



Analysis of Effect of Price Variation on Rice Production in Nigeria (1970 – 2011)

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Abstract

Food price instability is a frequent forerunner of macroeconomic shocks and political turmoil that can discourage long-run investment and curtail growth. The study used descriptive statistics tools to highlight the trend of rice Production over the years in the study area. Time series data of a period of 42 years was obtained from various sources spanning from 1970-2011 from editions of National Bureau of Statistics review of external trade, National Bureau of Statistics summary and annual abstract of statistics, Central Bank of Nigeria's economic and financial review and an online database maintained by Food and Agricultural Organization (FAO). The study revealed that price of rice and quantity of production has a positive effect on each other. The Cobweb theory can be used by the government to regulate the response of price to rice production. Since increase in price brings about an increase in production, in line with the theory of Supply which states that the higher the price, the higher the quantity supplied: government should implement policies that will subsidize the price of rice to consumers and increase the level of food security in the country.

Key words: Price, Variation, Rice production and Nigeria.

Introduction

Rice is the seed of the monocot plants *Oryza sativa* (Asian rice) or *Oryza glaberrima* (African rice). As a cereal grain, it is the most widely consumed staple food for a large part of the world's human population. It is the agricultural commodity with the third-highest worldwide production, after sugarcane and maize (FAO, 2012). Rice is normally grown as an annual plant, although in tropical areas it can survive as a perennial and can produce a ratoon crop for up to 30 years. World production of rice rose steadily from about 200million tonnes of paddy rice in 1960 to over 678million in 2009. Rice consumption in West Africa has increased substantially over the past decade, rapidly outpacing the growth rate of local production. The importance of rice in local consumption and production varies widely across countries in the region. Coastal countries in particular, have been largely dependent on importation to meet the growing gaps between production and consumption (Awoyemi, 2010).

Nigeria spans an area of 924,000 square kilometers, bordered by the Gulf of Guinea, Cameroon, Niger, Benin, and Chad. The topography ranges from mangrove swampland along the coast to tropical rain forest and savannah to the north. Nigeria is endowed with many natural resources. With its reserves of human and natural

resources, Nigeria has the potential to create a prosperous economy and provide for the basic needs of the population. If its enormous resource base is well managed could support a vibrant agricultural sector capable of ensuring the supply of raw materials for the industrial sector as well as providing employment for the teeming population Rice is cultivated in virtually all agro ecological zones in Nigeria. Agricultural production plays an important role in economic development of Nigeria. An estimated 60% of Nigerians live in rural areas and majority are engaged in small scale agricultural production (Okunneye, 2003). Before 1970's, agriculture was the pride of the Nigerian economy and it contributed over 60% to the Gross Domestic Product (Famoriyo, 1981). Historically, rice production in Africa has been low-yielding and uncompetitive against low-cost Asian imports, even when protected by high freight costs and substantial trade barriers (Gilbert, 2009). Skyrocketing prices in world markets, however, were a shock to African consumers, producers, and governments alike. Numerous initiatives have been announced to stimulate rice production on the continent. Food price volatility therefore has a greater impact on the developing world. Depending on the region, maize and rice are the most important food staples (Gilbert and Morgan, 2010). Unstable prices for important food staples, such as maize, rice, and wheat, can have acute economic, social, and political consequences (Timmer, 1995). Highly unstable prices can lead to inefficient agricultural production decisions, especially when markets for credit and risk are poorly developed. The human costs of food price shocks can be disastrous for the poor, because food staples often constitute a large share of poor farmers' incomes and poor consumers' expenditures. Food price instability is a frequent forerunner of macroeconomic shocks and political turmoil, which discourage long-run investment and curtail growth. Agricultural prices vary because production and consumption are variable (Gilbert and Morgan, 2010). Economists have distinguished between predictable and unpredictable variability, the latter being characterized in terms of shocks. Shocks to production and consumption transmit into price variability. Production can vary either because of variations in area planted or because of yield variations, typically owing to weather (Gilbert, 2010). Hence the study looks at the effect of the change in price on rice production in Nigeria.

Objective of the Study

The general objective of the study is to examine the effect of price variation of rice on Agricultural production in Nigeria. The specific objectives are to;

1. Describe the trend of Rice production in the study area.
2. Examine the effect of price variation on rice production in Nigeria.

Methodology

Scope of Study

This study employed time series data of a period of 42years, obtained from various sources spanning from 1970 - 2011. They are various AGROSTAT bulletins which includes editions of National Bureau of Statistics review of external trade, National Bureau of Statistics summary and annual abstract of statistics, Central Bank of Nigeria's economic and financial review and an online database maintained by Food and Agricultural Organization (FAO).

Analytical technique

Descriptive Statistics

Descriptive and inferential statistical technique such as graph is used to show the trend of Crop production. Percentage is used to get the levels of production in order to represent them on a graph.

Granger causality Test

Granger causality approach as proposed by Granger (1996) is to see how much of the current Y can be explained by the past values of Y and then to see whether lagged values of X can improve the prediction of Y, or equivalent if the coefficient on the lagged X's are statistically significant. This test assumes that the information relevant to the prediction of the variables in question is contained solely in the time series data on these variables. The Granger causality analysis used in the study involves the estimation of the following pairs as adapted from Ayinde, (2008); Ayinde *et al.* (2010),

$$Y_t = \alpha Y_{t-1} + \beta X_{t-1} + U_t \dots\dots\dots(1)$$

$$Y_t = \beta X_{t-1} + U_t$$

$$Y = Y_t - Y_{t-1}$$

Where it is assumed that the disturbance terms U_t is uncorrelated

Y_t and X_t are time series

Y_t = Rice production at time t

X_t = Rice price at time t

U_t = error

$_{t-1}$ = lag variables

By this model, variable that causes the other is identified. This leads to a bivariate regression model with lag variables:

$$Y = \beta_0 + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + U_t \dots\dots\dots(2)$$

Where Y_t = dependent variable identified by the causality model (W_t or Z_t)

Y_{t-1} , X_{t-1} = lagged dependent and independent variable

U_t = disequilibrium term

According to Gujarati (2003), the regression of non-stationary time series on stationary time series data would produce a spurious result; thus the non-stationary data is transformed by differencing as in equation (3)

$$\Delta Y_t = Y_t - Y_{t-1} \dots\dots\dots(3)$$

Unit Root test

Unit root test was done using the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979). This is used to test for being stationarity or non stationarity. A stationary series is one with a mean value which will not vary with the sampling period. A non-stationary series will exhibit a time varying mean (Juselius, 2006)

Table 1: unit root table

Explanatory variable	Dependent variable	Estimation Method
Stationary	Stationary	OLS
Non-Stationary	Non-Stationary	Co-integration
Stationary	Non-Stationary	Logically Inconsistent
Non-Stationary	Stationary	Logically Inconsistent

Source ; Gujarati (2003)

Results and Discussion

Descriptive statistics

Table 2 shows descriptive statistics where mean, minimum and maximum were analysed for the data series of rice. Rice having an all-time maximum production of 4,567,320 tonnes in 2011 and all-time minimum production of 218,000 in 1976. The all-time maximum price is 196202.30 in 1992, while the lowest price of rice through the 42years considered in this research is 37814.33 in the year 1983.

Table 2 Summary statistics for dependent and explanatory variables

	N	Minimum	Maximum	Mean	Std.Deviation
Price	42	37814.33	196202.30	75118.74	35703.36
Production	42	218000	4567320	2240105	1314271.66

Source: Data analysis 2014

Trend of Rice Production

The trend of rice production is shown in figure 1 below. A visual plot of the data is usually the first step in the analysis of any time series. The trend of rice production can be described thus: rice production increased at a relatively increasing rate, production fell in 1975 all through 1976 from where there has been significant rise in production of rice. Rice production fell drastically in 1990 and rose in 1991 from where production was relatively stable till 1992, from where there was a fall in 1994 Paddy rice production has been increasing between 2001 and 2006, followed by a decline in 2007 and a positive peak in 2008. From 2008 to 2010 production statistics show a decreasing trend in production, associated with a decline in area harvested between 2006 and 2010. This trend resulted into higher yields between 2008 and 2010, despite declining production (Figure 1). Increasing production between 2002 and 2006 can be explained as result of the implementation of the Presidential Initiative on increased Rice Production, although decreasing production between 2008 and 2010 is not in line with policies aimed at the development of the rice sector during those years, such as the National Rice Development Strategy and the Federal Market Stabilization Programme (Erenstein, 2003). There were differently levels of increases, decreases and stability in rice production from 1994 to 2010, with the highest production level in 2011, probably because of increasing population and consumption

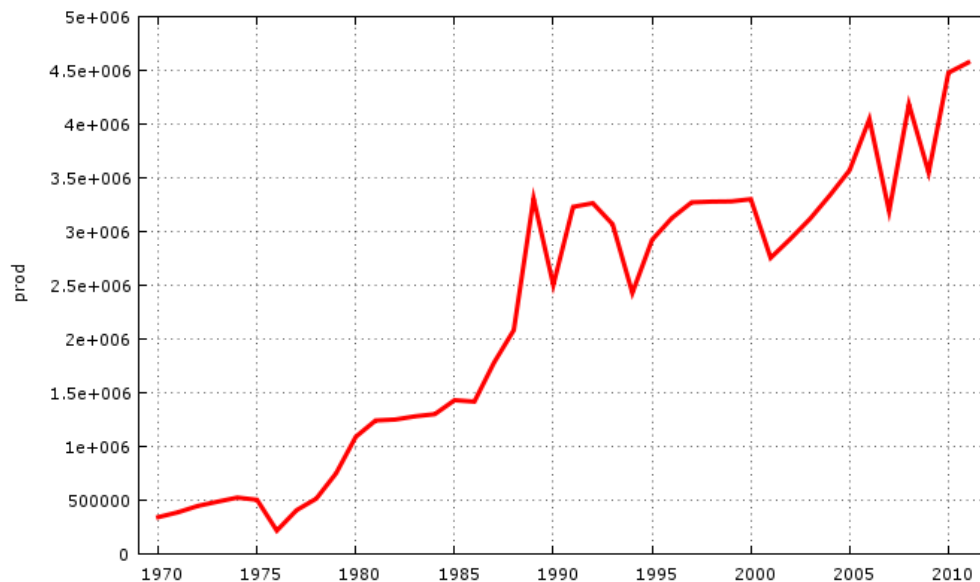


Fig 1. Source: Data analysis (2014)

Result For Granger Causality Test

Granger causality Wald tests

SAMPLE 1970 – 2011

Table 3 : Granger causality Wald tests

Equation Excluded	F- statistics	optimum lag	Probability	Decision
Prod → price	37.148	13	0.0265	Accept
Price → prod	22.514	13	0.0433	Accept

Source : Data analysis 2014

From Table 3, there is bidirectional granger causality. There is a bivariate relationship between rice production and rice price. A decrease in price will thus causes a decrease in production. This corresponds with the findings of Christiaensen (2009) and theory of supply which states that the higher the price, the higher the quantity supplied. This also goes in line with the cobweb theory which suggests that price can remain stuck in a cycle of ever-increasing volatility, which means lower price acts as incentive for lower supply in the next year and higher prices acts as incentive for greater supplies in the following year.

Table 4: Ordinary Least Squares Analysis Output

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
Const	1.45017e+06	157447	9.2105	<0.00001***
Rice Price	34.7899	4.17715	8.3286	<0.00001***
Mean Dependent Var	2240105	S.D. dependent var	1330204	
Sum Squared Resid	2.65e+13	S.E. of regression	814458.6	
R-Squared	0.634255	Adjusted R-squared	0.625112	
F(1, 40)	69.36592	P-value(F)	2.85e-10	
Log-Likelihood	-630.2025	Akaike criterion	1264.405	
Schwarz Criterion	1267.880	Hannan-Quinn	1265.679	
Rho	0.843804	Durbin-Watson	0.280506	

Source : Data analysis (2014)

OLS, using observations 1970-2011 (T = 42) Dependent variable: rice_production

From table 4, rice price shows a positive relationship to rice production. Decrease in rice price leads to a decrease in rice production, thus the effect that rice price has on rice production is a positive one. A variation in rice price will give a corresponding change on production which corresponds with the findings of Akpan (2007). The result

corresponds with the Cobweb theory which says lower price acts as incentive for lower supply in the next year and higher prices acts as incentive for greater supplies in the following year.

Conclusion and Recommendations

From the empirical analysis result, it is evident that price of rice and quantity of production has a positive effect on each other, which corresponds with the theory of supply. Thus a decrease in price of rice reduces the quantity that is being produced by the farmers so as not to run into a loss in production.

Based on the result from this study, the following recommendations are necessary:

- I. The government should stabilize the quantity of rice produced in the country, at a point in which the price of rice will favor the both consumers and producers.
- II. More effort should be given to production of rice considering its relevance to food security and the rising population of the country and efforts should be placed to counter the excessive rise in price.
- III. The Cobweb theory can be used by the government to regulate the response of price to rice production.
- IV. Since increase in price brings about an increase in production, In line with the theory of Supply which states that the higher the price, the higher the quantity supplied: government should implement policies that will subsidize the price of rice to consumers and increase the level of food security in the country.

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