

Rice Production and Economic Growth in Nigeria: An Econometric Assessment

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Abstract

This study is designed to investigate the impact of rice production on Nigeria economy using time series data between 1987 and 2022. Secondary data was sourced from United States Department of Agriculture (USDA) and World Development Indicator (WDI) 2023. The estimation of the model was carried out using the Fully Modified Ordinary Least Squares (FMOLS) technique. The findings from the study among others showed that a unit increase in local rice production (LRP) will lead to 1.3 billion increase in real gross domestic product (RGDP), and this suggests a significant positive relationship between LRP and RGDP. Similarly, a positive relationship between rice importation (IMR) and RGDP was observed. This of course negates the a priori expectation, and the result indicates relatively higher price of locally produced rice due to its high demands and the ban on imported rice. The study however suggests the need for the government to provide necessary machinery and modern equipment for rice farmers coupled with social amenities like fertilizers, good roads to access rice production, provision of “zero interest loans” majorly for rice farming so as to encourage Nigerians youth into commercial rice farming and hence boost massive rice production so as to lower the price of locally produced rice. The study also recommended that rice importation should be controlled and regulated so as to discourage foreign rice consumption.

Keywords: Rice production, FMOLS, Real GDP, Nigeria economy, Economic growth

INTRODUCTION

The importance of rice production in Nigeria economy cannot be overemphasized as a common food in every home in Nigeria cum a means of livelihood for many traders and farmers. Rice is now an important crop in Nigeria as its production indicates improvement of growth in the economy. Hence, rice has become a major source of calories for the urban poor (Damola, 2020). Rice is cultivated virtually in all agro-geological zone (Akande, 2001) from the mangrove and swampy ecologies of the zones of the river Niger in the coastal areas to the dry zones of Sahel in the north. Nigeria government have now depended largely on rice

intensification so as to improve production because yields are low, averring 2.0 tons per hectare (National Bureau of Statistics, 2019).

The Nigerian agricultural economy is primarily characterized by the production and sale of raw outputs, with limited capacity for transformation into value-added products. This is due to various constraints facing primary producers, including socio-economic, economic, environmental and technological factors. The result has been low production efficiency and a lack of diversity in goods produced. However, adding value to produce is an integral part of the food supply chain which expands the range, quality and utility of food supply (Bashorun, 2013).

The rice sector plays a critical role in conserving foreign exchange and improving the nation's economy as it serves as a staple food for approximately 2.6 billion people worldwide. Rice is the leading cereal crop in South and East Asia where over 92% of global output comes from; while America accounts for 5% and Africa accounts for only 3%. It provides more than one-fifth of calories consumed worldwide despite having relatively lower protein content compared to other cereals (Oladimeji, 2017). Generally, large scale production of rice was neglected or given little attention because of several factors including high importation of foreign rice, large scale smuggling and dumping of rice, differences in the quality of locally produced rice and foreign rice, and other internal factors include inadequate infrastructural facilities, high cost of production, lack of apt technology and lack of access to financial assistance.

The impact of rice production to Nigeria economy has attracted mixed debates among several scholars. For instance, recent studies (Damola (2020); Abah, Ochoche & Hundu (2021); Hussaini, Oladimeji, & Sanni (2019)) showed that rice production and cultivation contribute significantly to the economy. Other studies like Short, Mulinge, & Witwer (2012) showed less contributions of local rice production to the economy. USAID (2019) revealed mixed findings and argued that rice production can only contribute to the economy except when cultivated under right circumstances. Similarly, Bamidele et al., (2010) argued that imported rice is preferable to local rice, thereby impacting negatively on the economy. Therefore, arising from the foregoing debates, it can be argued that the debates of the impact of rice production to the economy are inconclusive, thus required further studies to shed more lights on the direction of impact. Hence the goal of this study is to bridge the gaps identified in literature.

The question seeks to be addressed by the study is that is there any significant relationship between rice production and economic growth in Nigeria? Also, does rice production has any significant impact on economic growth in Nigeria? The findings from the study will assist to provide more insight and policy direction on the ongoing debates on the impact of rice production to the economy and also contribute to extant literature.

The scope of the study will focus mainly on Nigeria's economy and emphasis will be on rice production from 1987 to 2022 so as to accommodate recent data on current output of local rice production, consumption and importation, hence making the work authentic. Again, the data that will be use will be a time series data, that is, a data that takes account of one particular economic agent or variable over a period of time. The data will be analysed with the use of

fully modified ordinary least squares (FMOLS). This study is relevant as it will provide value addition to the economy.

The study is divided into five sections. The rest of the paper is structured as follows: Section 2 provides a review of relevant literature while section 3 presents the methodology adopted. Section 4 discusses the results and analysis, and section 5 concludes the paper.

EMPIRICAL LITERATURE

Hussaini Oladimeji, and Sanni (2019) presented the determinants and profitability of rice farmers investment in value addition activities in Kebbi State and found that the net return of farmers in stage one value addition (parboiling, winnowing and drying) indicate the average rate of returns on investment was ₦1.25 indicating that for every ₦1 invested in value addition in the study area, a profit of ₦1 and 25 kobo was made. Moreso, it could be decided that the value added to rice in the study area was though on a small scale, and economically viable. However, the farmer's investment in stage two (parboiling, winnowing, drying and de-stoning) of value addition reveals that the average rate of return on investment (return per naira invested) was ₦1.33 indicating that for every ₦1 invested in the study area; a profit of ₦1 and 33 kobo was made. Thus, it could be concluded that value addition in the study area is profitable indicating that for every ₦1 invested in the study area; and for the category three of value addition (parboiling, winnowing, drying, de-stoning and bagging) activities a profit of ₦1 and 35 kobo was made. Thus, it could be concluded that value addition in the study area is profitable. And there will be increase in income, if the quality of rice can be increased by the farmers engaging in winnowing more to get good clean quality. This was in line with Ugwu (2012) also confirmed that rice processing is worthwhile investment at both processing and marketing level as evident in the net processing.

According to Chidiebere-Mark (2017) in analysis of value chain in rice production systems in Ebonyi State, reported in his findings that gross margin accruing to the rice processor or trader for a metric ton of basic milled rice is ₦55,800; and that if the processor goes further to add value to the rice by processing to quality rice, he incurs a cost of ₦2,600. This comprises costs of further processing activities like de-stoning and bagging. A metric ton of quality rice is sold at the price of ₦160, 000 per bag. The processor makes an additional gross margin of ₦9,400 per metric ton. The total gross margin accruing to that of quality rice is hence ₦65,200. This shows that though a higher amount is spent to further add value to get quality rice, the gross margin is higher than for basic milled rice. The percentage gross margin contribution to trade of basic milled rice and quality rice is 34.875% and 5.875%, respectively. Par-boilers and millers receive a marginal profit of 6.875% of the total worth. The small margins are a disincentive to the investment in rice processing by small miller. However, horizontal integration can increase the market share of these categories of value chain actors. The total percentage margin to producing one metric ton of further processed rice from paddy is 40.75%. This implies that investment in rice value chain and production of quality rice is profitable.

Furthermore, United States agency for international development (USAID, 2019) carried a study on Nigeria's rice value chain. The study aimed to examine the role of rice in Nigeria's food security and to present a practical vision for the development of the domestic rice value chain. The study found that under the right circumstances rice can be competitively produced by small holders of about 5 hectares. Furthermore, the study recommended that an increase in the number of industrial mills and development of the supply of high quality rice will have a positive spin-off effect on the market and operational efficiency in the rice supply channels and also recommended that Nigeria should develop a commercially-driven production, milling, processing and marketing capacity that can deliver at least one million extra metric ton (MT) of rice that is cost and quality competitive.

Chidiebere-Mark (2017) found out from his findings analysis of value chain in rice production systems in Ebonyi State Highlighting the author's contribution of processing basic milled rice to quality rice as shown in Figure 1. It showed the percentage value added of each activity at the processing stage. The percentage cost of adding value from paddy to basic milled rice is 7.625% and it covered activities like paddy transportation, parboiling and drying as well as milling. Percentage contribution of further processing to quality rice was estimated at the margin of basic milled rice of 34.875% is higher than that of quality rice of 5.875%. This may be a disincentive for processors to go into further processing. However, an extra margin raises the income of the processor as well as adds value to the rice to satisfy the demand and quality concern of the urban consumer.

Rice cultivation and active production has been the focus of attention of a number of studies in growing economy/ countries, particularly Nigeria. This reflects the importance of rice cultivation and active production in terms of the development of many upcoming economies. Akande (2001) In his study on the inter-regional competitiveness in relation with the production of food grains, among them is rice in Nigeria. He found out that, given what the economic environment was as well as the factor cost relationships that were present in Nigeria in the early 1990s, the country had comparative benefits in the rice cultivation and production. This comparative benefit is associated with the traditional and enhanced production practices and animal traction systems that were embraced by Nigerian.

Rahman (2012) in his studies estimated the farm-size-specific productivity of rice and economic growth using stochastic frontier approach in Bangladesh. The discovery was that large farms portions exhibited the highest productivity, gross returns were highest in small farms land and net returns were highest in marginal farms land. Khai (2011) carried out a study to estimate the technical efficiency of rice production in Vietnam and identify its determinants using stochastic frontier analysis method in the Cobb-Douglas production function. They were able to identified intensive labour, irrigation and education as the most important factors having positive impact on technical efficiency which was calculated at approximately 82%. The study indicated that increase in output and decrease in cost could be obtained using existing and new modern technology.

Short, Mulinge, and Witwer (2010) carried out a study on trade and agricultural competitiveness with attention to wheat and rice production in Kenya by applying value chain analysis. They noticed inefficiencies along the rice value chain that include high labour costs, high rates of rural-urban migration and water borne disease. They also noticed that high cost of fertilizers, chemicals and seeds were high, while yields were low and that changing weather patterns have reduced the Amount of water flowing to the schemes.

According to Omoare, and Oyediran, (2017) also speaking on rice importation problem says that rice importation is seen as a waste of foreign exchange based on the comparative advantage of the country in rice production and the cost of this rice imports represents a significant amount of lost earnings for the country in terms of jobs and income. However, WARDA (2013), rice quality and standardization are not yet well developed in Nigeria because rice processing in Nigeria and milling are still primarily conducted at the cottage level. Omoare and Oyediran (2017) recommended after their study on assessment of factors affecting rice value chains in gun state and Niger, Nigeria, that rice farmers should embark on value addition to enhance their income from rice production, rice farmers should approach commercial banks for loans to expand their farms and purchase processing equipment through their association. Hence they emphasized that government should provide basic rural infrastructure and incentives.

Kebede (2011) indicated that growth in production of rice can be grained through the use of technologies and production environment. Hence adoption of technologies will lead to substantial increase. Furthermore, according to Damola (2010), rice production constraints includes: lack of rice development policies, inadequate irrigation, low level of farming technologies, inadequate agricultural inputs, supply system, delay in disseminating improved seeds, inadequate and weak agricultural extension, and poor accessibility to institutional credits.

METHODOLOGY

Theoretical Framework

The theoretical framework of this work would be drawn from the empirical evidence provided by Fuller and Qin (2009), Pandey (2007), Todaro and Smith (2009), Fei (1949), Noij (1988), Pudasaini (1983) and most importantly by Oladimeji (2017) and other theorists like Harrod-Domar, Solow and Kaldor, and Cobb Douglas theory of production. There are different theories of growth, but for the sake of this work. Harrod-Domar model and the neoclassical model of economic growth (emphasis on Robert Solow) will be discussed. In what follows, two theories of economic growth will be summarize, viz: the Harrod-Domarmodel, and Neoclassical model of economic growth.

The Harrod-Domar Model

According to Iyoha (2007), this model was originally designed for use in developed economics but has increasingly become attractive for planning in developing countries because of its fixed capital-coefficient property. This growth model, developed from the work of Bristish economist, Sir Harrod and the American economist Evsey Domar, is “unstable” in that its

equilibrium is precariously balanced, as a knife edge. Although it is not quite realistic in the sense of being a description of the real world, it is pretty useful because it highlights the dual character of investment. Investment expenditures expand the supply of output; at the same time, they increase current income via an increase in aggregate demand (Iyoha, 2007).

Assumptions of the Model:

- The economy uses a fixed-coefficient or Leontief-type production function permitting no substitution between capital and labour in production.
- There is no technical change.
- The labour force grows at the same rate as capital stock.
- The economy is closed.

Given assumption (3), the rate of growth of income that utilizes existing capacity will also provide full employment for the growing labour force (These many talks and assumptions are not necessary. briefly talk about the Harrod-Domar model and specify its model in its original form. Then go ahead to tell us how you modified it to suit your usage whether by way of adapting or adopting it or designing a new model that suits your need.

The Model:

Let the labour force grow exogenously at the rate of **n**. then

$$L=L_0e^{nt} \tag{1}$$

Where **n** is interpreted as the natural rate of growth. Suppose that income is growing at the constant of **g**. then.

$$Y=y_0e^{gt} \tag{2}$$

Note that the rate of growth of income which provide full employment must also be **n**. therefore, income must be growing at the same natural rate, or

$$g=n \tag{3}$$

Thus the production function is given by

$$Y=\delta k \tag{4}$$

Where

Y = output,

K = capital stock;

δ = the capital coefficient

1/δ = the capital-output ratio.

The production function simplifies that labour is surplus, that is, capital is the only scarce factor of production. Another way of interpreting it is that capital and labour are completely complementary in production.

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For simplicity, abstract from the existence of a government sector, thus, there are only two sectors in the economy—the household and the business sectors. Assume that consumption is proportional to income. Therefore,

$$C=by \quad (5)$$

Where C stands for consumption expenditures and b is the marginal (and average) propensity to consume.

In equilibrium, we require that investment be equal to savings, i.e.

$$I=S \quad (6)$$

Given that the $MPC=APC=b$, then the $MPC=APS=1-b$. in other words, the saving ratio is equal to $1-b$.

Note that if the employment is to be maintained over successive periods, the increase in total spending from one period to the next one must exactly equal the increase in the full employment supply of output. From the demand side, increase in total spending equals increase in investment times the multiplier, or

$$\Delta Y = \frac{\Delta I}{(1-B)} \quad (7)$$

From the supply side, increase in the supply of output is equal to the increase in capital stock times the capital coefficient, or

$$\Delta Y =\delta\Delta k \quad (8)$$

Given that change in capital stock equals investment, we obtain

$$\Delta Y =\delta I \quad (9)$$

Combine relations (7) and (9) to obtained

$$\frac{\Delta I}{I} =\delta(1-b) \quad (10)$$

Which means that the percentage growth rate of investment that equates growth in demand and supply is equivalent or same as the capital coefficient multiplied by the savings ratio/proportion.

In the long run, if for steady rate growth, we expect the rates of growth of income and investment to be equal, i.e

$$\frac{\Delta Y}{Y} = \frac{\Delta I}{I} \quad (11)$$

Therefore, we require

$$g= \delta(1-b) \quad (12)$$

Thus, $\delta (1-b)$ is equal to g, is the “warranted” rate of growth.

Now combine (3) and (12) to obtain

$$n = \delta(1-b) = \delta s \tag{13}$$

Where s = saving-income ratio. The above equation requires the equality of the natural growth rate and warranted growth rate. Note that n , s , and δ are all constants. Clearly, this equality can only be met by chance or accident, thus steady state growth is unlikely and the system is unstable. Note that the key quantity is the level of investment require for full-employment, i.e, for full capacity utilization. This is the warranted rate of growth. In the model, if the warranted rate is too high, the economy tumbles into a spiraling depression. If the warranted rate of growth is too low, the economy will move into a spiraling boom.

The Harrod-Domar model has been modified in the neoclassical direction by Solow and Kaldor. Solow solves the problem of instability by allowing for easy capital-labour substitution. With variable factor proportions and flexible factor prices, Solow showed that the economy would asymptotically approach a steady state or golden age growth path which was stable.

Neo-Classical Model of Economic Growth

Assumptions of the model:

This is a one-sector model.the economy is closed and produces only one commodity. It uses two factors of production-labour and capital. Assume that the economy uses the variables factor proportions, neoclassical production function given is by

$$Y = F(K, L) \tag{14}$$

$$F_K > 0, F_{KK} < 0; \quad F_L > 0, F_{LL} < 0$$

The production function exhibits diminishing returns; that is, marginal products are positive but declining, the production function is further assume to be linearly homogeneous, that is., to exhibit constant returns to scale. Given this assumption, the production function $\{I = I(\Delta Y, i); \quad I_1 > 0, I_2 < 0\}$ can be rewritten also as , thus

$$Y = f(k), \quad f' > 0 \tag{15}$$

Where

$y = Y / L$ is output/head

$k = K / L$ is capital/head or capital intensive.

Note that the capital stock is the stock of the goods produced in the past but not consumed. Capital has a perpetual life. Labour is assumed to grow exogenously at a constant exponential rate. There is no technical change in the basic model.

But Solow’s model is based on the premise that output in an economy is produced by a combination of both labour (L) and capital (K), under constant returns, so that doubling input results in doubling outcme/result/Output. Contemporary versions distinguish between physical and human capital. Thus, the quantity of output (Y) is also determined by the efficiency (A) with which capital and labour is used. Thus can be shown mathematically as;

$$Y = Af(L, K). \tag{16}$$

Model Specification

Following the study by Khai (2011), which expresses the technical efficiency of rice production in Vietnam and identify its determinants using stochastic frontier analysis method in the Cobb-Douglas production function, and Osemwengie (2017) which expresses the relationship between non-oil exports as a linear function of economic growth proxy by real GDP. Thus the econometric model for the study is drawn from the above theoretical discussions with some modifications. The model takes local rice production, rice imported, domestic price consumption and RGDP to analyze the econometrics evaluation of rice production in Nigeria. Note, these variables are used at constant price.

RGDP=F (LRP, IMR, LRC)

Where:

RGDP– represents the real gross domestic product.

LRP– represents local rice production

IMR– represents rice import

LRC– represents local rice consumption

Note; real GDP is the GDP at factor prices deflated by the consumer price index (at constant factor cost).

The econometric form of the model is specified as

$$RGDP = B_0 + B_1LRP + B_2IMR + B_3LRC + E_i$$

A Priori Specification:

The expected signs (a priori expectation) of the coefficients of the explanatory variables are $B_0 > 0, B_1 > 0, B_2 < 0, B_3 > 0,$

Recall that each of the parameter (B_1, B_2, B_3) is associated with; local rice production (LRP), rice imported (IMR), local rice consumption (LRC) respectively, and B_0 is the intercept. E is the stochastic term.

Method of Data Analysis

This research work uses FMOLS econometric approach in analyzing data obtained. This method was used because of its blue properties.

Sources of Data

The data are sourced from both United States Department of Agriculture (USDA, 2022), and World Development. Indicators (WDI, 2022).

ANALYSIS OF RESULTS AND DISCUSSION OF FINDINGS

Descriptive Statistics

Table 2: Summary Statistics Results

	RGDP	LRP	LRC	IMR
Mean	3.14E+13	2730.778	4154.000	1466.472
Median	2.21E+13	2004.000	3775.000	1575.000
Maximum	6.98E+13	5355.000	7500.000	3200.000
Minimum	1.52E+13	1184.000	1152.000	164.0000
Std. Dev.	1.71E+13	1324.967	1958.699	881.3855
Skewness	1.024756	0.940800	0.312508	0.013130
Kurtosis	2.559333	2.460681	1.764662	1.854144
Jarque-Bera	6.592027	5.746925	2.875058	1.970515
Probability	0.037030	0.056503	0.237514	0.373343
Sum	1.13E+15	98308.00	149544.0	52793.00
Sum Sq. Dev.	1.03E+28	61443814	1.34E+08	27189415
Observations	36	36	36	36

Source: Researcher Computation E-views 8 (2024)

As shown in table 2 above, the mean value of Nigeria’s RGDP is 3.14E + 13. Rice importation is 1466.472 million tonnes, her local rice consumption is 4154 million tonnes, and local rice production is 2730.778 million tonnes. The highest level of local rice production is 7500 million tonnes which was realized in 2022 while the lowest level which was 1152 million tonnes and it was realized in 1987. This implies that local rice production has been increasing over the years. Still from table 2 above, all the variables are positively skewed as all the values associated with skewness are positive.

Econometrics Analysis

This section is concerned with model estimation and the use of relevant statistical and econometric tests to validate the competence of the specified model for policy-making, analysis and forecasting.

Unit Root Test

In this study, pre-estimation tests for ordinary least squares (OLS) or FMOLS, like the unit root test and co-integration test will be conducted. This is followed by multicollinearity test and heteroscedasticity tes

In literature, most time series data are non-stationary, and using such non-stationary data in running a regression might produce spurious results (Granger and Newbold, 1977).

Consequently, the time series data for all variables in the already specified model will be tested to determine their stationarity status, within the period of 1987-2022, since the first and second difference terms of time series data will usually be stationary. Hence to ascertain the stationarity status of the time series data, the Augmented Dickey-Fuller Test Equation

Table 3: Augmented Dickey-Fuller Test of Unit Root TEST at Level.

	TEST STATISTIC	1%	5%	10%	
LNRGDP	3.569966	-3.632900	-2.948404	-2.612874	NON-STATIONARY
LNIMR	-1.244399	-3.632900	-2.948404	-2.612874	NON-STATIONARY
LNLRC	-0.075507	-3.632900	-2.948404	-2.612874	NON-STATIONARY
LNLRP	1.178791	-3.639407	-2.951125	-2.614300	NON – STATIONARY

Source: Researcher’s Computation using E-views 8 (2024)

Table 4: Augmented Dickey-Fuller Test of Unit Root Test Results at First Difference

VARIABLES	TEST STATISTIC	CRITICAL VALUES			REMARKS
		1%	5%	10%	
DLNRGDP	-4.822030	-3.639407	-2.951125	-2.614300	STATIONARY***
DLNIMR	-5.790427	-3.639407	-2.951125	-2.614300	STATIONARY***
DLNLRC	-6.815130	-3.639407	-2.951125	-2.614300	STATIONARY***
DLNLRP	-10.63692	-3.639407	-2.951125	-2.614300	STATIONARY***

*NB: ***Significant at 1%.*

Source: Researcher’s Computation using E-views8(2024)

In table 3 above, all the data are not stationary at level. But in table 4, Augmented Dickey-Fuller Test of Unit Root test showed that the data are stationary at both first and second difference. Thus, the variable entering in this model are in line with the prescription of Blumdell and Bond (1998), which says that elements of econometrics equation must at least be stationary in their first difference. All the variables in the model are integrated variables which attained stationarity at 1% significant level after first and second difference.

Co-Integration Test

Co-Integration analysis is predicated on the pre-condition to check for the existence of a long run relationship between two or more variables data that are stationary. The Johansen co-integration analysis will be adopted for testing for the possible existence of a long run relationship among variables in this study. As a general rule, non-stationary time-series variables should not be used in regression models, to the problem of spurious regression (Hill, 2012), “if y_t and x_t are non-stationary I(1) variables, then we expect their difference, or any linear combination of them, such as $e_t = y_t - b_1 - b_2 x_t$ (i.e a linear combination of x and y is a new variable $z = a_0 + a_1 x + a_2 y$. here we set the constants $a_0 = -b_1$, $a_1 = 1$, and call z the services e_t), to be I(1) as well. However, there is an important case when $e_t = y_t - b_1 - b_2 x_t$ is a stationary I(0) process. In this case y_t and x_t are said to be co-integrated. Co-integrated implies that y_t and x_t share similar stochastic trends, and since the difference e_t is stationary, they never diverge too far from each other.”

Co-integration Test

Table 5: Johansen Co-integration Test Results

Variables	Level Of Significance	P-values
RGDP	5%	0.0002
IMR	5%	0.0024
LRC	5%	0.0348
LRP	5%	0.6210

Source: Researcher’s Computation using E-views 8(2024)

From the Johansen co-integration results presented in table 5 above, it can be seen that real gross domestic production (RGDP), rice importation (IMR), local rice consumption (LRC) and local rice production (LRP) are co-integrated at 5% level of significance while maintaining stationary. Thus, a long run relationship exists among the variables in the study.

Model Estimation

Here, Fully Modified Ordinary Least Square (FMOLS) method/technique will be used or employed to estimate the model since the data are stable at first difference with respect to 1% significant level.

Fully Modified Ordinary Least Square (FMOLS)

In statistics, FMOLS is a type of linear least squares method for estimating the unknown parameters in a linear regression mode, it is used not only when the time series data is not stationary at level but also when the data are cointegrated.

Table 6: Fully Modified Ordinary Least Squares

Dependent Variable: RGDP
 Method: Fully Modified Least Squares (FMOLS)
 Date: 05/08/24 Time: 12:09
 Sample (adjusted): 1988 2022
 Included observations: 35 after adjustments
 No cointegrating equation deterministic
 Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth
 = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IMR	1.83E+09	2.57E+09	0.714690	0.4800
LRC	-1.44E+09	2.66E+09	-0.542361	0.5913
LRP	1.31E+10	2.91E+09	4.496362	0.0001
R-squared	0.948930	Mean dependent var		3.16E+13
Adjusted R-squared	0.945738	S.D. dependent var		1.73E+13
S.E. of regression	4.03E+12	Sum squared resid		5.20E+26
Durbin-Watson stat	1.592309	Long-run variance		2.56E+25

The coefficient of determination (i.e. R^2) in table 6 above is 0.948930, while the adjusted R-square is approximately 0.945738. This (i.e. R^2) indicates that about 94 percent of the systematic variations in the explained variable (RGDP) is accounted for by the joint influence of the explanatory variables while the remaining 26 percent is due to other variables captured by the stochastic disturbance term. This further shows that the model is correctly specified. From the FMOLS result, the Durbin-Watson statistic (d-test) is approximately 1.6. This indicate that autocorrelation is absent in the estimated model, since the d-test is close to 2. Given the soundness of goodness of fit as analyzed above, we can therefore rely on the estimated parameter of the variables for policy making and forecasting.

The coefficient of local rice production (LRP) is positive as shown in table 5 and statistically significant at 5% level of significant as shown in table 6. In other word, we are 95% confident and sure that LRP will boost RGDP. Hence the estimated coefficient implies that a unit increase in LRP will bring about 1.3 billion increase in RGDP. This indicates that a continuous increase in the production of rice will bring about increase in RGDP.

The coefficient for rice importation (IMR) is positive which is contrary to the apriori expectation, and statistically significant at 5% level. The estimated coefficient implies that a unit increase in IMR, will lead to 1.8 billion increase in RGDP. This shows that importation of rice has the capacity to increase RGDP, this is ambiguous but could be because of relatively lower prices of imported rice over locally produced rice.

The coefficient for local rice consumption (LRC) is negative, though its contrary to the apriori expectation but statistically significant at 5%. The estimated coefficient implies that a unit increase in LRC will cause RGDP to reduce by 1.4 billion. Normally, the act of patronizing Nigeria made rice will serve as a trigger to the growth of the economy but from the FMOLS result, the reverse is the case and this could be that the cost of producing Nigerian made rice and the government expenditure on rice production is higher than the amount per bag citizens are willing to pay for locally produced rice, thereby making them to opt for foreign or imported rice.

Multicollinearity Test

Multicollinearity means the existence of high linear association among the explanatory variables of a regression model. The decision rule states that, if the correlation coefficient is greater than 0.8, we conclude that there is multicollinearity. But when otherwise, we say there is no multicollinearity among the explanatory in the model.

Table 7: Multicollinearity Test Results

	D(DLNRGDP)	D(DLNIMR)	D(DLNLRC)	D(DLNLRP)
D(DLNRGDP)	1	-0.258701	0.139178	-0.185345
D(DLNIMR)	-0.258701	1	0.440024	-0.018183
D(DLNLRC)	0.139178	0.440024	1	-0.196278
D(DLNLRP)	-0.185345	-0.018183	-0.196278	1

Source: Researcher’s Computation using E-views8 (2024)

Heteroscedasticity Test

Heteroscedasticity means that the variance of the residual of a model is not constant. It also means that a model is not heteroscedastic. It is important to know here that one of the assumptions of OLS is that the error term must be constant. To test for heteroscedasticity, ARCH and Harvey tests will be employed. The test results are shown below;

Table 8: Heteroscedasticity Test Results

TESTS	F-statistic	Prob.F	Obs*R- squared	Prob. Chi-Square
ARCH	0.260526	0.6133	0.274573	0.6003
Harvey	1.150326	0.3522	4.654324	0.3246

Source: Researcher’s Computation using E-views 8(2024)

The F-statistic for each of this test is shown in table 8 above alongside their associated probability. The results show that the probability of the ARCH tests and Harvey tests are greater than 0.05. Thus, it can be concluded that there is no problem of heteroscedasticity in the model. In other words, the variance of the residuals of the model is constant or homoscedastic.

CONCLUSION AND RECOMMENDATIONS

The overall purpose of this study is to determine the econometrics evaluation of the impact of rice production on Nigeria economy. It is interesting to know that the empirical analysis carried out revealed a significant long-run relationship between rice production (LRP) and real gross domestic production (RGDP). And this relationship is met at 5% significant level. Moreover, other variables are significant at different level. Hence, there is a long-run relationship between rice importation (IMR) and RGDP at 5% significant level. Again, there is a long-run relationship between local rice consumption (LRC) and RGDP at 1% significant level.

From the regression result and Johnsen co-integration test result, it can be deduced that there is a long-run relationship between the variables. Particularly, the fully modified ordinary least square (OLS) regression result revealed that rice importation (IMR), local rice consumption (LRC), local rice production all together explain approximately 94.8930% of the systematic variation in RGDP in Nigeria.

Moreover, the parameter estimates revealed the following results, firstly, the result revealed that there exist an elastic (positive relationship between rice import (IMR) and real gross domestic product (RGDP), though abiguous. The result revealed that there is a positive relationship between RGDP and local rice production (LRP). Hence, a percentage increase in LRP will lead to approximately 1,3 billion increase in RGDP.

Based on the above findings, the following recommendations are given to guide policy makers and all government agents

1. Government should increase their effort in the production of rice since there is a positive relationship between rice production (LRP) and RGDP.
2. Incentives should be given for rice farming so as boost rice production, participation and involvement by both working and non-working youth (that is, by those who are employed and those who are not employed).
3. Government should give loans (with zero interest) to the unemployed graduate (youth precisely) specifically for rice production.
4. Irrigation facilities and conducive environment should be made available for rice farmers. For example, the Fulani herdsmen should be ban from grazing in a rice, (and other crops), cultivated farm land.
5. Rice farmers should be provided with mechanization so as to ease and aid rice production in the country.
6. Rice importation should be controlled and regulated so as to discourage foreign rice consumption.
7. There should be reduction of the price of locally produced rice so as to encourage local rice consumption. This is so because the lower the price of locally produced rice, the higher the price of foreign rice imported (due to price effect) and the higher the quantity of local rice

consumed or purchased, which invariably means that there will be increase in local rice production in Nigeria.

8. More rice should be produce irrespective of the nature of the rice, whether forbidden rice or basmati because supply will always create its demand (Says law 1803).

REFERENCES

- Abah, D., Ochoche, C.O. & Hundu, I.S. (2021). Contribution of cereal crops production to agricultural output in Nigeria. *An Econometric Analysis. International Journal of Agricultural Economics, Management and Development*. 9(1): 12-25.
- Akande, T. (2001). An overview of the Nigeria rice economy, NISER Monograph series No. 11. *Nigerian Institute of Social and Economic Research (NISER), Ibadan*. Pp. 11.
- Bashorun, F, (2013). Evaluation of food supply, (First Edition). Ibadan Press. Oyo
- Blundell, R. (1998). Initial conditions and movement restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1): 115-143.
- Central Bank of Nigeria (CBN), (2008). Annual Report and Statement of Accounts for the Year Ended 31st December 2008. Available at: <http://www.cbn.org.ng>. Accessed 17 March, 2014.
- Chidiebere-Mark, N.M. (2017). The analysis of value chain in rice production systems in Ebony State. A PhD Thesis submitted to the Department of Agricultural Economics, Federal Universty of technology, Owerri
- Damola, A.A. (2020). Sector strategies and policies related to rice development in Nigeria. Mapping of poverty reduction strategies paper, (*PRSP*). Retrieved on March 24, 2024. From www.rwcwrafrica.org
- Fei, O. X. (1949). Chang, C. & Tung-Fei, H. (1949). *Earthbound china; a study of rural economy in yunnan*. Chicago, University of Chicago press.
- Fuller, Q. & Qin, L. (2009). Water management and labour in the origins and dispersal of Asian rice. *World Archaeology* 41(1): 88-111
- Food and Agricultural Organization (FAO) (2008).FAO rice information 3. Retrieved March 15, 2024 from <http://www.fao.org/rice-information>.
- Short, C., Mulinge, W. & Witwer, M. (2012). Analysis of Incentives and Disincentives for Rice in Kenya. Technical notes series, *MAFAP*, FAO, ROME.
- Gujarati, D. N., & Porter, C. D. (2009). *Basic Econometrics (Fifth Edition)*. McGraw-Hill, New York.
- Granger, C. W. J. (1981). "Some Properties of Time Series Data and Their Use in Econometric Model Specification," *Journal of Econometrics*, 3 (7): 121-130.

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- Granger, C. W. J. (1986). "Developments in the Study of Co-integrated Economic Variables", *Oxford Bulletin of Economics and Statistics*, 68, 213-228.
- Hill, I. (2012). *The principles of econometrics*, (fourth edition). USA
- Hussaini, A.S., Oladimeji, Y., & Sanni, S. (2019). The determinants and profitability of rice farmers investment in value addition activities in Kebbi State. *International Journal of Social Economics*. 3(2) 101 – 109.
- Iyoha, M .A. (2004). *Macroeconomics Theory and policy*.(First Edition). Mindex publisher, Benin City , Nigeria.
- Iyoha M.A., (2007). *Intermediate Macroeconomics*. (First Edition) Mindex publisher, Benin City, Nigeria.
- Kebede, T.A. (2011). *Farm household technical efficiency. A stochastic frontier analysis: A M.sc thesis submitted to the department of Economics and social sciences. Agricultural University of Norway* p 1-66.
- Khai, G. (2011). *Farm Household Technical Efficiency: A Study on Rice Producers in Selected Area of Jamalpur District in Bangladesh*. Retrieved March 18, 2024 from www.farmhouseholdtechnicalefficiency/wiki/net.
- National bureau of statistic-NBS (2019). *Rice data system in Nigeria*. Retrieved March 24, 2024 from www.nbs.org
- Noij, F. (1988). *Resident tenants at the ahero irrigation scheme, household economics and nutrition, ministry of planning and national development report No.29/1988*. Retrieved March 24, 2024 from www.fao.org
- Oladimeji Y.U. (2017). *Food production trend in Nigeria and Malthus theory of population: Empirical evidence from rice production*. *Nigerian Journal of Agriculture, Food and Environment*. 13(1):126-132. Ahmadu Bello University press, Zaria, Nigeria.
- Omoare, A., O. & Oyediran, W.O (2017). *The assessment of factors affecting rice (oryza spp.) value chain in Ogun and Niger State, Nigeria*. *Global Journal of Agricultural Research*. 5(4): 43-59.
- Osemwengie, P.K. (2017). *Non-oil exports and economic growth: evidence from Nigeria*. *Journal of Social and Management Sciences*, 3(2): 106-111
- Pandey, S. (2007). *Are less-favoured environments over-invested? The case of rice research in India*, *Food policy* 32 (2007) 606-623. New Delhi, India.
- Pudasaini, S.P. (1983). *The effects of education in agriculture: Evidence from Nepal*. *American Journal of Agricultural economics*, 65:508-515.
- Rahman, P. (2012). *Upland and swamp rice farming systems in Sierra Leone: An evolutionary transition in B.L Turner II & S.B Brush (Edu) Comparative farming systems* (Pp156-188). New York, NY: Guilford.

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- Todaro, M.P. (2003). "Economic Development, Eight Low Prize Edition, New Delhi: Pearson Education".
- Ugwu, H. (2012). Effects of agricultural reforms on the agricultural sector in Nigeria Ugwu, D.S. and O. Kanu, I.O. 2012. Effects of agricultural reforms on the agricultural sector in Nigeria. *Journal of African Studies and Development*, 4(2): 51-59.
- USAID. (2019). Report-Board-International-Food-and-Agricultural-Development.
- USAID / Nigeria (2010). Nigerian rice farmers: making money and feeding the country. Retrieved on 16th March, 2024 from <http://www.ricenigeria.com>.
- USDA. (2022). United State Department of Agriculture: Retrieved from www.indexmundi.com.
- West Africa Rice Development Agency (WARDA, 2004). Annual report. 2000-2003. The Africa Rice Centre, Bouake, Cote d' I voire, <http://www.war>
- World Bank.(2016). World Development Indicators (2016). Washington, DC: World Bank. doi: 10.1596/978-1-4648-0163-1. Retrieved from <http://creativecommons.org/>