SPATIAL PRICE TRANSMISSION AND MARKET INTEGRATION OF *Cistanthera papaverifera* (A. Chev.) IN URBAN AND RURAL SAWN-WOOD MARKETS, DELTA STATE, NIGERIA

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ABSTRACT

The study examined the trend in prices of *Cistanthera papaverifera* species of sawn-wood in urban and rural sawn-wood markets in Delta State, Nigeria. Secondary data on dimensions {2"×2"×16 (0.013m^3) 2"×3"×16 (0.019m^3) and 2"×4"×16 (0.025m^3)} of Cistanthera papaverifera species of sawn-wood monthly prices spanning 2004 to 2013 were sourced from sales receipt of sawn-wood sellers. The data were analyzed using Augmented Dickey Fuller (ADF) Test, Ravallion – IMC and Error Correction Mechanism test. Results revealed that price series in all the markets accepted the null hypothesis of non-stationarity at their levels at 1% and 5% significance level. The integration test revealed that the markets for all the dimensions of *C. papaverifera* species of sawn-wood considered were integrated in the long run. The Index of Market Concentration (IMC) indicates that the markets exhibit high short run market integration. The Error correction mechanism result indicated that the rates of price transfer were generally fast. This study concludes that sawn-wood marketing in Delta State have a high degree of market efficiency and recommends the provision of incentives to encourage tree planting as well as sustainable timber harvest and a greener environment.

Keywords: Sawn-wood, species, marketing, prices, efficiency.

INTRODUCTION

Market integration exists when prices among different locations of related goods follow similar patterns over a long period of time (Donovan *et al*., 2005). Group of prices often move proportionally to each other and when this relation is very clear among different markets it is said that the markets are integrated. Market integration is a measure of trading behaviour, information, and price differential between markets. Market integration means the existence of a measurable long-run relationship between spatially separated prices for the same good (Barrett, 2005). The speed of price convergence indicates the degree of market integration. Market integration as an important aspect of market research provides the basic data for understanding how specific markets work.

Spatial market integration of agricultural products has been widely used to indicate overall market performance, if price changes in one market are fully reflected in alternative market, these markets are said to be spatially integrated (Goodwin and Schroeder, 1991). Prices in spatially integrated markets are determined simultaneously in various locations, and information of any change in price in one market is transmitted to other markets (Gonzalez-

Rivera and Helfand, 2001). In more integrated markets, farmers specialize in production activities in which they are comparatively proficient, consumers pay lower prices for purchased goods, and society is better able to reap increasing returns from technological innovations and economies of scale (Vollrath, 2003). In order to facilitate forestry development process, analysis of market integration is considered pertinent and it is expected that favourable pricing efficiency will stimulate production and marketing.

The ubiquitous nature of wood has made it a valuable material in every stage of human development such as building construction, marine and sea applications, construction, railway, domestic appliances and musical instruments (ITTO, 2005). Sawn-wood is a major forest product in Nigeria and it serves as a raw material for wood based industries (Langbour and Gerarrad, 2007). Prime marketable product of most forests today is wood for use as timber, fuel-wood, pulp and paper, providing some 3.5 billion cubic meters of timber equivalent a year globally (ITTO, 2006). Out of the semi-processed and processed wood categories, sawn-wood has the highest production and demand, and it is the most widely distributed in Nigeria for construction purposes (FAO, 1999). It is locally marketed in designated plank markets and sawmills across the country. The grading of sawn-wood into categories (uniform and desirable quality) as it is processed helps to determine to a large extent the value and potential use possible for each board of sawn-wood (Pierre and Steve, 2006).

Locally, sawn-wood processing and marketing contributes to livelihood sustainability through employment and cash incomes in the rural and urban communities in Nigeria. The marketing of sawn-wood involves the exchange between a buyer and a seller at a given price. The price is such that the seller meets the total cost as well as profit margin (Olukosi and Isitor, 1990). It is therefore, the sum of all business activities involved in the movement of sawn-wood from point of production to the point of consumption (Bauer and Yameh, 1993). It shapes the management processes because it undoubtedly benefits the stakeholders, who depend on forest enterprises for survival (Olukosi and Isitor, 1990).

Timber trade in southern Nigeria is highly commercial with over 500 sawmills (Okunomo and Achoja, 2010). Presently, the rate of exploitation of forest resources in Nigeria is approaching a critical level and this is due to the fact that a large proportion of the population depends heavily on the forest products for survival (Oni *et al*., 2013). Despite the fact that Sawn-wood is a major forest product in Nigeria as it supplies raw material for wood-based industries (Langbour and Gerarrad, 2007), most of species of sawn-wood differ in mechanical properties, which informed their grading and by extension, their demand. Even with the grading, most species of sawn-wood are variedly priced. This price variation encourages the purchase of sawn-wood from regions of lower prices, thereby increasing demand and in order to meet with these demands, greater pressure is exerted on the forest estate, thus affecting forest development in the region.

Previous studies show that the forest pricing system in Nigeria is inefficient; while the forest product market is bereft of good performance due to the existence of structural and institutional weaknesses in the market, which have prevented the market from operating efficiently (Popoola *et al*., 2001). These structural and the institutional deficiencies are reflected in high distribution costs, distorted market prices and inadequate price transmission (Beak Consultants, 1999). As the population of the state continues to soar, increase in the demand for sawn-wood with corresponding price hikes will inevitably result in greater pressure on forest resources. The ability of a marketing system to efficiently carry out its function of contributing positively to the development of a country (Forestry development) depends on the ease with which price changes and responses are transmitted spatially and temporally between markets for a homogeneous commodity (sawn-wood). Owing to unavailability of data on transactions cost or low quality of such data in the state, synchronous price movement overtime will be used as a proxy for assessing marketing efficiency. A marketing system in which synchronous movement of prices is observed among spatially dispersed markets is considered as being integrated (Baulch, 1995).

MATERIALS AND METHODS

The 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

A 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 (road density, banks, communication network etc) (second stage). While one of the LGAs was economically and infrastructurally developed, the second was less economically and infrastructurally developed. Thus one of the LGAs in each senatorial district was designated as urban market (U), the second was considered as rural market (R). In Delta North Senatorial District Ika North LGA (U) and Ukwani LGA (R), in Delta Central, Sapele LGA (U) and Udu LGA (R), and in Delta South, Warri South LGA (U) and Patani LGA (R) were selected for the study. Four sawn-wood markets were then purposively chosen in each of the LGAs based on the prevalence of sawn-wood marketing in those markets. The prices of the selected dimension of *Cistanthera papaverifera* species of sawn-wood were the average of the prices obtained from the four sawn-wood markets in each LGA.

Structured questionnaire was developed and used for the study. Five (5) copies of the 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 twenty (120) respondents were sampled in the course of the study. Information on the monthly retail prices of the selected dimensions of *Cistanthera papaverifera* species of sawn-wood from January 2004 to December 2013 was collected from sales receipt for the study. The mean monthly prices in the urban and rural market were used for data analysis.

Data analysis

The study made use of a combination of analytical tools namely trend analysis, Ravallion IMC model, co-integration analysis and error correction mechanism.

Unit root test

The first step in carrying out a time series analysis is to test for stationarity (unit root) of the variables (price series) (Masliah, 2002). A price series does not have unit root if its mean and variance are constant over time. Non stationary variables are differenced to make them stationary. A variable that is non stationary is said to be integrated of the order I (1), a variable that has to be differenced once to become stationary is said to be integrated of the order 1 i.e., I (1). The augmented Dickey Fuller (ADF) was adopted to test for stationarity. This involves running a regression of the form:

$$\Delta Y_t = \alpha + \rho Y_{t-1} + \Sigma\delta_i \Delta Y_{t-1} + \mu_t \qquad \text{equation (1)}$$

Where
Δ = first difference operator
Y_t = sawn-wood price series being investigated
t = time variable
The null hypothesis is; ho: $\rho = 0$, meaning that a unit root exits in y, that is, y is non-stationary.

The alternative hypothesis is ha; ρ=1, that y is stationary.

If ADF value is more negative than the critical value, then the variable is significant (Hande *et al*., 2009).

Ravallion IMC model

The model seeks to determine whether a change in the price of the product in a local (rural) market is influenced by the change in price in the central (urban) market. The conventional demand – supply theory explains that the actual price of a commodity in a given market at a given point in time is higher than the equilibrium price when the product is "deficit" (*i.e.* excess demand where the demand is greater than domestic supply) and the price of which is lower than the equilibrium when it is "surplus" (*i.e.* excess supply where the domestic supply is greater than the demand). Consequently, there exists an opportunity for trade between these two types of markets (*i.e.* from surplus to deficit regional market), and ultimately these two markets become integrated by adjusting into a single price (Udith, 2007).

$$P_t = f_i(R, X_i) \; for \; i = 1, ..., n \text{..........(2)}$$

Based on Timmer (1974), the Ravallion model can be expanded as follows:

$$P_t = d_o + (1 + d_o)P_{t-1} + d_2(R_t - R_{t-1}) + (d_3 - d_1)R_{t-1} d_4 X_{it} + e_{it} \text{..........(3)}$$

P_t and R_t are the logarithm of the prices 1 and 2 for month *t*, respectively; X_i is a matrix of exogenous variables; d_i are regression parameters estimates and e_{it} is the random error

Where:

R_t = Market price 1(urban)

P_t = Market price 2 (rural)

R_{t-1} = Lagged price for market type 1(urban)

R_t-R_{t-1} = Difference between market price 1 and its lag (urban)

e_{it} = Error term or unexplained term

d_0 = Constant term

$(1+d_0)$ = Coefficient of market type 2 lagged price (rural)

d_2 = Coefficient of R_t-R_{t-1}

$(d_3 - d_1)$ = Coefficient of market type 1 lagged price (urban)

In general model, 'n' lags of market type 1 price and 'm' lags of the market type 2 price is possible. But with the introduction of "one lag" to this model and excluding X variables, one can derive the "Index of Market Concentration" (IMC), which is the ratio of the Rural Market Coefficient $(1 + d_0)$ to the urban Market Coefficient $(d_3 – d_1)$ (Timmer, 1974):

$$IMC = \frac{(1+d_o)}{(d_3 - d_1)} \quad \text{.......................................}(4)$$

Index of Market Concentration (IMC) is used to measure price relationship between integrated markets. It can be used to evaluate the level of integration between the market types in the short run. Index of Market Connection is interpreted as follows:

IMC < 1 implies high short-run market integration, IMC >1 implies low short-run market integration, IMC = ∞ implies no market integration, IMC = 1 implies high or low short run integration (theoretically).

The closer the value of the IMC to zero is, the higher the degree of market integration and thus, the higher the marketing efficiency. In order to capture the IMC values better, the values should be approximated to two decimal places (Popoola and Rahji, 2001).

Engle and Granger's Two-step Procedure

Engle and Granger (1987) test of co-integration (or common stochastic trends) starts by estimating the co-integrating regression (the first step),

$$x_{1,t} = \beta_1 + \beta_2 x_{2,t} + \cdots + \beta_p x_{p,t} + u_t \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where p is the number of variables in the equation. In this regression we assume that all variables are I(1) and might co-integrate to form a stationary relationship, and thus a stationary residual term $\Delta u_{0,t} = x_{1,t} - \beta_1 - \beta_2 x_{2,t} - \cdots - \beta_p x_{p,t}$ (In the tabulated critical values p = n). This equation represents the assumed economically meaningful (or understandable) steady state or equilibrium relationship among the variables. If the variables are co-integrating, they will share a common trend and form a stationary relationship in the long run.

The second step, in Engle and Granger's two-step procedure, is to test for a unit root in the residual process of the co-integrating regression above. For this purpose set up an ADF test like,

$$\Delta u_{0,t} = \propto + \pi u_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta u_{t-1} + \upsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Under the null of no co-integration, the estimated residual is I (1) because $x_{1,t}$ is I(1), and all parameters are zero in the long run. Finding the lag length so the residual process becomes white noise is extremely important. The empirical t-distribution test and the Dickey-Fuller tests are similar. The maintained hypothesis is no co-integration. Thus, finding a significant π implies co-integration. The alternative hypothesis is that the equation is a co-integrating equation, meaning that the integrated variable $x_{1,t}$co-integrates at least with one of the variables on the right hand side. If the dependent variable is integrated with d > 0, and at least one regressor is also integrated of the same order, co-integration leads to a stationary I(0) residual. The integrated properties of the dependent variable will if there is no co-integration pass through the equation to the residual. The decision rule is to reject the null hypothesis of no co-integration when the absolute value of t-statistics is greater than the critical values at the chosen probability levels.

Error Correction Model (ECM): Advantage of the error correction model is that it incorporates variables both in their levels and first differences. This helps to capture the short run disequilibrium situations as well as the long run equilibrium adjustments between prices. ECM incorporate short run and long run changes in the price movements.

An ECM formula which describes both the short- run and the long-run behaviours of prices is expressed below:

$$\Delta R_{it} = \gamma_1 + \gamma_2 \Delta U_{jt} - \pi \ddot{V}_{it-1} + \upsilon_{it} \qquad \text{equation (7)}$$

Where

γ_2 = impact multiplier (short run effect) that measures the immediate impact that a change in U_{jt} will have on a change in R_{it}.

π = feedback effect or the adjustment effect that shows how much of the disequilibrium is being corrected, that is the extent to which any disequilibrium in the previous period affects any adjustment in the R_{it} period.

$\ddot{V}_{t-1} = R_{it-1} - \dot{\rho}_1 - \dot{\rho}_2 U_{jt-1}$, shows the long run response.

The higher the absolute value of ECM, the faster the price movement among variables.

RESULTS AND DISCUSSIONS

Price Trend Analysis

Monthly retail price trend for *Cistanthera papaverifera* showed that prices in rural and urban sawn-wood market followed a similar pattern over the years for all three species under consideration. Prices were high during the dry season and low during rainy season. This may be attributed to the high demand for these species for construction and building activities during the dry season. Prices for all the dimensions of *Cistanthera papaverifera* were stable in the first five months of the year (January to May). A drop in prices was observed in the month of June to September and a price increased was observed in the last three months of each year under consideration for both the rural and urban sawn-wood markets. Prices ranged from ₦145 in January 2004 to a peak of ₦350 in January 2013 for the 2"×2"×16 (0.013 m^3) dimension in the urban market, while in rural sawn-wood market, prices ranged from ₦160 in January 2004 to a peak ₦380 in 2013. For 2”×3”×16 (0.019 m^3) sawn-wood dimension, urban market prices ranged from ₦240 in January 2004 to a peak of ₦480 in January 2013 while the rural market prices ranged from ₦260 in January 2004 to ₦500 in January 2013. A rise in prices for sawn-wood was also observed in the 2”×4”×16 (0.025 m^3) dimension. Prices of sawn-wood increased from ₦ 355 in January 2004 to ₦660 in January 2013 and ₦365 in January 2004 to ₦600 in 2013 for urban and rural sawn-wood markets respectively. The retail price in urban market is slightly lower than that in the rural market.This might be attributed to the urban market being the major sawn-wood producing area in the state. The prices are characterized by fluctuations. There was a rise in prices in both markets in early 2004 through 2013.

Stationarity Test for *Cistanthera papaverifera* species of sawn-wood Price Series in Delta State

A variable is said to be non-stationary when the ADF t-statistics is smaller in absolute terms than the critical values. The result in Table 1 shows the stationarity test for *Cistanthera papaverifera* species of sawn-wood and the selected dimensions using ADF procedure. The results indicated that all variables except rural market price for dimension three [2”×4”×16 (0.025m^3)] were not stationary at their level since the ADF t-statistics is smaller in absolute terms than the critical values. The null hypothesis of non-stationarity was accepted at a probability of 1% and 5% level of significance at their level. The null hypothesis was however rejected at first difference for rural and urban *Cistanthera papaverifera* species of sawn-wood and their dimensions. This agrees with the findings of Chirwa, (2000) and Yusuf *et al*., (2006) that commodity prices are stationary at the order of first difference.

Table 1: Result for unit root testing for sawn-wood price

Variables (Market pairs	ADF (At level)	P. values	Remark	ADF(1st Difference)	P. values
R C.spp D1	-0.9477	0.7693	N.S	-3.9379*	0.0025
U C.spp D1	0.5033	0.9861	N.S	-3.9676*	0.0023
R C.spp D2	-0.0137	0.9546	N.S	-4.0716*	0.0016
U C.spp D2	2.5958	1.0000	N.S	-4.4180*	0.005
R C.spp D3	-10.3819*	0.0000	S	-6.1287*	0.003
U C.spp D3	0.6438	0.9903	N.S	-3.5157**	0.0093

Source: compiled from result of stationarity test
** & *denote significance at 1% and 5% probability level, MacKinnon critical values of ADF statistics are -3.493 (1%) & – 2.889 (5%). H_o is there is unit root. If ADF value is greater in absolute value than the critical value the H_o is rejected.

Ravallion Index of Market Concentration (IMC) Analysis

The regression and index of market concentration of sawn-wood prices for *Cistanthera papaverifera* and the respective dimensions is presented in tables 2. The result showed that all the species and dimensions considered showed high short run market integration with 2”×4”×16 (0.025 m^3) dimension having the highest IMC value of –0.01 and dimension 2”×2”×16 (0.013 m^3) having the lowest IMC value of -0.07. From the result, price information of sawn-wood will be transmitted instantaneously within a month across markets (from urban to rural markets). Using the Index of Market Concentration as a proxy for marketing efficiency, the dimensions of C. *papaverifera* in the market pairs shows there is presence of market efficiencies indicating low variation in price across space and time. This result disagrees with the finding of Popoola *et al*., (2001) that the forest pricing system in Nigeria is inefficient. This has prevented the market from operating efficiently. It agreed with the findings of Popoola and Rahji, (2001), that there is high degree of market efficiency in sawn-wood market in Nigeria.

Table 2: Regression result for market pair (Rural and Urban) of sawn-wood and dimensions

Species	Constant	Rural (P_{t-1})	Urban (R_{t-1})	R- R($_{t-1}$)	IMC	Classification
	A	**B**	**C**	**D**	**B/C**	
Cistantherpapaverifera						
2”×2”×16 (0.013 m^3)	-0.3118	-0.4280	6.4670	5.9230	-0.07	High SRMI
2”×3”×16 (0.019 m^3)	-0.6827	-0.5317	13.0955	12.4309	-0.04	High SRMI
2”×4”×16 (0.025 m^3)	12.5598	-0.4915	102.2478	103.8822	-0.01	High SRMI

Source: compiled from result of Ravallion IMC test

Engle-Granger Co-integration Analysis

Co-integration test was carried out since all variables were integrated of the same order I (1). The results of co-integration test of urban and rural sawn-wood prices in Delta State are presented in Table 3. The result showed that all dimensions of C. *papaverifera* species of sawn-wood were co-integrated. The criterion for selection is that the trace statistic value must be greater in absolute term than the critical value at 0.01 and 0.05 levels of significance. From the result in Table 3, the null hypothesis of no co-integration, i.e., H_0 was rejected. This is because calculated trace statistics for the null of H_0 are greater in absolute values than the critical values. C. *papaverifera* species with 2”×3”×16 (0.019 m^3) had the lowest trace statistics of 4.0676 with dimension 2”×4”×16 (0.025 m^3) having the highest trace statistics of 11.5230. This implies that prices of C. *papaverifera* species and all dimensions considered are tied together in the long run. The co-integrating relationship indicates that price in the rural market can be used to predict urban market prices and *vice versa*. There is price transmission between the markets, indicating that Forest Stakeholders i.e sawn-wood traders in the urban and rural market in Delta State as well as consumers will realize the appropriate profit from trade because correct price signals will be transmitted through the marketing chain.

Table 3: Result for Engle and Granger co-integration test of urban and rural sawn-wood prices in Delta State.

Species	Dimension	t- statistics	Probability
Cistanthera papaverifera	2”×2”×16 (0.013 m^3)	-9.6862*	0.0000
	2”×3”×16 (0.019 m^3)	-4.0676*	0.0000
	2”×4”×16 (0.025 m^3)	-11.5230*	0.0000

Source: compiled from result of Co-integration Test

H_0: No co-integration, H_a: co-integration. Critical values at 1% and 5% level of significance are -3.493 and 2.889(MacKinnon critical values of ADF statistics). When the absolute value of t-stat > critical value, reject H_0. * denotes rejection of H_0

Error Correction Mechanism Analysis

The Error Correction Mechanism (ECM) result as presented in Table 4 showed the rate at which price changes are transferred from rural to urban sawn-wood markets. The Error Correction Model is the rate of price transmission at which price is restored to equilibrium in the short run. The ECM coefficient shows the speed at which short run fluctuations get corrected within the lag periods. The speed which sawn-wood prices in the markets return to their equilibrium depends on the proximity of the ECM coefficient to one. The ECM values must be negative and statistically different from zero. The stronger the negative values the shorter period it takes for prices in states to reach their equilibrium position, the shorter the time to complete price adjustment, the better integrated is the market and vice versa (Goletti *et al.*, 1995). Large values of ECM are indications of how swiftly market prices are transferred from the urban market to rural market within a particular time frame (monthly). Low values imply low inefficiencies in terms of price information flow between markets. The result showed that the entire ECM coefficient for all species and dimensions in the state were significant at 5%. Rural – Urban pair had the lowest value of – 0.3219 with 2”×2”×16 (0.013 m^3) dimension and the highest value of -0.6092 was recorded for dimension 2”×4”×16 (0.013 m^3). The different rates of sawn-wood price transfer from the result have implication on the performance of the markets. The high value signifies that there will be about 61% instantaneous adjustment of sawn-wood prices for rural and urban prices across market within a given time frame (one month). Large values of ECM are indications of how swiftly market prices are transferred from rural to urban sawn-wood market in Delta State on a monthly basis, hence high market efficiencies. Traders operating between these markets could easily form correct expectation about price changes and this would help them in taking proper decisions on the dimension and time of purchase of sawn-wood therefore minimizing the problem of price uncertainty.

Table 4: Result of error correction mechanism for sawn-wood prices

Market pair	ECM coefficient	Standard error	Probability	R^2
Rural – Urban				
C. spp D1	-0.3219	0.2234	0.0524	0.8967
C.spp D2	-0.6049	0.1778	0.0009	0.9129
C.spp D3	-0.6092	0.1810	0.0010	0.3356

$\alpha = 0.05$

CONCLUSION AND RECOMMENDATION

This study concludes that sawn-wood marketing in Delta State has a high degree of market efficiency and recommends the provision of incentives to encourage tree planting as well as sustainable timber harvest and a greener environment. The study recommends that sawn-wood price information should be made available to the public to stimulate their interest in Forestry investment.

REFERENCES

Barrett, B.C. (2005). Spatial market integration. Cornell University Final version, August 2005.Entry in Lawrence E. Blume and Steven N. Durlauf, editors, *The New Palgrave Dictionary of Economics, 2nd Edition* (London: Palgrave Macmillan, forthcoming) 1-7Pp

Bauer, P.T. and Yameh, B.S. (1993). Economics of marketing reforms. *In*: Abbot, J.C. Agric and Food Marketing in Developing Countries, Selected Reading, *CTA/CABI Publication Series*: 108- 132.

Baulch, R.J. (1995). Spatial price equilibrium and food market integration. Ph.D. Thesis, Stanford University.

Chirwa, E.W. (2001). Liberalization of food marketing and market integration in Malawi. Final report of an AERC sponsored research work presented at the Biannual Economic Research Workshop, Nairobi, Kenya, May 27- June 1.

Dickey, D.A. and Fuller, W.A. (1979). "Distribution of the estimators for autoregressive. Time series with a unit root". *Journal of the American Statistical Association*, 74:427–31.

Donovan G Hesseln, H. and Garth, J. (2005). Credit availability: a possible barrier to growth for the Alaska forest products industry? *Forest science* 20(3): 177-183

Engle, R., and Granger C. (1987). Co-integration and error correction: Representation, estimation and testing. *Econometrica*, 55(1), 251–276.

FAO (1999). Forest Resources Study, Nigeria. Overview: Revised national report. Forestry Monitoring Evaluating Coordinating Unit Dimension1: 108Pp.

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.

González-Rivera, G. and Helfand, S.M. (2001). The extent, pattern, and degree of market integration: A multivariate approach for the Brazilian rice market. *American Journal of Agricultural Economics* 83: 576-592.

Goodwin, B.K., and Schroeder T.C. (1991). Co-integration tests and spatial price linkages in regional cattle markets, *American Journal of Agricultural Economics* 73(2): 452-464.

Hande E. and Joniada M. (2009). Analysis of co-integration in capital markets of France, Germany and United Kingdom. *Economics & Business Journal: Inquiries & Perspectives Dimension 2 Number 1 October 2009*

ITTO (2005). Status of tropical forest management: ITTO Technical Series No 24.

ITTO (2006). Annual review and assessment of the world timber 2005. Document GI-7/06. Trade in Secondary Processed Wood Products. Yokohama, Japan.

Langbour, P. and Gerard, J. (2007). Further processing in Central Africa. *Tropical Forest Update* 17: 7-10.

Mackinnon, J. (1990). Critical values for co-integration tests, San Diego University of California (San Diego), Department of Economics Discussion paper 90-94Pp.

Masliah M.R. (2002). Stationarity and non-stationary identification. Internet Publication.

Okunomo, K. and Achoja, F.O. (2010). Economic impact assessment of African timber and plywood company in Sapele, Delta State, Nigeria. *African Journal of General Agriculture* 6(3): 169-167.

Olukosi, J.O. and Isitor, U.S. (1990). Introduction to Agricultural marketing and prices, principles and applications. Living Book Series, All G.U. Publication, Abuja, Nigeria 65Pp.

Oni O.A, Oladele O.I, and Ajayi, O.M. (2013). Economics of tropical deforestation in Nigeria. *Life Science Journal* 10(2): 1048-1055.

Pierre, B. and Steve, G. (2006). The illustrated guide to "American Hardwood Lumber Grades.

Popoola, L. and Rahji, M.A.Y. (2001). "Spatial market integration test of *Terminalia ivorensis* Sawn wood markets in Nigeria". Journal of Tropical forest products (7): 1-9 (2001).

Popoola, L. Rahji, M.A.Y. and Adesoye, P.O. (2001). Analyses of spatial and temporal variations in prices of some sawn-wood in south western Nigeria. *Ghana Journal of Forestry* 10: 32-41.

Udith, K. and Jayasinghe M. (2007). An economic analysis on spatial integration of regional rice markets in Sri Lanka.

Vollrath, T.L. (2003). North American Agricultural market integration and its impact on the Food and Trade Economics Division, Economics Research Service, USDA, USA. Agricultural Information Bulletin No. 784.

Yusuf, S. A., Akanbi O. A. and Ajani, O.I.Y. (2006). Spatial price analysis of cassava and its products in Kwara State Nigeria, (1994-2006). *Journal of Economics and Rural Development* 15(2): 103-112.