TRENDS AND GROWTH RATES IN PRICE OF LOCAL RICE IN RURAL AND URBAN MARKETS OF NIGER STATE (2000-2016) NIGERIA

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Abstract
The study analyzed the trend and growth rates in prices of local rice in rural and urban markets of Niger State, secondary data, which was average monthly retailed prices per kg of local rice in the study area from January 2000 to December 2016 was used for the study. Data was sourced mainly from Nigerian Bureau of Statistics (NBS), the data were analyzed using descriptive statistics, Augmented Dickey Fuller (ADF) unit root test and exponential growth equation model, the E-views software was used for the analysis. The result shows that the maximum price for rice per kg was ₦ 259.63 and ₦ 261.43, for local rice in rural and urban markets of the state respectively. The ADF unit root test shows that all the price series became stationary after taking the first difference, thus having an order of integration of I(1). The graph of the trend in the prices shows that a close relationship between the prices as they tend to move together in an upward and irregular pattern. The result of the exponential trend equation for the growth rate using the ATA period, shows an accelerated growth rates during the pre ATA period and the entire period. The study recommends that government should uphold it policy on increasing local rice production by providing necessary incentives and enabling environment for farmers.

Keywords: Trend, Growth rate, Price and Rice

Background of study

Rice is the most important staple food for about half of the human race (Imolehin and Wada, 2000). Rice is the leading staple food in Nigeria that is cultivated and consumed in all parts of the country (Ayanwale *et al*.,2011). It was primarily an urban middleclass product, but has now become a more widely consumed staple food. Nigeria currently is leading in terms of per capita consumption of rice in sub-Sahara Africa with about 10% of the 2000 average daily calorie intake is been gotten from rice (Mohanty, 2013), and average growth in per capital rice consumption is likely to continue to increase in Nigeria for some times partly due to increase in population (Erenstein *et al.*, 2004). 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.

The level of domestic rice production in Nigeria in 2012 was about 3.5 million metric tons per annum; while the domestic demand stood at about 6.1 million metric tons per annum (Central Bank of Nigeria CBN, 2013), in 2016 the estimated demand for rice is 6.3 million tons, while the supply is 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.

The Agricultural Transformation Agenda (ATA) of the Federal Ministry of Agriculture and Rural Development sees Agriculture is an important sector of the economy with a high potentials for employment generation, food security and poverty reduction. According to ATA blue print, Low productivity in Nigeria over years compared to leading countries like Malaysia, Thailand, Indonesia, and Brazil has been largely due low fertilizer and improved seed utilization and inadequate government expenditure and the inability to compete with others, thus food imports are growing at an unsustainable rate of 11% per annum. (FMARD,2011).

The vision of the ATA strategy is to achieve a hunger-free Nigeria through an agricultural sector that drives income growth, accelerates achievement of food and nutritional security, generates employment and transforms Nigeria into a leading player in global food markets to grow wealth for millions of farmers. The main target is to grow the agricultural sector through the various commodities rice inclusive and also to generate employment opportunities. For instance, rice transformation plan would involve massive local production of milled rice which will be aimed at substituting parboiled (imported) rice. The expectation is that with the advent of high quality lower cost milled rice, a significant portion of demand in the domestic rice market will shift from parboiled rice to milled rice. A projected decline in demand for high quality parboiled rice from 1.9M metric tons to 1.3M metric tons between 2011-2015 and a shift in demand for milled rice from 0M metric ton in 2011 to 1.1M in 2015 is expected (FMARD,2011).

Aim and objectives of the study

The aim of the study is to analyze the trend and growth rates in price of local rice in rural and urban markets of Niger State, Nigeria. The specific objectives are;

1. describe the price series of local rice in rural and urban markets in the study area,
2. examine the trend and growth rate in price of local rice in rural and urban markets of Niger State, using the Agricultural Transformation Agenda (ATA) period.

Methodology

Study area

The study area is Niger State (North Central) the was carved out of the former North-Western State in 1976 and it is located in North Central Nigeria. The State lies between Latitudes $8^{o}20'$ and 11^{0} 30' North and Longitudes $3^{o}30'$ 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 (Niger State Bureau of Statistics (NBS), 2012). The 2006 population census shows that the 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 among the largest States in Nigeria 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) and about 95% of the land is arable and serve 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, varying from 1,100mm to 1,600mm in the southern part of the state. Its maximum temperature is normally 37^{0}C which is recorded between March and June, while minimum temperature is around 21^{0}C recorded between December and January (Development Action Plan for Niger State, 2008). This climatic condition favours the production of many types of crops which include rice, maize, guinea corn, millet, melon, yam, cassava, cowpea, soya beans, potatoes, groundnut, cotton, sugarcane, and vegetables of various kinds, but the major staple food of the majority of the population are rice, maize, guinea corn, millet, yam, potatoes and cassava, therefore farmers all over the state lay more emphasis on their production and hence, the processing and marketing.

Niger State has 25 Local Government Areas (LGAs) which are grouped into three agricultural zones; I, II and III, with each zone having 8, 9 and 8 LGAs respectively. There are three major

ethnic groups in the State, *Nupe, Gbagyi* and *Hausa.* Other minority tribes include *Kadara, Dibo, Kakanda, Koro, Kambari, Dukkawa, Dakarkari, Kamuku, Gana-Gana* etc.

Sampling Procedure and Sampling Size

A two-stage sampling procedure was used for this study. The first stage is the selection of Niger State being one of the major rice producing State in Nigeria. The second stage was the collection of average monthly retailed prices per kilogram (kg) of both local rice for rural and urban markets in the state from 2000 to 2016 period (17years), thus the sample size will be 204 observations.

Method of Data Collection

This study mainly used secondary source of data which was the average monthly retailed prices per kg of local rice for rural and urban markets in Niger State. The prices were collected for a period of 17 years, that is from January,2000 to December, 2016. Data was obtained from National Bureau of Statistics (NBS).

Method of Data Analysis

The study applied series of statistical and econometric tools to achieve the stated objectives. The tools used include exponential trend analysis, but before running any of the analysis, the data set was tested for stationarity using the Augmented Dickey Fuller Test and also a suitable lag length was selected for the analysis.

Test for stationarity

The test for stationarity precedes the use of any of the aforementioned tools, because in time series studies the data has to be stationary before any further analysis is run. A time series is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods strictly depend on the distance or lag between the two periods and not the actual time at which the covariance is computed (Gujarati, 2004).

Augmented Dicky Fuller (ADF) test for stationarity

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. The idea behind the ADF test is to simply regress a time series variable Y_t on its one period lagged value Y_{t-1} and find out if the estimated β is statistically equal to 1 or not. Given the autoregressive process of order one AR (1),

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

Where;

Y_t = price in time t,

e_t = a serially uncorrelated white noise error term .

if $\phi = 1$, the serie Y_t is nonstationary, if $\phi < 1$ then the series Y_t is stationary. To test for β, Y_{t-1} is subtracted from both side of the equation to obtain the following equation

$$Y_t - Y_{t-1} = Y_{t-1} (\phi - 1) + e_t \qquad (2)$$

this can to rewritten as

$\Delta Y_t = \beta Y_{t-1} + e_t$ (3)

Where; $\beta = (\phi - 1)$, and Δ is the first difference operator, thus in practice equation 3.3 is estimated and the null hypothesis of $\beta = 0$ is tested against the alternative hypothesis of $\beta \neq 0$. If $\beta = 0$, then $\phi = 1$, it implies that there is unit root problem and Y_t is nonstationary but when $\beta \neq 0$, then $\phi < 1$ and the series Y_t is stationary. But according to Erdogdu (2007), the t- value of the estimated coefficient of Y_{t-1} does not follow the t-distribution even in large samples, therefore the decision to reject or accept the null hypothesis of $\beta = 0$ is based on the critical values of the tau statistic in the Dickey Fuller (DF) test.

The DF test is based on the assumption that the error terms are not serially corrected, however in practical sense they show evidence of serial correlation, therefore the ADF test was developed to resolve this problem. In the ADF test the lags of the first difference are included in the regression equation in order to whiten the noise of the error term e_t, the equation is presented as

$\Delta Y_t = \beta Y_{t-1} + \phi_i \sum_{i=1}^{m} \Delta Y_{t-1} + e_t$ (4)

When intercept and time trend are added, the model becomes

$\Delta Y_t = \alpha_1 + \alpha_2 t + \beta Y_{t-1} + \phi_i \sum_{i=1}^{m} \Delta Y_{t-1} + e_t$ (5)

Where; α_1 and α_2 are constant and coefficient of time trend respectively.

The ADF test will be carried out on equations 3, 4 and 5), where Y_t represents a random walk without drift , a random walk with drift, and a random walk with drift around a deterministic trend.

Lag length Selection

A suitable lag was selected for each of the analysis using the various lag length selection criteria such as:

1. Akaike's information criterion: $AIC_\rho = n\ln(\sigma^2) + 2p$
2. Schwarz information criterion: $SIC_\rho = n\ln(\sigma^2) + n^{-1} p \ln(n)$
3. Hannan-Quinn criterion: $HQC_\rho = n\ln(\sigma^2) + 2n^{-1} p \ln(\ln(n))$
4. Final prediction error: $FPE_\rho = \ln(\sigma^2)(n+p)(n-p)^{-1}$
5. Corrected version of AIC: $AIC_\rho = \ln(\sigma^2) + n\frac{1+\frac{\rho}{n}}{1-\frac{p+2}{n}}$

Where n = sample size. $\sigma^2 = (n - p - 1)^{-1} \sum_{t-1}^{n} \varepsilon_t^2$ and ε_t are the model residuals.

Growth Rate in Prices

Objective 2 was achieved by the use of trend analysis. Here the average monthly retailed prices of both local and imported rice was used to investigate the nature of the growth rate in prices. The model is specified below

$P_t = b_o e^{bt} e^{ut}$ (6)

$\text{Log}_e p_t = \log_e b_o + b_1 t + u_t$ (7)

Where;

Exponential growth rate (r) = $e^{b1} - 1 \times 100$

Thus the quadratic exponential trend equation is specified as

$\text{Log}_e p_t = b_o + b_1 t + b_2 t^2_2 + u_t$ (8)

Where

P_t = average monthly prices of rice, b_o = constant, b_1 and b_2 = are coefficients

t = time trend (1, 2, 3,------n) if;

$b > 0$: the price has accelerated growth,
$b < 0$: the price has decelerated growth and
$b = 0$: the price has stagnant growth.

RESULTS AND DISCUSSION

Table 1: Summary statistics of local rice prices in rural and urban markets of Niger state.

Variables	RLN (₦ /kg)	ULN (₦ /kg)
Mean	104.34	109.52
Median	103.77	101.18
Maximum	259.63	261.43
Minimum	30.00	28.97
Std. Dev.	47.99	52.81
Skewness	0.743	0.819
Kurtosis	3.83	3.63
Jarque-Bera	24.59	26.23
Probability	0.00	0.00
Observations	204	204

Source; Data analysis 2018.

Where; RLN-Price of local rice in rural market Niger State, ULN- Price of Local Rice in urban Niger State.

The result of the summary statistics in table 1 revealed the maximum price for rice in the study area over the period under study (2000-2016) to be ₦ 259.63 and ₦ 261.43, per kg of local rice in rural and urban market respectively in the state. While the minimum price was ₦ 30.00 and ₦ 28.97 per kg for local rice in rural and urban markets of the Niger State respectively. The skewness showed that the data is positively skewed (value greater than zero), implying that the data has many small values. The kurtosis value which is greater than 3 shows the existence of sharp peaks in the data, indicating that data were not normally distributed.

ADF test for unit root

Table 2: ADF test for prices of local rice in rural and urban markets of Niger State

Variables	Stage	t-statistic	t-critical (5%)	Order of int.	Remarks
PRLN	Level	1.158	-2.876	-	Non-stationary
	1st difference	-8.711***	-3.433	I(1)	Stationary
PULN	Level	2.162	-2.576	-	Non-stationary
	1st difference	-11.919***	-3.432	I(1)	Stationary

Source: data analysis, 2018

Where; PRLN is Price of Rural Local Rice in Niger state, PULN is Price of Urban Local Rice in Niger state, PRIN is Price of Rural imported rice in Niger state and PUIN is Price of Urban Imported Rice in Niger state.

In time series analysis one of the first things is to ascertain whether the series are stationary (do not have unit root), before any further analysis is ran. That is to ensure that the properties of the series are not affected by change in time only. According to Shrestha and Bhatta (2018),

Augmented Dickey Fuller (ADF) test is the most common method of testing unit root. Thus, the ADF test for Niger state prices series which are prices of local rice in rural and urban markets as revealed by table 2 that all the price series were non-stationary at level as indicated by the absolute value of t-statistics which was less than absolute value of t-critical at 5% level of precision. But all the price series become stationary after taking the first difference (with no intercept, with intercept and with intercept and trend), as the absolute value of the t-statistics was greater than the absolute value of t-critical at 5%. This is in line with the results of the study of Acquah and Owuso (2012) and that of Akpan *et al.* (2014), who reported that prices of agricultural commodities are generally integrated at first order. A suitable lag was selected based on the Akaike Information Criterion (AIC) for all the series.

Trend in prices

Figure I below shows the trend in the price of local rice in rural and urban market of Niger State. The visual aid us to see the pattern of movement in the prices over the period of study.

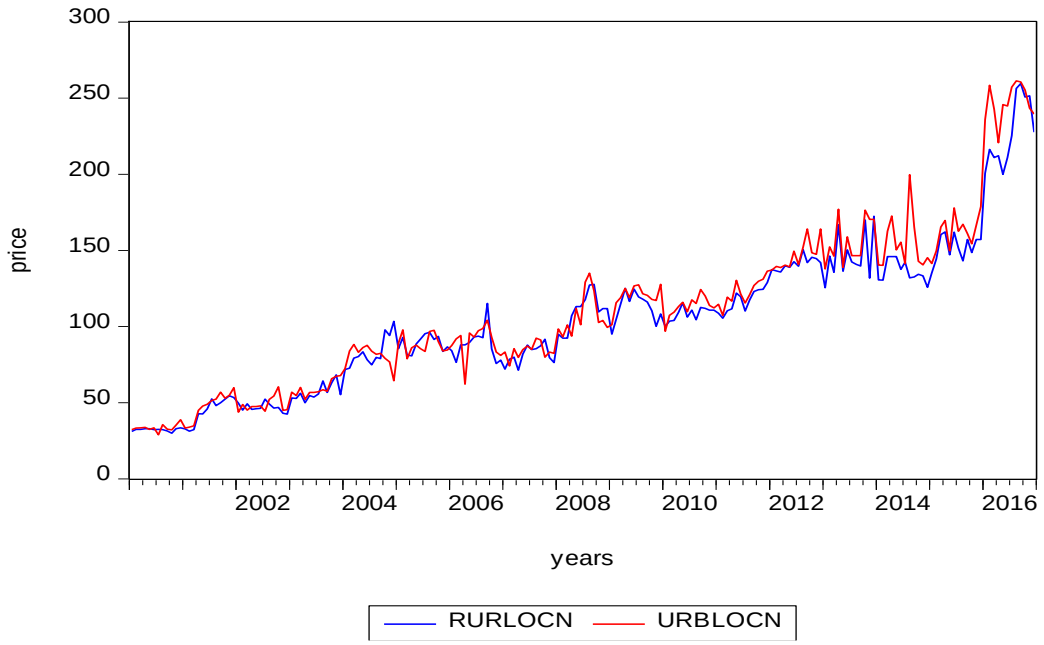

Figure 1: Trend in prices of local rice in rural and urban markets of Niger state

The graph of the trend in prices of local rice in rural and urban markets of Niger state shows a very close relationship between the prices, as the series tend to move together showing a gradual increase in the prices from year 2000 up to 2016 as shown in figure 1, where the prices got to it peak level in 2016 having moved from 150/kg in 2015 to 250/kg in 2016 with about 75% increase. This is shown in the continuous rise in the prices especially from 2015 to 2016 where the prices appear to be virtually the same in both markets.

Growth rate in prices

The growth rate in the price of local rice in Niger State is shown in table 3. The rate of growth in the price series were checked using the Agricultural Transformation Agenda (ATA) period, where

the price series are grouped into pre ATA period (2000 to 2010), ATA period (2011 to 2016) and the entire period under study (2000 to 2016).

Table 3: Growth rates for local rice prices in rural and urban markets of Niger state

Variables	Pre ATA	Period (2000-2010)	ATA period	(2011-2016)	Entire period	(2000-2016)
	RLN	ULN	RLN	ULN	RLN	ULN
A	3.36***	3.43***	4.84***	4.85***	3.53***	3.58***
	(100.59)	(104.70)	(114.21)	(112.85)	(111.15)	(117.60)
b_1	0.021***	0.020***	-0.002	0.007	0.013***	0.012***
	(18.26)	(17.22)	(-0.88)	(0.29)	(18.66)	(18.21)
b_2	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(-9.98)	(-8.80)	(4.07)	(3.14)	(-7.72)	(-6.30)
GR (%)	2.1	2.0	-0.2	0.07	1.30	1.20
R^2	0.909	0.909	0.713	0.736	0.912	0.923
F	649.46***	651.98***	85.53***	96.37***	1039.7***	1204.9***
N	132	132	72	72	204	204
Inference	A	A	D	A	A	A

Source: Data analysis, 2018

Where: RLN means price of local rice in rural market Niger, ULN means price of local rice in urban market, a is constant, b_1 and b_2 are coefficients, GR is growth rate, R^2 is coefficient of multiple determination, F is the F-ratio and N is number of observations, A means accelerated and D means decelerated.

*** is significant level at1% and numbers in parenthesis are t-value

The result on table 3 revealed that during the pre ATA period of 2000 to 2010, the prices of local rice in both rural and urban markets of Niger State had accelerated growth rates of 2.1% and 2.0% respectively. This indicates that the prices of local rice were increasing during that period. Table 3 also showed a decelerated growth rate for the price in rural market which is a production centre for the ATA period. This may be attributed to the fact that though during the ATA period farmers were sensitize on the need to take farming as a business, but may be incentives were provided that lead to lower cost of production that translated to lower growth rate in prices. On the other hand accelerated growth rate was observed in urban market which is a consuming area for the ATA period. This is as a result of the market being dominated by marketers not producers and as such, transportation cost and other charges incurred by the marketers are transfer inform of higher prices to the consumers in that area and thus, a positive growth rate.

Table 3 further shows that generally looking at the entire period under study (2000 to 2016), the price of local rice had an accelerated growth rate of 1.30% and 1.20% for rural and urban markets respectively. That is generally prices of local rice was soaring during that period, which may be attributed to other external factors such as sudden rise in fuel price which have direct effect on cost of transportation of goods which is also transfer to the prices of the goods.

Summary and Recommendations

The study analyzes trend and growth rates in local rice prices in Niger state. The result shows that the maximum price for rice per kg was ₦259.63 and ₦261.43, for local rice in rural and urban markets of the state respectively, while the minimum was ₦30.00 and ₦28.97, respectively. The ADF unit root test shows that all the price series became stationary after taking the first difference, thus having an order of integration of I(1).

The graph of the trend in the prices shows that a close relationship between the prices as they tend to move together in an upward and irregular pattern. The result of the exponential trend equation for the growth rate using the ATA period, shows an accelerated growth rate for all the series during the pre- ATA period and the entire period.

It is recommended that government should uphold its policy on increasing local rice production by supplying necessary incentives to the formers such that supply meets demand. Also price should be regulated and managed such that producers, marketers and consumers have fovourable prices at their various levels.

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