ANALYSIS OF TRADE LIBERALIZATION POLICIES ON AGRICULTURAL OUTPUT GROWTH IN NIGERIA (1960-2014)

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ABSTRACT

The study was carried out to analyse the effect of trade liberalization policies on agricultural output growth in Nigeria, using time series data from 1960-2014. The objectives were to; estimate the differences in agricultural output before and after trade liberalization period and estimate the long and short-run effect of agricultural trade policies on agricultural output in Nigeria. Data for the empirical study were sourced from various issues of the Central Bank of Nigeria (CBN) statistical bulletin and publications of the National Bureau of Statistics (NBS). Both descriptive and inferential statistics were used to analyze the data. The estimation procedure was the co-integration and error correction model. The analysis reveals that the mean agricultural output after trade liberalization (AGR GD2) was different from that of the pre-trade period (AGR GD1) and also the t-test result confirms that there exist a significant difference between agricultural output during the pre-trade and post-trade liberalization period given that the t_{cal} (4.5146) was greater than the t_{crit} (2.0484) at 5% level of significance. The long–run and short-run regression results shows that trade openness and exchange rate had a negative effect on agricultural output in the three models meaning that trade openness will lead to reduction in agricultural output both in the long and short-run. The study therefore recommended that monetary authorities should adopt policies that will reduce the volatility of the exchange rate. Also the institution of import quota could curb the negative effect of trade openness on agricultural output growth in Nigeria.

KEYWORDS: Agricultural output, Trade liberalization, Trade openness, long-run, Short-run.

INTRODUCTION

Prior to the oil boom of the early seventies, Nigeria's agricultural development efforts enjoyed tremendous government support in form of production, processing and marketing incentives. In realisation of the importance of agricultural development to the economic growth of the nation, input supply and produce marketing systems were brought under state official monopoly. This led to the setting up of marketing boards to mediate between the farmers and the international market. 'Their objectives were to stabilise prices paid to the producers, ensure public access and control over foreign exchange earnings, strengthen the marketing mechanisms, create an ideological antipathy to private traders and impose constraints on multinational enterprises. In spite of these laudable objectives, the monopolistic marketing structure created under the hospices of commodity boards served as a great disincentive to farmers and represented agencies for taxation as the producer prices paid to the farmers were well below world prices" Idowu, 1986 Olayide, and Olatubosun, 1974; Idachaba, 1990; Akanji and Ukeje, 1995. 'Other factors such as the oil boom syndrome and relative strength of the Nigerian currency (Naira) to other currencies were seen to have negatively influenced agricultural production and marketing during this period'' Idowu (1986). There was a consistent decline in aggregate Agricultural output due to the negative influence of this marketing boards in the 1970s and 1980s as efforts were made by the authorities to find out the appropriate policy response towards restoring Agricultural output to the prime position it used to enjoy before the advent of crude oil boom.

However, there has been a gradual decline in agriculture's contributions to the nation's economy despite the rich agricultural resource endowment "Manyong *et al.*, 2005; Mohammad and Atte, 2006; Ekpo and Umoh, 2012" as evident in the contribution of agriculture to the GDP of the nation as well as the rising value of food import (CBN, 2010).This development prompted government to initiate several agricultural policies/projects and programmes to enhance agricultural output growth in Nigeria. The reorganization of the marketing boards in 1976 gave rise to the creation of seven different commodity boards. These commodity boards where set up to encourage the production and marketing of cash crops. After twenty eight years of this practice, how well has the agricultural sector fared? The exposure of the agricultural sector to global markets by

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the commodity boards, have rendered the Nigerian agricultural commodity less attractive and its contributions to GDP have remain obscure. It is in this light that this study seeks to answer the following questions; what is the trend of agricultural output before and after the trade liberalization periods? Are there differences in agricultural output before and after trade liberalization periods? And what is the long and short - run impact of agricultural trade policies on agricultural output growth over the years?, and at the same time, suggest policy recommendations expected to bring back the lost glory of the agricultural sector in the country, and there is no better time than now when the prices of oil is dwindling with its attendant effects on the country's revenue, the best sector to salvage the situation is agriculture.

1.1   REVIEW OF RELATED LITERATURE

Ahungwa, Haruna, Rakiya and Abdusalam (2014) carried out a study on "trend analysis of the contribution of Agriculture to the Gross Domestic Product of Nigeria". The study examined the pattern and contribution of agriculture to Nigeria's Gross Domestic Product (GDP), (1960-2012). The results of the study showed a clear dominance over other sectors from 1960-1975. Further analysis depicted an undulating trend, intertwining with the industrial sector from 1976-1989. The regression results showed that agriculture contributed significantly to the nation's GDP having a coefficient of 0.664. This cumulative effect of agriculture on GDP clearly affirmed the dominance of the sector's contribution to the GDP of Nigeria.

Ude and Agodi (2015) in their study on "Trade openness makes sense, using Nigeria trade policy as yardstick", used Autoregressive Conditional Heteroscedasticity (ARCH), Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Pairwise-Granger causality frameworks to show that there exists a relationship between trade openness and economic growth. Interest rate and exchange rate were found to be significant factors affecting Nigeria's economic growth rate. The study concluded that the Nigerian trade policy makers should not only be responsible for formulating trade policies but should also take into consideration the policy environment.

Felix, Ukweni and Martins (2013) carried out a study on the impact of trade liberalization on Nigeria Agricultural sector. The study made use of cointegration and error correction model for its analysis. Two models were stated for the study. The first model captured the impact of trade liberalization on Nigerian agricultural productivity while the second model was on the impact of trade liberalization on Nigerian agricultural export sub-sector. The results of the Error Correction Model of Ordinary Least Square (OLS) from the time -series analysis confirm that agricultural degree of openness and agricultural export to import price ratio were significant in the both models; whereas, agricultural capital formation, real exchange rate and foreign investment on agriculture were not significant. The Error Correction Model findings from the MODEL 2 follow the same direction as the MODEL 1. Therefore, it becomes necessary for policy makers to formulate policies that

will eventually enhance investment in agricultural capital formation, real exchange rate and foreign investment on agriculture in Nigeria as this will lead to increased output and promote exportation of agricultural products.

Felix, Kolawole and Musa(2013) also conducted a similar study on "trade liberalization and economic growth in Nigeria using cointegration."Ordinary least squares was adopted in estimating the influence of trade liberalization on economic growth in Nigeria (1970-2012) with a view to examining their long term relationship and structural change that may have occurred with the implementation of a free trade regime in 1986. In the study, trade liberalization was conceived as openness and proxied as the ratio of total trade to GDP. The results of the study showed that liberalization supports economic growth in Nigeria with an evidence of a long run relationship. Strong evidence was found to support a structural change taking place in 1986 with the adoption of free trade policy. However export was reported to be negatively related to growth. The study concluded by recommending that an enabling environment that will engender further growth such as better infrastructural base, adequate financing support adherence to international best practice in export and sound institutional structure be put in place for sustainability

Ugagu (2012) conducted a study on the impact of trade liberalization on Nigeria's Agricultural output. Ordinary Least Square (OLS) regression was used as the analytical tool. The study revealed that trade openness had significant positive relationship with agricultural output in Nigeria while exchange rate, SAP policies both had a negative and significant effect on agricultural output. Further results showed that trade liberalization on an aggregate exact a significant positive impact on agricultural output in Nigeria. It impact on an average is about 14 percent in increase on agriculture output. In the disaggregated model the study found significant impact differences. It thus concluded that trade liberalization has fairly significant positive impact on agricultural output in Nigeria.

An analysis of Agricultural production in Nigeria by Muhammad and Atte (2006) focused on the growth of the agricultural sector of the Nigerian economy. With the use of descriptive statistics and Duncan multiple range test regression analysis as the major analytical tool, and average growth rate, population growth rate, and consumer price Index seen as the major factor of domestic production in agriculture. Results suggest the imperative for Nigerians to embark on trade liberalization policies in order to sustain growth in agriculture and industrial sectors.

2.0   METHODS

2.1   Sources of data

Time series data for this research were obtained from several sources covering the period 1960 to 2014. These include the Consumer Price Index (CPI) and Agricultural output from various issues of National Bureau of Statistics (NBS) Statistical bulletin; while the Gross Domestic Product (GDP), Interest rates and exchange rate were obtained from Central Bank of

Nigeria(CBN) website (http://statistics.cbn.gov.ng/cbn-onlinestats/)

2.2 Method of data analysis

Unequal sample independent student t-test was used to determine the differences in agricultural output before and after trade liberalization. The t-test model is specified thus:

$$T_{cal} = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{S^2x}{n_1} + \frac{S^2y}{n_2}}}$$

$$df = \frac{\left[\frac{S^2_1}{n_1} + \frac{S^2_2}{n_2}\right]^2}{\left[\frac{S^2_1}{n_1}\right] + \left[\frac{S^2_2}{n_2}\right]}$$

Where,

x = mean of post- trade liberalization period

y = mean of pre- trade liberalization period

s_x^2 =standard deviation of post- trade liberalization period

s_y^2 = standard deviation of pre- trade liberalization period

n_1 =Sample 1, number of observation

n_2 = Sample 2, number of observation

2.3 The Model

The study employed the cointegration and error correction model to examine the effect of the agricultural trade policy on agricultural output; implicitly stated thus;

Y= f(X$_1$, X$_2$, X$_3$, X$_4$, X$_5$, X$_6$…..U) …………………….. **(1)**

Dependent variable (Y) = Agricultural output growth (i.e., Gross Domestic Product (GDP)).
X$_1$= Trade openness
X$_2$= Total investment
X$_3$= Interest rate
X$_4$= Exchange rate
X$_5$=Consumer price index
X$_6$= Dummy.
U= error term

The explicit forms of the model with and without structural breaks are stated below;

Model 1

LnAGDP = β$_0$ + β$_1$Ln OPt + β$_2$ LnINT + β$_3$Ln EXCH + β$_4$LnCPI + β$_5$LnGOVI + β$_6$Ln DUM + u$_i$ ……............. **(2)**

This model was used to analyze the effect of agricultural trade policies on agricultural output growth for the period 1960-2014.

Model 2

LnAGDP = β$_0$ + β$_1$LnOPt + β$_2$LnINT+ β$_3$LnEXCHt + β$_4$LnCPI + β$_5$LnGOVI + u$_i$ ……............................... **(3)**

This was aimed to show the effect of agricultural policies on output growth before liberalistation(1960 -1985).

Model 3

LnAGDP = β$_0$ + β$_1$LnOPt + β$_2$LnINT+ β$_3$LnEXCHt + β$_4$LnCPI + β$_5$Ln GOVI + u$_i$ …………................. **(4)**

The data used for this model was from 1986 to 2014, to ascertain the effect of agricultural policies on output growth after trade liberalization.

Where;
Ln= Natural log of numbers to base 10.

AGDP= Index of Agricultural output (GDP) in Nigeria at time t

OPt= Degree of openness which is export plus import divided by GDP. It is used as a proxy for trade liberalization

INT= Real interest rate

EXCH = Exchange rate which represent a proxy of exchange rate prices at time t

CPI = consumer price index

GOVI= government investment

DUM = which take the value of 1 in the SAP period and 0 in the rest of the period

U$_t$=error term.

β$_0$= intercept (constant term)

β$_0$… β$_6$ = Elasticity coefficients of the explanatory variables

2.3.1 A priori expectation

Trade openness is defined as the ratio of the sum of exports and imports to the total GDP (X+M/GDP) owing to its positive impact on agricultural output (β$_1$>0).

Total investments equally has a positive relationship with agricultural output due to trade restrictions which attracts foreign firm, thus, raises the demand and returns to factor (β$_5$>0). Government investment included both domestic and foreign investments.

Interest rate (r) relates to the lending rate due to certain inflationary effects. It has a negative impact on agricultural productivity as high interest rates(r) suppress investments (β$_2$>0), as such, it provides opportunities not only to convert money to time deposits but also leads to a reduction in investments by the private sector that results in poor agricultural growth.

Consumer price index (CPI) affects the volume of trade and agricultural output negatively if it goes up (i.e. (β$_4$< 0).

The trade liberalization dummy variable was added to capture the impact of SAP policy.

Exchange rate is expected to have a positive effect on agricultural output. It is also expected that if the exchange rate is devalued, the volume of agricultural exports increases. It should have a positive impact on agricultural output (β$_3$>0). SAP dummy coefficient is

expected to be positive because trade liberalization policies should increase output in the agricultural sector ($\beta_6 > 0$).

2.3.2 ESTIMATION PROCEDURE

Unit Root Test

In order to evade spurious regression result the variables were tested for stationarity using the Augmented Dickey Fuller (ADF) test. The test analyzes the order of integration of the time series. According to Greene (2003), the Augmented Dickey Fuller (ADF) test is employed to test for unit root based on an equation of the following forms:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \Sigma \gamma \Delta Y_{t-j} + e_t \text{ .... } \textbf{(5)}$$

The test is to verify if $\beta 0 = 0$. Thus, $H_0: \beta = 0$ indicate that the series X_t contains a unit root and is therefore non-stationary and the alternative hypothesis $H1: \beta 0 < 0$, indicates that the series is stationary. This study compares the ADF test statistic with the Mackinon criterion at a 5% level of significance. If ADF test statistic is greater than the Mackinon criterion, the null hypothesis is rejected and we conclude that the time series is stationary.

Test for cointegration

Co-integration exists between non-stationary data if their linear combination, namely the residuals of the co-integrating regressions is stationary (Granger, 1981). Thus spurious regression can only be avoided if a stationary co-integrating relationship is established between the variables.

Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as long-run equilibrium relationship among the variables.

The purpose of co-integration test is to determine whether groups of non-stationary series are co-integrated or not. Recall the presence of co-integration relation from the basis of the error correction specification. In testing for co-integration, we use the method develop by Johansen (1988).

Where we find one co-integrating equation, using the trace and or Eigen value test, we say that the variables are co-integrated and thus a valid long-run relationship exists between them.

3.0 RESULTS AND DISCUSSIONS

3.1 Differences between agricultural output before and after trade liberalization.

From table 1 it can be seen that the mean agricultural output after trade liberalization (AGR GD2) (4081485) was different from that of the pre-trade period (AGR GD1) (6837.5312). This implies that post-trade liberalization period brought about an increase in agricultural output than the pre-trade liberalization period. Also the result of the analysis showed the calculated t-value (4.5146) was higher than the critical t-value (2.0484) for the two periods. Thus, the null hypothesis was rejected. The economic implication is that, there exists a significant difference between agricultural output during the pre-trade and post- trade liberalization period. This may be due to the emphasis that liberalization in trade is primarily as a result of price efficiencies and perfect competition. According to Andersen and Babula (2008), 'policies associated with liberalization in trade helps to improve welfare of the economy through a reduction in dead weight loss in both monopoly and oligopoly'. They further opined that 'there exist a link between trade openness and Agricultural output'. Agricultural output can gain from trade openness resulting from trade policies as it demands competitive agricultural products to enhanced farmers participation and get expected production levels. Nigeria is a beneficiary from these trade policy reforms and increased foreign trade which has enhanced a shift away from protectionism to a more liberalized economy.

Table 1: Comparison of Agricultural output before and after trade liberalization.

Variable	N	mean	Variance	Df	Tstat	tcrit
AGRGD1	26	6837.53	5238089.16	28	4.515*	2.048
AGRGD2	29	4081485	2.36E+13			

Note:* two sample assuming unequal variance
Source: Authors own estimation from time series data

3.2 Unit Root Test Result

The unit root test results are summarized below. The results were estimated by considering the order of integration of each of variable using the Augmented Dickey- Fuller (ADF) type of unit root test at a 1% and 5% level of significance. From table 2, the entire variable are integrated at order one except trade openness (OP),

which means that they are stationary at first difference. As can be observed from the table, the null hypothesis of the presence of a unit root cannot be rejected for these variables (GDP, CPI, EXCH, INT, and GOVI) as it is clear that the critical ADF values are larger in absolute terms than the corresponding calculated values.

Table 2: Results of ADF unit root tests with constant and no trend.

variables	ADF(Level)	1st diff	critical value 1%	5%	Order of integration
GDP	1.3077	-4.736	-3.58	-2.93	I(1)
CPI	1.1872	-3.613	-3.58	-2.93	I(1)
OP	-3.337		-3.58	-2.93	I(0)
EXCH	0.3308	-5.728	-3.58	-2.93	I(1)
INT	-1.4882	-10.318	-3.58	-2.93	I(1)
GOVI	-0.9346	-11.1336	-3.58	-2.93	I(1)

Source: Authors own estimation from time series data

3.3 Long-run effect of Agricultural Trade Policy on agricultural productivity in Nigeria.

Table 3 provides the parameter estimates of the effects of agricultural trade policies on agricultural productivity(1960 to 2014). The openness in trade variable and real interest rate showed a negative and significant effect on agricultural productivity at 1% level. This implies that a 10% increase in openness and interest rate leads to a reduction in agricultural productivity while consumer price index (CPI) had a positive and significant effect on agricultural productivity. During the period (1960-2014) several changes occurred in the country's economy. This was the introduction of open market as well as trade and tariff policies. Government investment and exchange rate both had a positive effect on agricultural productivity but was not significant.

The parameter estimates of the Model 2 and Model 3 is presented in tables 3 and 4.The adjusted R^2 for model 2 & 3 was 0.99 and 0.98% respectively. This implies that 99 percent of the total variation in the real GDP (dependent variable) is explained by the explanatory model. Trade openness was negatively related and significant at 1% level in model 2 & 3. It was evident the closed economic policies led to unsupported competitiveness and reduced imports and exports.

Both models show that government investments and interest rate had a negative and insignificant effect on agricultural productivity. Exchange rate is positively related to agricultural productivity after 1986(1986-2014) and it was statistically significant at 10%. The sign of the coefficient is in line with the a-priori expectation of the model. This means that when exchange rate was appreciated by one unit, agricultural productivity will increase by 0.1829 percent all things being equal. This was not in line with the result of Ugagu, (2012) but was in line with the findings of Ude and Agodi, (2015) who had a positive relationship between exchange rate and economic growth within the period in which Nigeria adopted unrestricted trade policies.

The coefficient of consumer price index (CPI) is positive for the three models, but did not meet the a-priori expectation of the model. That is there is a significant positive relationship between consumer price index and agricultural productivity in Nigeria. This also means that when inflation increases by one percent, agricultural output will also increase by one point all things being equal. It means that rising inflation encourages farmers to produce more output.

In the three models trade openness had a negative effect on agricultural productivity. This was in line with the findings of Felix *et al* (2013) who obtained a similar result and concluded that the result shows that Nigeria imports more than she exports.

Table 3: Long-run co-integration regression and test statistic (model 1) from 1960- 2014

Variable	Coefficient	std error	t-ratio
constant	10.9546	0.2906	
LnCPI	1.1421	0.0544	
LnOP	-0.2119	0.0824	2.5717**
LnEXCH	0.0661	0.0527	1.2549
LnINT	-0.3761	0.104	-3.6172***
LnGOVI	0.0334	0.0355	0.942

R^2=0.9966, Adj R^2=0.9962, Log likelihood =14.3397,*=10%, **=5% and ***=1% level of significance
Source: Authors own estimation from time series data

Table 4: Long-run co-integration regression and test statistic (model 2) from 1960-1985.

Variable	Coefficient	Std. Error	t-ratio
constant	10.6814	0.59833	17.8521***
LnCPI	1.1702	0.0606	19.3261***
LnOP	−0.3084	0.1266	-2.4362**
LnEXCH	−0.5235	0.4009	-1.3060
LnINT	−0.34925	0.2552	-1.3685
LnGOVI	0.0293	0.0248	1.1836

R^2=0.9909, Adj R^2=0.9885, Log likelihood =24.3891
Source: Authors own estimation from time series data

Table 5: Long-run co-integration regression and test statistic (model 2) from 1986-2014

Variable	Coefficient	Std. Error	t-ratio
Const	10.4704	0.9199	11.3819***
LnCPI	1.13783	0.1423	7.9964***
LnOPEN	−0.2936	0.1667	-1.7616*
LnEXCH	0.1829	0.1635	1.1186
LnINTR	−0.2326	0.2928	-0.7943
LnGOV	−0.0178	0.0925	-0.1929

R^2=0.9863, Adj R^2=0.9832, Log likelihood =1.7314
Source: Authors own estimation from time series data

3.4 Estimates of the short-run effect of Agricultural Trade Policy on agricultural productivity in Nigeria.

Table 6depicts that the parsimonious model had a better fit compared with the over-parameterized model, having a higher F-statistic (8.0667), significant at the 1% level of significance compared with F-statistic (4.5771) of the over-parameterized model, which is significant at the 1% significance level in model 1. The variables of the reduced model explains the agricultural trade policies better than the over- parameterized model as the adjusted$R^2$for the reduced model (0.5307) is higher than that of the over-parameterized model(0.4819). Similar evidence has been indicated by the Akaike and Schwarz information criteria (SIC)value. A model with lower SIC value is preferred in terms of a rival model.

From the result, the coefficient of the error correction term ECM (-1) was negative as expected highly significant at the 1% level. This supports cointegration and suggests the existence of long-run steady-state equilibrium between the explanatory variables. The ECM indicates a feedback of about 29.4% of the previous year's disequilibrium from long-run elasticity of the explanatory variables resulting in a negative and significant relationship between exchange rate, openness and GDP. However, in the short-run, the 10% increase in openness and exchange rate leads to a reduction in productivity by 8% and 17%. The short-run coefficient of openness and exchange rate carries a negative sign and were both significant at 10% and 5% level of significance. This implies that liberalizing trade has not enhanced agricultural productivity in the short-run. This result was not in line with the findings of Felix, Kolawole and Musa (2013) and Anowor, Ukweni and Martins (2013). In their study, they both had a significant and positive result between openness and agricultural performance. Thus, in both short and long-run,

agricultural productivity is inelastic with respect to openness and exchange rate. The negative relationship between exchange rate and GDP may not be totally unexpected because of the devaluation of Nigeria currency and upward swing of exchange rate. Consumer price index(CPI), Interest rate(INT), government investment (GOVI) and SAP(DUM) all had a positive and significant effect on agricultural productivity(AGPD). CPI was significant at 10% while others were significant at 1% level of significance. This implies that a 10% increase in CPI, INT, GOV and DUM will lead to an increase in productivity by 78%, 19%, 3% and 6%.

Table 6 and7 also depicts the parsimonious error-correction model for model 2and 3. It was observed that the parsimonious model had a better fit relative to the over-parameterized model for both model 2and3 as indicated by a higher F-statistic value which is significant at the 1% level compared to F-statistic of the over-parameterized model, which is significant at the 5% level for both model. The adjusted R^2 for the reduced model was higher than the adjusted R^2 of the over-parameterized model for both models.

Also, the coefficient of ECM (-1) carried a negative sign on a priori basis and was highly significant at 1% level for model 1 and 5% for model 2. This suggests the existence of long-run steady-state equilibrium between the explanatory variables. The ECM indicates about 94% and 24% feedback from previous year's explanatory variables for model **2** and **3**. The result revealed that for both model, consumer price index (CPI) had a positive and significant effect on agricultural productivity. This implies that a 10% increase in consumer price index will lead to 14.3% and 7.83% increase in agricultural productivity for model 2 and 3.

Trade openness had a negative and significant effect on agricultural productivity. It was significant at 5% for model 2 and 1% for model 3. The economic

implication is that an increase in trade openness will lead to reduction in agricultural productivity in the short-run. The negative sign of the variable implies that Nigeria import exceeded export. Furthermore, result revealed that within the period 1960-1985 (model 2) that government investment policy had a positive and significant effect on agricultural productivity and obeyed the expected a-priori sign. The positive sign of the variable implies that foreign investment in Nigeria is relatively encouraging. Its effect was significant at 1% level of significance. This implies that a 1% increase in government investment will lead to 0.0692% increase in agricultural productivity within the study period.

Table 6: Estimates of parsimonious error correction model (1960-2014)

Variable	Coefficient	Std. Error	t-ratio
Const	0.0284	0.0274	1.0366
ΔLnCPI	0.7817	0.1322	5.9122***
ΔLnOPEN	−0.0889	0.0523	-1.6995*
ΔLnEXCH	−0.1720	0.0771	-2.2287**
ΔLnINTR	0.1903	0.1028	1.8526*
ΔLnINTR(-1)	0.1972	0.0980	2.0109*
ΔLnGOV	0.0329	0.0178	1.8423*
DUM	0.0676	0.0359	1.8774*
ECM(-1)	−0.2935	0.0902	-3.2513***

R^2= 0.6058, AdjR^2= 0.5307, F [8, 42] = 8.0667***, DW=1.7878, AIC= -70.3717, SC= -52.9853
Source: Authors own estimation from time series data

Table 7: Estimates of parsimonious error correction model (1960-1985)

Variable	Coefficient	Std. Error	t-ratio
Const	−0.0576	0.0329	-1.7508*
ΔLnCPI	1.4321	0.2341	6.1182***
ΔLnGOV	0.0692	0.0191	3.6125***
ΔLnGOV(-1)	0.0534	0.0191	2.7966**
ΔLnOPEN	−0.2232	0.0895	-2.4937**
ECM(-1)	−0.9459	0.2126	-4.4480***

R^2= 0.7279, AdjR^2=0.6479, F [5, 17] =9.0970***, DW=2.1055, AIC= -45.7904, SC= -39.9774
Source: Authors own estimation from time series data

Table 8: Estimates of parsimonious error correction model (1986-2014)

Variable	Coefficient	Std. Error	t-ratio
Const	0.0795	0.0381	2.0856**
ΔLnCPI	0.7831	0.1588	4.9326***
ΔLnOPEN	−0.1355	0.0667	-2.0326*
ECM (-1)	−0.2441	0.1015	-2.4051**

R^2= 0.5947, AdjR^2= 0.5394, F [3, 22] = 10.7603***, DW=1.9942, AIC= -33.5060, SC= -28.4736
Source: Authors own estimation from time series data

CONCLUSION

The results of the explanatory variables reveals an increase trade openness and interest rate will lead to reduction in agricultural output in the long run. This is contrary to *a priori* expectation and suggest the need for urgent policy measures to curtail their negative effect on agricultural output. However, in the short-run, trade openness had a negative effect on agricultural output in Nigeria.

RECOMMENDATIONS

The following recommendations were made based on the result:

- There should be some restrictions in trade on certain agricultural commodities especially those commodities that the country have comparative advantage in production.
- The Nation's monetary authorities should adopt policies that will reduce volatility of the exchange rate, since the fluctuation of the

exchange rate had a negative effect on agricultural output.

- Government should encourage both foreign and local investment in agriculture through research and development.

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