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Empirical Analysis of Agricultural Production and Inflation Rate in Nigeria (1970-2006)

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ABSTRACT

Agriculture was known to be one of the major contributors to national development, but suffering from neglect has resulted to heart-aching inflation in Nigeria. Inflation in Nigeria of the recent has been attributed to high food prices. Increasing population growth has also rendered the growth in agricultural sector insignificant resulting to a little rise in output level. This study therefore analyzed the Nigerian agricultural production and inflation rate and examines their linkage and dimension. Time series data from 1970 to 2006 were employed for this study. The analytical techniques employed are descriptive statistics and Granger Causality model.

The result revealed that there were variations in the trend of both inflation rate and agricultural output. The change in agricultural output (inventory change) caused inflation during the 1970-2006 period and not vice-versa. The result showed that there is direct relationship between agricultural output change and inflation rate. In addition, increase in previous year's inventory change of agricultural production increases inflation rate. Consequently, policies that can absorb the excess in agricultural output inventory thus resulting into food prices and inflation stability are recommended.

Keywords: Agricultural production, Inflation, Empirical analysis, Granger Causality

INTRODUCTION

Nigeria, though depends largely on the oil industry for its budgetary revenue, the country is still predominantly agrarian. As the main stay of the economy, agriculture remains the major source of food for most of the Nigerian population, providing the means of livelihood for over 70% of the population and a major source of raw materials for the agro-allied industries (Okumadewa 1997, World Bank 1998). The sector in periods immediately after the independence performed outstandingly these roles, to such an extent that regional development witnessed during that period was attributed directly to the sector (Basalirwa*et al*, 2005, Encyclopaedia of the Nation, 2008). The percentage contribution of agriculture to Gross Domestic Product (GDP), has declined

tremendously from 55% in 1965 to 17% in 2004, thus leading to decline in its contribution to national development (Okuneye, 2002, World Bank Indicator 2006, Encyclopaedia of the Nation 2006).

Agricultural production in Nigeria is characterized by multitudes of small-scale farmers scattered over wide expanse of land area, with small holdings ranging from 0.05-3.0 hectares, rudimentary farming system, low capitalization, low yield per hectare, poor access to modern inputs, poor infrastructure, land/environmental degradation, inadequate research, inadequate extension services and poor response to technology adoption strategies with poor returns on investment (Olayemi 1994, Manyong*et al*, 2005). These small-scale farmers who provide about 85% of total agricultural produce are resource-poor and they also depend largely on agricultural labour market. The farmers usually have little or no form of savings, poor storage facilities and the farming practices adopted are highly labour intensive. The socio-economic and production characteristics of the farmers in conjunction with unfocused government policies and poor infrastructural base, all interact in affecting the production in the agricultural sector, thus resulting in low production, high prices of food items underdevelopment and concomitant poverty in the country (Okuneye, 2002).

In a bid to redirect its focus on agriculture, the Nigerian Government became directly involved in several strategies including National Accelerated Food Production Programme (1972), Agricultural Development Projects (1974), Guaranteed Minimum Price Scheme (1975), Operation Feed the Nation (1976), Agricultural Credit Guarantee Scheme (1977), River Basin Development Authorities (1979) and Structural Adjusted Programme (1985). These were large scale agricultural projects specializing in the production of grains, livestock, dairies and animal feeds. The Nigerian Agricultural and Co-operative Bank (NACB) was also established in 1973 as part of government's effort to inject the oil wealth into agricultural sector through the provision of credit facilities to support agriculture and agro-allied businesses (Olagunju, 2000). In spite of all these efforts, as at mid 70's, Nigeria became a net food importer. In 1982 alone, Nigeria imported as much as 153,000 metric tons of palm oil at the cost of 92 million USD and 55,000 metric tons of cotton valued at 92 million USD (Alkali, 2007). Since the 1990's and until the recent ban on rice importation, Nigeria has been spending an average of 60 million USD on the importation of rice annually. Between 1995 and 1998, the government further embarked on the reformation of the lending policies of the Agricultural Credit Guarantee Scheme (ACGS) for easier access to agricultural credit schemes. The government also established the Calabar Export Processing Zone (EPZ) and initiated the Enugu, Kaduna, Jos and Lagos EPZ's with each specializing in specific food and cash crops. In fact the National Rolling Plan for 1996-1998 assumed that by year 2000, Nigeria would have been able to feed its population, develop the capacity to process agricultural raw materials both for local industries, for export and thus

significantly increase the contributions of the agricultural sector to the GDP (Lawal, 1997). These lofty objectives have rather turned to be a mirage (Olukoya, 2007). The current status of agricultural production has not met the need of the ever increasing population couple with the increase in cost of production by inflating prices (Braun, 2008, Manyong*et al*, 2005).

Food price has been rising in the country since food expenditure constitutes a larger share in the basket of consumer prices. On the global level, food inflation accounted for 44% of global inflation in 2007 up from 27% in 2006 (Durmus, 2008). On the supply side, the amount of resources allocated for agricultural production has been dwindling for a while due to rapid urbanization and industrialization. A shift in labour force from agricultural to non-agricultural sectors has been experienced in many developing countries- including Nigeria and more recently, the drought that hit most part of the world has created a supply crises, aggravating the upward trend in food prices (Durmus, 2008). On the demand side, the huge jump in energy prices and rising environmental and political concerns force many Countries to seek alternative sources. The production and consumption of bio-fuels is increasing rapidly and thus prices of crops and commodities used for bio-fuels in the world are also increasing. Thus the study therefore analyzed the Nigerian agricultural production and inflation rate and examines their linkage and dimension in order to reveal the possible solution to the increasing food prices and declining agricultural growth in Nigeria.

METHODOLOGY

Nigeria is situated in the West African region and its main longitudes and latitudes is 10^{o}N and 8^{o}E respectively (World Map, 2009).It has a land mass of 923,768 square kilometer that falls within its latitude and longitude with a broad longitudinal range of diverse ecological lands in the south to the interior uplands, plateau and highlands in the North. It is estimated that about 25 million hectares are cultivated each year which implies a High Cropping Intensity with respect to arable land. Forestry constitutes about 26 million hectares while crops contributes some 27% of GDP, livestock another 3.3% and forestry and fisheries 1.5%. Some of the country's agricultural exports include cocoa, vegetables, fruits and cotton and these exports only represent less than 5% of export earnings (ADB, 2004)

Time series data between the period of 1970 and 2006 mainly from the secondary sources were used for this study. These data were obtained from National Bureau of Statistics, Federal Ministry of Agriculture, and Central Bank of Nigeria.

Descriptive analysis and Granger causality analysis were employed for the study. The Granger causality analysis used involves the estimation of :

$$W_t = \sum_{t-1}^{n} \alpha_1 Z_{t-1} + \sum_{j-1}^{n} \beta_j W_{t-j} + U_{1t} \text{.....(1)}$$

$$Z_t = \sum_{i=1}^{n} \alpha_1 Z_{t-1} + \sum_{j-1}^{n} \delta_j W_{t-j} + U_{2t} \text{ ……(2)}$$

It is assumed that the disturbance terms U_{1t} and U_{2t} are uncorrelated.

Wt = inflation rate at time t; Zt = agricultural output at time t; t-1 = Lag variable.

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

$$Y_t = \beta_0 + \beta_1 X_t + \beta_2 X_{t-1} + \beta_3 Y_{t-1} + U_t \text{ …….. (3)}$$

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

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

U_t = disequilibrium term

According to Gujarati (2004), the regression of non-stationary time series on stationary time series data would produce a spurious result, thus the non-stationary data is transformed into stationary by differencing as in equation (4)

$$\Delta Y_t = Y_t - Y_{t-1} \text{……(4)}$$

Where Y is the time series variable. Hence stationary test was performed using the Augmented Dickey-Fuller test. The non-stationary data were transformed before the use of Granger causality test.

RESULTS AND DISCUSSION

Trend Of Agricultural Output

The lowest agricultural output level during the years studied was recorded as 21.496 million tonnes in 1983 (figure 1). This could be attributed to the PRE-SAP Era (1970-1985). This era was characterized by overvaluation of the naira exchange rate and sharp increases in foreign exchange earnings which resulted from rising oil revenues and thus aided increase in food importation. This view as supported by Ukeje (2003) resultantly led to changing taste arising from this importation and low demand of traditional crops such as local rice, yams and cowpea with adverse consequence of reduction in the production of crops despite the huge ammount of subsidies by the government for domestic production during that period. The increased petrol naira inflow into the economy led to increased public sector wages and thus drained labour from rural areas

thereby depriving the agricultural sector of the much needed man power through migration. Also the domestic industries were protected through tarriff concessions and it was more lucrative to invest in industry rather than in agriculture. There was a continous increase in agricultural output from 1987 to 2000 before it fell in 2001 (figure 1). This rise did not meet the demand of the increasing population.

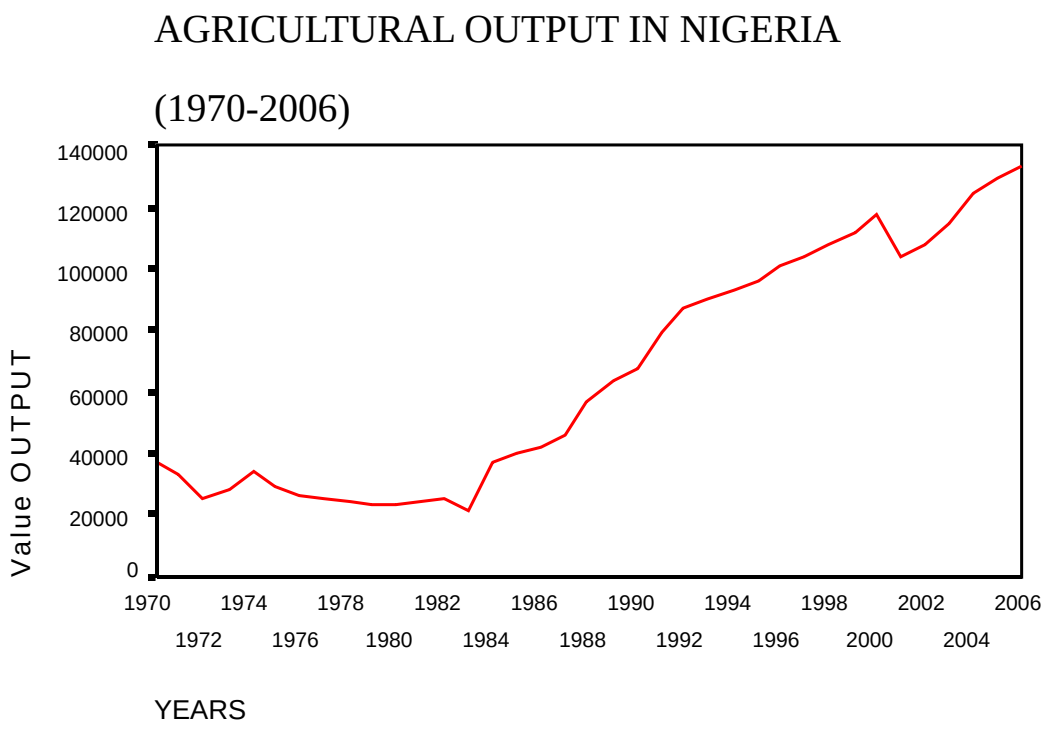


FIGURE 1: Agricultural Output in Nigeria (1970 – 2006)

The maximum output of 133.475 million tonnes was experienced in 2006. Over the period, agricultural output averaged 65.78 million tonnes.

Trend of Inflation

Inflation rate reached a double digit during the early years of oil wealth in Nigeria, except in 1972 and 1973 when a single-digit rate was experienced. The surging inflation rate during the period of 1971 to 1977 as seen in figure (2) was probably due to increased oil revenue which narrowed the fiscal gap. Infrastructural facilities were improved and promoted alongside with projects that were ambitious and unproductive through the country's oil earnings. This is in line with Onwiduokit (2000) findings. In the 1970's it

could be that government expenditure fuelled the inflation rate due to the advice of policy makers to embark directly on banking, insurance, clearing and forwarding activities, among others this is in addition to the government's involvement in the petroleum and mining sectors which were the commanding height of the economy.

When the year-by-year basis was used to record inflation rate, the years 1986 and 1987 had a relatively low rates of 5.4 and 10.2% respectively. The sharp reduction (from 39.6% in 1984) in 1986 could be attributed to an improvement in food sector particularly in 1986. The inception of Structural Adjusted Programme (SAP) in July 1986 brought the uncommon increase in the inflation rate from 5.4% in 1986 to 40.9% in 1989, which threatened to destroy the fabric of Nigeria society. This SAP-induced inflation led to many imbalances such as redistribution of income which led to personal insecurities and reduced personal satisfaction, and thus the interpersonal and institutional tensions increased leading to deterred investment and inhibited consumer spending. These imbalances also agree with the findings of Anyawu (1992).

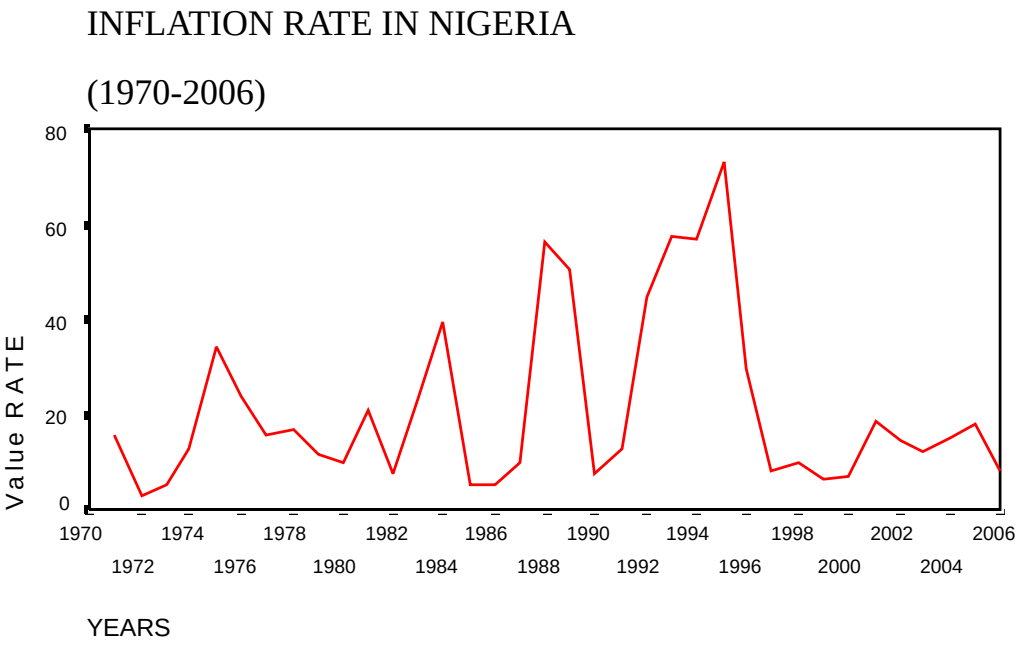


FIGURE 2: Inflation Rate in Nigeria

The highest rate of inflation in Nigeria (72.8%) was recorded in 1995 when the percentage change of domestic food price was 71.5% on the aggregate. It was 75.2% for rural and 62.1% for urban areas. This could be a result of increase in oil revenue from N162,102.40 million in 1993 to N324,547.60 million in 1995. This appreciable rise in the general price

level can also be attributed to the era of guided deregulation (1994-1999) during which all sub sectors of agriculture recorded lower growth rates. This led to increased food importation which rose to an average of ₦70, 484.1 million, representing an annual growth of 78.1% and 11.9% of total imports.

The inflation rate declined significantly from 72.8% in 1995 to 29.3% in 1996 and by 1997, there was a successful reduction to a single digit 8.5% ever since the 1990 against the 53% average rate in the previous years. This reduction may be due to the relatively good harvest of staples made possible by favorable rainfall pattern and the resultant fall in prices, exchange rate stability, sustained fiscal discipline and non-accommodating monetary policy.

The inflation rate increased from 8.5% in 1997 to 10% in 1998. The rising cost of production of goods and services, which was probably induced by scarcity of petroleum products, frequent power outage, infrastructure and equipment deterioration and the effect of upward review of the salary structure in the public sector may be the possible factors that led to the increase. This is also in agreement with Olubusoye and Oyeromade (2008). The mean inflation rate over the period was 20.34%

GRANGER CAUSALITY TESTS

Table 1 shows that inflation rate was stationary at the level, that it has no unit root.

Table 1: **Results of stationary test**

Variables	Level	1st difference	2nd difference	Unit root	Decision
Inflation rate (W)	-4.0674*	-6.5998*	-7.7557*	I(0)	Stationary
Agric output (Z)	-0.0804	-4.9773*	-7.8701*	I(1)	Non-Stationary

Note: Critical values: 1% = -3.6289 (Source: field survey, 2009)

Agricultural output exhibit unit root at the level but became stationary after differencing once(ΔLZ). The differencing thus depicts the change in production of the present year and previous years output that can be called the inventory change. The Granger causality test requires that the two variables be stationary (Maddala, 2001), therefore the agricultural output that is not stationary at its level was turned to be stationary by differencing it (i.e. Zt-Zt-1= ΔZt).

Table 2:Results of Granger Causality Test

The linkage result in table 2 shows that there is a unidirectional causation from inflation to agricultural output change, thus inflation in Nigeria depends on agricultural output change during the time frame.

Variables	Observation (n-r)	F-values	Probability	Decision
ΔZt→W	31	2.62750	0.05541	Accept
W→ΔZt	31	0.94872	0.47168	Reject

(Source: field survey, 2009)

Note: ΔZT =change in agricultural output; Lags = 5 and the relationship is established at 10% significance level

Table 3 presents the result of the bivariate model. The adjusted R^2 of the estimated model is well-behaved, Durbin-Watson shows no serial autocorrelation and the F-statistics shows that the overall regression is significant at 1% level.

Table 3: Regression Results

Variables	Coefficient	Standard Error	t-statistics	Probability
Constant	1.1733*	0.0034	342.4963	0.0000
LW(-1)	0.0013	0.0028	0.4643	06558
Δ LZ	1.2632*	0.0149	84.6819	0.0000
Δ LZ(-1)	-0.0024	0.0149	-0.1640	0.8708
ECM(-1)	1.0040	0.0028	362.700	0.0000

(Source: field survey, 2009)

Note: Adjusted R^2 = 0.9908 (**) = 1% significance

Durbin-Watson = 2.4469 (*) = 5% significance

F-statistics = 42401.13

The regression equation is given thus:

LW = 1.1733 + 0.0013LW (-1) + 1.2632ΔLZ– 0.0024ΔLZ (-1) + Ut…….(5)

Where: W = inflation rate, W (-1) = lagged inflation, Δ Z = change in agricultural output and Δ Z (-1) = lag of change in agricultural output.

Equation (5) gives the dimension of causality. Lagged values of inflation rate positively affect the current inflation rate. That is the previous rate has positive impact on the present inflation. The changes in agricultural output also exhibit a positive impact on current inflation. This means that the increase (decrease) production change in output of the previous and the current year (inventory change) lead to a rise (fall) in inflation. This

could be that if the inventory is large that the farmers are at the mercy of the middlemen who purchase the output at a lower price, and thus dispose the output at a higher price. An increase in inventory change can also discourage the farmers from producing in the current season and thus there is a production fall which could lead to a price increase. The result in equation (5) shows the dimension of inflation and agricultural output, as a unit decrease in inflation results from a decrease in agricultural inventory change by 1.26 and vice versa. The lagged change in output has a negative effect on current inflation.

CONCLUSION

There are opportunities to be developed as a nation if the governments focus on maintaining an increase in agricultural production and absorbing the inventory changes.

Inflation can be kept at a minimum in the country if there is good harvest of agricultural output with possible inventory absorbing mechanism in place. Hence the call for the following policy measures: Government, private institution and farmers association need to encourage farmers in times of surplus by absorbing the excesses and possibly distribute it to the appropriate quarters to curtail inflation. Government, Non-governmental agencies and farmers association should seek ways to adjust for the change in agricultural output overtime (inventory changes). This can be done through investment in storage and processing facilities.

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