PRICE BEHAVIOUR OF LOCAL AND IMPORTED RICE IN RURAL AND URBAN MARKETS OF NIGER STATE, NIGERIA

Bako[1*],R.U., F.D. Ibrahim[1], C.O. Adebayo[1] and U.S. Mohammed[1]
[1]Department of Agricultural Economics and Farm Management, Federal University of Technology Minna,Niger State, Nigeria
[*]Corresponding Author'sE-mail: r.usman@futminna.edu.ng,
Phone number: 07060733035

ABSTRACT
The study analysed the price behaviour of local and imported rice in rural and urban markets of Niger state, Nigeria, specifically the study examined the trend in prices, determined the co-integration between the price series and ascertained the movement and direction of prices. Secondary data which were the average monthly retailed prices of local and imported rice in rural and urban markets per kilogram of rice was used from January 2000 to December 2016 (204 observations). The data were sourced from Niger Sate Bureau of Statistics and were analysedusing descriptive statistics, Augmented Dickey Fuller (ADF) test, Johansen Cointegration Model, Error Correction Model (ECM) and Granger Causality test. The result shows that the mean prices of local rice in rural and urban markets were ₦41.13 and ₦116.22 per kilogram respectively, while that of imported rice was ₦201.85 and ₦207.55 respectively and the kurtosis shows that the variables were normally distributed, while the trend shows an upward and irregular pattern in the prices of both local and imported rice in the two markets. The ADF test shows that the variables were stationary at first difference I(1), while Johansen test indicated the presence of cointegration among the local and imported rice prices in the markets as shown by the trace statistics and max Eigen statistics which were significant at 5% level of probability each. The ECM result shows that there is a long run relationship among the prices but there was a low speed of adjustment in the short run as indicated by the coefficient of -0.0139. The Granger causality result shows a unidirectional causal relationship between prices of imported rice in rural and urban markets and also in prices of local rice in urban and rural markets over the period of study. It is recommended that the flow of market information should be enhanced by the marketers and also government should be firm on its policy on rice.

KEY WORDS: Price trend, local and imported rice, urban and rural markets.

INTRODUCTION

Global demand for agricultural products is expanding rapidly and the demand for food products is foreseen to continue to grow for several decades as a result of a combination of population growth, rising per capita incomes and urbanisation (Nasirin *et al.*, 2015). Cereal grains have been the principal component of human diet, more than 50% of world daily caloric intake is derived directly from cereal grain consumption (Joseph, 2011). Rice is the most important staple food for about half of the human race (Imolehin and Wada, 2000).

The demand for rice in Nigeria has been soaring over the years (Ayanwale *et al*, 2011).Since the mid1970s, rice consumption in Nigeria has risen tremendously growing by 10.3% per annum. According to Federal Ministry of Agriculture and Rural Development (FMARD), (2011), there is an increasing demand for rice in Nigeria, as rice consumption was 5 million metric tons in 2010 and is expected to reach 36 million metric tons by 2050. According to NBS (2012), a study on household expenditure by commodity, shows that urban households spend 8.65% of their income on rice while the rural householdsuse up to 9.07% of their income on rice. A combination of various factors seems to have triggered the structural increase in rice consumption over the years with consumption broadening across all socio-economic classes, including the poor (Oyinbo *et al.*, 2013). According to the(Global Agriculture Information Network GAIN, 2012), the rising demand is as a result of increasing population growth and income level.In 2016 the estimated demand for rice stood at 6.3 million tons, while the supply was 2.3 million tons (FMARD, 2016). And according to Daramola (2005) and Awe (2006) any shortfall in supply of rice creates incentive for rice importation in the country, which reduces the country's foreign exchange earnings.

Prices are signals that direct and coordinate not only the production and consumption decisions but also the marketing decisions over time, form and space (Kohls and Uhl, 2001),Price is a major endogenous determinant of supply and demand,the price of the commodity is center to its transaction, and the quantity bought by buyers usually depend on their purchasing power in relation to the price. According to Mondal (2010), agricultural produce prices are notoriously unstable and consequently, price instability leads to uncertainty in the income of the producers as well as the quantity purchased by the consumers.

Niger State is a rice producing state with an average production rate of 5 tons per hectare and this rank the state as the highest producer of rice in Nigeria

(Jalingo,2017), also Niger State Ministry of Agriculture (2017), estimated rice production figure shows a yield of 5.31 tons per hectare. Also according to the National Agricultural Extension and Research Liason Service (NAERLS,2019), Niger State has the highest increase in rice production in 2017 and 2018 cropping season. Despite the availability of rice in the state, the price of rice has been on the increase. According to Paulin (2011), the continuous and persistentincrease in price of food commodities can lead to food insecurity and significantly affects the poor people in both urban and rural areas, as their purchasing power erodes as prices increase. According to Burakov,(2016) a rise in food prices put pressure on the household sector of an economy.

Therefore, fluctuations in the prices of agricultural products (especially major staples) have become of great concern to economists and policy makers (Adekoya *et al.*, 2013). Thus, there is need to know the trend in the prices, the direction of the movement in prices between rural and urban markets among other things to be able to inform and guide policy makers adequately.

Objectives of the Study: The aim of the study is to examine price behavior of local and imported rice in rural and urban markets of Niger state.

Theobjectives are to;

i. examine the trend in prices of local and imported rice in rural and urban markets in the study area,
ii. determine cointegration between prices of local and imported rice in rural and urban markets in the study area, and
iii. ascertain the lead market between rural and urban markets for local and imported rice in the study area.

METHODOLOGY

Study Area: The study area is Niger State (North Central) Nigeria. Niger State was carved out of the former North-Western State in 1976.The State lies between Latitudes 8°20' and 11^0 30' North and Longitudes 3°30' and7^0 20' East and share border with the Republic of Benin (West), Zamfara State (North), Kebbi (North-West), Kogi (South), Kwara (South-West), Kaduna (North-East) and South-East by FCT Abuja (National Bureau of Statistics (NBS), 2009). The 2006 population census shows that Niger state has a population of 3,950,249 with an annual growth rate of 3.4% (National Planning Commission (NPC), 2006). The projected population at 3.4% annual growth rate gives a population of 5,293,333 by 2016,Niger State is the largest States in Nigeria by land mass, covering about 86,000km^2 (or about 8.6 million hectares) representing about 9.3% of the total land area of the country (Development Action Plan for Niger State, 2008).Estimated 95% of the land is arable and serves as source of employment for the predominantly rural population whose primary occupation is farming.

Niger State experiences two distinct climatic seasons in a year.These are rainy and dry seasons. Rainfall is steady and evenly distributed, usually between May and November. Its maximum temperature is normally 37^0C which is recorded between March and June, while minimum temperature is around 21^0C recorded between December and January (Development Action Plan for Niger State, 2008).

Method of Data Collection and Sample Size: This study used secondary data which are average monthly retailed prices of local and imported rice for rural and urban markets in Niger State. The data were collected fromNiger State Bureau of Statistics and Niger State Ministry of Agriculture, for a period of 17years that is from January, 2000 to December, 2016, thus the number of months under study is 204 months.

Method of Data Analysis: The study applied descriptive statistics, Augmented Dickey Fuller (ADF) test for stationarity, Vector Autoregressive Model (VAR), Co-integration and Granger Causality test. The presence of unit root in a time series means the series is nonstationary and this generates unreliable results regarding the hypothesis testing According to Upender (2012), one method of testing for unit root and the order of integration of time series is the use of ADF.

Given the autoregressive process of order one AR (1),

$$Y_t = \phi\, Y_{t-1} + e_t \qquad (1)$$

When constant and trend is added to equation 1, it becomes

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \beta Y_{t-1} + \phi_i \sum_{i=1}^{m} \Delta Y_{t-1} + e_t \qquad (2)$$

Where; Y_t = price in time t,

Δ = first difference operator

α ,$\beta$and ϕ_i = parameters to be estimated

e_t = a serially uncorrelated white noise error term .

if ϕ =1, the serie Y_t is nonstationary, if $\phi < 1$ then the series Y_t is stationary.

Also, a suitable lag was selected for each of the analysis using the various lag length selection criteria such as Akaike's information criterion, Schwarz information criterion, Hannan-Quinn criterion, Final prediction error and Corrected version of AIC:

Descriptive statisticswere used to achieve objective 1, where summary statistics of the pricesincluding mean, minimum, maximum, skewness, kurtosis as well as graphs were used to examine the trend in the price series.

Johansen co-integration test was used to achieve objective 2.The variables were modelled as Vector Autoregressive Model (VAR). The general model is specified as;

$$\Delta p_t = \propto + \sum_{i=1}^{k-1} \Gamma_i \, \Delta p_{t-1} + \Pi \; p_{t-1} + \mu_t \quad (3)$$

Where;

Δ = is the first difference operator,

p_t =is a n x 1 vector containing the price,

Γi = The matrix of short run coefficients,

Π = The matrix of long–run coefficients,

μ_t= The normally distributed errors and

K = Number of lags that will be adequately large enough to capture the Short-run dynamics of the underlying VAR and to produce normally distributed white noise residuals.

Granger causality test was used for objective 3,The Granger model for this study as adopted from Izekor *et al*., (2016)is represented as;

$$RP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i \; UP_{t-1} + \sum_{j=1}^{n} \beta_j \; RP_{t-j} + \varepsilon_t \quad (4)$$

Where;

n = number of observations,

M = number of lag ,

RP_t = rural market price,

UP_t = urban market price,

α and β = parameters to be estimated and

ε_t = error term

Hypothesis

H_0: price of rice in rural market does not determine the price of rice in urban market for local and imported rice.

H_1: price of rice in rural market determine the price of rice in urban market for local and imported rice.

RESULTS AND DISCUSSIONS

The summary statistics of the prices showed that the minimum and maximum prices for local rice was ₦28.97 and ₦325.98, ₦20.01 ad ₦276.68 in urban and rural markets respectively and ₦150.04 and ₦345.87, ₦135.59 and ₦346.02 in urban and rural markets respectively for imported rice in Niger State. Furthermore, all the prices were positively skewed to the right, implying that the data all have positive values. Price of imported rice for both rural and urban markets in Niger State were significant at 1% probability level ($P < 0.01$) while price of local rice in both rural and urban markets of the study area were significant at 5% probability level ($P < 0.05$) indicating that these variables had the kurtosis matching that of a normal distribution.

The trend in the rice price series were visualized by the use of graphical plots, the trend in urban and rural market prices of local rice in Niger state as shown in figure 1. has been increasing and the urban market price was always higher than the rural (producing) market, but at the tail end in 2016 prices were almost very close with a little difference between the rural and urban markets especially in the months of 196-200 that is April-August 2016.

Figure 2 shows the trend in imported rice prices in both rural and urban markets. The price series for both markets shows almost the same pattern throughout the period under study. This may be attributed to the fact that the rice was imported into the state.

The ADF test for stationarity as presented in table 1, shows that although all the variables were non stationary at levels but became stationary at first difference with order of integration 1, I(1). This result is in accordance with the result of Emokaro and Ayantoyinbo (2014) who observed the same with monthly price series of local rice in Osun State. Also, all the variables were all significant at 1% probability level ($P < 0.01$).

Since all the variables were integrated of the same order 1(1), Johansen test for cointegration was used to determine long run relationship for the variables. The result as presented in table 2 shows a tracestatistic of 351.6595 which is greater than the critical value 47.21 at 5% level of significance ($P < 0.05$); this indicates that there was one co-integration equation among the variables. Therefore, based on the decision rule, the null hypothesis of no co-integration among the variables price of imported rice in rural and urban areas and price of local rice in rural and urban areas of Niger State was rejected. This implies that there is a long run relationship among the variables. The result was also confirmed by the Max Eigen statistics of 133.2789 which is greater than the critical value of 47.21 at 5% level of significance ($P < 0.05$) thereby indicating the presence of co-integration among the variables. This result is in line with those of Ojo *et al*., (2015) and Akpan (2014), which all revealed the presence of co-integration between price series.

Since the variables were co-integrated, an Error Correction Model (ECM) was carried out to ascertain the speed of adjustment of the price series. Table 3 shows that in the long run, the result of ECM shows that the ECM coefficient (-1.1089) was negative and statistically significant at 1% probability level ($P < 0.01$) this is an indication that there is a long run relationship between the prices during the period under study. The result also shows that the coefficient of price of imported rice in the rural areas and price of local rice in urban areas of Niger State were positive and statistically significant at 1% ($P < 0.01$) probability level.

In the short run, the ECM coefficient as presented in table 3 was -0.0139, which indicates a low speed of adjustment of the variables towards equilibrium. This implies that the speed of adjustment at which the variables used in the model will be in equilibrium is at the rate of 1.39%. The values of the information criteria 30.8229, 31.1097 and 31.5319 for Akaike information, Hannan Quin and Schwarz respectively shows that the error in the model had been corrected.

The result of the Granger causality test among the prices as presented in table 4 shows that there is a unidirectional causal relationship between price of imported rice in the rural markets of Niger State and price of imported rice in the urban markets of Niger State. That is, the price of imported rice in the rural markets of Niger State granger causes the price of imported rice in urban markets of Niger State. This implies that the price of imported rice in the rural markets of Niger State can be used to predict the price of imported rice in the urban markets of the State. Hence, the null hypothesis of no granger causality was rejected at 1% probability level ($P < 0.01$).

The result also shows a unidirectional causal relationship between price of local rice in the urban markets of Niger State and price of local rice in the rural markets of Niger State. That is, the price of local rice in the urban areas of Niger State granger causes the price of local rice in the rural areas of Niger State. This implies that the price of local rice in the urban areas of Niger State can be used to predict the price of local rice in the rural areas of the State. Hence, the null hypothesis of no granger causality was rejected at 10% probability level ($P < 0.10$).

Table 1: Augmented Dickey Fuller (ADF) Unit Root Test for the Price series

Variable	Level	1st Difference	Order of Integration	Critical Value (1%)	Critical Value (5 %)
PNUI	-0.035 (0.9555)	-13.819*** (0.0000)	I(1)	-3.476	-2.888
PNRI	-1.140 (0.6987)	-15.169*** (0.0000)	I(1)	-3.476	-2.888
PNUL	1.440 (0.9973)	-12.078*** (0.0000)	I(1)	-3.476	-2.888
PNRL	-0.560 (0.8797)	-13.827*** (0.0000)	I(1)	-3.476	-2.888

Source: Output from data analysis, 2018.
***implies significant at 1% probability level
Figures in parenthesis are probability values.
PNUI = Price of Niger Urban Imported Rice; **PNRI** = Price of Niger Rural Imported Rice; **PNUL** = Price of Niger Urban Local Rice; **PNRL** = Price of Niger Rural Local Rice

Table 2: Johansen Co-integration Test for the monthly price series

Hypothesized No. of CE(s)	Max Statistics	Trace Statistics	Critical Value (5%)
None*	133.2789	351.6595	47.21
At most 1	90.6943	218.3806	29.68
At most 2	87.1296	127.6863	15.41
At most 3	40.5568	40.5568	3.76

Source: Output from data analysis, 2018.
* implies rejection of null hypothesis at 5% probability level.

Table 3: Estimates of the Vector Error Correction Model for the price series

Variable	Coefficient	Standard Error	t-statistics
Long Run			
ECM (-1)	-1.1089	0.1923	5.77***
PNRI (-1)	-0.5095	0.0549	9.28***
PNUL (-1)	-0.2922	0.0753	3.88***
PNRL (-1)	-0.0425	0.0451	0.94
Constant	0.0834		
Short Run			
ECM (-1)	-0.0139	0.0293	1.12
PNUI (-1)	0.1151	0.1521	0.76
PNUI (-2)	0.0635	0.0958	0.63

PNRI (-1)	-0.3672	0.0816	4.50***
PNRI (-2)	-0.1632	0.0550	2.97***
PNUL (-1)	-0.1707	0.0977	1.75*
PNUL (-2)	0.0081	0.0908	0.09
PNRL (-1)	0.0129	0.0401	0.32
PNRL (-2)	0.0434	0.0398	1.09
Constant	-0.0137	0.7043	0.02
Log likelihood	-3039.277		
AIC	30.8228		
HBIC	31.1097		
SC	31.5319		

Source: Output from data analysis, 2018.
*****, **** and ***** implies significant at 1%, 5% and 10% probability level respectively.
PNUI = Price of Niger Urban Imported; **PNRI** = Price of Niger Rural Imported; **PNUL** = Price of Niger Urban Local; **PNRL** = Price of Niger Rural Local; **AIC** = Akaike information criterion; HBIC = Hannan Quinn Criterion; **SC** = Schwarz criterion.

Table 4: Result of granger causality test

Null Hypothesis	F-ratio	Prob > F	Decision
PNUI does not granger cause PNRI	0.18727	0.8294	Accept
PNUI does not granger cause PNUL	2.3111	0.1020	Accept
PNUI does not granger cause PNRL	0.70307	0.4964	Accept
PNRI does not granger cause PNUI	10.069	0.0001	Reject
PNRI does not granger cause PNUL	2.0137	0.1364	Accept
PNRI does not granger cause PNRL	0.0045	0.9955	Accept
PNUL does not granger cause PNUI	0.29773	0.7429	Accept
PNUL does not granger cause PNRI	2.013	0.1365	Accept
PNUL does not granger cause PNRL	2.4168	0.0920	Reject
PNRL does not granger cause PNUI	0.6477	0.5260	Accept
PNRL does not granger cause PNRI	0.0377	0.9630	Accept
PNRL does not granger cause PNUL	1.586	0.2075	Accept

Source: Output from data analysis, 2018.
PNUI = Price of Niger Urban Imported; **PNRI** = Price of Niger Rural Imported; **PNUL** = Price of Niger Urban Local; **PNRL** = Price of Niger Rural Local.

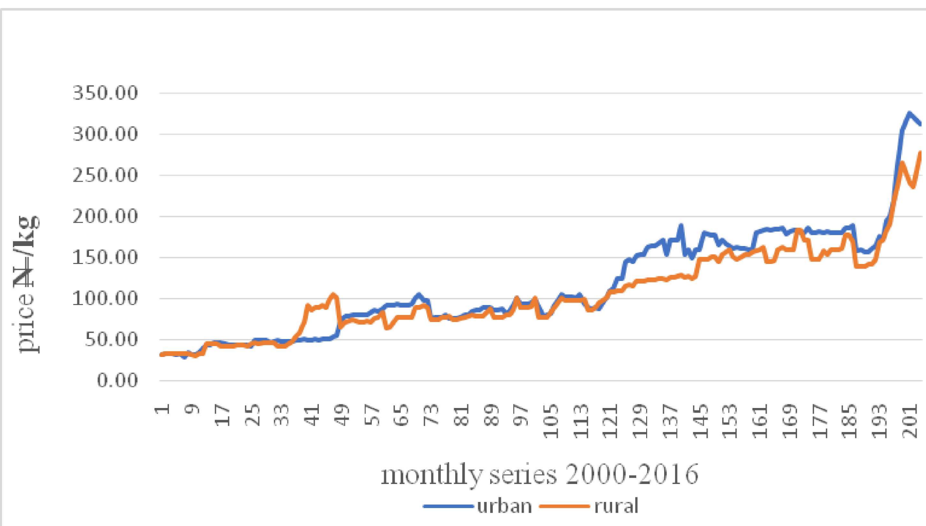

Figure 1: Trend in urban and rural market prices of local rice in Niger State

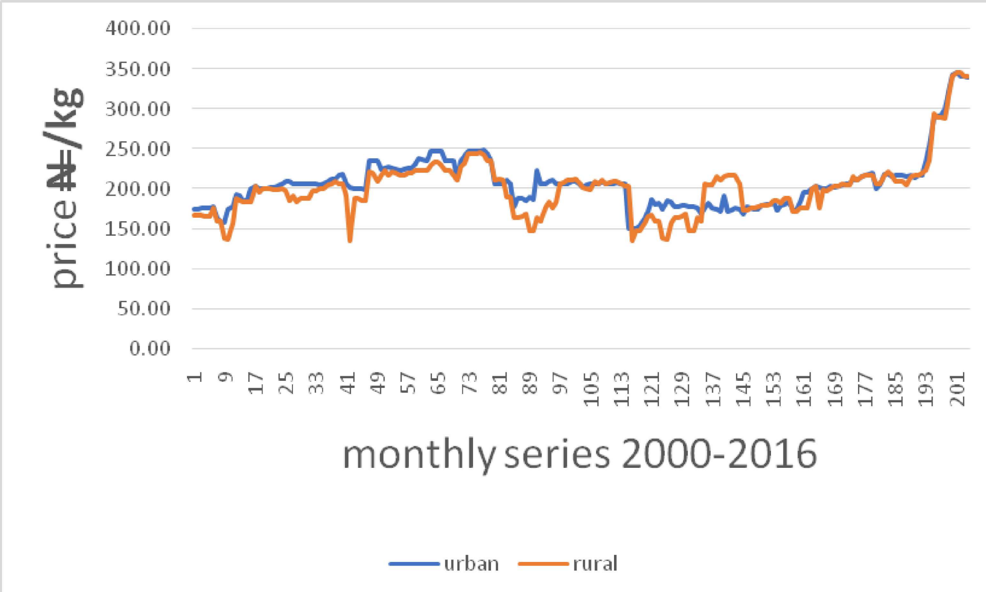

Figure 2: Trend in urban and rural market prices of imported rice in Niger State

CONCLUSION AND RECOMMENDATIONS

The result of the study has shown that prices of local and imported rice was increasing over the period under study, and were integrated of order one I(1). The prices are connected in the long run but have a low speed of adjustment in the short run. Though the null hypothesis of the granger causality of most of the market pairs were accepted, the alternative hypothesis was accepted for pairs of rural imported and urban imported as well as price of urban local and rural local which are all unidirectional.

It is recommended that the flow of market information should be enhanced by marketers, government policy on ban on the importation of rice should be firm and also local production should be enhanced and fully supported by government to close demand supply gap.

REFERENCES

Adekoya,O.A. ,Ashaolu O.F., Adewuyi, S.A., Phillip, B., Dipeolu, A.O. , & Omotayo, A.M. (2013). Price trend analysis of selected food grains in Ogun State, Nigeria (1988-2012). *Journal of Agricultural Science and Environment* 13: 104-115

Akpan, S.B., Ini-mfon V.P. &Udoka, S.J. (2014). Analysis of monthly price transmission of local and imported rice in rural and urban markets in Akwa Ibom State, Nigeria (2005-2013). *International Journal of Agriculture and Forestry* 4(1): 6-18.

Awe, O. (2006). Ban on rice importation depresses global trade. Punch Newspaper, May 20. [Online] Available: http://www.punchng.com/ Accessed: Jan 20, 2015.

Burakov, D. (2016). Oil prices, exchange rate and prices for agricultural commodities: Empirical evidence from Russia", *AGRIS on-line Papers in Economics and Informatics*. 8 (2): 33-47.

DAP (2008). Development Action Plan for Niger State, 2008.

Emokaro C. O. & Ayantoyinbo A. A.(2014). Analysis of market integration and price variation in rice marketing in Osun State, Nigeria. *American Journal of Experimental Agriculture,* 4(5): 601-616

Daramola, A.G. (2005). Government policies and competitiveness of Nigerian economy. A paper presented at the workshop on rice policy and food security in Sub-Sahara Africa. Organized by WARDA, Cotonou, Republic of Benin.

Federal Ministry of Agriculture and Rural Development (2011). Agricultural Transformation Agenda Blue Print; we will grow Nigeria's Agricultural Sector.

Federal Ministry of Agriculture and Rural Development (2016). The green alternative; Agricultural promotion policy 2016-2020. Policy and strategy document.

Global Agricultural Information Network (2012). Nigeria grain and feed annual report. Report number: NI1204.

Imolehin E.D.& Wada A.C. (2000). Meeting the rice production and consumption demands of Nigeria with improved technologies , National Cereals Research Institute (NCRI) Badeggi, Nigeria,.

Izekor, O. B., Alufohai, G. O. & Eronmwon (2016). Analysis of market integration and price variation in garri marketing in Edo State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment.* 12(4):123-130.

Jalingo, M. (2017). Fadama III intervention increases rice production. By Niger Printing and Publishing Company, Published 27/03/2017.

Joseph M.A. (2011). Major cereal grains production and use around the world.ACS symposium series1089:1-13.

Kohls, R.L. & Uhl, J.N. (2001). *Marketing of agricultural products*, 9th edition, Englewood Cliffs. Prentice Hall.

Mohanty, S. (2013). Trends in global rice consumption. *Rice today* 12(1):44–45. Google Scholar.

National Agricultural Extension and Research Liason Services (2019). Wet season agricultural performance report for 2017 and 2018. In Nigeria.

National Bureau of Statistics (2016). Nigerian GDP report; Quarter two 2016.

Nasirin, S., Magnus J., Björn, H., Agnes A.D. & Göran, D. (2015). Drivers of rice production: Evidence from five Sub-Saharan African countries. *Agriculture and Food Security* 4:12

Ojo, A.O., Ojo, M.A., Adebayo, C.A & Coker, A.A. A. (2015). Analysis of rural and urban rice markets integration in Niger State, Nigeria: Error correction model approach.*Journal of Tropical Agricultural Research and Extension* 18 (1):41-51

Oyinbo, P.O., Omolehin R.A. & Abdulsalam Z.(2013). Household consumption preference for imported and domestic rice in Kaduna State, Nigeria: Implication for rice quality improvement. *Production, Agriculture and Technology journal* Nassara State University Keffi. 9(1):29-37

Paulin, N. (2011). A value chain and market integration analysis of the cassava market in the Democratic Republic of Congo. Unpublished Thesis Department of Agricultural Economics and Rural Development, University of Pretoria. pp 4.

Upender, M. (2012). Applied econometrics 3rd Edition, Vrinda Publication Limited, 205.