $\frac{Va}{Vb} \times 100$ ……(3)
1

Where;

E = Wood Utilization Efficiency (%)
Vb = Total Volume of Wood obtained before Construction (cm3) Va = Total Volume of Wood after Construction (cm3).

RESULTS

The result from Table 2 showed the measures of input and output, volume of wood used, wood waste and the efficiency in the construction 6 x 6ft bed among the selected furniture Workshops namely: Gwale, Kano municipal and Dala furniture workshops.

Table 2: Input and output volume of wood used in constructing 6 x 6ft bed

Observations	Units	Mean	Std. Deviation
Gwale furniture workshops			
Input	cm3	189000.00	.00
Output	cm3	95815.38	.00
Wood waste	cm3	93936.27	1283.68
Efficiency	%	50.69	.00
Kano municipal furniture workshops			
Input	cm3	228375.00	14418.01
Output	cm3	95815.38	.00
Wood waste	cm3	132559.43	14417.79
Efficiency	%	43.98	5.24
Dala furniture workshops			
Input	cm3	249187.50	18754.43
Output	cm3	95815.38	.00
Wood waste	cm3	152247.11	19966.77
Efficiency	%	38.64	2.87

Source: Field Survey, 2017

Table 3 showed the measures of input and output volume of wood used volume of wood waste and the efficiency in construction of a four door wardrobe (2000 x900 x 400mm), among selected furniture workshops namely: Gwale, Kano municipal and Dala furniture workshops respectively.

Table 3: Input and output volume of wood used for construction a four-door wardrobe (2000 x900 x 400mm)

Observations	Units	Mean	Std. Deviation
Gwale furniture workshops			
Input	cm3	230850.00	16637.07
Output	cm3	153629.44	.00
Wood waste	cm3	67095.5600	3.90
Efficiency	%	69.80	
Kano municipal furniture workshops			
Input	cm3	257062.50	16591.37
Output	cm3	153629.44	.00
Wood waste	cm3	116933.06	30218.35
Efficiency	%	57.38	6.58
Dala furniture workshops			
Input	cm3	282300.00	21695.99
Output	cm3	153629.44	.00
Wood waste	cm3	118170.53	20128.16
Efficiency	%	56.87	4.18

Source: Field Survey, 2017

DISCUSSION

From the results, it is evident that wood is not efficiently utilized in most of the furniture workshops in Kano metropolis, this is due to poor machines in most of their furniture workshops and the furniture makers listed the same types of wood species as their products used when construction both bed and wardrobe. In construction 6 x 6ft bed the result showed that Dala furniture workshops had the highest mean of 282300.00cm3 with a standard deviation of 21695.99cm3. This result implies that the volume of wood used in construction 6 x 6 Bed was higher in Dala furniture workshops than any other furniture workshops in the study area, with mean of 152247.11cm3 with a standard deviation of 19966.77cm3. In constructing 6 x 6ft bed Gwale furniture workshops had the highest wood conversion efficiency compared to other workshops in the study area, this is occurred as a result of standard and different machines used in their workshops. The result also implies that the volume of wood used in construction of a four door Wardrobe (2000 x 900 x 400mm) was highest in Dala furniture workshops than any other furniture workshops with mean of282300.00cm3. The result shows that all the furniture workshops have the same outputs of mean 153629.44cm3 with mean 0.00 in construction of a four door wardrobe. Dala furniture workshops had the highest wood waste with a mean of 118170.53cm3 with a standard deviation of 20128.16cm3. This implied that in the construction of a four door wardrobe (200 x900 x 400mm) Dala workshop had a highest wood waste volume. And in terms of

efficiency, Gwale furniture workshops had the highest efficiency compared to other workshops in the study area with 69.80%. This is in line with Arosof et al. (2016) who reported that furniture producers were technically inefficient i.e. they are operating below the frontier while 48.5% were efficient, the implication of this result is that most of the furniture producers do not have the necessary modern technologies for productivity and they also fairly utilized and allocated the existing resources. This is in accordance with Darmavan et al. (2006) who posited that many small scale enterprises lack the necessary skill and resource to operate efficiently. Some of them preferred buying materials in little quantities rather than buying in bulk in order to enjoy economies of scale. According to Giroh et al. (2008), variations in technical efficiency of farmers can arise from their characteristics and existing technologies; this could also be said for furniture makers, as the existence of technical inefficiencies provides a good ground in determining the sources of inefficiency for furniture makers. This is in line with findings of Adebara et al. (2014) who reported that market survey revealed that timber on market were characterized by variable dimension; non-uniformity in thickness, width, length; non-parallel edges and merchandise on the basis of appearance. Dokonyero (2005) attributed that inaccurate dimension of sawn timber to poor condition of saws and poor workmanship. Ishengoma et al. (1994) argued that in order to be efficiently and economically utilizing various timber species detailed knowledge of their properties was necessary.

CONCLUSION

The study has revealed that wood is not efficiently utilized in most of the furniture workshops in the study area. Formal education is paramount since furniture construction requires the taking of measurement for very effective utilization of wood in furniture making.

In order to ensure the efficient wood utilization in the study area, furniture makers should undertake refresher courses, workshops, seminar and sensitization from time to time in order to enhance their technical capacity in furniture making.

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