



## PRICE VARIATION AND MOVEMENT OF *Halea ciliata* SPECIES OF LUMBER IN DELTA STATE, NIGERIA

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### ABSTRACT

The study examined the intensity of price movement and trend analysis of selected volumes ( $0.013\text{m}^3$ ,  $0.019\text{m}^3$  and  $0.025\text{m}^3$ ) of *Halea ciliata* in urban and local lumber markets in Delta State of Nigeria. Monthly sales records of *Halea ciliata* species of lumber (2010-2019) were taken from sales receipt and were analyzed using econometric analysis. Results showed that prices of *Halea ciliata* species of lumber and the volumes considered were non-stationary in their level forms but were stationary at first difference ( $P \leq 0.01$  and  $P \leq 0.05$ ). The indices of market concentration were less than one suggesting elevated level of short run market integration. Co-integration test showed that a long run stable relation exist between prices in local and urban markets while the Error correction mechanism reflect that the extent of price movement is relatively fast. The study concluded that lumber market for *Halea ciliata* is integrated and operated efficiently. It was recommended that intensive forest restoration be embarked upon for continuous supply of lumber to sellers.

**Keywords:** Efficiency, Local, Lumber, Markets, Price variation, Urban.

### INTRODUCTION

In the author's opinion, majority of forest product markets in Nigeria are poorly integrated. Unity and efficiency in price movement is important for development of products markets, especially in ensuring uniformity in economic wellbeing and production cost across spatial markets (Michal and Patrick, 2020). When there is uniformity in price information, strong market integration exist, showing the existence of soaring level of competition and connection between or among such markets (Birge *et al.*, 2020). Market strongholds and transportation challenges are some of the major causes of price inequality between markets with consequence of poor market integration (Martinez-de and Vendrell, 2017). Studying efficient marketing of products harvested from the forest in Nigeria is important for Forestry sector development. It has two major importance; stakeholder's satisfaction and environmental sustainability, especially as forests (it trees, land and other resources) are regarded as the earth lungs. Therefore, the market for products harvested from the forest is dynamic. Lumber, obtained from tree and processed in sawmills is a key marketable wood product in Nigeria. Its uses are vast and the harvesting of trees for lumber is a main cause of forest degradation (Igben and Ohiembor, 2015). This is further heightened as majority of local and urban dwellers livelihood depend on trade in forest products (Pandey *et al.*, 2016).

Variation exists in mechanical characteristics of lumber gotten from various species, hence their grading and demand. The grading of lumber into categories after processing helps to influence the value and likely use possible for each board of lumber (Michael *et al.*, 2017). The prices of lumber also vary with species even with their grading. This price disparity boosts excessive lumber production and sales in areas with lower price (Yogisha, 2006). The impact is intense deforestation in those areas. Despite the uniqueness of forest ecosystem and the prolonged effect of deforestation, movement of lumber prices between markets in the state for various species is scarce. Ohwo and Adeyemi (2015) examined market integration of *Poga oleosa* species of lumber. Investigation of other species is important to have an understanding of lumber market performance in Delta State.

## MATERIALS AND METHODS

### The Study Area

The study was conducted in Delta, a State rich with diverse timber species from its rainforest, Nigeria. It is situated between longitude 5°00' and 6°45' East and latitude 5°00' and 6°30' North (Figure 1). As a result, there exist various sawmill and lumber markets.

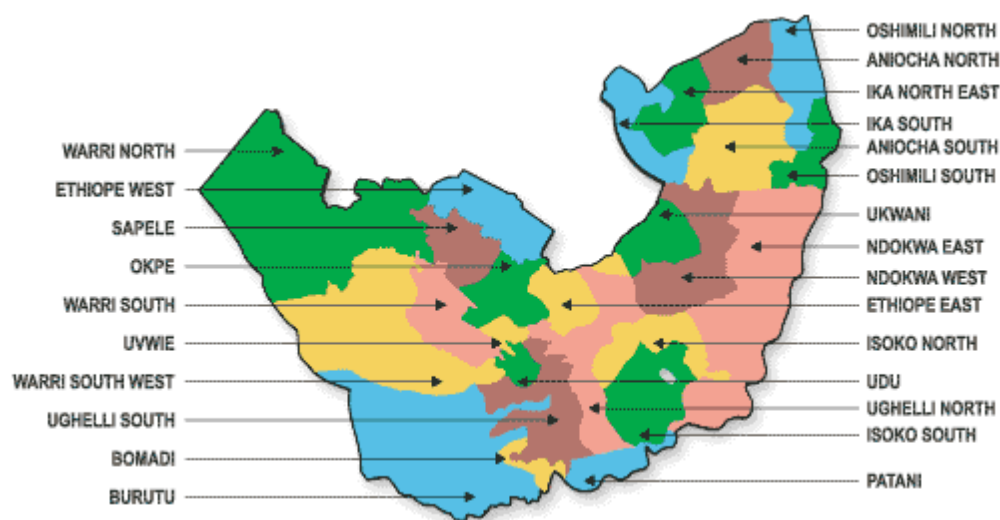


Figure 1: Map of Delta State

### Sampling Procedure

Three (3) informants each were selected purposively from local and urban lumber markets in the 25 Local Government Area of the State. The criterion for selection was based on years in business. Informants that have spent over 10 years in lumber sells were interviewed for the study. An 150 lumber sellers were sampled.

### Method of Data Collection

Price data were obtained monthly for three (3) volumes (0.013m<sup>3</sup>, 0.019m<sup>3</sup> and 0.025m<sup>3</sup>) of *Halea ciliata* species of lumber (2010-2019) from sales records of lumber sellers in local and urban lumber markets (LUM).

### Method of Data Analysis

Econometric analysis of Unit Root Test, Augmented Dickey Fuller, Ravallion IMC model, Engle and Granger (1987) test of co-integration and error correction model (ECM) were data analytical tools employed to test for the presence of unit root and price information flow amongst the local and urban markets.

### RESULTS AND DISCUSSION

The average monthly price movement of *Halea ciliata* and the various volumes for urban and local lumber markets (Figures 2 to 4) were characterized by fluctuation. There was an increment in prices of lumber in LUM from 2010 to 2019. The price fluctuated from ₦240 in January 2010 to ₦470 in January 2019 for the 0.013m<sup>3</sup> volume in the urban market (UM), while in local market (LM), price rose from ₦270 in January 2010 to ₦480 in 2019. For 0.019 m<sup>3</sup> lumber volume, UM prices increased from ₦370 in January 2010 to ₦590 in January 2019 while the LM trend from ₦380 in January 2010 to ₦620 in January 2019. For 0.025m<sup>3</sup> volume, price rose from ₦480 in January 2010 to ₦780 in January 2019 and ₦490 in January 2010 to ₦740 in 2019 for urban and local lumber markets, respectively.

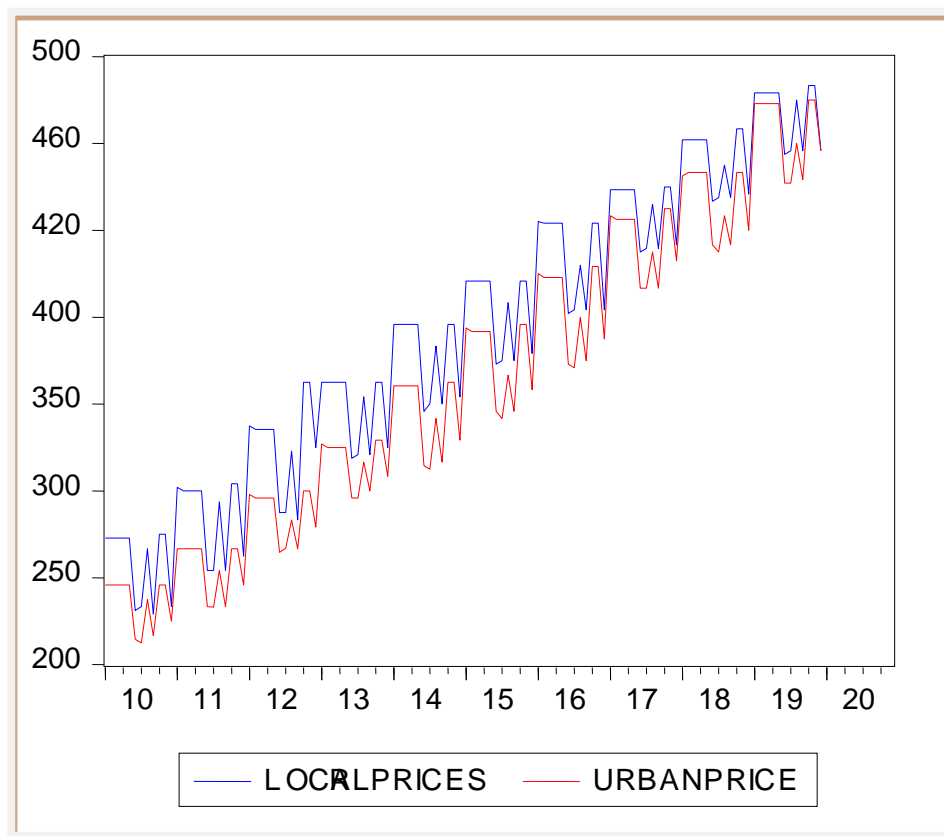


Figure 2: Average month-long retail price data of *Halea ciliata* 0.013 m<sup>3</sup>

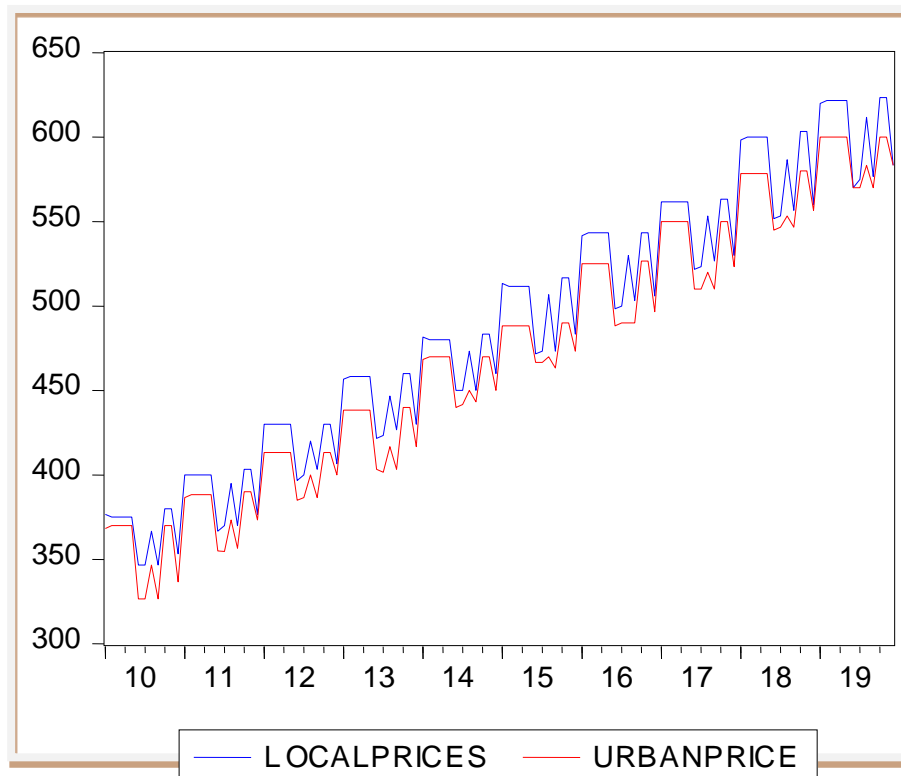


Figure 3: Average month-long retail prices of *Halea ciliata* 0.019 m<sup>3</sup>

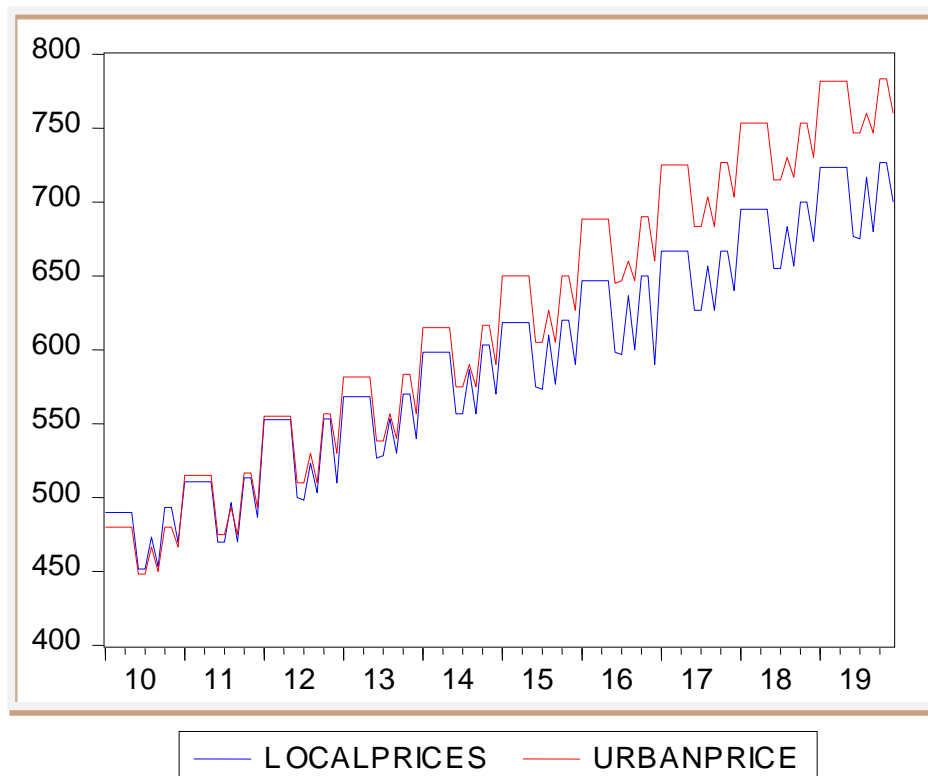


Figure 4: Average month-long retail price trend of *Halea ciliata* 0.025 m<sup>3</sup>



### Test of Stationarity for Prices of *Halea ciliata* Species of Lumber

The findings revealed the acceptance of non-stationarity in the various volumes at level forms (Table 1). The hypothesis of non-stationarity was rejected at first differential. This conforms to reports of Ajibade *et al.* (2018), Ajibade *et al.* (2019) and Pei-Tha *et al.* (2020), that prices of commodity may contain unit root at first difference. Therefore, the variables were subjected to co-integration test and were integrated without unit root in the same order I (1).

**Table 1:** Test of Unit Root for Lumber Price

Market pairs	ADF (At level)	P-value	Rema rk	ADF (1 <sup>st</sup> difference)	P-value	Remar k
L H.spp 0.013 m <sup>3</sup>	-0.8177	0.8098	N.S	-5.2129*	0.0000	S
U H.spp 0.013 m <sup>3</sup>	2.1648	0.9999	N.S	-9.9873*	0.0000	S
L H.spp 0.019m <sup>3</sup>	-0.3529	0.9120	N.S	-4.0792*	0.0016	S
U H.spp 0.019 m <sup>3</sup>	0.1461	0.9678	N.S	-4.8346*	0.001	S
L H.spp 0.025 m <sup>3</sup>	0.0616	0.9613	N.S	-5.4381*	0.0000	S
U H.spp 0.025 m <sup>3</sup>	-0.5178	0.8824	N.S	-3.0711**	0.0318	S

Note: \*\*( $P < 0.01$ ) and \*( $P < 0.05$ ). MacKinnon critical values of ADF statistics are -3.526 (1%) and -2.902 (5%).  $H_0$ : unit root exist. ADF value > in absolute value than critical value, reject  $H_0$ .

Source: Data analysis (2020)

### The Ravallion IMC Analysis

High short-run price movement exists for all volumes of *Halea ciliata* lumber considered (Table 2). The 0.025 m<sup>3</sup> and 0.019 m<sup>3</sup> volumes had the peak and least IMC value of -0.23 and -7.66, respectively. The extent of market integration is quantified by the closeness of IMC values to zero. There exist great level of market integration and efficiency when IMC value is closer to zero. The result shows that price movement of lumber occurs monthly across markets. Using the IMC as substitute for efficiency, the volumes of *H. ciliata* in paired markets indicate efficiencies showing low discrepancy in spatial prices. This observation negates that of Africa Growth Initiative (2016) who stated that forest pricing system and markets in third world countries are inefficient.

**Table 2:** IMC for LUM Pairs of Lumber and Volumes

Species	Constant W	Local ( $P_{t-1}$ ) X	Urban ( $L_{t-1}$ ) Y	L- $L_{(t-1)}$ Z	IMC X/Y	Class
<i>Halea ciliata</i>						
0.013 m <sup>3</sup>	-0.2412	0.9458	4.1332	4.1210	0.23	High SRMI
0.019 m <sup>3</sup>	-0.3679	-0.4044	0.0528	-0.4070	-7.66	High SRMI
0.025 m <sup>3</sup>	-0.0072	-0.2970	-6.2376	-6.6784	0.05	High SRMI

Source: Data analysis (2020)



### Engle-Granger Co-integration Analysis

The result using the Engle Granger critical values showed that market for all volumes of *H. ciliata* co-integrated (Table 3) (Trace statistics (TS) < critical values (CV) at  $P < 0.05$ ). The  $H_0$  was rejected. *H. ciliata* species of  $0.019 \text{ m}^3$  had the topmost TS of -3.8793 and  $0.025 \text{ m}^3$  had the least TS of -10.8590. The implication is that prices movement is evident for all volumes of *H. ciliata* species in the long run. Hence, prices in LM is useful in the prediction of that of UM and vice versa as observed by Iheke and Obasi (2017) and Ajibade *et al.* (2019).

**Table 3:** Engle-Granger Test of Co-integration for Urban and Local Lumber Prices

Species	Volume ( $\text{m}^3$ )	t- statistics	Probability
<i>Halea ciliata</i>	0.013	-5.2201*	0.0000
	0.019	-3.8793*	0.0031
	0.025	-10.8590*	0.0000

Note:  $H_0$  implies no co-integration. The CV at 5% level of significance is -1.95 (Engle Granger critical value). When  $TS < CV$ , reject  $H_0$ , \* $H_0$  rejected

Source: Data analysis (2020)

### Error Correction Mechanism Analysis (ECM)

The intensity of price variation transfer from local to urban lumber markets is shown in the ECM result in Tables 4. The ECM shows the velocity of price movement towards balance in the short possible time. Its coefficient reflects the time involved in price movement to evenness in one month. The nearness to one the ECM coefficient, the faster lumber prices attains equilibrium. The ECM values are negative and different from zero statistically. The greater the ECM values, the lesser time prices reaches equilibrium, the enhanced the integration of market and vice versa (Goletti *et al.*, 1995). The ECM coefficient results for all volumes of *H. ciliata* species were significant ( $P < 0.05$ ). The least and highest value of -0.4857 and -0.9820 was attained for  $0.025 \text{ m}^3$  and  $0.013 \text{ m}^3$ , respectively, in Local – Urban markets. The peak value implies there is 98% immediate alteration of lumber prices in local and urban lumber market in one month. The implication is that elevated level of price movement and efficiency exist for  $0.025 \text{ m}^3$  of lumber.

**Table 4:** Result of ECM for Lumber Prices

Market pair	ECM coefficient	Standard error	Probability	$R^2$
Local – Urban				
H.spp D1	-0.7447	0.3563	0.0389	0.9963
H.spp D2	-0.9820	0.2303	0.0000	0.9111
H.spp D3	-0.4857	0.0900	0.0000	0.9682

Note:  $\alpha = 0.05$

Source: Data analysis (2020)





## CONCLUSION AND RECOMMENDATION

The study examined price movement as proxy for efficiency of lumber market of *H. ciliata* in LUM of Delta State. The prices of three volumes of lumber ( $0.013\text{m}^3$ ,  $0.019\text{m}^3$  and  $0.025\text{m}^3$ ) from 2010 to 2019 were examined. The price data contained unit root in level form but, absent at first difference. The markets for lumber were efficient with about 98% rapid movement of price for  $0.025\text{m}^3$  monthly. The encouragement of forest restoration and tree planting for continuous supply of lumber to the market is recommended from the study.

## REFERENCES

- Africa Growth Initiative (2016). *Foresight Africa: Top priorities for the continent in 2016*.
- Ajibade, B. T., Ayinde, E. O., Abdoulaye, T. and Ayinde, K. (2018). Modelling the price of Maize and its Determinants in Nigeria: Error Correction Model Approach. *Albanian J. Agric. Sci.*, **17**(4): 235-242.
- Ajibade, B. T., Ayinde, E. O. and Abdoulaye, T. (2019). Spatial Market Integration and Price Information Flow in Nigeria Markets: The case of Yam. *Alanya Academic Review*, **3**(2): 181-200.
- Birge, J. R., Chan, T. C. Y., Pavlin, J. M. and Zhu, I. Y. (2020). *Spatial Price Integration in Commodity Markets with Capacitated Transportation Networks*. Final Gasoline Paper, Pp.1-38.
- Engel, R. F. and Granger, C. W. J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, **55**(2): 251-276.
- Goletti, F., Ahmed, R. and Farid, N. (1995). Structural Determinant of Market Integration: The Case of Rice Markets in Bangladesh. *The Developing Economies*, **33**(2): 185-202.
- Igben, J. L. and Ohiembor, O. M. (2015). Lumbering as a Factor of Deforestation in the Freshwater Swamp Forest in Delta State, Nigeria. *International Journal of Research in Agriculture and Forestry*, **2**(9): 1-9.
- Iheke, O. R. and Obasi, A. C. (2017). Marketing and market integration of rice in Abia State. *The Nigerian Agricultural Journal*, **48**(2): 171-179.
- Martinez-de, A. V. and Vendrell, J. M. S. (2017). *A capacitated commodity trading model with market power. Real Options in Energy and Commodity Markets*. World Scientific, Pp.31-60.
- Michael, H. R., Henry, B., Marta, B., George, F., Thomas, R., Darshil, U. S., Guanglu, W., Li, Y., Patrick, F., Danielle, D., Julian, A., Paul, D., Linden, P. F. and Oren, S. (2017). The wood from the trees: The use of timber in construction. *Renewable and Sustainable Energy Reviews*, **68**(1): 333-359.
- Michal, A. and Patrick, B. (2020). *Market integration in India*. International monetary Fund working Paper /20/115/, JEL Classification Numbers: F15; E39; O53 Pp. 1-20.
- Ohwo, O. A. and Adeyemi, A. A. (2015). Price transmission and market integration of sawnwood of *Poga oleosa* (Pierre) in Delta State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, **11**(3): 114-122.



- Pandey, A. K., Tripathi, Y. C. and Kumar, A. (2016). Non Timber Forest Products (NTFPs) for Sustained Livelihood: Challenges and Strategies. *Research Journal of Forestry*, **10**(1): 1-7.
- Pei-Tha, G., Awadh, A. M. G., Norimah, R., Shu-Ern, L., Muzafar, S. H. and Zalina, Z. (2020). Stock market integration in the presence of leading macroeconomic information: evidence from 30 selected countries. *Journal of Critical Reviews*, **7**(6): 568-579.
- Yogisha, S. B. (2006). *The structure, conduct and performance of rice marketing system in Cross River and Ebonyi State, Nigeria*. Unpublished PhD Dissertation, University of Calabar, Nigeria.