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Impact of Agricultural Output on Economic Growth in Nigeria (1981-2013)

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Abstract
The objective of this paper is to determine the impact of agricultural output on economic growth in Nigeria. Due to the Government neglect in agricultural sector the agricultural output contributed little or nothing to the total revenue of Nigeria. The methodology adopted a neo-classical accounting framework in specifying the functionality of capital stock (K), labour (L) and output (A) to economic growth. The use of Augmented Dicker Fuller Unit root test, Engel Granger, Johansen Co-integration and parsimonious Error correction model analysis confirms relationship between fiscal deficit, agricultural output and economic growth in Nigeria over the period understudy. The ECM co-efficient was well behaved with a negative sign implying a dynamic model that takes into consideration the long and short-run properties of the relationship between the dependent and independent variables in the study. The hypothesis indicates that no causality relationship between agricultural output and economic growth in Nigeria. Government should encourage large scale farming to private sector so as to increase agricultural output. Investment in infrastructure should be done in rural areas; this will go a long way to discourage rural- urban migration and improving the quality of life in the rural areas where most population resides.

Key words: *Economic growth, Development, Output, Agricultural sector*

Introduction

Agriculture has been defined as the production of food and livestock and the purposeful tendering of plants and animals, (Ahmed, 1993). He stated further that agriculture is the mainstay of many economies and it is fundamental to the socio-economic development of a nation because it is a major element and factor in national development. Economic history provides us with ample evidence that agricultural revolution is a fundamental pre-condition for economic growth, especially in developing countries (Woolf and Jones, 1969; Oluwasanmi, 1966; Eicher and Witt, 1964). In the same view**,** Okolo (2004) described agricultural sector as the most important sector of the Nigeria economy which holds a lot of potentials for the future economic development of the nation as it had done in the past. Notwithstanding the enviable position of the oil sector in the Nigerian economy over the past three decades, the agricultural sector is arguably the most important sector of the economy. Agriculture's contribution to the Gross Domestic product (GDP) has remained stable at between 30 and 42 percent, and employs 65 per cent, of the labour force in Nigeria (Emeka, 2007).

The literature has reported that in spite of Nigeria's rich agricultural resource endowment, there has been a gradual decline in agriculture's contributions to the nation's economy (Manyong *et al.*, 2005). In the 1960s, agriculture accounted for 65-70% of total exports; it fell to about 40% in the 1970s, and crashed to less than 2% in the late 1990s. The decline in the agricultural sector was largely due to rise in crude oil revenue in the early 1970s. Less than 50% of the Nigeria's cultivable agricultural land is under cultivation (Ugwu, 2015). Over the years, previous governments in Nigeria have embarked on many programmes to revitalize and revamp agriculture in Nigeria. These programmes have not turned to tide up the trend in Agriculture over the years. This is because the oil sector has continued to occupy the topmost position of the highest contributor to Nigeria's gross domestic product over the years. The implication is that despite efforts made to revamp agriculture, the desired result is yet to be achieved. Also, there is also the need for current empirical studies to complement various theoretical claims to validate the claim about Agricultural output as the engine of growth (Johnston and Mellor (1961); Thirtle, Lin and Piesse 2003) and causality relationship between agricultural output and economic growth, especially in developing countries. Few studies have ventured in this area. These problems serve as the motivation for this study.

This study is divided into five sections. The first section is the introduction. Section two is the literature review including the framework of study. Section three presents the Methodology and general

specification of the model. Section four presents the results of the analysis and their implications, while the last section is the concluding statement and recommendations.

Hypotheses

1. Ho: Agricultural output has no significant impact on economic growth in Nigeria.
2. Ho: There is no causality relationship between Agricultural Output and Economic Growth in Nigeria

Literature Review

Agricultural growth has played a historically important role in the process of economic development, evidence from industrialized countries as well as countries that are rapidly developing today indicate that the sector has been the engine that contributes to the growth of the overall economy. Johnston and Mellor (1961) asserted, "Agriculture contributes to the economic growth and development through five inter-sectoral linkages. The sectors are linked via, (i) supply of surplus labour to firm in the industrial sector, (ii) supply of food for domestic consumption, (iii) provision of market for industrial output,(iv) supply of domestic savings and industrial investment and (v) supply of foreign exchange from agriculture export earnings to finance import of intermediate and capital goods". In addition to these five direct market-based linkages, Timmer (1995) observed that agriculture indirectly contributes to economic growth via its provision of better caloric nutrient intake by the poor, food availability, food price stability and poverty reduction. Many empirical studies have examined the relationship between agriculture and economic growth.

Oji-Okoro (2011) examined the impact of the agricultural sector on the Nigerian economy using panel data for the period of 1986-2007and the technique of multiple regression. The result indicated a positive relationship between Gross Domestic Product (GDP) *vis a vis* domestic saving, government expenditure on agriculture and foreign direct investment.

Olajide, Akinlade and Tijani (2012) analyzed the relationship between Agricultural resource and economic growth in Nigeria. Using OLS methodology, the results revealed a positive cause and effect relationship between gross domestic product (GDP) and agricultural output in Nigeria. Agricultural sector is estimated to contribute 34.4 percent variation in gross domestic product (GDP) between 1970 and 2010 in Nigeria.

Oyatade and Applanaidu (2013), extended the previous empirical studies on the issue providing some evidence from time series data period over 1980 – 2011. In this study, the independent variables were agricultural, manufacturing and services sector whereas the dependent variable is the gross domestic product (GDP). The model was tested using

unit root test, ordinary least square (OLS), serial correlation LM test and heteroskedasticity test to analyze the significant contribution between the dependent and independent variables. The result shows that agricultural and services sector of non-oil export component contributed significantly to the economic growth (GDP) of Nigeria.

Gbaiye *et.al* (2013) determined if a significant long-run relationship exists between agricultural exports and economic growth in the present-day Nigeria for the period 1980 to 2010. The underlying models are the Export-Led Growth Hypothesis and the Neo-classical Growth Model. In the formulated model, Real Gross Domestic Product was used as the proxy for economic growth. The explanatory variables used were Gross Fixed Capital Formation, Labour force, Foreign Direct Investment and Agricultural exports. The study discovered that a long run equilibrium relationship exists between agricultural exports and economic growth and the relationship is elastic in nature meaning that a unit increase in agricultural exports would bring a more than proportionate increase in the Real Gross Domestic Product in Nigeria.

Enoma (2011) analyzed the impact of agriculture credit on economic growth in Nigeria using the method of Ordinary Least square, time series data spans the period 1986 to 2007 was used for data analysis. Finding revealed that agricultural variables have impact on economic growth and their contribution to export growth has been encouraging.

Nadira and Fagge (2014), analyzed the impact of agricultural credit on economic growth with emphasis on the Agricultural Credit Guarantee Scheme fund (ACGSF). Secondary data are solely used in the study from 1978-2011. The study uses vector autoregressive (VAR) model to evaluate the interrelationship among the variables of interest; Gross Domestic Product (GDP), Inflation (INF), Loan to cash crop (LCC), and Loan to livestock (LLS). The results showed that Improved and efficient credit programmes are needed in the sector that will lead to higher productivity and increased economic growth.

Gilbert, *et al* (2013) explored and quantified the contribution of agricultural exports to economic growth in Cameroon. The study employs an extended generalized Cobb-Douglas production function model, using food and agricultural organization data and World Bank Data from 1975 to 2009. All variables were non stationary and of an order I (1), so the Co-integration test was conducted for long run equilibrium. All the variables confirmed co-integration and as such the conventional vector error correction model was estimated using the Engle and Granger procedure. The findings of the study show that the agricultural exports have mixed effect on economic growth in Cameroon. Coffee

export and banana export has a positive and significant relationship with economic growth. On the other hand, cocoa export was found to have a negative and insignificant effect on economic growth.

Dim & Ezenekwe (2013) in their study answered the question, 'Does agriculture matter for economic development in Nigeria?' Life expectancy is modeled against agricultural output and agricultural expenditure, amongst other variables. Agricultural output is also modeled against a host of socio-economic, natural and human factors, which influence agricultural productivity. Applying Augmented Dickey-Fuller unit root test, Ordinary Least Squares, and the Newey-West method on secondary data and dummy variable used in the study, it was found that agricultural output has negative and significant impact on life expectancy in Nigeria. The impact of agricultural expenditure was found to be positive but not significant. The study submits that as much as agriculture may matter for economic development, reliance on the sector alone without corresponding and simultaneous development of other crucial sectors such as education, health, and industry will not yield positive fruits for economic development in Nigeria.

Omigie, *et al* (2013) explored the nexus amongst government agricultural spending and its inherent volatility level, total capital employed and turnover of the agricultural sector of the stock market and agricultural output in Nigeria. Time series data from 1978-2008 were employed. Data were analyzed using square of mean-adjusted relative change volatility estimation method, co-integration and error correction model and two-stage-least squares regression technique. There is the existence of a long-run relationship amongst government agricultural spending, total capital employed and turnover of the agricultural sector of the stock market and agricultural output. Government agricultural spending is influenced by its lag (0.42) and agricultural output (-1.94). Government agricultural spending stimulates the development of the agricultural sector of the stock market, while its volatility is an impediment. The agricultural sector of the stock market is an effective window policy makers can exploit to increase agricultural output.

Umaru & Zubairu (2012) investigated the contribution of agricultural sector and petroleum sector to the economic growth and development (GDP) of the Nigerian economy between 1960 and 2010 through the application of Augmented Dickey- Fuller technique in testing the unit root property of the series; after which Chow breakpoint test was conducted to test the presence of structural change or break in the economy. The results of unit root suggest that all the variables in the model are stationary and the results of Chow breakpoint test suggest that there is no structural change or break in the period under review. The results

also revealed that agricultural sector is contributing higher than the petroleum sector, though they both possessed a positive impact on economic growth and development of the economy. A good performance of an economy in terms of per capita growth may therefore be attributed to a well developed agricultural sector capital. A major policy implication of this result is that concerted effort be made by policy makers to increase the level of productivity of agricultural sector in Nigeria by improving expenditure on the sector so as to boost the growth of the economy.

Tochukwu (2012) investigated The Impact of Agricultural Development on Nigeria Economic Growth (1980-2010). Taking advantage of ordinary least square method (OLS), the research carried out by means of secondary data and using the independent variables. Agricultural Development (AGD), Capital Formation (CFN) Inflation Rate (INF), and Interest Rate (INT) to re-examine the question of whether agriculture could serve as an engine of Economic growth in Nigeria. The result from the empirical analysis shows that the productivity in agricultural sector has appreciably impacted positively on the economic growth in Nigeria.

A review of the empirical literature shows that most of the reviewed studies did not carry out a causality analysis between agricultural output and economic growth. Some of the studies did not consider agricultural output strictly as explanatory variable. Some of them used expenditure in agriculture (Oji-Okoro 2011) as proxy for Agricultural sector in their analysis. Only few of the studies carried out a long run analysis (Gbaiye *et al* 2013). It is these gaps this present study intends to cover.

Methodology

This study employed econometric methodology for the purpose of data analysis. The methods of ordinary least square will be employed to estimate the regression coefficients. The time series data includes gross domestic product (proxy for economic growth), gross fixed capital formation (proxy for capital stock) labour remuneration (proxy for labour) agricultural output for the period 1981-2013. They were sourced from the Central bank of Nigeria statistical Bulletin various issues. The Unit Root tests will be conducted to test the stationarity of the time series data. The unit root equation is given as: It is given as:

$$\Delta Y_t = t_o + t_1 y_{t-1}\ t_\alpha, \text{trend} + \sum P_{j=1}\ \Delta y_{t-1} + y_t$$

Where Δy indicates the first difference of Y_t and P is the lag length of the augmented terms for Y_t. The equation above allows the researcher to test whether the variable Y_t is a stationary series. The null hypothesis in the ADF test is that Y_t is non-stationary or has a unit root.

Co-integration and Error correction models will be conducted to verify the existence and degree of the

dynamic nature of the model. In order to test for the dynamic relationship between the variables in the model, the study compares the speed of adjustment in the independent error correction models using the ECM coefficient. If the ECM term is non-zero, the model is out of equilibrium. That is, there is equilibrium. If the ECM term is positive, it means that the GDP is too large to be in equilibrium. The ECM term is expected to be negative. Therefore change in GDP will have to be negative to restore the equilibrium. In other words, if GDP is above its equilibrium value, it will start falling in the next period to correct the equilibrium error.

The equation is stated thus:

$\Delta GDP = \beta_o + \beta_1 \Delta K + \beta_2 \Delta L + \beta_3 \Delta A + \partial ECM(-1) + \mu$ ……*(ii)*

Where: Δ is difference operator; and ECM is the OLS residual estimated from the first step regression.

The Granger causality analysis will be used to determine the causality between agricultural output and economic growth. The Granger causality test assumes that the information relevant to the prediction of these variables in the regression is contained solely in the time series data on these variables. This model was applied by Haruna (2012) to investigate the direction of relationship between real and financial sector growth in the context of recent capital market reforms in Nigeria. A general form of the granger causality analysis is stated. Assuming we are working to determine the causality between two variables: Banking sector credit (BSC) and Economic growth (GDP). The Granger causality test involves estimating the following pairs of regressions: BSC and GDP:

$$GDP_t = \sum_{i-1}^{n} \alpha_i K_{t-i} + \sum_{i-1}^{n} \alpha_i L_{t-i} + \sum_{i-1}^{n} \alpha_i A_{t-i} + \sum_{j=1}^{n} \beta_{t-j} GDP_{t-j} + u_{1t} \ldots\ldots\ldots\ldots (1)$$

$$K_t = \sum_{i-1}^{n} \alpha_i K_{t-i} + \sum_{i-1}^{n} \alpha_i L_{t-i} + \sum_{i-1}^{n} \alpha_i A_{t-i} + \sum_{j=1}^{n} \beta_{t-j} GDP_{t-j} + u_{2t} \ldots\ldots\ldots\ldots (2)$$

$$L_t = \sum_{i-1}^{n} \alpha_i K_{t-i} + \sum_{i-1}^{n} \alpha_i L_{t-i} + \sum_{i-1}^{n} \alpha_i A_{t-i} + \sum_{j=1}^{n} \beta_{t-j} GDP_{t-j} + u_{3t} \ldots\ldots\ldots\ldots (3)$$

$$A_t = \sum_{i-1}^{n} \alpha_i K_{t-i} + \sum_{i-1}^{n} \alpha_i BSCL_{t-i} + \sum_{i-1}^{n} \alpha_i A_{t-i} + \sum_{j=1}^{n} \beta_{t-j} GDP_{t-j} + u_{4t} \ldots\ldots\ldots\ldots (4)$$

In the above model, each variable functions is endogenous. In all the models F tests are conducted to determine whether β, α, ρ, and σ are significantly different from zero.

Decision Rule:

The Granger causality analysis follows F-distribution. Reject Ho if the probability of F-ratio < 0.05, if otherwise, accept Ho.

Model Specifications

The functional relationship between agriculture output and economic growth is captured by the neoclassical growth model. This theory states that output (growth) is a function of capital stock and labour given the state of technology. Re-stating equation 1:

$Q_t = Af(K_t, L_t)$ ……*(1)*

Agriculture augments productivity of labour by providing food and other materials for the labour force. The total productivity factor (*A*) augments labour, so we have:

$Q_t = Af(K_t, L_t, A_t)$ ……*(4)*

Also investment in agriculture leads to increase in output.

$Q_t = f(K_t, L_t, A_t)$ ……*(5)*

Where GDP_t = gross domestic product (dependent variable)

Explanatory Variables:

K_t, = Gross capital formation (capital stock)

L_t, = labour remuneration (labour)

A_t, =agricultural output

Results and Discussions

We begin to test the time series data to determine if they are amenable for long run use and prediction. The unit root test for stationary was conducted for this purpose. The Variables for analysis are subjected to the Augmented Dickey-Fuller test Unit Root test. The regression was run with intercept to ensure uniformity and balance in their Error correction modeling estimation. The result is presented in Table 1. A look at table shows that all the time series variable were I(2) except GDP which was I(1). Since all the time variables are not stationary, we go further to test if they have a long run relationship. This is regarded as the test for Co-integration, to see if the residuals of non-stationary time series variable can become stationary if combined in a linear form. Below is the unit root test of the overall residual – Engle-Granger Co--integration analysis.

The result of Engle-Granger Co-integration analysis is shown on Table 2 in the appendix. The result indicates that the unit root test of the OLS residual is stationary when regressed at 5 lags, no trend, and no intercept. In other words, the time series variables are co-integrated. The absolute ADF t-statistic (-5.448132) exceeds the 5% critical value of -1.956406, implying that Co-integration exist. The present study found that a long run relationship subsist between agricultural output and economic growth. This is supported by Gbaiye *et al*. (2013) who discovered that a long run equilibrium relationship exists between agricultural exports and economic growth and the relationship is elastic in nature meaning that a unit increase in agricultural exports would bring a more than proportionate increase in the Real Gross Domestic Product in Nigeria. Gilbert et al. (2013) agricultural exports have a long-run relationship with economic growth in Cameroon.

Having established that Co-integration exists, we go further to calculate the speed by which the dependent variable GDP is restored

back to equilibrium if there is a shock. This is the error correction model analysis displayed in Table 3. The error correction model result above indicates Agriculture contributes positively to economic growth but it is not significant. A 1% change in agricultural output causes GDP to increase by 0.34%. Also labour and capital contributes positively to economic growth. A 1% change in capital stock causes GDP to increase by 0.01%. A 1% change in labour supply causes GDP to increase by 0.04%. The ECM term is correctively signed and well behaved (It is negative). The result above indicates that the ECM term is significant at 10%. It takes about 39.35% for GDP to restore itself to equilibrium after a shock. Very few studies support the present finding. The study by Oyatade and Applanaidu (2013) shows that agricultural and services sector of non-oil export component contributed significantly to the economic growth (GDP) of Nigeria. Also, Enoma (2011) findings revealed that agricultural variables have impact on economic growth and their contribution to export growth has been encouraging. In addition, the study Olajide, Akinlade and Tijani (2012) revealed a positive cause and effect relationship between gross domestic product (GDP) and agricultural output in Nigeria. This present study differed greatly from the outcome of the study by Dime and Ezenekwe (2013) who found that agricultural output has negative and significant impact on life expectancy in Nigeria. The impact of agricultural expenditure was found to be positive but not significant. Real gross domestic product and industrial output were also found to influence life expectancy.

Table 3 presents the result of the Granger causality test. Result shows that neither agriculture output nor GDP granger causes each other, since the probability of the F-statistic for the two null hypotheses exceeds 0.05. In other words, there is no causality relationship between agricultural output and GDP in Nigeria over the period under study. This is against economic theory.

Conclusion

Going by the econometric investigation done in this study, the study concludes that Agricultural output has a positive but not significant impact on economic growth in Nigeria over the period under study. The implication is that agriculture is yet to contribute significantly to the growth of the Nigerian economy. Again, the relationship between agricultural and economic growth was found to be positive. This implies that agriculture has the potential of contributing more to the economy if given adequate and required attention. A long run relationship exists between agricultural output and economic growth. There is no causality relationship between agricultural output and economic growth.

Recommendations

1. This study reveals that the contribution of agricultural output to economic growth in Nigeria is positive. Though, not statistically significant, the positive nature of the relationship implies that agriculture has the potentiality of taking the Nigerian economy to greater heights. Therefore, there is need for greater and urgent attention for policy makers and economic managers to look for ways of enhancing agricultural output in the Nigerian economy. As a way of encouraging Nigerians to embark in farming, government encourage commercial and large scale farming as a means of increasing agricultural output.
2. There is the need for increased investment in physical infrastructure, especially in the rural areas. This would go a long way in discouraging rural-urban migration and improving the quality of life in the rural areas, where most of the population are engaged in Agriculture.
3. Government should look for ways of providing land for commercial farming, especially for private sectors investors who are willing to go into large scale farming.

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APPENDIX

Table 1: Result of Unit Root Test Analysis

S/N	VARIABLES	ADF t-stat	5% critical value	Order of Integration	Trend
1	Log(A)	-5.962350	-2.963972	I(2)	With trend
2	Log(K)	-4.227698	-2.963972	I(2)	With trend
3	Log(L)	-2.756165	-1.955681	I(2)	No trend, no intercept
4	Log(GDP)	-5.304311	-2.960411	I(1)	With trend

Source: Eviews 7 computations

Table 2: Engle-Granger Cointegration Result

Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.448132	0.0000
Test critical values:	1% level	-2.669359	
	5% level	-1.956406	
	10% level	-1.608495	

*MacKinnon (1996) one-sided p-values.

Table 3: Parsimonious Error Correction Model

Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 07/05/15 Time: 23:53

Sample (adjusted): 1983 2013
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.210926	0.033514	6.293744	0.0000
D(D(LOG(K)))	0.016390	0.105577	0.155242	0.8778
D(D(LOG(L)))	0.047549	0.059910	0.793685	0.4346
D(D(LOG(A)))	0.344601	0.261480	1.317888	0.1990
ECM(-1)	-0.393566	0.222525	-1.768635	0.0887

R-squared	0.207477	Mean dependent var	0.215398
Adjusted R-squared	0.085551	S.D. dependent var	0.189149
S.E. of regression	0.180877	Akaike info criterion	-0.435308
Sum squared resid	0.850630	Schwarz criterion	-0.204020
Log likelihood	11.74727	Hannan-Quinn criter.	-0.359914
F-statistic	1.701656	Durbin-Watson stat	1.557749
Prob(F-statistic)	0.179898		

Table 4: Granger Causality Result

Pairwise Granger Causality Tests
Date: 07/05/15 Time: 23:19
Sample: 1981 2013
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LOG(A) does not Granger Cause LOG(GDP)	31	2.42187	0.1085
LOG(GDP) does not Granger Cause LOG(A)		0.12018	0.8872