Price Differences and Causal Factors in Marketing of Selected Sawn-Wood Species in Delta State, Nigeria

Ohwo O.A
Department of Forestry and Wildlife, Delta State University Asaba Campus
oghenekevweabigail@gmail.com

Abstract
The study examined price differences and causal factors of selected species of sawn-wood over a period of ten years (2005-2014) in some selected sawn-wood market in Delta State. Purposive sampling technique was adopted for the study. Data on demographic characteristics, identification of wood species sold in the state and causal factors for price differential were analyzed using descriptive statistics while factorial design in one way analysis of variance was used to test if significant differences exist in the price series data for the selected species. The result revealed that varieties of sawn-wood species are sold in the state. *Pterocarpus osun*, *Combretodendron africanum, Berlina congolensis* were selected based on the fact that they were sawn into the volumes 0.013 m^3, 0.019 m^3 and 0.025 m^3under consideration. Majority (79%) of the respondents considers the cost of production and profit margin before fixing sawn-wood prices. About 38.33% of the respondents affirmed that seasonal changes where the major causes of price difference. Significance differences ($P < 0.05$) were observed for the selected species of sawn-wood with respect to species, volumes, market categories and number of years. The significant differences revealed that sawn-wood market in the state is efficient.

Keywords: Sawn-wood species, volumes, causal factors, price differences

INTRODUCTION
The roles of marketing in the development of the forestry sector cannot be overemphasized as market serves as the link between the producers and the consumers. Investor decisions in Forestry are guided by readily available and reliable information on prices of forest goods. An investor's decisions depend on anticipated profits which depend on anticipated prices of forest trees thereby making prices an important tool in markets economic analysis (Momoh *et al.*., 2007). Efficient marketing is a measure of the stability of price differential between markets over time. The notion of market efficiency between markets is compatible with significant price differentials, which are stable over time (D'Angelo, 2001). In the presence of logistic costs, a pair of markets can exhibit a high price differential, and still form a market with smooth flow of information of prices. Understanding the reasons for price differences is important as it provide essential information in policy decision towards market development.

Sawn-wood is gotten from round log which is a major forest product in Nigeria. Sawn- wood are marketed locally in designated plank markets and sawmills across the country. Locally, so many people engaged in sawn-wood marketing because of the regular profit from the enterprise which accounts for good livelihood standards among sawn-wood traders (Kalu *et al.*, 2009), by providing employment and income in the rural, peri-urban and urban communities in Nigeria (Aiyeloja *et al.*, 2013). Sawn-wood marketing involves the exchange between a buyer and a seller at a given price, such that the seller recovers the cost incurred with some profit (Olukosi and Isitor, 1990). It shapes forest management processes because the profits obtained by the stake holders who depend on forest enterprises for survival is not disputed. The major determinant of economic investment in forestry subsector is the efficiency of the marketing link between the marketing agents by ensuring that they derive maximum benefit from sawn-wood marketing (Johnson, 1990).

However, in the last two decades, the inability of the forests to sustain the wood based industries with wood has lead to increase in wood prices (Arowosoge *et al.*., 2008, Sekumande *et al.*., 2011). It has been observed that price varies for same dimensions and species of sawn-wood in different locations and seasons in Delta State. This price variation encourages arbitrage market condition to intensifying pressure on the forest estate, thus affecting forest development in the state. The factors responsible for these variations in market prices of species of sawn-wood in Delta State are not known. The study was carried out to determine most traded timber species in sawn-wood marketing as well as price differences and causal factors of some selected species of sawn-wood in Delta State.

MATERIALS AND METHODS

Study Area

The study was conducted in Delta State. Delta State is Located in the South-south geopolitical zone of Nigeria. It lies approximately between longitude 5°00' and 6°45' E and latitude 5°00' and 6°30' N with a total land area of 16,842 km^2 and a total population of 4,098,291.

Data collection

Multi-stage (three-stage) sampling technique was adopted for the study. The first stage involved the inclusion of the three senatorial districts (North, Central and South) of the state. From each of the senatorial districts, two LGAs were chosen on the basis of economic and infrastructural development (second stage) Thus one of the LGAs in each senatorial district was designated as urban market (U), the second peri-urban (PU) and the third was considered as rural market (R). In Delta North Senatorial District Ika North LGA (U), Ndokwa West LGA (PU) and Ukwani LGA (R), in Delta Central, Sapele LGA (U), Ughelli North LGA (PR) and Udu LGA (R), and in Delta South, Warri South LGA (U), Warri North LGA (PU) and Patani LGA (R) were selected for the study (Fig. 1). Four sawn-wood markets were then purposively chosen in each of the LGAs based on the prevalence of sawn-wood marketing in those markets.

Five (5) copies of structured questionnaire were administered in each of the chosen markets. This made a total of twenty (20) respondents in each of the LGAs. One hundred and eighty (180) respondents were sampled in the course of the study. Information on the most traded species of sawn-wood and the monthly retail prices of the selected dimensions of three species of sawn-wood from January 2005 to December 2014 were collected from sales receipt for the study. The mean monthly prices in the urban, peri-urban and rural market were used for data analysis.

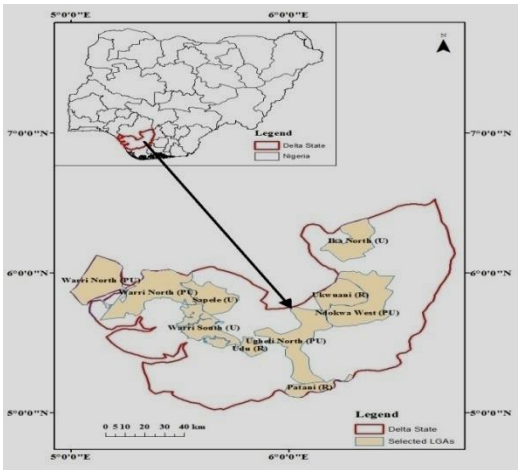

Figure 1: Map of the Study Area

Data analysis

The data on demographic characteristics, identification of the traded species of sawn-wood and causal factors of price differential were analysed using descriptive statistics such as table and frequencies while factorial design in one way analysis of variance was used for comparing significant variation in prices among the three categories of markets.

Factorial design: A factorial design is an experimental design in which each level of each factor is paired up or crossed with each level of every other factor. In other words each combination of the levels of the factors is included in the design. A one-way ANOVA refers to a design with one factor. Factorial designs allow us to determine if there are interactions between the independent variables or factors considered. An interaction implies that differences in one of the factors depend on differences in another factor.

A one way factorial design has a linear combination of

$$y_{ij} = \mu + A_i + B_j + AB_{ij} + \varepsilon_{ij} \ldots\ldots\ldots Equation\ (1)$$

Where

Y_{ij} = individual observation, μ = General mean, A_i = effect of factor A, B_i = effect of factor B, AB_{ij} = effect of interaction AB and ε_{ij} = experimental error.

RESULTS AND DISCUSSION

Demographic Characteristics of Sawn-wood Marketer in the Study Area

The age, gender and marital status of the respondents are presented in Table 1. The result shows that majority (43%) of the sawn-wood marketers were within the age range of 41-50 years. This is in line with the findings of Sekumade *et al.*. (2011) that middle age people dominate sawn-wood business because of the energetic nature of the business. The result further revealed that sawn-wood market was dominated by men, who made up 75% of the respondents corroborating the findings of Kalu *et al.*. (2009); Izekor and Izekor (2011); Sekumade and Oluwatayo, (2011) and Aiyeloja *et al.*. (2013). These authors stated that in Nigerian economy, most capital intensive and arduous jobs are dominated by males. Majority (83%) of the respondents across the study area were married while 7% of the sawn-wood marketers were widows and widowers. The large involvement of married people in the business may be a reflection of the fact that sawn-wood marketing serves as a means of income and employment generation, supporting the findings of Aiyeloja *et al.*.(2013) who stated that "sawn-wood marketing serves as a source of income and employment generation to forest stakeholders who engaged in the forest-related activities". Majority (51%) and (34%) of the respondents had secondary school and tertiary education respectively. This shows that sawn-wood marketing serve as a source of employment generation in Delta state which also corroborates the findings of Adeyoju (2001). Furthermore, 56% of the respondents have been actively involved in sawn-wood marketing between 11-20 years while 25% fell within the 0-10 years categories. The result of new entrant (25% of the respondents) confirms the finding of Popoola (1998), "that the percentage of new entrant into the wood based sector in the last two decades has been negligible". The result reveals that 88% had active sawn-wood sellers associations while 12% of the respondent had none. About 87% of those that had sellers associations participated in the association activities with only 13% none participating members. The respondents believed that the timber dealers association in the state serves as a link between the sawn-wood marketers and the government which is represented by the forestry officers in each of the LGAs in the state. The business was seen by the marketers as a profitable

one, and as such, it is believed increases the earning of the stakeholders in the business with particular reference to Delta State.

The list of the sawn-wood species traded in Delta State is presented in Table 2. The forty three (43) species identified makes up 72% of the marketable wood species in Nigeria. This result corroborates the findings of Popoola (1999), who gave the total known Nigeria marketable wood species to be 60 species. Three sawn-wood species were selected for the study. These include *Pterocarpus osun,* (Plate 1a), *Combretodendron africanum,* (Plate 1b), and *Berlina congolensis,* (Plate 1c). They were selected on the basis of the fact that they were sawn into volumes 0.013 m^3, 0.019 m^3 and 0.025 m^3 under consideration in the study.

Plate 1 (a) *P. osun*0.019 m^3

Plate 1 (b): *C. africanum* 0.025 m^3

Plate 1 (c): *B. congolensis* 0.013 m^3

Price Differences and Causal Factors among Different Market Categories

The criteria for fixing prices in marketing of sawn-wood are presented in Table 3. The result reveals that majority (79%) of the respondents considered the cost incurred in obtaining the sawn-wood and add profit margin in fixing prices. This is in agreement with the finding of Olukosi and Isitor (1990). About 17% of the respondents fixed prices of sawn-wood based on the forces of demand and supply. This agreed with the basic economic law of demand and supply (Braeutigam, 2010). Only 4% considered both the expenses incurred in purchasing the sawn-wood and market forces of demand and supply.

Factors affecting prices of sawn-wood identified in the state include seasons, free nature of the market, lack of storage facilities and scarcity. Majority of the respondents (38.33%) affirmed seasons as a major cause of price difference. Prices of sawn-wood were observed to be high during the dry season and low during the rainy season. This may be due to the fact that majority of the producing sawmills and chain saw millers transport their log by rafting and by thug boats during the rainy season when the water level in the creeks is high which negatively affected sawn-wood price due to low demand. This agreed with the findings of Kalu *et al.*. (2009) who stated that season influences prices of round log in Benin City, Edo State. Lack of storage facilities also necessitate the sawn-wood sellers to sell off their products at lower prices so as not to run into losses from deterioration and loss of face value of the woods during the rainy season. This is a set-back to Forestry development as it promotes wasteful utilization of forest resources thereby affecting sustainable forest managements hence scarcity of forest goods especially sawn-wood. This agreed with the finding of Sekumande *et al.*. (2011), who stated that inadequate storage facilities have led to unaccountable wastage of agricultural raw materials. Wood availability and scarcity are also synonymous with supply and demand. Sawn-wood has the highest demand without a balanced supply as observed in Delta State. These agreed with the findings of Adeyoju and Enabor, (1995); Popoola and Ajewole (2001). These authors stated an imbalance in demand and supply of forest products.

The result of the 3×3 factorial design in completely randomized design (CRD) for sawn-wood prices with market category and sawn-wood volume as the factors is presented in Table 5.

The result reveals that the prices of sawn-wood significantly differ with respect to market category and the three volumes of sawn-wood, since F-calculated is greater than the tabulated F-values at 0.05%level of significance. The effect of the interaction between market category and sawn-wood volumes on the prices was also significant ($P < 0.05$).

The mean prices increases with increasing volume with 0.025 m^3having the highest mean price and 0.013 m^3having the lowest mean price. This agreed with the findings of Kalu and Owolabi, (2011) who stated that grading of sawn-wood into dimensions/volumes helps to determine the prices of sawn-wood.

The result of the 3×3 factorial design in completely randomized design (CRD) for sawn-wood prices with market category and the selected species of sawn-wood as the factors is presented in Table 6. The result shows that the prices of sawn-wood significantly differ with respect to market category and the three selected species. There were significant difference ($P < 0.05$) in the effect of the interaction between market category and selected species of sawn-wood prices. The significant difference observed in the prices of the selected species of sawn-wood and market categories corroborates the findings of Aiyeloja, (2013) who stated that the characteristics of sawn-wood are consistent with the species of the tree; such as strength, hardness, durability and appearance which vary between species and that the factors influencing buyer preference were species quality, availability and price respectively.

The result of 3 × 10 factorial design in completely randomized design (CRD) for sawn-wood prices with market category and number of year as the factors is presented in Table 7.The result shows that sawn-wood prices significantly differ($P < 0.05$) with respect to market category and the number of years under study. There were no significant differences ($P > 0.05$) in the effect of the interaction between market category and sawn-wood prices for the number of years investigated. The significant difference observed for sawn-wood prices for market categories and number of years as factors corroborates the findings of Sekumade *et al.*. (2011) and Abbott (2009). They stated that increase in demand for wood and agricultural products over the years have led to increased prices of these products.

The result of mean separation (LSD tests) for the market category, sawn-wood species, volumes and year under investigation are presented in Table 8 (a,b,c,d). With respect to market category, the result shows that there were significant differences among the three categories. The highest mean sawn-wood price of ₦ 414.40 was recorded in peri-urban market while the least mean sawn-wood price of ₦ 355 was recorded in the urban area. The highest price in peri-urban markets may be linked to the fact that they get their wood from sawmills and chain sawmilers and as such incurred sufficient cost in transporting and loading/off-loading sawn-wood. These costs are considered in price fixing hence the increased prices of sawn-wood in these regions. With respect to the sawn-wood volumes, all the three sawn-wood volumes differ significantly in their mean market price values. The sawn-wood dimensions of 0.025 m^3, 0.019 m^3 and 0.013 m^3 had mean market values of ₦487.80, ₦374.50 and ₦269 respectively.

The LSD result for the selected species of sawn-wood revealed that there were significant differences in the mean prices of the three species with *Pterocarpus osun* having the highest mean market price of ₦ 403.20, and *Berlina congolensis* having the least mean market price of ₦ 351.90. Though all the selected species are termed hardwood by the marketers, consumer preference for *Pterocarpus osun* influenced its price in agreement with the demand price relationships. The prices of sawn-wood significantly differ across the 10 years under study. The highest mean sawn-wood price of ₦ 492.70 was recorded in 2014, with the least mean market

price of ₦ 261.20 in 2005. This may be as a result of the increasing demand against the limited supply of these desired species of sawn-wood. This corroborates the findings of D'Angelo (2001), Adeyoju and Enabor (1995) and Sekumade *et al*.. (2011) who stated that "the notion of market efficiency between markets is compatible with significant price differentials, and that increase in the demand for wood products has led to the increase in the price of sawn-wood".

Table 1: Age, gender and marital status of the respondents in the study area

Variables	Group	Frequency	Percentage (%)
Age	21-30	5	3
	31-40	36	20
	41-50	77	43
	51-60	50	28
	>61	12	7
	Total	**180**	**100**
Gender	Male	135	75
	Female	45	25
	Total	**180**	**100**
Marital status	Single	18	10
	Married	150	83
	Widowed	12	7
	Divorces	0	0
	Total	**180**	**100**
Level of education	No formal	0	0
	Primary	27	15
	Secondary	91	51
	Tertiary	62	34
	Total	**180**	**100**
Years in business	0-10	46	25
	11-20	100	56
	21-30	30	17
	>31	4	2
	Total	**180**	**100**
Sawn-wood association	Yes	159	88
	No	21	12
	Total	**180**	**100**
Member of association	Yes	156	87
	No	24	13
	Total	**180**	**100**

Source: Field survey (2015)

Table 2: Trade and Botanical names of the species of sawn-wood in Delta State

S/N	Trade names	Botanical names	S/N	Trade names	Botanical names
1	Mahogany	*Khaya ivorensis*	23	Kerosene wood	*N/A*
2	Iroko	*Milicia excels*	24	Comwood	*Pterocarpus osun*
3	Alstonia	*Alstonia boonei*	25	Opepe	*Nauclea diderrichii*
4	Bombax	*Bombax bounopozense*	26	Abura	*Pterocarpus osun*
5	Danta	*Combretodendron africanum*	27	Congo afara	*N/A*
6	Oleku	*Berlina congolensis*	28	Teak	*Tectona grandis*
7	White circular	*Sterculia oblonga*	29	Gmelina	*Gmelina arborea*
8	Akomu	*Pycnanthus congolensis*	30	Ekhimi	*Piptadeniastrum Africana*
9	Odorin (paint wood)	*N/A*	31	Ojoo	*Antiaris Africana (toxicaria)*
10	White canarium	*Canarium schweinfurthii*	32	Marikana	*Marilcara obovota*
11	Obeche	*Triplochiton scleroxylon*	33	Apa	*Afzelia Africana*
12	Segesege	*Albezia zygia*	34	Okwen	*Brachystegia kennedyi*
13	Ekki	*Lophira alata*	35	Oma	*Cordial millenii*
14	Otuaro	*N/A*	36	Fagara	*Fagara macrophylla*
15	Black Afara	*Terminalia ivorensis*	37	Owewe	*Combretodendron africanum*
16	Walnut	*Lovoa trichiliodes*	38	Agbagon	*Daniella ogea*
17	Mansonia	*Mansonia altissima*	39	Sapele wood	*Entandrophragma cyclindricum*
18	Ghana obeche	*Hanua klaineana*	40	Mangrove wood	*Rhizophora spp*
19	Berlina	*Berlina congolensis*	41	Okpe mansonia (guarea)	*Guarea cedrata*
20	Baphia	*Baphia nitida*	42	Okan	*Cylicodiscus gabunensis*
21	Jacob wood	*Amphimax pterocarpoides*	43	Agba	*Gossweilerodendron balsamigerum*
22	Ubelo	*Strombosia pustulata*			

N/A=Not available

Source: Field survey (2015)

Table 3: Criteria considered in fixing prices of wood

Variables	Frequency	Percentage
Expenses incurred and profit	143	79
Forces of demand and supply	30	17
Both	7	4
Total	**180**	**100**

Source: Field survey (2015)

Table 4: Causal factor for price differences

Variables	Frequency	Percentages
Seasons	69	38.33
Free nature of market	28	15.73
Lack of storage facilities	34	19.11
Scarcity	49	27.52
Total	**180**	**100**

Source: Field survey (2015)

Table 5: Result 3×3 factorial design in CRD for sawn-wood prices with market category and volume as the factors

Source	Df	SS	MS	Fcal	F_{tab}
Category	2	6837952	3418976	348.77*	2.99
Volumes	2	77623676	38811838	3959.18*	2.99
Interaction	4	1324986	331247	33.79*	2.37
Error	9711	95192269	9803		
Total	9719	180978883			

Indicates significant at α = 0.05

Table 6: Result 3×3 factorial design in CRD for sawn-wood prices as market category and species as the factors

Source	Df	SS	MS	Fcal	F_{tab}
Category	2	6837952	3418976	195.72*	2.99
Species	2	4271402	2135701	122.26*	2.99
Interaction	4	226726	56682	3.24*	2.37
Error	9711	169642802	17469		
Total	9719	180978883			

Indicates significant at α = 0.05

Table 7: Result of 3×10 factorial design in CRD for sawn-wood prices with market category and year as the factors

Source	Df	SS	MS	F_{cal}	F_{tab}
Category	2	6837952	3418976	279.33*	2.99
Year	9	55420394	6157822	503.09*	1.88
Interaction	18	111799	6211	0.51	1.57
Error	9690	118608737	12240		
Total	9719	180978883			

Indicates significant at α = 0.05

Table 8: Least significant difference (LSD) results for the factorial experiments

(a) Market category

Variables	Urban	Peri-urban	Rural
Mean prices	355.0[a]	414.4[b]	361.9[c]

(b) Volumes

Variables	0.013 m^3	0.019 m^3	0.025 m^3
Mean prices	269.0[a]	374.5[b]	487.8[c]

(c) Species

Variables	*Combretodendron africanum*	*Pterocarpus osun*	*Berlina congolensis*
Mean prices	376.2[a]	403.2[b]	351.9[c]

(d) Years

Variables	1	2	3	4	5	6	7	8	9	10
Mean prices	261.2[a]	283.4[b]	310.9[c]	355.8[d]	366.3[e]	388.0[f]	417.2[g]	442.1[h]	473.5[i]	492.7[j]

N.B.: Means with the same alphabet as superscript are not significantly different from each other

CONCLUSION

The study concludes that variety of sawn-wood species are traded and the market for sawn-wood is efficient since there is significant price differences among the three selected species and volumes over a period of ten (10) years in Delta state. The study recommends the provision of storage facilities and price stabilization policy for sawn-wood market improvement.

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