Agriculture Output and Economic Growth? A Causality Test in Nigeria

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Abstract: The connection between economic growth and agriculture output is well recognized in the literature, but the causation of the relationship is quite confusing. Understanding the direction of causality between the two variables is good for policy formulation. This study examines the relationship between economic growth and agriculture output from 1970 to 2015. The variables used are real GDP and agriculture output. Engel-Granger causality test was used to test the route of causality between the two variables. The results show a bi-directional causality between them. Given the inevitability of economic recession, this paper recommends programmatic diversification from oil related products to agriculture based production.
Keywords: Real GDP, Agriculture , Granger-Causality Test

INTRODUCTION

Substantive evidence in the literature have revealed that agriculture plays a major role in the process of economic growth. The World Food Summit held in Rome[1] reinforced the supportive role played by agriculture at ensuring food security, poverty alleviation and prevention of unemployment. Within the confines of Nigerian economy, agriculture played a dominant role in process of economic growth after the independence in the early 1960s before the discovery and exploration of crude oil. The sector contributed immensely to the growth performance of the economy in the area of food supply, raw material production, employment generation, foreign exchange inflows and GDP stabilizer. However, the emergence of crude oil cut short the revenue generated from agriculture to the GDP. During the period 1960-1969, average agriculture share in the GDP stood at 57.2%. It nose-dived sharply to 31.7%, 34.7%, 33.4%, 35.3% and 37.7% during the periods 1970-1979, 1980-1989, 1990-1999, 2000-2009 and 2010-2015 respectively [1]. The neglect of agriculture was sustained due to petro-dollar income from crude oil.

Agriculture suffocated significantly during the oil boom period. Nigeria has great potentials for agricultural development but the opportunity eroded due to policy inconsistency, over dependence on oil, infrastructure decay, agriculture research gaps, capital inadequacy and corruption. Consequently, Nigerian economy became monolithic, thereby relying on crude oil revenue for economic survival. However, the global fluctuations in crude oil prices in the international market adversely affected Nigeria's economy with attendant decline in GDP growth and other macroeconomic indicators. The abysmal decline in economic activities resulted into economic recession [2]. From the foregoing, there is need by the government to resuscitate agricultural sector in order to leverage on the dwindling performance from crude oil revenue to the GDP. The neglect of agricultural sector has resulted into stunted and epileptic growth which affected macroeconomic indicators[2].

Growth is a necessary but not a sufficient condition for sustainable development. If growth

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[1].The World Food Summit was held in 2009. The summit converged in opinions and recommended that adequate attention be given to agriculture based on the sector's antecedents in raising the quality of societal welfare (see Cervantes-Godoy & Dewbre, 2010).

[2].The following are examples of macroeconomic policy variable indicators: Food production, prices of goods and services, industrial inputs (raw materials), employment and foreign exchange. Food production reduced, prices of goods and services have skyrocketed, raw materials needed for production went out of sight, employment opportunities crippled, foreign exchange became a scarce commodity. Food situation in Nigeria seems to have taken an unexpected dimension as prices have skyrocketed. The cost of acquiring agricultural materials have also gone up significantly since 2006. The price have ceased to come down ever since then. As reported by Agwu et al, 2011, the Food and Agriculture Organization (FAO) indicated that food price index rose on average of 9% in 2006 as against what was obtained in 2005. When compared to the period December, 2006 to December, 2007 the increase in the value of the index was 37 percent. The CBN (2009) pointed out that food shortages in Nigeria have resulted into importation of food items and this have further worsened the trade balance position of the country.

fundamentals [3] are not appropriately addressed, sustainable development may be eluded. However, food requirement for the teeming population constitute the critical driver of growth process and it falls under the canopy of agriculture. This implies that any short falls in food supply has implications on growth quality and economic welfare. In order to address the question of agriculture neglect, both federal and state governments have mapped out programmes that would rejuvenate agriculture and promote qualitative growth. Quite a number of the programmes were coordinated by agencies created under the ministry of agriculture. The programs include: Operation Feed the Nation, National Accelerated Food Production Project, Green Revolution, National Seed Multiplication Program and Agro Service. Despite the economic benefits that the programmes has, they all faded off prematurely due to policy inconsistency, unseriousness in project continuity and financial constraints.

The theoretical position on the relationship between agriculture and economic growth has drawn series of divergent positions among researchers and the issue remained unresolved. In order to concretize the causal dynamics of relationship between agriculture and economic growth, empirical exposition is therefore required. A large number of studies have empirically documented that agriculture output alone drives structural transformation in an economy and that any neglect in the sector has detrimental effects on rural poverty [3-5]. In addition, scanty empirical information on the relationship between agriculture and economic growth informed the motivating spirit behind this study. This study further complements the existing body of knowledge by making some contributions by providing comparisons between agricultural sector performance and economic growth in Nigeria. Apart from the introduction, section 2 presents the review of literature on agriculture and economic growth linkages. Section 3 explains the research methodology, while section 4 presents the empirical analysis. Section 5 discusses the empirical results and policy implications. Section 6 gives the summary and recommendation.

REVIEW OF LITERATURE

The literature has articulated the role played by agriculture to the Nigerian economy [6-9]. Going by the theory of development, an underdeveloped economy is driven by two sectors, traditional agricultural sector and modern industrial sector [10]. The two sectors formed

the basis of Rostow [11] analysis on the five stages of economic growth process. According to Rostow, the growth stages include: traditional society, pre-condition for take-off, take-off, drive to maturity and age of high mass consumption. The first three stages clearly spelt out the pivotal role played by agriculture. The other two stages leveraged on the performance of agriculture as springboard for industrial take off. This process clearly marked the genesis of agriculture and economic growth linkages.

Empirically, volumes of studies have extensively analyzed the relationship between agriculture and economic growth, though no unanimity of agreement on the exact relationship. While some studies suggested that agriculture drives economic growth [12-13], others maintained that the externality derived from agriculture by other sectors are too insignificant and non-responsive to economic growth [14]. However, the growth recorded in the agricultural output has been found to catalyze growth in the non-agricultural economy by creating inter-sectoral linkages[4] [15, 16]. Some strands of studies have also suggested that agriculture may not always promote desired economic growth particularly if the economy largely depend much on agriculture export [17-19]. The justification advanced for this position is that fluctuations in the global economic market may have adverse effects on domestic economy and possibly result into trade shocks.

Empirical works on the relationship between agriculture development and economic growth are relatively few and scanty in Nigeria. For example Bakare [20] carried out an econometric analysis of sustainable agriculture and rural development during the period 1980-2010 using vector autoregressive approach. Findings from the study showed that the previous values of agricultural output predicted the future behaviour of rural development. In another study, Odetola & Etumnu [21] investigated the contribution of the agriculture sector to economic growth using the growth accounting framework and time series data from

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[3].The growth fundamentals that needs to be addressed include: food supply, income distribution, shelter, health care, prices and employment. Any deficiency in their supply would retard the quality of growth and development.

[4] . Johnston and Mellor (1961) explained the contribution of agriculture to economic growth within the context of five inter-sectoral linkages. In the analysis, the sectors are linked through: (i) supply of surplus labour to firms in the industrial sector; (ii) supply of food for domestic consumption; (iii) provision of market for industrial output; (iv) supply of domestic savings for industrial investment; and (v) supply of foreign exchange from agricultural export earnings to finance import of intermediate and capital goods.

1960-2010. The causality test result indicated that agriculture growth granger caused GDP growth. Interpretatively, this implies that agriculture sector contributed positively and consistently to economic growth in Nigeria. Umaru & Zubairu [22] conducted an empirical analysis on the contribution of agriculture and petroleum sector to the growth and development of Nigerian economy using annual time series data which spanned the period 1960-2010. Within the context of OLS methodological framework, findings from the study showed that agricultural sector contributed much to national output than does the petroleum sector. Olajide *et al* [23] analyzed the relationship between agricultural resource and economic growth in Nigeria between 1970 and 2010 using Ordinary Least Square (OLS) regression method. The study found a positive causal relationship between GDP and agricultural output. Specifically, the literature track on the relationship between agriculture and economic growth tilted towards a linear relationship with one another, reinforcing the theoretical position held in the literature, attributing periodic growth to agricultural performance.

RESEARCH METHODOLOGY
The Model
Specifically, the model can be specified as:
$$Ecogr = f(Agout) \qquad (1)$$
Expressed in linear form, we have :
$$Ecogr_t = \beta_0 + \beta_1 Agout_t + \mu_t) \quad (2)$$
Where $Ecogr_t$ denotes economic growth; $Agout$ is agriculture output ; μ_t is the error term and t stands for time. All variables in the model specifications of this study are in their log forms.

Scope of the study and sources of data
The scope of this study spanned the period from 1970 to 2015. The choice of this period was largely informed by the availability of data as well as the need to examine the relationship between the variables in Nigeria over a considerable length of time.

In order to facilitate this time series analysis, data were generated from the Central Bank of Nigeria Statistical Bulletin(various issues)

Time series properties of data
We ascertained the time series characteristics of the variables using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests procedure. The reason for this is to avoid spurious results.

Estimation technique
This study attempts to establish the direction of causality between the variables in the model, especially that between the growth variable and agriculture output after carrying out the unit root and cointegration tests.

Empirical Analysis
Unit root tests were conducted for the variables using the Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test and the results are presented in Table 1. Note that the MacKinnon critical values for the Augmented Dickey-Fuller (ADF) test, using the Akaike information criterion (AIC); and Phillips-Perron test, using the Newey-West bandwidth, as well as the Barlett-Kernel spectral estimation method at 1%, 5% and 10% significance levels were -6.5120, -6.9524, -6.5242 and -9.3828 respectively. Stationarity (unit root) tests conducted for the set of variables in the model revealed that all the variables are I(1) variables (integrated of order 1). That is, they are not stationary at levels but are all stationary at their various first differences.

Table 1: ADF Unit Root Results

Variables	ADF Test Statistic	PP Test Statistic	Order of Integration	Lag Length
Ecogr	-6.5121	-6.9524	I(1)	2
Agrout	-5.2893	-9.3828	I(1)	2

Source: Author's computation

As evidenced from Table 1, all the variables are stationary at levels but integrated of the first order. The study then proceeded to test if they are cointegrated. The result is presented table 2.

Table 2 presents the cointegration result for the model. Here, it is observed that the variables in the equation are cointegrated. The trace and max-Eigen values indicated the presence of two (2) cointegrating equations at 5% levels. The existence of this cointegration implies that there is a long run equilibrium relationship existing between the variables in the equation. This is to say that if a set of variables are cointegrated, the effects of a shock to one variable spread to the others, possibly with time lags, so as to preserve a long run relationship between the variables.

Table 2: Johansen cointegration test

Included observations: 43 after adjustments				
Trend assumption: Linear deterministic trend				
Series: ECOGR AGROUT				
Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.509161	34.63729	15.49471	0.0000
At most 1 *	0.089607	4.036794	3.841466	0.0445
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.509161	30.60050	14.26460	0.0001
At most 1 *	0.089607	4.036794	3.841466	0.0445
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

DISCUSSION OF EMPIRICAL RESULTS AND POLICY IMPLICATION

As shown in tables 2 and 3 on the relationship between economic growth and agriculture output in Nigeria, the study rejected the null hypotheses in both cases that agriculture output does not Granger cause economic growth and that economic growth does not Granger cause agriculture output, and accepted the alternative hypotheses in both cases. This is obvious, given the values of their respective probability in the Granger causality table. In this situation, it is concluded that there is a bi-directional relationship between economic growth and agriculture output in Nigeria. The causality runs both ways. This implies that bi-directional causality between economic growth and agriculture output is found in the long run period. Along with the result of the cointegration, it was observed that if the system is exposed to a shock, it will converge to the long run equilibrium at a relatively high speed for economic growth and agriculture output. The result here corroborates the findings by Odutola & Etumnu [21], Umaru & Zubairu [22] and Olajide *et al* [23].

Table 3: Pairwise Granger causality test

Sample: 1970 2015			
Lags: 3			
Null Hypothesis:	Obs	F-Statistic	Prob.
AGROUT does not Granger Cause ECOGR	43	0.28702	0.0444
ECOGR does not Granger Cause AGROUT		0.73281	0.0539

This result shows that agriculture has a great potentials in the process of economic transformation and revenue mobilization following the dwindling performance of oil revenue in Nigeria. Sustaining agricultural production would open the window for employment opportunity, provide food security for the teeming population and mobilization of foreign exchange rate through exports of agricultural products.

SUMMARY AND RECOMMENDATION

This paper has investigated the causality between economic growth and agriculture output in Nigeria. The result showed a bi-directional causality between economic growth and agriculture output. The finding of bi-directional causality between economic growth and agriculture output has vital policy implications for the economic planners. The ongoing diversification of economic base from oil related products to agriculture related products should be done with the country's economic growth in focus.

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