

Determinants of Rice Production: A Guide for Food Security Policy in Nigeria.

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ABSTRACT

The study determined factors affecting rice production in Nigeria using time series (1972 - 2002) data. Linear regression analysis was used to explain the relationship between the independent variable Nigeria's annual rice output and five explanatory variables (Inflation(X_1), Lagged-price of rice(X_2), Rainfall(X_3), Rice-import(X_4) and Technological change(D_1)). Rice production was found to respond positively to inflation, price and rainfall. On the other hand rice import and technological changes had negative effects on rice production. The study recommends that inflation be effectively controlled as a way of improving crop production particularly rice.

Introduction

Rice is an important food crop in Nigeria. Its production does not only provide the much needed food for over half of the Nigeria population, it also offers employment opportunities for millions of urban and rural dwellers involved in some form of crop production, processing, storage and marketing (Kaka, 2007). Rice is the second most important cereal in the world after wheat in terms of production (Jones, 1995). However, in terms of area of lands under food crops production in the country, rice ranks sixth after sorghum, millet, cowpea, cassava and yam (Imolehin and Wada, 2000). The crop is relatively easy to produce, easy to prepare, and it is grown by both commercial and subsistence farmers.

With expansion of the cultivated land area to rice, there has been a steady increase in rice production and consumption in Nigeria. The production increase has, however, not been enough to meet the consumption demand of the rapidly growing urban population, who has a great preference for parboiled rice (Singh *et al.*, 1997). This situation led to acute demand for parboiled rice in recent times, which contrasted with Nigeria's self-sufficiency in rice during the 1960s. In Africa, FAO (2002) reported that apart from Egypt and Morocco, which have attained self-sufficiency in local rice production, all other

countries in the Saharan Africa have rice demand exceeding local production. FAO (2002) reports that in 2002, four of the six largest rice importers in the world are in Africa viz: Nigeria, Cote d'Ivoire, Senegal and South Africa.

Nigeria has experienced rapid growth in per capita rice consumption during the last two decades. Rising demand was partly the result of increasing population, increased income and rapid urbanization and associated changes in family income levels. (Akande, 2002). The average Nigerian now consumes more than 100 kg of rice per year, representing 9% of total calorie intake (Rice web, 2001). The success of government programs launched to increase rice production have not been able to reduce the resulting rice deficit. The imposition of a ban on rice imports from 1985-1995 and the ensuing increase in the relative price against other major crops boosted rice production mainly through an increase in the price and cultivated hectares (Tijjani, 2006). In spite of the increase in the price and cultivated hectares of rice, per capita consumption has maintained an upward trend and Nigeria is still not self-sufficient in rice. The study therefore identifies factors that prevent rice production from meeting its domestic demand. This is a view to harnessing the factors for policy formulation and food security in Nigeria.

METHODOLOGY

Time series data (1972-2002) for the empirical determination of factors affecting rice production were sourced from the Federal Office of Statistics (FOS) and Central Bank of Nigeria. All relevant data collected were analysed using multiple regression analysis.

To determine factors affecting rice production in Nigeria, the multiple regression model was specified. The total annual rice production (Y) was specified as the dependent variable to be explained by inflation (X_1), lagged price of the crop (X_2), rainfall (X_3), import of rice (X_4), and technological change (D_1). The model is specified as follows:

$$Y = f(X_1, X_2, X_3, X_4, D_1, + e)$$

Where,

Y = Nigeria's annual rice production (tonnes)

X_1 = inflation (CPI)

X_2 = lagged price of rice (N/kg)

X_3 = rainfall (mm/annum)

X_4 = import of rice (N)

D_1 = technological change (dummy)

e = error term

The linear regression model used in the analysis is of the form:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5D_1 + e$$

Where Y, X_1 - X_4 , D_1 , and e are as earlier defined

b_1 - b_4 are parameter estimates.

RESULTS AND DISCUSSION

Factors Affecting Rice Production

The F-value was significant ($p < 0.01$) implying that the independent variables included in the model adequately explained the dependent variable. The result shows that the R^2 -value was 0.817, which indicates that about 82 percent of the variation in rice production was explained by the independent variables included in the model. As shown in Table 1, rice production was found to respond positively to inflation (X_1), own price (X_2) and annual rainfall (X_3). On the other hand rice imports and technological changes had negative effects on rice production. However, inflation, rainfall and technological changes are statistically significant at 1%, 5% and 10% levels, respectively, while price and rice import were not significant. The result of the linear model is presented in Table 1.

The relationship between inflation rate (X_1) and rice output is positive and significant ($p < 0.01$). The results implied for 1% increase in inflation there is 1.34 metric tons increase in rice

production. Inflation is usually a measure of increase in general prices of goods and services. With inflation, farmers are bound to receive high prices for their produce. This implies that the higher the inflation rate, the higher the income (at least the nominal) of farmers and the higher the investments in rice production. Upton (1996) suggested that technological innovations and the associated capital investment due to high agricultural prices during inflation are generally assumed to result in higher agricultural productivity and a right shift in the supply curve.

Price (X_2) had a positive though significant relationship with rice production. This means that the higher the price received by farmers the higher their investments in rice production and the higher their output. According to this finding, every unit increase in price per metric ton of rice increases rice production by 5 metric tons. The finding reconciles with Tomek and Robinson (1981) that favourable agricultural prices can have marked influence on farm outputs and level of farmer income. Abbot and Makeham (1979) made it explicitly clear that today's prices allocate present supplies and influence the size of future output. Thus high prices eventually lead to high output. This finding reveals that favourable producer price per unit weight of rice could be used as a measure of increasing rice production.

Rainfall (X_3) was found to have positive and significant ($p < 0.05$) influence on rice production, as such the higher the amount of rainfall received, the higher the rice production. The result further revealed that every unit increase in rainfall received result in 3.16 metric tons increase in rice production. This finding agreed with Parsley (1992) who noted that rainfall plays a significant role in sustaining plant growth leading to increase in output. Daramola and Igbokwe (1999) also concur with this finding, noting that rice can be cultivated with appreciable output over a wide range of climatic conditions being one of the most adaptable food crops and responds positively to adequate rainfall.

Rice import (X_4) was found as expected to have a negative but significant relationship with rice production. This implies that increase in rice importation result in a decrease in rice production. This is much expected, since any increase in market supply is expected to affect demand and consequently price of the product. Farmers will thus receive low prices for their produce which will be translated in to low investment and low output. This finding reveals that every unit increase in increase in rice

importation expenditure will result in 6.60 metric tons decrease in local rice production. This study conforms to Upton (1996) who observes that increase in supply results in a decrease in price and output. Tomek and Robinson (1981) also emphasized on the need for farmers to be given favourable price in order to make necessary investments.

The development and spread of new technology (X_1) is essential for the continuing growth of agricultural production and incomes. Hence, the findings of this study revealed a negative and significant ($p < 0.10$) relationship between technological changes and rice production, thus implying a decrease in rice production with more technological changes. Technological development is an important factor in boosting crop production, in that it allow the farmer to cultivate more land, use agricultural machinery, improved varieties of seeds, fertilizers etc. This finding hence disagrees with Daramola and Igbokwe (1999) and Akinsanmi (1988). Upton (1996) also disagreed with this finding that technological innovations and the associated capital investment are generally assumed to result in increase in productivity. This finding could however, be a true representation of the Nigerian situation where majority of the farmers are peasant and operating at subsistence level with little or no capital to adapt improved agricultural technologies.

CONCLUSION

The study examined factors affecting rice production in Nigeria using time-series data (1972-2002). The data collected were analysed using regression analysis. The result of the study indicates that inflation, price, and rainfall had positive influences on rice production in Nigeria. These factors can be effectively utilized for policy formulation to boost rice production and by extension food security in Nigeria. Further more, the study serves to emphasize that there are potential benefits to be derived from greater self sufficiency and reduction in import dependency, and that favourable agricultural prices can have marked influence on the rate at which new technology is adopted and hence on the rate of change of rice output. This would not only improve farmers' livelihood, but could also contribute an important share to the rice production increases needed in the near future to compensate for high population growth rates. The following recommendations are made based on the findings of this study.

- National Agricultural Marketing Research Institute should be established to carry out

research on the marketing of agricultural produce.

- Efforts should be intensified by the Nigeria government to improve agricultural production through favourable agricultural prices, suspension of rice imports and new farming methods
- Inflation should be effectively controlled and price stabilized.
- Rural farmers should be trained on the use of agricultural innovations and new farming methods in order to boost crop productivity.

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Table 1: Results of the linear regression analysis on factors affecting rice production in Nigeria

Variable	Coefficients	Std error
Intercept Bo	-2806.323 (-0.624)	4495.188
Inflation(X ₁)	1.336 (3.585)*	0.373
Price (X ₂)	5.005 (1.487) ^{ns}	3.366
Rainfall (X ₃)	3.155 (2.159)**	1.482
Rice import (X ₄)	-6.596 (-1.011) ^{ns}	0.000
Tech change. (X ₅)	-98.361 (-1.807)***	54.423
R ² (0.817)	Adj. R ² (0.756)	F-Value(13.374)

The values in parentheses indicate t-values; * - Significant at 1% level; ** - Significant at 5% level; *** - Significant at 10% level; ns - Not significant