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IMPACT OF GOVERNMENT AGRICULTURAL POLICIES ON THE MAJOR STAPLE FOOD PRICES IN NIGERIA (1966 - 2011).

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ABSTRACT

This study assessed the impact of government agricultural policies on the prices of major staple food in Nigeria. It described the trend of the major staple food prices and determined the effect of government agricultural policies on the major staple food prices in Nigeria. Secondary data were sourced from various organizations and used for this study. These data were transformed from their nominal value to real value and analyzed using descriptive statistics, unit root test, ordinary least square model, cochrane-orcutt, least absolute deviation estimators and simultaneous equation model.

The study revealed that the prices of most of the major staple foods were at the peak value between 1991 and 1993 while their prices were at the lowest value between 1978 and 1983. The study observed that the price of cowpea is most volatile seconded by maize. The study further established that the prices of staple foods were inter-related. Also, it was showed that agricultural credit guarantee scheme funds (ACGSF), agricultural policies during structural adjustment period (SAP) and post-structural adjustment period (PSAP) were statistically significant while the agricultural input subsidy scheme was statistically insignificant. The study recommended painstaking formulation and implementation of agricultural policies and re-structuring of agricultural of input scheme.

***Key word**: Agricultural policy, staple food, prices and government*

1. INTRODUCTION

The agricultural sector is an important economic sector in Nigeria's economy because it plays a major role in rapid growth and development of the nation (Famoriyo and Nwagbo, 1981). Agriculture provides food for the growing population, employment for over 70% of the total

population, raw materials and foreign exchange earnings for the development of industries (Giroh *et al.,* 2010). In spite of the predominance of the petroleum sector and significant dependence of Nigeria economy on this sector, agriculture continues to be an important source of economic resilience and mainstay (Ojo and Akanji, 1996; NEEDS, 2004). Department for International Development (2003) also stated that agriculture is the economic heart of most developing countries including Nigeria and most likely source of significant economic growth.

Agriculture refers to the production and consumption of cultivated commodities which is dominated by small-scale farmers who produce about 80% of the total food requirement (Fayinka, 2004). These farmers are characterized by strong dependence on agricultural labour market, little or no forms of savings, poor storage facilities and cultural practices adopted were labour intensive (Festus, 2005 and Fakayode, *et al.,* 2008).

The performance of agriculture since 1970 in Nigeria clearly showed that it contributes more than 30% of the annual Gross Domestic Product (GDP), accounts for over 70% of the non-oil exports and provides over 80% of the food needs of the country (Adegboye, 2004). National Bureau of Statistics also reported in 2008 that Agriculture contributed 42 percent of Nigeria's gross domestic product (GDP). It is the second largest export earner after crude oil and the largest employer of rural labor; thus, the sector ranks as a key contributor to wealth creation, poverty reduction and food security in the country.

However, the oil boom in the early 1970s caused a severe fall in the percentage contribution of the agricultural sector to 35 percent in the early 1980s and according to Okoh (2004), the export of crude oil constituted about 96% of total exports. It is imperative to note that Nigeria once a leading exporter of several agricultural products like Cocoa, Rubber, Palm Kernel and Groundnuts has lost her leadership position in the exportation of these agricultural products (Mesike *et al.,* 2007). Consequently, food imports continued to rise in value. For instance, food import as a percentage of total imports rose from 3.5% in 1991 to 11.8% in the year 2000 (CBN, 2000; Akosile, 2003; Nyanko, 2006). Also, for the past two decades, while population grew at a rate between 2.5% and 3% per annum, food production grew at a rate of about 2.5% per annum (CBN, 1999; World Bank, 2001). So, the pressure on domestic price levels persisted as the consumer prices; which reached very high levels at the end of 1993 increased further. Data from the Federal Office of Statistics (FOS, 1998) showed that the average all-items composite

consumer price Index (CPI) for the first half of 1994 stood at ₦1, 105.10. This represents an increase of 41.5% and 121.3% over the levels in the corresponding periods of 1993 and 1992 respectively (CBN, 1994). The CBN (1994) report further confirmed that the food components, which accounted for 69.1% of the expenditure bracket, recorded a lessen effect on the rate of price increase. This led to declining per capita production, high and rising food prices, increased food import and a growing deterioration in the nutritional status of the average Nigerian.

The realization of this by the Government led to the formulation and implementation of different agricultural programmes and policies aimed at preventing the collapse of the economy and subsequently targeted at short-to-medium-term adjustment to ensure sustainable growth of the economy. The agricultural policies and programmes instituted by the government over the years were summarized in table 1.

Also, According to Manyong (2005), three agricultural policy phases can be recognized as;

- Pre-structural Adjustment Period (before 1986),
- Structural Adjustment Period (1986 – 1993) and
- Post-structural Adjustment Period (1994 till date).

But despite many attempts to increase domestic food crop production and subsequently reduce the food prices through agricultural policy programmes formulation and implementation by the federal government; Nigeria is still a net importer of many food commodities especially the grains (CBN, 2010). Also it is observed that several agricultural policy and programme periods in the country accompany food crop output and price variability (CBN, 2010). Therefore, this study seeks to describe the trend of the major staple food prices and also determine the effects of government agricultural policies on the major staple food prices in Nigeria. The findings from this study would contribute to the increased understanding of impact of government agricultural policies on some key variables in the Agricultural sectors and the entire economy. Also, the results from this study would be useful for the agricultural policy makers and other researchers as well.

2. THEORTICAL AND CONCEPTUAL FRAMEWORKS

Theoretical Framework

Keynesian economic theory that advocated for government intervention in economies is chosen to support this research. It states that 'an injection in the economy by way of investment (public or private)

leads to a more than proportionate increase in the aggregate demand of the economy' (Investopedia, 2011). This theory was named after John Maynard Keynes, a British economist who lived from 1883 to 1946. He agitated for government policies (increased expenditures and lower taxes) to stimulate demand and pull the global economy out of the Depression.

The general equation for this theory in a close economy is given as:

$$y = c + i + g \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .. (1)$$

The product market; *IS* equation is $y = c\big(y - t(y)\big) + i(r) + g \ldots\ldots\ldots\ldots\ldots\ldots (2)$

The money market; *LM* equation is $\frac{\bar{M}}{P_o} = m = i(r) + k(y) \ldots\ldots\ldots\ldots\ldots\ldots . (3)$

Where;

y = National Income

c = Consumption Expenditure

i = Investment

g = Government Expenditure

t = tax

r = interest rate

$\frac{\bar{M}}{P_o} = m$ = money balances (Brandson, 1972)

Conceptual Framework

Conceptually, Agricultural Policies and Programmes are believed to affect different aspects of Agriculture. Anytime Agricultural Policies are implemented; they are meant to achieve specific objectives such as increase in Production, reduction of food price, increase in value addition, and availability of farm inputs among others. These objectives are mostly targeted at enhancing food security and agricultural Productivity. Theoretically, an increase in food production as a result of Agricultural Policies and Programmes formulation and implementation can reduce food price and either increase or decrease farmers' income. The conceptual framework is presented in the chart (figure 1).

Recent Studies on Agricultural Prices and Agricultural Policies

Babula *et al*. (1995) used co-integration test in studying the role of the Exchange Rate on United States Corn Exports. The study found that there was no co-integration between exchange rates, price, sales, and shipments with respect to United States corn exports. But estimates obtained

using both structural econometric models and time series methods generally showed varying degrees of exchange rate impacts on agricultural prices and quantity traded. Obayelu and Salau (2010) employed Johansen co-integration test for assessing the existence of long-run relationships between the agricultural response to prices and exchange rate in Nigeria. The Schwartz Information Criterion (SIC) was used to select the optimal truncation lag length to ensure the errors were white noise in ADF. In this study, the Schwarz Criterion (SC) and the Likelihood Ratio (LR) test suggested that the value p = 2 was the appropriate specification for the order of VAR model. Thus, there is a unique long-run equilibrium relationship between the agricultural prices and exchange rate. Also, when the co-integration rank was tested based on the Maximum likelihood approach by Johansen (1988) (Johansen Trace test), it showed the existence of two co-integrating equations at 5 percent significance level implying that there was a common trends in the process. Rosa and Vasciaveo (2012) analyzed the interactions among the prices of some agricultural commodities in Italy and United States by using co-integration test. The authors discovered that there was evidence of co-integration between US and Italian commodities supporting the unique price condition in the two countries.

Musa (2011) also employed co-integration test to conduct study on assessment of the new agricultural policy of 2001 in achieving agricultural development in Nigeria (1986 – 2007). The study revealed that individually most of the variables employed: fixed asset in agriculture, labour employed in agriculture, foreign private investment in agricultural sector, supply of credit by commercial banks to agriculture and government expenditure in agriculture were insignificant in explaining the growth in agricultural sector. However, jointly they have a strong power in influencing the sector. Though in some cases, there was upward movement in agricultural output but not significant in relation to development requirement of Nigerian economy. Similarly, in Mesike (2012) study on the Impact of Government Agricultural Policies on Export of Cocoa and Rubber in Nigeria, he adopted the Engle Granger two-step procedure to test for co-integration of exports of cocoa and rubber with their fundamentals. It was seen that the absolute value of the Augmented Dickey-Fuller (ADF) test statistic was greater than its critical value at 1%, so co-integration was not rejected. The results indicated that the exports of cocoa and rubber co-integrated with the government agricultural policies. The existence of co-integration among the dependent variables and their determinants implied that there was a long-run equilibrium

relationship between the variables used in the model. In addition, Ayinde *et al.* (2013) applied co-integration test in Modeling Nigerian Government Revenues and Total Expenditure and established that there was a long-run equilibrium between the variables at 5% significant level.

It has been revealed in the literature that most of the time series studies on the agricultural prices and agricultural policies had employed co-integration test to establish long term relationship between or among the variables concerned. Ayinde *et al.* (2013) employed co-integration test to evaluate the effects of climate change on rice production in Niger state, Nigeria. The study found out that humidity had a negative effect and minimum temperature had a positive effect. According to Gujarati and Porter (2009) co-integration deals with the relationship among variables, where unconditionally each has a unit root. Co-integration means that, despite the variables being individually non-stationary, a linear combination of two or more time series can be stationary. It suggests that there is a long-run, or equilibrium relationship between them. The model of co-integration is an econometric technique which allows identifying at the same time the degree and the direction of integration of two time series (Ngirente, 2008). Variables having unit root mean that they are non-stationary (after which unit root test has been conducted).

Most importantly, the underline assumption for employing co-integration test in any time series analysis is that the variables under consideration are non-stationary and if otherwise, the use of co-integration test is invalid since the regression results based on the ordinary least square estimator would be efficient (Gujarati and Porter, 2009 and Upender, 2012).

3. RESEARCH METHODOLOGY

Study Area

It is a federal constitutional republic comprising 36 states and its Federal Capital Territory, Abuja. The country is located in West Africa and shares land borders with the Republic of Benin in the west, Chad and Cameroon in the east, and Niger in the north. Its coast in the south lies on the Gulf of Guinea on the Atlantic Ocean. There are over 500 ethnic groups in Nigeria, of which the three largest are the Hausa, Igbo and Yoruba. Agriculture used to be the principal foreign exchange earner of Nigeria. At one time, Nigeria was the world's largest exporter of groundnuts, cocoa, and palm oil and a significant producer of coconuts, citrus fruits, maize, pearl millet,

cassava, yams and sugar cane. About 60% of Nigerians work in the agricultural sector, and Nigeria has vast areas of underutilized arable land.

Sources of Data

Secondary data were used for this study. The sources were; World Bank Database, Food and Agriculture Organization (FAOSTAT), Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS) and Federal Ministry of Agriculture and Rural Development (FMARD).

Method of Data Collection

In carrying out this study, six major staple foods were purposively selected as they are among the food products of majority of the population in Nigeria and even in African countries. The selected major staple foods were maize, cassava, cowpea, yams, sorghum and rice. For each staple food selected, data on price over forty years (1966-2011) were collected from Food and Agriculture Organization (FAOSTAT) and National Bureau of Statistics. Also, the information on the past and present prevailing agricultural policies was collected from FMARD and major economic and financial indicators were gathered from World Bank database and CBN. The prevailing policies considered were Agricultural Credit Guarantee Scheme Fund (ACGSF), Structural Adjustment Period (SAP), Agricultural Input Subsidy and Post-Structural Adjustment Period (PSAP) while economic and financial indicators considered were annual inflation rate and population growth rate.

Analytical Techniques

The Data were analyzed using descriptive statistics, Regression analysis and Simultaneous Equation Model. The statistical packages employed were Eviews 8, gretl and SPSS 16 and Stata 10 (Statistical software) and statistical processes were employed in order to achieve an appropriate analysis. To deal with national currency fluctuations, which might cause price to look as though they are integrated; all prices were quoted in naira per tonne (₦/tonne) and series of prices were all deflated by using Consumer Price Index (CPI). The real prices obtained were then used for the analyses.

$$Real\ Price = \frac{Nominal\ Price}{Consumer\ Price\ Index} \times 100 \quad \text{..... (4)}$$

Descriptive Statistics

Descriptive statistics such as graphs, mean, minimum, maximum and standard deviation were employed to achieve the specific objective one (1) stated earlier. They were used to describe the trend of the price of each of the selected major staple foods.

Unit Root Test

The unit root test is the most widely adopted test of stationarity or non-stationarity over the past year which is mainly conducted on time series data. Test of the stationarity of the variables is paramount to avoid a spurious result. There are several methods for testing the presence of unit roots. The most widely used method is Augmented Dickey-Fuller (ADF). This method was employed in this study (Gujarati, 2003). These models were adapted from Ravallion (1986), Mohammad (2005), Ayinde *et al* (2010) and Emakoro&Ayantoyinbo (2014).

The unit root model is stated below.

$$\delta X_t = \alpha + \delta X_{t-1} + \sum_{k=1}^{p} \beta \delta X_{t-k} + \varepsilon_t \quad \ldots\ldots (5)$$

Where:

X_t = price at time t

δ = first difference operator

t = time indicator

ε_t = the error term

δ, α and β = parameters to be estimated

k = number of lag of the price variables to be included.

Regression Analysis

A multiple regression is concerned with the relationship between a dependent variable and a series of *m* independent variables. The multiple regressions allow the analyst to control for the multiple factors that simultaneously affect a dependent variable. The multiple regression equation produces an (*m+1*) dimensional surface.

The generic linear regression model to examine the effect of the various agricultural policies on staple food prices takes the form:

$$\Delta P_t = \beta_0 + \beta_1 (ACGSF)_t + \beta_2 (SAP)_t + \beta_3 (AIS)_t + \beta_4 (PSAP)_t + \beta_5 (INR)_t + \beta_6 (PR)_t + \varepsilon_t \quad \ldots\ldots (6)$$

Where:

P_t = price of each major staple food in time t (major Staple foods are maize, cassava, sorghum, cowpea, yam and rice) in naira per tonne.

ACGSF = Agricultural Credit Guaranty Scheme Funds (the dummy variable took 1 from 1978 to 2011 and 0 otherwise)

SAP = Structural Adjustment Period (the dummy variable took 1 from 1986 to 1993 and 0 otherwise)

AIS = Agricultural Input Subsidy (the dummy variable took 1 from 1976 to 2011 and 0 otherwise)

PSAP = Post-structural Adjustment Period (the dummy variable took 1 from 1994 to 2011 and 0 otherwise)

INR = Inflation Rate

PR = Population Growth Rate

β_i = Coefficients (i = 0,1,2,3,4,5 and 6)

ε_t = Error term (adapted from Mesike *et al.*, 2010, Obayelu and Salau, 2010 and Ayinde *et al.*, 2013).

Note: The dummy variables for the agricultural policies took one (1) in the active period of the policies and zero (0) when the policies were inactive. Also, some of these policies are still active till present but for the purpose of computation, this study considered them from 1966 to 2011.

Cochrane-Orcutt Estimator

Cochrane-Orcutt Estimator was employed where error terms were correlated i.e. autocorrelation problem occurred among the variables. It was used to correct for autocorrelation problem because the ordinary least square (OLS) estimator was less efficient.

The Cochrane-orcutt procedure:

$$Y_t = \beta_1 + \beta_2 X_{t2} + \beta_3 X_{t3} + \dots \beta_k X_{tk} + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

$$\mu_t = \rho\mu_{t-1} + \varepsilon_t \qquad -1 < \rho < 1$$

The Cochrane-orcutt (CORC) iterative procedure (Cochrane and Orcutt, 1949) requires the transformation of the regression model (8) to a form in which the OLS procedure is applicable. Re-writing equation 9 for the period t-1 we get

$$Y_{t-1} = \beta_1 + \beta_2 X_{(t-1)2} + \beta_3 X_{(t-1)3} + \dots \beta_k X_{(t-1)k} + \mu_t \dots\dots\dots\dots\dots\dots\dots (8)$$

The equation above is transformed by multiplying equation 8 term by term to by ρ and subtracting from equation 9, we obtain

$$Y_t^* = \beta_1^* + \beta_2 X_{t2}^* + \beta_3 X_{t3}^* + \dots \beta_k X_{tk}^* + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots (9)$$

It should be noted that the error term in equation 9 satisfies all the properties needed for applying the least squares procedure. Therefore, the equation is efficient for the estimation of the effect of government agricultural policies on the prices of staple major foods.

Least Absolute Deviation Estimator (LAD)

One of the basic assumptions underlying ordinary least square estimation is that the error terms be normally distributed. Of course this assumption could be violated and whenever this occurs, least absolute deviation is used to correct for errors not normally distributed.

Considering equation (8), LAD regression involves finding the estimates of β_0, β_1, β_2 … β_k denoted b_0, b_1, b_2, … b_k, that minimize the sum of the absolute values of the residuals,

$$\sum_{i=1}^{n} |y_i - \hat{y}_i| \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (10)$$

Where $\hat{y}_i = b_0 + \sum_{k-1}^{k} b_k x_{ik}$ represent predicted values.

LAD model is more trustworthy than the OLS model as the former is more robust, especially when the errors appear to be quite skewed (Adapted from Dielman, 2005)

Simultaneous Equation Model

Simultaneous equation model consisted of more than one equation for each of the mutual or jointly dependent or endogenous variables. The model for this study as adapted from Babatunde and Qaim (2010) is specified below.

$$lnP_{yam} = \alpha_0 + \beta_1 lnP_{cas} + \beta_2 PSAP + \beta_3 SAP + \varepsilon_1 \dots\dots\dots\dots 11$$

$$lnP_{maz} = \alpha_1 + \beta_4 lnP_{sor} + \beta_5 PSAP + \beta_6 SAP + \varepsilon_2 \dots\dots\dots\dots .12$$

$$lnP_{cow} = \alpha_2 + \beta_7 lnP_{ric} + \beta_8 PSAP + \beta_9 SAP + \varepsilon_3 \dots\dots\dots\dots .13$$

$$lnP_{cas} = \alpha_3 + \beta_{10} lnP_{yam} + \beta_{11} PSAP + \beta_{12} ACGSF + \varepsilon_4 \dots\dots\dots\dots 14$$

$lnP_{ric} = \alpha_4 + \beta_{13} lnP_{cow} + \beta_{14} PSAP + \beta_{15} ACGSF + \varepsilon_5$ 15

$lnP_{sor} = \alpha_5 + \beta_{16} lnP_{ric} + \beta_{17} PSAP + \beta_{18} SAP + \varepsilon_6$ 16

Where:

P_{yam} = Price of yams = (₦ per tonne)

P_{maz} = Price of Maize (₦ per tonne)

P_{cas} = Price of Cassava (₦ per tonne)

P_{cow} = Price of Cowpea (₦ per tonne)

P_{ric} = Price of Rice (₦ per tonne)

P_{sor} = Price of Sorghum (₦ per tonne)

SAP = Structural Adjustment Period

$PSAP$ = Post Structural Adjustment Period

$ACGSF$ = Agricultural Credit Guarantee Scheme Funds

α_0 - α_5 = Intercepts

β_1 - β_{18} = structural parameters or coefficients

Note: The model was fitted based on the granger-causality test results and theoretical ground. This was done to identify each equation in the model. Identification of each equation in the equation system was necessary to obtain numerical estimates of the parameters of the structural equation from the estimated reduced-form coefficients. Some of the equations in the model were exactly identified while some were over-identified.

The procedures for equation identification were stated below;

If k = g – 1, the equation is exactly identified

If k > g – 1, the equation is over-identified

If k < g – 1, the equation is under-identified (Maddala, 2001)

Where:

K = number of excluded endogenous variable plus excluded exogenous variable.

G = number of endogenous variable in the system.

4. RESULTS AND DISCUSSION

This chapter deals with the presentation, interpretation and discussion of data collected for the study after being analyzed. The study uses figures (graphs) and tables to present the results for easy understanding.

4.1 Description of the Trend of the Major Staple Food Prices in Nigeria (1966 – 2011)

The figures 4 to 9 describe the trend of major staple food prices in Nigeria over the studied periods. The lowest and highest prices of each staple food were identified and the study also discussed the trend of staple food for the past five years being the recent prices. This is done to know how the prices of staple food would behave for at least the next five years.

Figure 4 shows the price of maize in Nigeria from 1966 to 2011. The price of maize moved in a zig zag manner over the period under study. The trend line equation is y = 535.0x - 1E+06. The price fluctuated between the lowest value of ₦19, 853 in 1983 and highest value of ₦85, 821 in 1992 with the mean of ₦ 4.84E4 and standard deviation of 15931.055. Considering last five years price movement, it is observed that the price of maize increased sharply from ₦ 46285.81 in 2007 to ₦ 64784.24 in 2008 followed by gradual increase in 2009 (₦ 66583.1), 2010 (₦ 67321.25) and 2011 (₦ 68241.87).

Figure 5 shows the price of Cowpea in Nigeria from 1966 to 2011. The price of Cowpea fluctuated over the period under study. The trend line equation is y = 169.8x - 23866. The price moved from the lowest amount of ₦34, 222 in 1983 to the highest amount of ₦182, 612 in 1993 with the mean of ₦ 9.9E4 and standard deviation of 37984.804. In the last five years, the price of cowpea rose sharply from ₦ 67104.6 in 2007 to ₦ 103235.8 in 2008 and then by gradually increased in 2009 (₦ 106102.4), 2010 (₦ 107278.6) and 2011 (₦ 108745.7).

Figure 6 represents the price of Cassava in Nigeria from 1966 to 2011. The price of Cassava varied over the period under the studied periods. The trend line equation is y = 20796 - 89.04x. The price moved from the minimum value of ₦12, 845 in 1981 to the maximum value of ₦52, 684 in 1985 with the mean of ₦ 3.09E4 and standard deviation of 8, 813.615. It is observed there was a sharp fall in cassava price between 1984 and 1985. The sharp fall in price of cassava in 1985 might due to effectiveness of agricultural policies and fiscal policies during that period. In the last five years, it was observed that the price of cassava rose slightly from ₦ 19252.15 in

2007 to ₦ 26436.36 in 2008 and then by steady increase in 2009 (₦ 27170.42), 2010 (₦ 27471.62) and 2011 (₦ 27847.29).

Figure 7 depicts the price of Rice in Nigeria from 1966 to 2011. The price of Rice swung over the period study period. The trend line equation is y = 1E+06 - 613.3x. The price moved from the lowest value of ₦37, 814 in 1983 to the highest value of ₦196, 202 in 1992 with the mean of ₦ 7.91E4 and standard deviation of 37077.565. It is observed that the price of rice was relatively low before the sudden increase which reached the highest value in 1992. Then, the price fell sharply in 1994 after slight falling in 1993. After which the price fluctuated slightly from 1994 to 2011.

Figure 8 shows the price of Sorghum in Nigeria from 1966 to 2011. The price of sorghum undulated over the period under study. The trend line equation is y = 649.3x - 1E+06. The price fluctuated between the lowest value of ₦20, 480 in 1978 and ₦82, 096 in 1991 with the mean of ₦ 4.55E4 and standard deviation of 15631.532. In the last five years, it is observed that the price of sorghum increased sharply from ₦ 35353.46 in 2007 to ₦ 62427.08 in 2008 then, followed by steady increase in 2009 (₦ 64160.49), 2010 (₦ 64871.75) and 2011 (₦ 65758.92).

Figure 9 illustrates the price of yams in Nigeria from 1966 to 2011. The price of yams varied over the period studied. The trend line equation is y = 784.6x - 1E+06. The price moved from the minimum value of ₦22, 342 in 1978 to the maximum value of ₦116, 262 in 1993 with the mean of ₦ 6.34E4 and standard deviation of 18095.685. It is observed that within last five years the price continued increasing steadily.

Descriptive Statistics of Major Staple Food Prices

The descriptive statistics was further used to determine the minimum, maximum and mean price per tonne of the major staple foods while the Standard Deviation of the price of the major staple foods is estimated to determine the degree of the volatility of the major staple food prices from 1966 to 2011.

Table 2 shows the minimum, maximum, mean and standard deviation of the major staple food prices. The study reveals that price of cowpea is most volatile among all the major staple food prices next by rice price. This means that the prices of cowpea and rice changed often over the periods under study and the implication of this is that it could be difficult to predict the future prices of these crops. The high volatility of cowpea price could be due to constant fluctuations in its production- a consequence of climate variability and insect infestation while that of rice could be due to low rice production in the country and in the effort to augment rice production with imports, the rice price becomes more volatile. The implication of this is that many local farmers are being discouraged to increase their production since they have become the price takers and is even difficult for them to predict the next year price. Conversely, the volatility of cassava price is the lowest among the studied major staple food prices next by price of maize. The less volatility of cassava price might due to the fact Nigeria is the world leading cassava producer and thereby the effect of external factors on its price is minimal. The finding of this study supported the earlier studies on the analysis of incentives and disincentives for cassava in Nigeria and effect of Climate Variability on Agricultural Production and Innovation in Guinea Savannah Region of Nigeria (FAO, 2013 and Ayinde *et al.,* 2013).

Effect of Government Agricultural Policies on the Staple Food Prices in Nigeria

Regression analysis was carried out to determine the effect of government agricultural policies on the major staple food prices. The model specified each staple food prices as a function of Structural Adjustment Period (SAP), Post Structural Adjustment Period (PSAP), Agricultural Input Subsidy (AIS), Agricultural Credit Guarantee Scheme Funds (ACGSF), Inflation rate and Population Growth rate. The results are summarized in table 6.

Table 6 shows regression results of price of major staple food on government agricultural policies. The study shows that Structural Adjustment Period (SAP) and Post Structural Adjustment Period (PSAP) had negative effect on the price of sorghum. Hence, the sorghum

price kept increase over the years despite various agricultural policies put in place. The Jarque-Bera (JB) test on the prices of cowpea, cassava and yams shows that their residuals were not normally distributed. This therefore violated one of the basic assumptions of ordinary least square (i.e. the error terms are normally distributed). Hence, robust estimator (least absolute deviation) is used to correct for the violation. In the same vein, the Durbin-Watson confirmed the presence of autocorrelation in the prices of maize and rice which also violated another Ordinary Least Square (OLS) regression basic assumption that the error terms are uncorrelated. Thus, the Cochrane-Orcutt estimator was used to correct for the problem of autocorrelation. All these tests are necessary so as to ensure that any inferences drawn from the OLS regression results are efficient. The results are presented in table 7.

The results in table 7 reveals that Structural Adjustment Period (SAP) had positive effect on the prices of maize, rice and cowpea while it did not have any effect on the prices cassava and yams. The Post- Structural Adjustment Period (PSAP) had positive effect on the prices of maize and cowpea, negative effect on price of cassava and no effect on prices of rice and yams. Agricultural Credit Guarantee Scheme Funds (ACGSF) negatively impacted the prices of maize, rice and cowpea, positive effect on the price of cassava and no effect on the price of yams. The table further reveals that Agricultural Input Subsidy (AIS) had no effect on all the staple food prices under consideration.

Previously, it has been shown that some agricultural policies have either positive or negative impact while some agricultural policies did not have effect on the staple food prices. However, the mechanisms through which this impact occurs were not completely clear. An expected direct effect is that agricultural policies contribute to overall staple food prices. But there may also be more indirect effects when agricultural policies have an influence on staple food prices through inter-linkages in food prices. This is therefore shown in table 8.

The coefficients in columns 1 and 6 (equations 13 and 18) of table 8 shows that structural adjustment period and post-structural adjustment period have positive impact on the prices of yams and sorghum. The coefficients in column 2 shows that structural adjustment period and post-structural adjustment period have negative impact on the price of maize. Column 3 shows that the post-structural adjustment period has positive impact on the prices of cowpea. Column 4 shows that only post-structural adjustment period has negative impact on the price of cassava.

Column 5 shows that structural adjustment period has positive effect on the price of rice while agricultural credit guarantee scheme fund has negative effect on the price of rice. It can also be deduced from the table that the prices of staple food inter-relate: if the price of cassava increases by ₦1.00, the price of yams would increase by ₦0.76; if the price of sorghum increases by ₦ 1.00, the price of maize would increase by ₦ 1.99; if the price of rice increases by ₦1.00, the prices of cowpea would increase by ₦ 1.21; if the price of yams increases by ₦1.00, the price of cassava would decrease by ₦ 0.08; if the price of cowpea increase by ₦1.00, the price of rice would increase by ₦ 0.38 and if the price of rice increases by ₦1.00, the price of sorghum would increase by ₦ 0.38.

5. Conclusion and Recommendations

This study established that the some government agricultural policies have positive effect on the prices of most staple foods in Nigeria despite the several challenges bedeviling the growth and development of the agricultural sector. However, continuous increase in the price of major staple food which was the main problem identified in this study might be due to the fact that most agricultural policies formulated and implemented lack some elements that would revolutionize staple food production in Nigeria. Also, inference from the regression results shows that most agricultural policies focused on some staple foods such as maize, cassava and rice leaving other staple foods with little or no attention. Based on the findings of this study the following recommendations were drawn:

- ✓ Re-structuring of Agricultural Input Scheme,
- ✓ Painstaking Formulation and Implementation of agricultural Policies,
- ✓ Government should employ bottom-top approach when formulating and implementing agricultural policies.
- ✓ Deep involvement of main actors i.e. the farmers and agricultural expertise in the formulation and implementation of agricultural policies as it is believed to enhance the effectiveness of agricultural policies.
- ✓ Areas where there are conflict with the assigned role to the identified stakeholders in the current Agricultural Policies i.e. Agricultural Transformation Agenda (ATA) should be revisited in order to make it more effective.

- ✓ Given that some of the important policies affecting agriculture originate from other sectors, deepened dialogues among the policy makers across the sectors is inevitable in order to make agricultural policies more effective.

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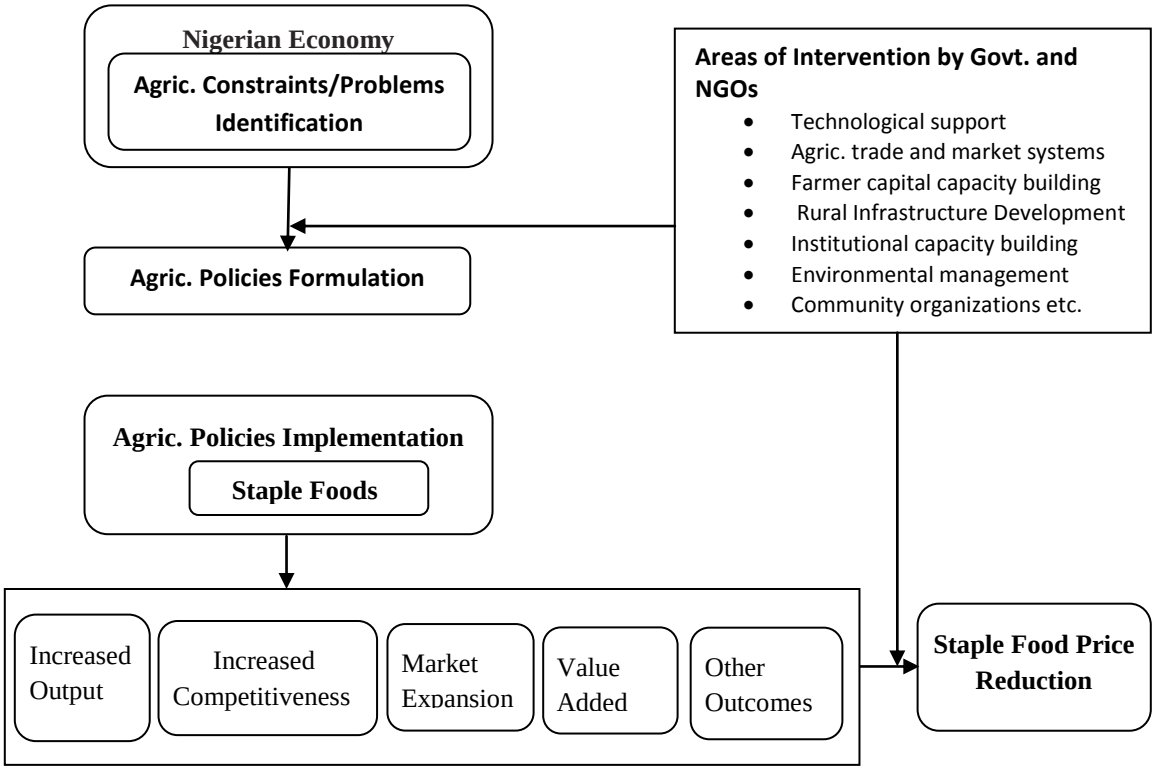
Table 1: Summary of Agricultural Policies and Programmes embarked by the Government to revamp the agricultural sector

1. Forest Policy (1937)	6. Agricultural Policy (1952)	11. OFN (1976)	16. BLP for Rural Women (1987)	21. NEEDS (1999)
2. Forest Policy (1945)	7. WNPAN Resources(1959)	12. RBDAs (1976)	17. NALDA (1978)	22. NSPFS (2002)
3. Agricultural Policy (1946)	8. Farm Settlement (1959)	13. Agricultural Input Subsidy (1976)	18. ACGSF (1978)	23. RTEP (2003)
4. Policy for the marketing of oils (1948)	9. NAFPP (1972)	14. GR (1980)	19. FSP(1994) and FEAP(1996)	24. Seven Point Agenda (2007)
5. Forest Policy for Western Region (1952)	10. ADP (1974 and 1989)	15. DFRRI (1986)	20. NFDP (1990s)	25. Agricultural Transformation Agenda (2011 till date)

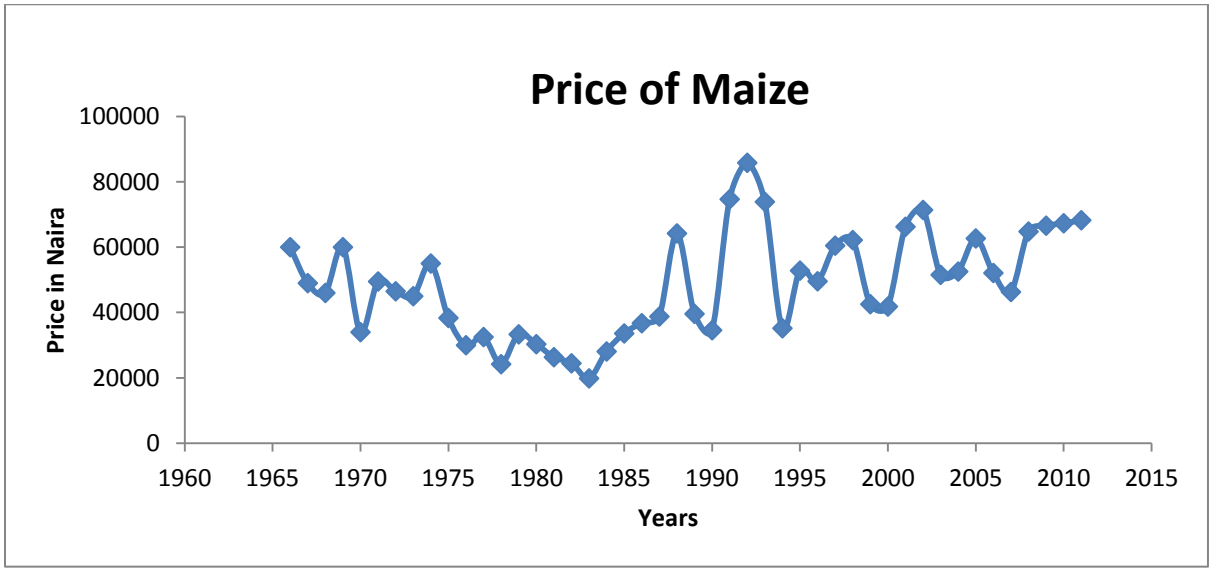
Figure 1: A simplified Chain of How Agricultural Policies affects Staple Food Prices in Nigeria.



Source: Researchers' Initiative, 2014.

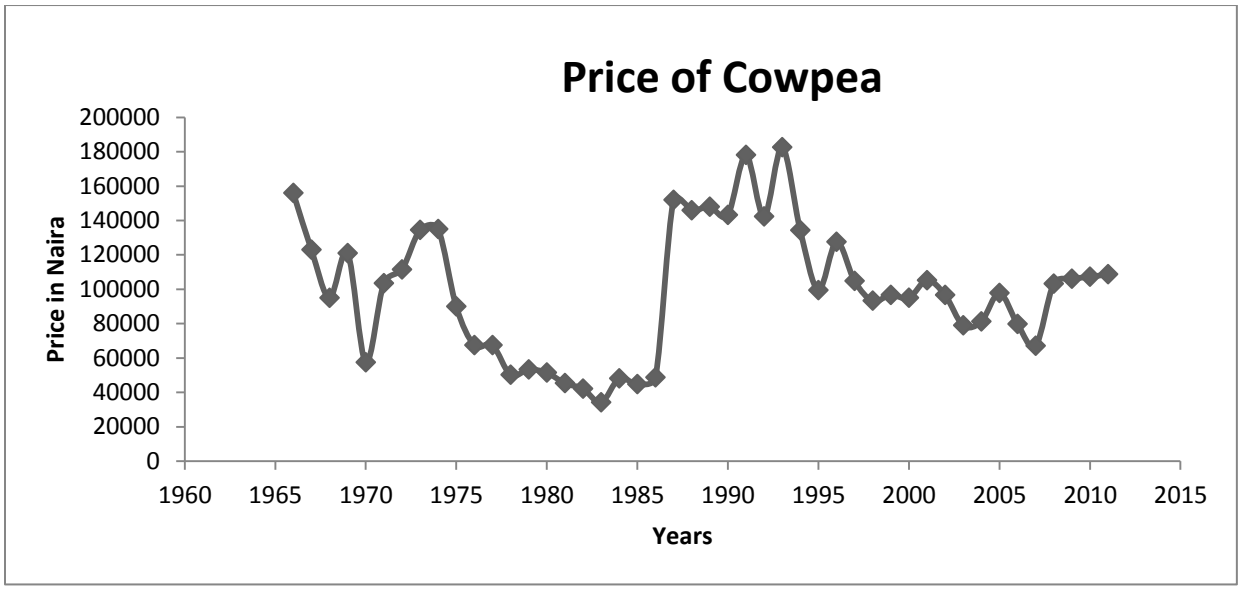
Figure 2: Map of Nigeria

Figure 4: Trend of Price per Tonne of Maize in Nigeria (1966 – 2011)



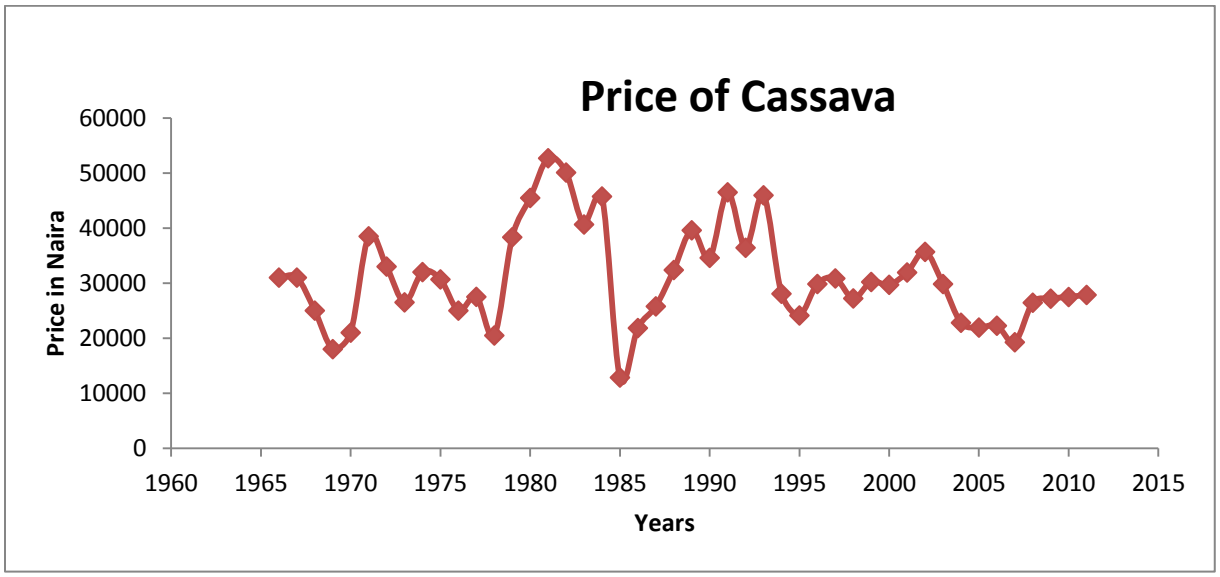
Source: Author's illustration using data from FAOSTAT, 2014.

Figure 5: Trend of Price per Tonne of Cowpea in Nigeria (1966 – 2011)



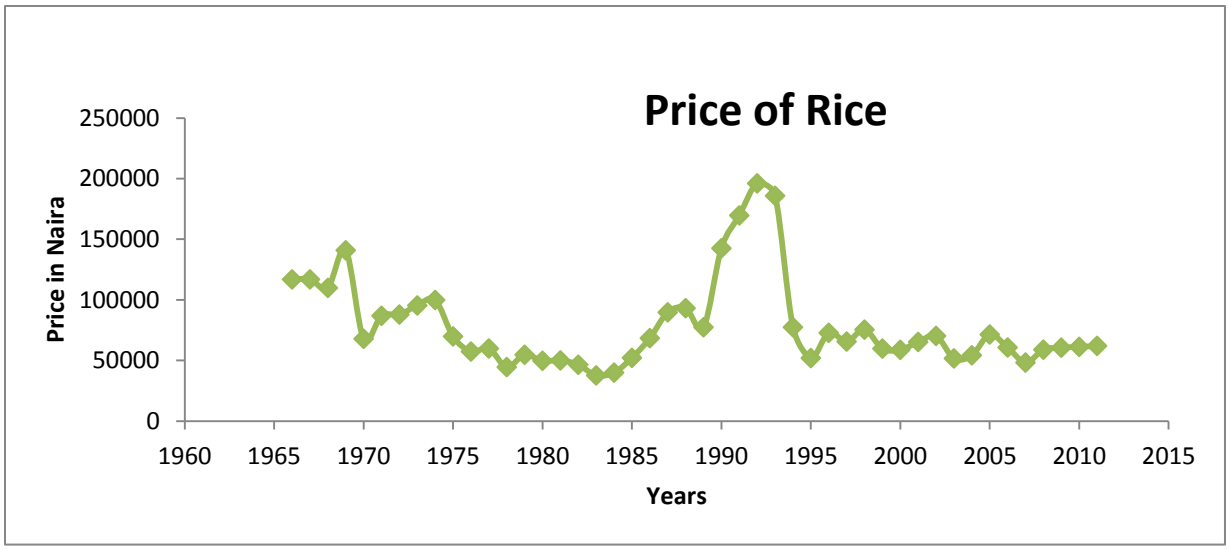
Source: Author's illustration using data from FAOSTAT, 2014.

Figure 6: Trend of Price per Tonne of Cassava in Nigeria (1966 – 2011)



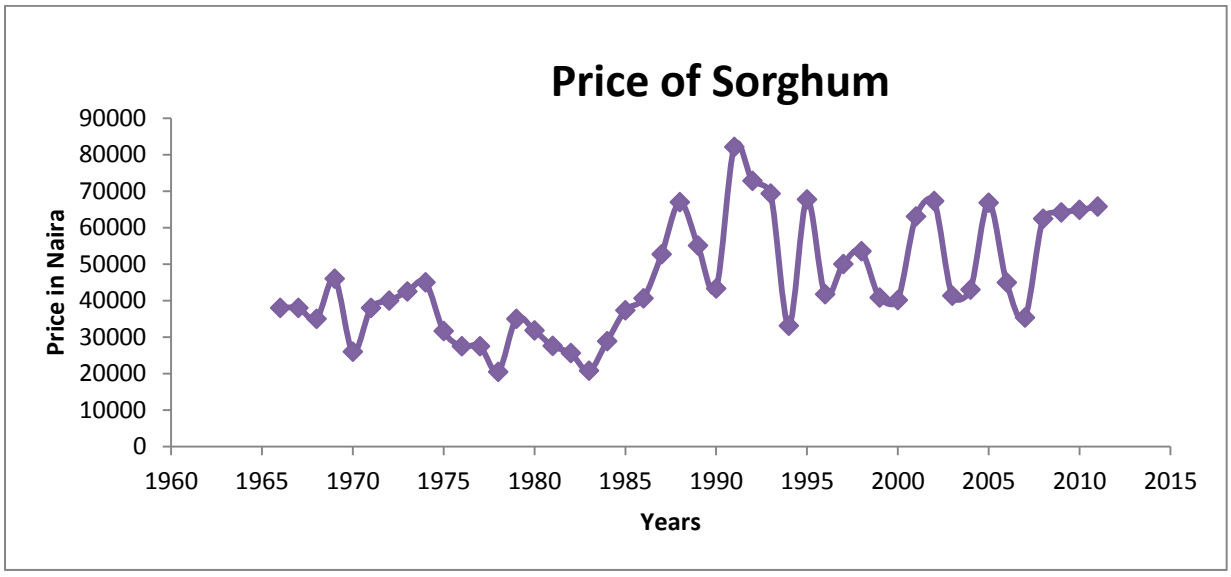
Source: Author's illustration using data from FAOSTAT, 2014.

Figure 7: Trend of Price per Tonne of Rice in Nigeria 1966 - 2011



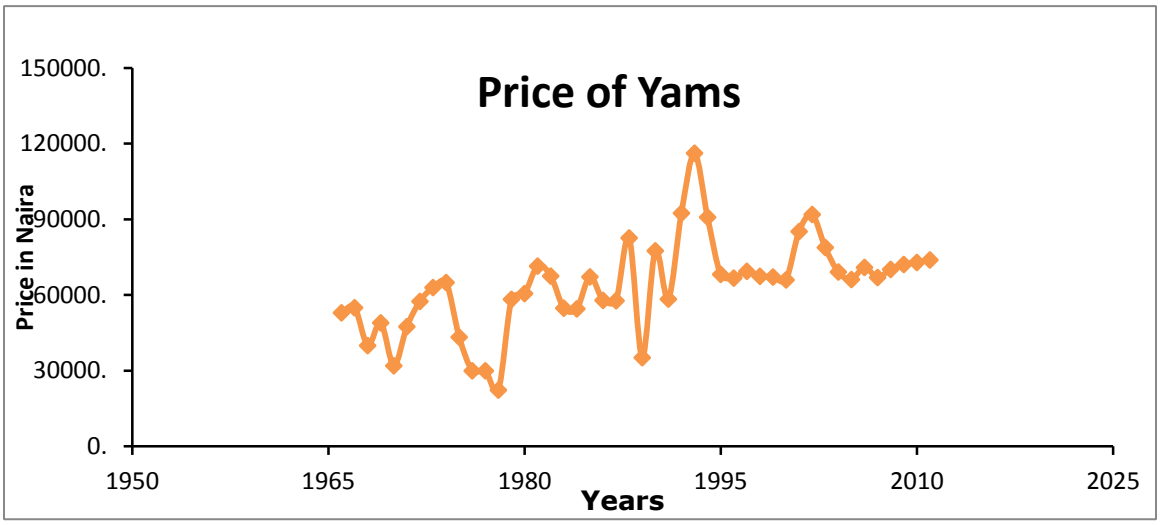
Source: Author's illustration using data from FAOSTAT, 2014.

Figure 8: Trend of Price per Tonne of Sorghum in Nigeria 1966 - 2011



Source: Author's illustration using data from FAOSTAT, 2014.

Figure 9: Trend of Price per Tonne of Yams in Nigeria (1966 – 2011)



Source: Author's illustration using data from FAOSTAT, 2014.

Major Staple Foods	Minimum Price per tonne (₦)	Maximum Price per tonne (₦)	Mean Price per tonne (₦)	Std Deviation
Maize	19, 853 (1983)	85, 821 (1992)	48,448	15931.055(5^{th})
Cowpea	34, 222 (1983)	183, 612 (1993)	99,052	37984.804(1^{st})
Cassava	12, 845 (1985)	52, 684 (1981)	30,892	8813.615(6^{th})
Rice	37, 814 (1983)	196, 202 (1992)	79,130	37077.565(2^{nd})

Sorghum	20, 480 (1978)	82, 096 (1991)	45,472	15631.532(4^{th})
Yams	22, 342 (1978)	116, 262 (1993)	63,373	18095.685(3^{rd})

Source: Author's Computation using data from FAOSTAT, 2014.

Table 6: Ordinary Least Square Regression Results of Major Staple Food Prices on Government Agricultural Policies (1966 – 2011)

	MAJOR STAPLE FOOD PRICES					
Variables	lnMaize	lncowpea	lnCassava	lnRice	lnSorghum	lnYams
Constant	11.1996***	172543***	41413.3**	12.5878***	10.7465***	12.1675***
	(0.589737)	(58320.5)	(19090.3)	(0.551469)	(0.571989)	(0.605767)
Inf.rate	0.000149087	403.515	71.9374	0.000109328	0.715723	0.0005771
	(0.00244008)	(241.306)	(78.9874)	(0.00228175)	(0.130061)	(0.00250641)
PG.rate	-0.197773	-28538.6	-5612.11	-0.478454**	0.579697	-0.592268**
	(0.242967)	(24027.6)	(7865.02)	(0.227201)	(0.106422)	(0.249571)
SAP	0.628387***	85493.3***	-4934.61	0.853027***	-0.0495837***	0.122589
	(0.134096)	(13261.1)	(4340.79)	(0.125395)	(0.139434)	(0.137741)
PSAP	0.666766***	45129.4***	-12228.5***	0.197726*	-0.178301***	0.203375*
	(0.109725)	(10850.9)	(3551.87)	(0.102605)	(0.147018)	(0.112707)
AIS	-0.094155	-13088.6	-1452.07	-0.107326	0.00082651	0.0200477
	(0.14376)	(14216.8)	(4653.64)	(0.134432)	(0.00236665)	(0.147668)
ACGSF	-0.359562**	-41519.3***	12535.6**	-0.426711***	-0.108778	0.321903**
	(0.15158)	(14990.1)	(4906.76)	(0.141744)	(0.235655)	(0.1557)
F-stat	8.617249	11.74819	2.669120	15.47438	9.601144	5.828843
$\bar{R}^2$	0.503878	0.589000	0.182037	0.658693	0.534195	0.391670
DW	1.699781	1.834624	1.435971	1.270237	2.077592	1.786983
JB	1.5361	10.3019	7.79464	0.462064	5.27466	6.94146
	[0.463918]	[0.00579395]	[0.0202962]	(0.793714)	[0.0715521]	[0.0310944]

( ) = Std. Error $\bar{R}^2$= Adjusted R-squared DW = Durbin-Watson JB = Jarque-Bera ***, *** and * indicate 1%, 5% and 10% significant levels respectively.

Source: Author's Computation using data from FAOSTAT, 2014.

Table 7: Cochrane-Orcutt and Least Absolute Deviation Regression Results of Major Staple Food Price on Government Agricultural Policies (1966 – 2011)

	Cochrane-Orcutt Estimator		Least Absolute Deviation (Robust)Estimator		
Variables	lnPMaize	lnPRice	lnPCassava	lnPCowpea	lnPYams
Constant	11.0412***	12.6966***	36551.8*	82183.6	11.6186
	(0.677397)	(0.856661)	(21131.6)	(82144.5)	(0.88201)
Inf.rate	0.000826158	-0.00273468	42.0193	46.5644	0.00294399
	(0.00257531)	(0.0024319)	(114.2)	(375.467)	(0.0042783)
PG.rate	-0.147129	-0.528272	-2708.8	8944.07	-0.38593
	(0.275146)	(0.338693)	(8417.32)	(35047.8)	(0.389797)
SAP	0.618398***	0.708531***	-5129.39	97707***	0.0681738
	(0.147908)	(0.166528)	(8333.58)	(20133.1)	(0.23787)
PSAP	0.650902***	0.0666211	-12387.7*	51288.8***	0.0660924
	(0.123738)	(0.158718)	(6368.41)	(10041)	(0.162192)
AIS	-0.100929	-0.0283829	-2114.04	-8366.45	0.075325
	(0.143424)	(0.116938)	(4405.63)	(24359.5)	(0.244585)
ACGSF	-0.3288*	-0.310565*	12009.8*	-51389.8**	0.403357
	(0.162563)	0.175265	(6896.86)	(24664.9)	(0.2575)
F-stat	8.617249	5.459520			
$\bar{R}^2$	0.517950	0.714564			
P-value	0.000107	0.000375			
DW	1.892441	2.098520			
AIC			954.6497	1057.747	3.135333

( ) = Std. Error $\bar{R}^2$= Adjusted R-squared DW = Durbin-Watson AIC = Akaike Information Criterion ***, ** and * indicate 1%, 5% and 10% significant levels respectively.

Source: Author's Computation using data from FAOSTAT, 2014

Table 8: Structural Relations of Staple Food Prices and Government Agricultural Policies

	Staple Food Prices					
Variables	P_{yam}	P_{maz}	P_{cow}	P_{cas}	P_{ric}	P_{sor}
Constant	2.922474	-10.19158**	-2.337177	11.10003*	7.046985***	6.1359***
	(5.345927)	(5.09115)	(1.691615)	(6.328248)	(1.18748)	(1.518652)
SAP	.2418624*	-.8245743***	-.0585529		0.5263546***	0.3907287***
	(0.1271152)	(0.3135415)	(0.1221885)		(0.0934015)	(0.109695)
PSAP	0.4849026***	-.4973537**	.4096726***	-0.2335053*		0.4975939
	(0.1051268)	(0.2408042)	(0.071643)	(0.1385091)		(0.0643177)

ACGSF				0.2472921	-0.3500614	
				(0.2002764)	(0.069542)	
P_{yam}				-0.0811016		
				(0.5899174)		
P_{cas}	0.762854					
	(0.5178217)					
P_{ric}			1.215653***			0.3812152***
			(0.1517879)			(0.136268)
P_{cow}					0.3777785***	
					(0.1029764)	
P_{sor}		1.99331***				
		(0.4903175)				
Chi^2(model Significance)	25.45***	42.67***	111.98***	8.27***	131.43***	86.84***
$\bar{R}^2$	0.3215	0.4122	0.7382	0.1100	0.7782	0.6882

Notes: The number of observations in this simultaneous equation model is N = 46. Figures in parentheses are std. Error *, **, *** indicates significant level at the 10%, 5% and 1% level, respectively.