VOL. 7, NO. 9, SEPTEMBER 2012 ISSN 1990-6145
ARPN Journal of Agricultural and Biological Science


www.arpnjournals.com

PRICE FORMATION AND TRANSMISSION OF STAPLE FOOD STUFFS IN OSUN STATE, NIGERIA

Akintunde O. K[1]., Yusuf S. A[1]., Bolarinwa A. O.[1] and Ibe R. B.[2]
[1]Department of Agricultural Economics, University of Ibadan, Nigeria
[2]National Horticultural Research Institute, Idi Ishin, Ibadan, Oyo State, Nigeria
E-Mail: akintundekamil@yahoo.com

ABSTRACT

This study examined the trend in staple foodstuffs prices in urban and rural market of Osun state, Nigeria. Secondary data on gari, beans, rice and maize monthly prices spanning 2006/2008 were sourced from Macro-Statistics Department, Osun State Planning Commission. The data were analyzed using Augmented Dicker Fuller (ADF) test, Granger-causality test and Index of Market Connection. Empirical results revealed that the price series in all the markets accepted the null hypothesis of non-stationarity at their levels at 5% significance level. The integration test showed that none of the markets examined had prices tied together in the long- run. The Granger-causality model revealed that eight market links rejected their respective null hypothesis of no granger causality, two of the market links exhibited bi-directional granger causality or simultaneous feedback relationship while other six market links exhibited uni-directional granger causality. It also revealed that rural beans market and rural gari market are the markets occupying leadership positions in staple food price formation and transmission in the markets investigated. Therefore, the study recommends that the leader markets should be the target for any planned national pricing policy for increased consumption of staple foodstuffs The Index of market connection (IMC) indicates that the markets exhibit low short run market integration. The study concludes that the agricultural commodity markets in developing countries may be subject to a high degree of marketing inefficiency and recommends a nation-wide policy to improve food marketing efficiency in Nigeria.

Keywords: price formation, price transmission, gari, beans, rice, maize, granger causality, Nigeria.

INTRODUCTION

Important food grain in Nigeria whose production is being emphasized to remedy food deficit and importation includes maize, sorghum, millet, rice and pulses (Aihonsu and Akorede, 2002). Prices are a standard and important component of market and food security analysis because they serve as an indicator of both food availability and food access. Prices are a measure of availability because they tend to rise as the supply of food falls in relation to demand (e.g., poor production, constrained imports of food), and they tend to fall when supply expands in relation to demand (e.g., a bumper harvest). Food prices are also a measure of food access because they affect the household's purchasing power: the ability of a household to acquire goods and services based on the amount of money or other forms of wealth they possess. Consumer prices of food determine how much food a household can buy given their level of income or wealth (FEWS NET, 2009).

Food and nutrition security are the fundamental challenges to human welfare and economic growth in Africa (Benson, 2008) especially with the recent escalation of food prices, a situation that is making the globe to be facing a worsening food crisis unseen in the last 30 years and having the potential of leading to catastrophe (Ikeokwu, 2008). High food prices have serious implications for food and nutrition security, macroeconomic stability and political security of any nation. Except clothing and shelter as the basic necessities of life, food remains the most vital item in the hierarchy of need because of its centrality to human existence. Ruthless expedition for food has shaped human history, provoked wars, migration and undermined the growth of nations. Lack of access to food influences food intake and consequently impact on the health and nutritional status of households (WHO, 2008a).

Prices observed through time are as a result of a complex mixture of changes associated with seasonal, cyclical, trend and irregular factors. The most common regularity observed in agricultural prices is a seasonal pattern of change. Normally, prices of storable commodities are lowest at harvest time, rise as the season progresses, and reach a peak prior to the next harvest (Olukosi and Ositor, 1990). The purpose of selling directly to consumers is to reduce the charges for possession utility. Anytime an intermediary is forced to own and hold inventory, it must be financed. These finance charges for possession utility are included in the purchase price of the product (Downey and Erickson, 1987).

Agricultural prices greatly influence the pace and direction of agricultural development. Prices serve as market signals of the relative scarcity or abundance of a given product; prices also serve as incentives to direct the allocation of economic resources and to a large extent they determine the structure and rate of economic growth. The liberalization of agricultural markets implies accepting potentially substantial variation in prices across time, space and product form. This price variation is necessary if agricultural markets are to perform its marketing functions (Tschirley, 1995). Information on agricultural commodity price in both developed and developing countries like Nigeria is important to both producers and consumers. Prices vary almost throughout the year and understanding the trend of such variations is therefore

essential for good planning by the producers, consumers and policy makers. An average household after the price increase spends as high as 75% of their income on food compared with an average of 65% before food crisis (Zoellick, 2008).

The volatility in price of agricultural commodities in Nigeria has been attributed to various factors including variances in bargaining power among consumers, cyclical income fluctuations among sellers and consumers, natural shocks such as flood, pests, diseases, and inappropriate response by farmers to price signals (Gilberts, 1999, Udoh *et al*., 2007, Adebusuyi, 2004). Short- run fluctuations in agricultural commodity prices occur between production seasons (Cashin and Pattillo, 2000). During the harvesting period, farmers offer to the market the minimum price for their products. In the offseason, prices become high due to reduced production and seasonal changes (Akpan, 2002). Product price instability among agricultural commodities is a regular phenomenon in markets across Nigeria (Akpan, 2007). Instability in commodity prices among markets could be detrimental to the marketing system and the economy as a whole. It could cause inefficiency in resource allocation among sellers and consumers depending on the source of variability (that is whether it is induced by supply or demand side or both). It could also increase poverty level among low income earners in the society (Polaski, 2008).

Rice, maize, gari and beans are among staple food items whose prices are highly unstable between seasons in Osun State. Consumers pay different amounts for the same product in different markets separated by few kilometers. Price instability of agricultural commodity would be considered a normal phenomenon if it does not significantly differ from one market to another. On the contrary, if products prices are significantly different among markets it may distort resources flow and may also likely negate some objectives of the governments (Akpan and Aya, 2009).

This paper examines the relationship between price levels of staple foodstuffs in different markets of Osun state and seeks to determine whether or not they are linked. This study therefore analyzes the trend in price of staple foodstuffs in the rural and urban markets as well as the level of integration between markets for these staple food items in Osun state and determines the causal relationship between and among the series. The study is based on the assumptions that there is no causal relationship between rural and urban prices of staple foodstuffs and secondly it is assumed that there is causal relationship between rural and urban prices of staple foodstuffs.

METHODOLOGY

This section presents the methodological framework adopted for the study. The subsequent subsections deal with nature and sources of data, the scope of data collected and analytical procedures.

Sources and scope of data

The data for this study were obtained from secondary sources. The data was from the monthly price series of Osun State Central Pricing System (CPRS) collected by the Macro-Statistics Department, Osun State Planning Commission. The data collected were the monthly retail prices of staple foodstuffs (Rice, Maize, Gari and Beans). Monthly retail prices covering between January, 2006 and December, 2008 inclusive were obtained for rural and urban markets across the state.

Analytical procedure

The study made use of a combination of analytical tools namely trend analysis, co integration, Granger causality procedures and Ravallion-imc model.

Test for stationarity

The first step in carrying out a time series analysis is to check for stationarity of the variables (price series in this case. A series is said to be stationary if the means and variances remain constant over time. It is referred as I (0), denoting integrated of order zero. Non stationary stochastic series have varying mean or time varying variance. The price series in this study were first tested for stationarity. The purpose was to overcome the problems of spurious regression. A stationary series tends to constantly return to its mean value and fluctuations around this mean value have broad amplitudes, hence, the effects of shocks are only transient. Other attributes of stationary and non-stationary data and their implications in econometric modeling are discussed by Adams (1992), Gujarati (1995) and Juselius (2006).

A variable that is non -stationary is said to be integrated of order *d*, written *I (d)*, if it must be differenced *d* times to be made stationary. In the same way, a variable that has to be differenced once to become stationary is said to be *I (1)* i.e., integrated of order 1. The augmented Dickey Fuller (ADF) was adopted to test for stationarity. This involves running a regression of the form:

$$\Delta P_t = \beta_1 + \beta_{2t} + \delta P_{t-1} + \alpha_1 \sum_{i=1}^{m} \beta_i \Delta P_{t-1} + \varepsilon_t \qquad (1)$$

Where

Δ = first difference operator
P_{it} = food price series being investigated for stationarity
t = time or trend variable

The null hypothesis that $\delta = 0$ implies existence of a unit root in P_{it} or that the time series is non-stationary. The critical values which have been tabulated by Dickey and Fuller (1979), Engle and Yoo (1987) and Mackinnon (1990) are always negative and are called ADF statistics rather than t-statistics. If the value of the ADF statistics is less than (i.e., more negative than) the critical values, it is concluded that P_{it} is stationary i.e., $P_{it} \sim I(0)$.

When a series is found to be non-stationary, it is first-differenced (i.e., the series $\Delta P_{it} = P_{it} - P_{it-1}$ is obtained and the ADF test is repeated on the first-differenced series.

If the null hypothesis of the ADF test can be rejected for the first-differenced series, it is concluded that $P_{it} \sim I(1)$. The price series for all the markets included in this study were investigated for their order of integration.

Co-integration test

Two or more variables are said to be co-integrated if each is individually non-stationary (i.e., has one or more unit roots) but there exists a linear combination of the variables that is stationary. Other attributes of co-integration are as shown in Engle and Yoo (1987) and Silvapulle and Jarasuriya (1994). After the stationarity test, the study proceeds by testing for co-integration between market price series that exhibited stationarity of same order.

The maximum likelihood procedure for co-integration propounded by Johansen (1988), Johansen and Juselius (1990, 1992) and Juselius (2006) was utilized. This is because the two-step Engle and Granger procedure suffers from the simultaneity problem and the results are sensitive to the choice of dependent variables (Baulch, 1995). Adopting a one-step vector auto-regression method avoids the simultaneity problem and allows hypothesis testing on the co-integration vector, r. The maximum likelihood procedure relies on the relationship between the rank of a matrix and its characteristic roots. The Johansen's maximal eigen value and trace tests detect the number of co-integrating vectors that exist between two or more time series that are econometrically integrated. The two variable systems were modeled as a vector auto-regression (VAR) as follows:

$$\Delta X_t = \mu_t + \sum_{i=1}^{k} \Gamma_i \Delta X_{t-i} + \pi X_{t-k} + \varepsilon_t \quad (2)$$

Where

X_t = N x 1 vector containing the series of interest (staple foodstuffs spatial price series)
□ and □ = matrices of parameters
K = number of lags and should be adequately large enough to capture the short-run dynamics of the underlying VAR and produce normally distributed white noise residuals
ε_t = vector of errors assumed to be white noise.

Test for causality

When two series are stationary of the same order and co-integrated, one can proceed to investigate for causality. This is because at least, one Granger-causal relationship exists in a group of co-integrated series (Alexander and Wyeth, 1994; Chirwa, 2001; Nielson, 2006). The causality test is represented by the error correction equation below:

$$\Delta P_{it} = \beta_0 + \beta_1 P_{j(t-1)} + \beta_2 j_{(t-1)} + \sum_{i=1}^{m} \delta_i \Delta P_{i(t-i)} + \sum_{i=1}^{m} \alpha_i \Delta P_{j(t-i)} + \varepsilon_{it} \quad (3)$$

Where

m and n are number of lags determined by Akaike Information Criterion.

Rejection of the null hypothesis (by a suitable F-test) that $\alpha_h = 0$ for h = 1, 2.....n and = 0 indicates that prices in market j Granger-cause prices in market i. If prices in i also Granger-cause prices in j, then prices are determined by a simultaneous field-back mechanism (SFM). This is the phenomenon of bi-directional causality. If the Granger-causality runs one way, it is called unidirectional Granger causality and the market which Granger causes the other is tagged the exogenous market.

Index of market connection (IMC)

The index of market concentration was used to measure price relationship between integrated markets. Following Oladapo and Momoh, (2007) approach, the actual rural price is given by the equation bellow.

$$P_t = \beta_0 + \beta_1 P_{t-1} + \beta_2 (R_t - R_{t-1}) + \beta_3 R_{t-1} + \varepsilon_t \quad (4)$$

Where

R_t = urban price (in Naira)
P_t = rural price (in Naira)
R_{t-1} = lagged price for urban market (in Naira)
$R_t - R_{t-1}$ = difference between urban price and its lag (in Naira)
E_t = error term
β_o = constant term
β_1 = coefficient of rural lagged price
β_2 = coefficient of $R_t - R_{t-1}$
β_3 = coefficient of urban lagged price

From the estimation of equation (4) above, the Index of Market Connection (IMC) is given by:

$$IMC = \frac{\beta_1}{\beta_3} \text{ where } 0 \leq IMC \leq \infty \quad (5)$$

If:
IMC < 1 implies high short run market integration
IMC > 1 implies low short run market integration
IMC = ∞ implies no market integration
IMC = 1 high or short run market integration

RESULTS AND DISCUSSIONS

Price trend analysis

The minimum price of Gari in the rural area was found to be ₦40.00/bowl which was obtained in March, April and May, 2007. However, the maximum price in the rural area was obtained in July, 2006 at the rate of ₦100.00/ bowl. Similarly for urban Gari, the minimum price attained was ₦40.00/bowl in November, 2006; December, 2006 and January, 2007 whereas the maximum price was ₦90/bowl recorded in May, 2006 as shown in Figure-1.

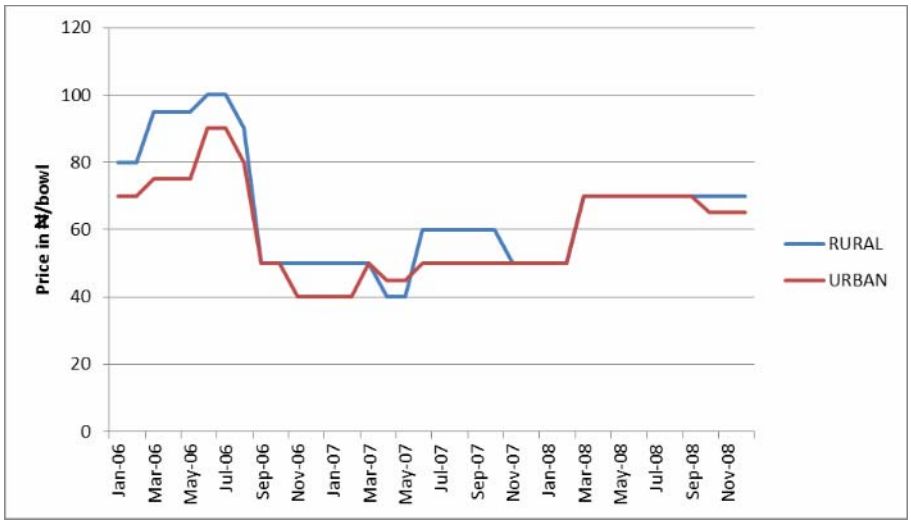

Figure-1. Trend in rural and urban prices of gari in Osun State (2006 - 2008).

In the same pattern as above; the minimum price of a bowl of beans obtained in the rural market of Osun state was ₦80.00/bowl within September, 2006 and January, 2007. The maximum price ever attained in rural market was ₦210.00/bowl in December, 2008. Furthermore, the minimum price ever attained in beans' urban market was ₦50.00/bowl obtained between November, 2006 and January, 2007 while the maximum price was obtained in December, 2008 and was ₦180.00/bowl, respectively (Figure-2).

Figure-2. Trend in rural and urban prices of beans in Osun State (2006 - 2008).

In the same vein, the lowest price of a bowl of rice ever attained in the rural market of Osun state was ₦180.00/bowl in January, 2006 while the highest price ever attained in rural market was ₦360.00/bowl in March, 2008. Also, the lowest price obtained in rice's urban market was ₦170.00/bowl obtained in January, 2006 while the highest price was obtained in March, 2008 and was ₦350.00/bowl, as shown by Figure-3.

Figure-3. Trend in rural and urban prices of rice in Osun State (2006 - 2008).

Similarly, the lowest price of maize that was obtained in the rural market of Osun state was ₦82.00/kg in January, 2006 while the highest price was attained in rural market of ₦120.00/kg in March and July, 2008. Also, the lowest price obtained in maize's urban market was ₦50.00/bowl obtained in January, 2006 while the highest price was obtained in March, 2008 and was ₦120.00 as shown in Figure-4. The reason for the variation in price can be attributed to the economic principle of supply and demand.

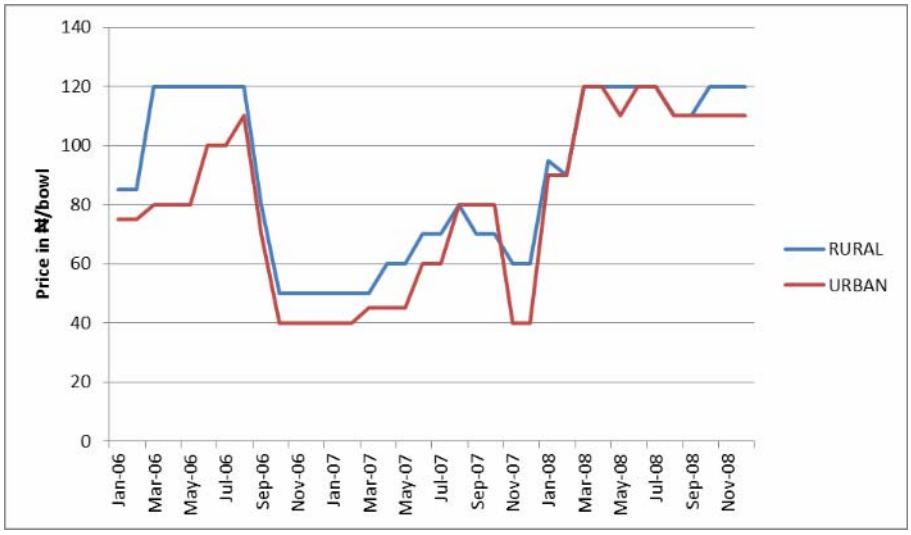

Figure-4. Trend in rural and urban prices of maize in Osun State (2006 - 2008).

Stationarity test of staple food price series in Osun State

The result in Table-1 shows the stationarity test for the staple food using ADF procedure. The results indicate that all the variables are not stationary at their level. The values of the ADF t-statistics were smaller in absolute term than the critical value. This showed that the null hypothesis of non-stationarity could be accepted at the probability of 5 percent level of significance. Therefore, the null hypotheses of non-stationary were accepted for all the variables at their level. When first-differenced, however, the null hypothesis of non-stationarity was rejected in favour of the alternative as the values of the ADF t-statistics were greater in absolute term than the critical value. The findings here corroborate earlier findings that food commodity price series are mostly stationary of order 1 i.e., I (1) (Alexander and Wyeth, 1994; Ogundare, 1999; Franco, 1999; Okoh and Egbon, 2003; Chirwa, 2001; Mafimisebi, 2001 and Oladapo, 2003). The result is probably explained by the fact that most food price series have trends in them because of inflation and therefore exhibit mean non-stationarity. They need to be first-differenced to become stationary.

Table-1. Results of unit root test of staple food price series.

Variable (market price series)	Price level I (0)		First difference I (1)	
	ADF statistics	Remarks	ADF statistics	Remarks
Rural Gari Market	-1.8285	Non-stationary	-5.2106***	Stationary
Urban Gari Market	-1.5831	Non-stationary	-5.3177***	Stationary
Rural Beans Market	0.2308	Non-stationary	-4.3131***	Stationary
Urban Beans Market	-1.1705	Non-stationary	-5.6514***	Stationary
Rural Rice Market	-1.5294	Non-stationary	-5.7403***	Stationary
Urban Rice Market	-1.2553	Non-stationary	-6.1401***	Stationary
Rural Maize Market	-1.2266	Non-stationary	-4.9200***	Stationary
Urban Maize Market	-1.631436	Non-stationary	-5.1218***	Stationary

Source: Compiled from result of stationarity test.
Notes: 1. Critical values are -3.6329 and -3.6394 at the 99 percent confidence level for price level and first difference series, respectively.
2. *** significant at 1 percent level.

Co-integration analysis

Co-integration test was carried out on all the variables to determine the existence of long-run relationship between the price variables. Table-2 presents the result of the co-integration test involving the use of Johansen Maximum Likelihood test to determine the number of co-integrating relations. Both the maximal eigen value and trace tests are perfectly in agreement of acceptance of null hypothesis of no co-integration at 5% significance level in all the four market pairs investigated which revealed that there was no long-run equilibrium of market price series. Therefore, there was no perfect transmission of information in all the four market pairs. When there is perfect transmission of price information in a network of markets, producers, marketers and consumers will realize the appropriate gains from trade because correct price signals will be transmitted down the marketing chain thus enabling producers to specialize according to comparative advantage. Markets that are not integrated will convey inaccurate price information that has the tendency to distort production and marketing decisions and contribute to inefficient product movements (Baulch 1997).

Table-2. Johansen maximum likelihood tests and parameter estimates for I(1) market pairs.

Market pairs	Eigen value	Trace statistics	Critical value (5%)	Probability	Hypothesized No. of Co-integrating equation
RUMPG-URMPG	0.28 0.09	14.07 3.05	15.49 3.84	0.08 0.08	None At most 1
RUMPB-URMPB	0.23 0.00	8.98 0.02	15.49 3.84	0.37 0.89	None At most 1
RUMPR-URMPR	0.23 0.03	10.31 1.23	15.49 3.84	0.26 0.27	None At most 1
RUMPM-URMPM	0.32 0.07	15.20 2.31	15.49 3.84	0.06 0.13	None At most 1

Source: Compiled from result of co-integration test

RUMPG is rural market price of Gari; URMPG is urban market price of Gari while RUMPB is rural market price of Beans and URMPB is urban market price of Beans. Also, RUMPR is rural market price of Rice; URMPR is urban market price of Rice while RUMPM is rural market price of Maize and URMPM is urban market price of Maize.

Granger-causality and exogeneity in staple food markets in Osun State

The result of the pair-wise Granger-causality test is shown in Table-3. Out of the 36 market pairs tested for Granger-causality, only eight market links rejected their respective null hypothesis of no granger causality. From the result of the analysis; six market links exhibited uni-directional granger causality while other two market links

exhibited bi-directional granger causality or simultaneous feedback relationship. These market links are rural maize market-rural beans market and rural beans market-rural maize market. Rural beans market has a strong exogeneity over rural maize market as it granger-caused rural maize at 5% significance level while rural maize prices granger-caused rural beans prices at 10%.

The results also revealed that rural beans market and rural gari market are the markets occupying leadership positions in staple food price formation and transmission. The analysis here provides a sufficient ground to permit the conclusion that exogeneity occurs in staple food marketing in Osun state in favour of these two markets. The case of rural beans market was strong exogeneity while that of rural gari could be classified as weak exogeneity. The finding that rural beans market and rural gari markets (both in the rural area) has been the origin of stochastic trends driving the market for staple food has the implications that these markets play dominant roles in the staple food market in Osun state. This may be consistent with the importance in daily diets consumption of beans and gari by the people in the area and the affordable prices of the foodstuffs to the local people.

Table-3. Result of pair wise granger-causality test for staple markets in Osun State (2006-2008).

Null hypothesis	Observations	F-statistic	Probability
URBAN beans does not granger cause RURAL beans	34	0.71	0.50
RURAL beans does not granger cause URBAN beans		4.60	0.02**
RURAL gari does not granger cause RURAL beans	34	5.44	0.01***
RURAL beans does not granger cause RURAL gari		1.35	0.28
URBAN gari does not granger cause RURAL beans	34	4.52	0.02**
RURAL beans does not granger cause URBAN gari		2.17	0.13
RURAL maize does not granger cause RURAL beans	34	2.46	0.10*
RURAL beans does not granger cause RURAL maize		3.83	0.03**
URBAN maize does not granger cause RURAL beans	34	0.78	0.46
RURAL beans does not granger cause URBAN maize		6.63	0.00*
URBAN maize does not granger cause URBAN beans	34	0.06	0.94
URBAN beans does not granger cause URBAN maize		3.74	0.04**
RURAL maize does not granger cause RURAL gari	34	1.79	0.19
RURAL gari does not granger cause RURAL maize		2.70	0.8*

Source: Compiled from result of granger-causality test.
Notes: 1. only the 7 market links pair with significant parameter estimates are shown
2. *significant at 10%, **significant at 5%, ***significant at 1%.

The indices of market concentration (IMC)

The result of the indices of market connection (IMC) is presented in Table-4 below. For gari, beans, rice and maize market pairs, the IMC were 24, 1.77, 1.53 and 3.42 respectively. The IMC for these market pairs were greater than one thus indicating low short run market integration. The results also show that price changes in the rural market do not cause immediate change in the prices in the urban market. Thus, it confirms earlier result of lack of perfect transmission of information in all the four market pairs.

Table-4. Indices of market connection.

Market pairs	crops	R^2	Adjusted R^2	F statistics	DW	IMC classification
Rural and urban	Gari	0.90	0.89	90.57	1.58	24 low short run market integration
Rural and urban	Beans	0.95	0.94	180.82	1.78	1.77 low short run market integration
Rural and urban	Rice	0.96	0.96	271.09	1.65	1.53 low short run market integration
Rural and urban	Maize	0.94	0.93	149.21	1.69	3.42 low short run market integration

CONCLUSION AND RECOMMENDATIONS

This study is an evaluation of price formation and transmission of staple foodstuffs in Osun state, Nigeria. The study delineated long-run and Granger-causal relationships between market price series. In the analysis of dynamic price relationships in the long-run, the study investigated order of integration of the time series data so that spurious regression estimates could be avoided. The stationary test indicated that the prices were not stationary at level form. However, at first difference prices became stationary thereby leading to the rejection of the null hypothesis of no stationary in the prices of the commodities.

The result of the granger causality test confirmed rural beans and rural gari markets occupying the leadership position in price formation and transmission. The policy implication of this is that when it is desired that a national pricing policy for increased consumption of staple foodstuffs be implemented, the identified leader markets should be the targets. This is because prices formed in them are efficiently transmitted to the other (follower) markets with very minor distortions during the transmission process. The indices of market connection market exhibit low short run market integration which revealed that price changes in the rural market do not cause immediate change in the prices in the urban market. The general implication of the findings of this study is that agricultural commodity markets in developing countries may be subject to a high degree of marketing inefficiency owing to regional market segmentation. It also shows that the tendency for price differentials between different areas to reach their equilibrium values quickly is low as is the ability of price differences to converge to their long-run equilibrium levels. Therefore, there is a need for a nation-wide policy to improve food marketing efficiency in Nigeria. The result of this will be an efficiently functioning network of markets that delivers food to consumers at an affordable cost with elimination of exploitative tendencies by any group of market intermediaries.

REFERENCES

Adams C.S. 1992. Recent Developments in Econometric Methods: An Application to the Demand for Money in Kenya. AERC Special Paper 15, September.

Adebusuyi B. S. 2004. Stabilization of commodity market of interest to Africa. Paper presented at the workshop on constraints to growth in sub-Saharan Africa, held in Pretoria, South Africa.

Aihonsu D.Y. and F.A. Akorede. 2002. Maize Marketing in a Border Community: The Case of Imelo-Alcon Local Government Area of Ogun State Nigeria. A paper presented at the 2002 Annual Conference of the Nigerian Association of Agricultural Economists, held at Ahmadu Bello University, Nigeria.

Akpan S. B. 2002. Analysis of Gross Margin Efficiency of rice beans and gari in Selected markets in Cross River State. Unpublished undergraduate project work. UNICAL. Zaria, November 5th. pp. 110-120.

Akpan S. B. 2007. Relative Price Variability and Inflation: A case study of Grain subsector in Nigeria. Unpublished Master Degree Thesis. University of Uyo, Nigeria.

Akpan S. B. and E.A Aya. 2009. Variances in Consumers Prices of Selected Food Items Among Markets In Cross River State. Global Journal of Social Sciences. 8(2): 49-52.

Alexander. C. and Wyeth J. 1994. Co-integration and Market Integration: An Application to the Indonesian Rice Market. Journal of Development Studies. 30(4): 303-328.

Baulch B. 1997. Testing Food Market Integration Revisited. Journal of Development Studies. 33(4): 512-534.

Baulch R.J. 1995. Spatial Price Equilibrium and Food Market Integration. A Ph.D Thesis of the Stanford University, Stanford, California, USA.

Benson T. 2008. Assessing Africa's Food and Nutrition Security Situation. IFPRI 2020 Africa Conference Brief 1.

Cashin P. and Pattillo C. 2000. Terms of trade shocks in Africa: Are they short-lived or long-lived? IMF Working Paper. Washington, DC: IMF.

Chirwa E.W. 2001. Liberalization of Food Marketing and Market Integration in Malawi. Report of AERC Sponsored Research.

Dickey D.A. and Fuller W.A. 1979. Distribution of Estimators for Autoregressive Time Series with Unit Root. Journal of American Statistical Association. 74(366): 427-431.

Downey W.D. and S.P. Erickson. 1987. Agribusiness Management. McGraw Hill Inc. p. 70.

Engle R.F. and Yoo B. 1987. Forecasting and Testing in Co-integrated Systems. Journal of Econometrics. 35(2): 143-159.

FEWS NET. 2009. Adjusting Prices for Inflation and Creating Price Indices. FEWS NET Markets Guidance, No. 3 May.

Franco R. 1999. Testing the Quality-Price Relations in Parmigiano and Padano Cheese Markets. Journal of International Food and Agribusiness Marketing. 10(3): 19-43.

Gilbert C. 1999. Commodity risk management for developing countries. Paper prepared for the 3rd meeting of the international task force (ITF).

Gujarati D.N. 1995. Basic Econometrics. New York, Mc Graw Hill, 3rd Ed. Geneva, 23-24 June. 1999.

Ikeokwu N. 2008. The Global Food Crisis and the Challenge to Nigeria. The Nigerian Village Square, Tuesday, 27 May 2008. Available at http://www.nigeriavillagesquare.com.

Johansen S. 1988. A Statistical Analysis of Co-integration Vectors. Journal of Economic Dynamics and Control. 12(2-3): 231-54.

Johansen S. and Juselius K. 1990. Maximum Likelihood and Inference on Co-integration with Applications to the Demand for Money. Oxford Bulletin of Economics and Statistics. 52: 169-210.

Johansen S. and Juselius K. 1992. Testing Structural Hypothesis in a Multivariate Co-integration Analysis of the PPP and UIP for the UK. Journal of Econometrics. 53: 211-44.

Juselius K. 2006. The Co-integrated VAR Model: Methodology and Applications. Oxford University Press (manuscript).

Mackinnon J. 1990. Critical Values for Co-integration Tests. San Diego University of California (San Diego), Department of Economics Discussion, Paper 90-4.

Mafimisebi T.E. 2001. Spatial Price Equilibrium and Fish Market Integration in Nigeria. Unpublished Ph.D Thesis, University of Ibadan, Nigeria. p. 201.

Nielson M. 2006. Market Integration and Causality in Demand, The Case Study of Farmed Trout in Germany. Paper delivered at the 13th Biennial Conference of International Institute of Fisheries Economics and Trade, Portsmouth, U.K, July 11. 14: 12.

Ogundare G.O. 1999. The Determinants of the Traditional Export Crops in Nigeria Using Co-integration Approach. Unpublished M.Sc Thesis, University of Ibadan, Nigeria. p. 65.

Okoh R.N. and Egbon P.C. 2003. The Integration of Nigeria's Rural and Urban Foodstuff Markets. A Report of AERC Sponsored Research.

Oladapo O.O. 2003. Market Integration for Pineapples in Nigeria. An Unpublished Ph.D Thesis, University of Agriculture, Abeokuta, Nigeria.

Oladapo M.O and Momoh S. 2007. Food price Differences and Market integration in Oyo State, Nigeria. International Journal of Agricultural Research. 2(1): 69-74.

Olukosi J.O. and S.N. Isitor. 1990. An Introduction to Agricultural Marketing and Prices, Principles and Application. Living Books Series G.M Publications, Abuja, Nigeria. pp. 15-20.

Polaski S. 2008. Rising Food Prices, Poverty and Doha Round. Carnegie endowment for international Peace.

Silvapulle P. and Jayasuriya S. 1994. Testing for Philippines Rice Market Integration: A Multiple Co-integration Approach. Journal of Agricultural Economics. 45(3): 369-380.

Tschirley D.L. 1995. Using Micro Computer spreadsheets for spatial and temporal price analysis: An Application to Rice and Maize in Ecuador. In: Gregory J.S. (ed.). Prices, Products and People; Analyzing Agricultural Markets in Developing Countries. Lynne Rienner publishers, Inc. Boulder, Colorado. pp. 277-299.

Udoh E. J. and Sunday B. A. 2007. Estimating Exportable Tree Crop Relative Price Variability and Inflation Movement under different Policy Regimes in Nigeria. European Journal of social Science. 5(2): 17-26.

WHO. 2008a. The global food crisis: implications for the health of people in the African region. An information note from the WHO Regional Office for Africa.

Yusuf S. A, Akanbi O. A and O. I. Y Ajani. 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.

Zoellick R. 2008. Food Crisis: How prepared is Nigeria? In Nigeria Sunday THIS DAY Newspaper. April 27. p. 25.