Agricultural Output and Economic Growth in Nigeria

Babatunde Afolabi, Biodun Ogundele, Ibukun Felix Olusegun, Bode Owoseni

Department of Economics, Afe Babalola University, Ado Ekiti, Nigeria

This research work examined the impact of Agriculture output on Economic Growth in Nigeria, with the objective of determining the relationship between the Agricultural sector and the Economic Growth rates in Nigeria. Thus, the research was aimed at examining the contributions of agriculture (value added) to the growth of the national economy, investigating government expenditure on agriculture in Nigeria, and determining the contributions of crop production from agriculture on the Nigerian economy. Data were collected from the World Bank Data base and CBN statistical bulletin. Co-Integration and Vector Error correction model techniques were employed as well as the Granger Causality test to determine the causality relationship between Agriculture and Economic Growth. As a result of the data collected, analyzed and interpreted, the research found that Agriculture has positive and long run impact on Economic Growth in Nigeria. The paper recommends amongst many other things that the Government of Nigeria should put in more efforts to diversify the Nigerian economy as the Nigerian agricultural sector currently suffers a lot of marginalization which has not enabled it to contribute more significantly as it should.

Key words: Agriculture, Economic Growth, Government Expenditure, Diversify.

INTRODUCTION

Background of the study

Without gainsaying agriculture throughout history has served as an integral part of man’s primary survival with the basic provision of food for man’s consumption. In a more definitive sense, agriculture entails more than just the provision of food for man; it has also served man in a more economic aspect of life. Thus, agriculture can be defined as the growing of food and cash crops as well as the rearing of animals for both immediate consumption as well as economic purposes. There are a number of economic activities that are linked with agricultural processes which are carried out with the sole purpose of making profit. These activities may include some of the following; livestock and forestry, fishery, processing and finally the marketing of such agricultural produce. In a study carried by Ewetan, Fakile, Urhie and Oduntan (2017) they found that the agricultural sector contributed positively and consistently to the economic growth in Nigeria, reaffirming the sector's importance in the economy.

There are numerous other definitions of agriculture propounded by scholars of both economics and agriculture. Some of these definitions will be highlighted as follows. According to Mowenyu (2001) agriculture is the form of agriculture which farmers use their small land holdings to produce enough for their own consumption, and the little remaining is used for exchange against other goods. Other scholars tried to define other aspects or types of agriculture such as sustainable agriculture, shifting cultivation, conservation agriculture among others.

According to Waugh (2009) a sustainable agricultural system is one that can indefinitely meet the requirements for food, feed and fiber at social acceptable economical and environment costs.

*Corresponding author: Babatunde Afolabi, Department of Economics, Afe Babalola University, Ado Ekiti, Nigeria. E-mail: atunne@gmail.com
In the field of shifting cultivation, Crosson (1992) argues that in this type of agriculture a path of forest land is cleared by a combination of felling and burning and crops are grown. After two to three years the fertility of the soil begins to decline, the land is abandoned and the farmers move to clear a fresh piece of land elsewhere in the forest as the process continues. While the land is left, the forest regrows in the cleared area and soil fertility and biomass is restored. After some several years for example a decade, the farmer may return to the first piece of land. The Nigerian agricultural sector was renowned for the export of cash crops (agricultural crops and produce with export value) namely cocoa, rubber, hides and skin, groundnut palm among a host of many others. The agricultural sector holds an enormous potential for the growth and economic development of the country. Kamil, Sevin, Festus (2017)

Agriculture’s influence on the growth of an economy cannot be over emphasized. It serves as a source of food, employment opportunities as well as the provision of foreign exchange earnings for the economy, Onuze (2012). Surplus accounted for in this sector of an economy can further be directed into the growth and development of other sectors of the economy thus ensuring the general growth of the economy. Thus, agriculture will always be crucial to the improvement of an economy due to its fundamental contribution to the survival of man and the economy in which he exists.

The growth of agriculture in Nigeria over recent years has been repeatedly stunted due to a number of regrettable factors which include corruption, poor management, and insufficient storage facilities among many other factors, Sanusi (2010). Although these factors have greatly hindered the growth and development of agriculture in Nigeria, this wasn’t always the case as Nigeria actually experienced increasing levels of growth and development in her agricultural sector. This growth was experienced during the period of colonialism in Nigeria which was between the periods of 1860-1960. The most notable achievements of this era include the establishment of a botanical research stationing Lagos by Sir Claude McDonald in 1893. During the post-independence era, there were numerous polices adopted and formulated by the government to enhance the production and output levels of the agricultural sector. These policies included farm settlement schemes and the National Accelerated Food Production Program (NAFPP) which commenced in the year 1972. Other notable developments in the agricultural sector include; Operation Feed the Nation (1976), River Basin and Rural Development Authorities (1976), Green Revolution Program (1980), and so on. Despite these numerous attempts to boost agricultural resource output in the sector, in recent years the agricultural sector continues to suffer mismanagement due to corruption and other factors present in the economy.

Awokuse (2009). It is important to state that since the discovery of crude oil in the late 1950’s, the agricultural sector has since been greatly neglected and as such rendering Nigeria a mono-cultural crude oil based economy. Thus making it increasingly important to re-examine and analyze the various impacts of agriculture to the growth of an economy. Hence this paper attempts to extensively analyze the important contributions of agricultural output to the growth of the Nigerian economy. The objective of the study is to examine the impact of agriculture on Nigeria’s economic growth. And also investigate government expenditure on agriculture in Nigeria.

The rest part of the paper is divided into three sections, section two discussed the literature review, and section three handled the methodology and results while the last section discussed the findings and recommendations of the study.

LITERATURE REVIEW

Conceptual Framework

In Nigeria, agriculture is the number one employer of individuals in the economy with about 70% of the total population of Nigeria being actively involved in agriculture or activities associated with agriculture such as processing and marketing of the agricultural produce (Anriquez and Stamosulis, 2007). Thus with such proportions of individuals in the country playing an active role in the sector, the agricultural sector impacts directly in the lives of individuals with the provision of food and income which such stakeholders in the sector use to sustain their livelihoods. As mentioned before, agriculture entails a lot more than just the growth of crops and the rearing of animals. Other components of Agriculture include fishery, forestry and animal breeding.

This justifies the need for urgent actions and interventions to address the myriads of problems of the rural areas and set the nation on the path to glory and excuse a larger proportion of the nation’s population from inhuman living circumstances in order achieve greatness. It is probably as a result of the aforementioned that successive governments in Nigeria have executed several agricultural development interventions aimed at improving or elevating the level of agricultural production that will ensure self-sufficiency in food production. These interventions can be viewed from two perspectives that are based on Policy and Nature of the Agency. An attempt is made in this paper to review some intervention programmes of successive governments in Nigeria. The 1962-1968 development Plan was Nigeria's first national plan. Among several objectives, it emphasized the
introduction of more modern agricultural methods through farm settlements, co-operative (nucleus) plantations, supply of improved farm implements (e.g. hydraulic hand presses for oil palm processing) and a greatly expanded agricultural extension service.

a) Policy Based Intervention Programmes

i) National Accelerated Food Production Programme (NAFPP)

This programme was designed in the early 60s by both the Federal and state governments to accelerate the production of grains (maize, rice, guinea corn, millet, wheat, cassava and cowpeas). It was the opinion of the initiators of this programme that target crops for accelerated production are major staple foods of Nigerians and if produced in abundance, hunger and related food crisis will be put to check. This was achieved through the introduction of high yielding varieties, use of appropriate fertilizers, agrochemicals, good storage and processing facilities, provision of credit as well as marketing outlets. In addition, several research institutes were mandated to develop improved crop varieties and were made popular through extension agents and the use of mass media.

ii) Operation Feed the Nation (OFN)

In 1976, Operation Feed the Nation was launched by the administration Gen Obasanjo to address the problem of rising food crisis, rural-urban migration and escalating food import bills. The OFN programme attempted to mobilize the general public to participate actively in agricultural production and ensure self-sufficiency in food production. The programme stimulated Nigerians to farming through the strategy used. Some of these strategies included subsidized production inputs, increased bank credit to farmers, establishment of commodity boards and fixing of attractive prices for agricultural produce.

iii) Green Revolution Programme (GR)

The Green Revolution Programme replaced the Operation Feed the Nation of the Federal Military Government by the civilian government of Alhaji Shehu Shagari in 1979. This was an attempt to bring about radical changes in Nigerian Agricultural production and eliminate inherited food problems of successive governments. Large, medium and small-scale farmers received a number of incentives to boost their production level during the implementation of the programme. Livestock and crop components were introduced while the research institutes were re-organized to make them more responsive to the need of the programme (Williams, 1981).

B) Agency-Based Intervention Programmes

i) National Agricultural Land Development Authority (NALDA)

This development authority executed a national agricultural land development programme aimed at moderating the problems of low utilization of abundant farm land, thereby increasing food production level of farmers through expansion of farmers’ farm lands. A survey conducted by the Central Bank of Nigeria in 1998 indicated that the agency was able to develop 16,000 hectares of land. Out of this, 12,984 (81.1%) was cultivated with various crops. It also provided extension services to farmers at project sites. The overall goal of NALDA was to encourage farmers to plant above what they can consume, so that the surpluses can be sold at the local markets or exported to other countries for foreign exchange earnings.

ii) River Basin Development Authority (RBDA).

The existing abundant water resources in the country and its potential for increasing agricultural production prompted the establishment of River Basin Development Authority (RBDA). The scheme became necessary because of persistent short rainy seasons in many parts of the country which has continued to restrict cultivation to single cropping pattern the year round. However, the establishment of various large-scale irrigation facilities the country witnessed unprecedented multiple cropping patterns. In addition, larger areas were put into cultivation, while livestock and fisheries production were intensified. Available statistics from eight River Basin Development Authorities showed that there was an increase in the tempo of activities in 1998 when the total land area developed by the authorities rose from 30.3 thousand ha in 1994 to 47.7 thousand ha in 1998. William (1981) had earlier reported that the Hadejia-Jama’are River Basin and Tiga and Challawa dams located in former Kano State could conserve enough water to irrigated land that can produce over 50% of the nations need for wheat, 30% of its need for rice, cotton and sugar cane. In addition, it could produce several thousand tons of fish; develop livestock, poultry and hydroelectric power generation.

iii) Agricultural Development Programmes (ADPs)

The idea of Agricultural Development Programmes is an offshoot of the concept of integrated agricultural and rural development. It started in 1972 in Northern Nigerian towns of Gombe and Gusau with two pilot projects assisted by the World Bank. This became necessary because of the need for the application of knowledge and skills in all the relevant areas of agriculture. This concept involves the provision of infrastructural facilities such as roads, schools, water supply in the rural areas at the right times in required quantity to farmers. The ADP is the implementation organ of the state ministry of agriculture and natural resources. It is semi-autonomous and focuses on the small farmer. It adopts the integrated rural development strategy in its operations (Jibowo, 2005). The success of the Gombe and Gusau projects encouraged other state governments to embark on more of such projects with the assistance of the World Bank. Since then, Nigeria has continued to witness agricultural development programmes of various dimensions. It is
against this background that effective extension services have been established. The closest assistance ever realized by farmers in Nigeria have come from contact with various Agricultural Development Programmes (ADPs) and the extension agents working under the Training and Visit (T and V) system. The Activities of ADPs in Nigeria spread over three thematic areas; provision of infrastructural rural facilities, conducting worthwhile trainings on improved agricultural technologies and supply of farm inputs.

iv Directorate of Food, Road and Rural Infrastructure (DFRRI)

Trends in the transformation of the rural sector shows that despite the huge investment in the agricultural sector, which was assumed will automatically bring about eradication of rural poverty and isolation has not been achieved. This is partly due to the deplorable conditions of rural areas, enormous size and dwindling economic resources to address the problem of rural under development in Nigeria. In 1987, the Babangida administration established the Directorate of Foods, Road and Rural Infrastructure (DFRRI). On establishment, DFRRI attempted to open the rural areas through the construction of access roads, and provision of basic amenities of modern living. This is inevitable because it has long been realized according to Otubanjo (1992) that the economic future of Nigeria depends on the development of rural areas. Therefore, the potentials of rural areas were seen to be both immediate and long term.

Empirical Review

Over the years, there have been numerous empirical studies carried out in a quest to evaluate just how effective or how contributive agriculture is to economic growth. Some researchers have been led to believe that economic growth is dependent on the growth and development of the traditional sector (agricultural sector) while others on the other hand believe that the impact of agriculture on the growth of the economy was rather passive and not direct. Those that advocated for the development of the agricultural sector accompanied by industrial improvement believed the sector to being a critical pre-condition for economic growth (Schultz, 1964; Timmer, 1995, 2002). There have been previous attempts made by LDC’s to modernize their economy without developing their agricultural sector first. This therefore resulted to insignificant growth rates and uneven distribution of income (Bhagwati and Srinivasan, 1975). It is thus important to take note that an advanced agricultural sector will provide the economy with the resources it needs to become an industrial one (Thirtle, Lin and Piesse, 2003). For example, several Asian economies such as China and Thailand have enjoyed significant growth in the past three decades.

While in comparison, the growth experienced by African and Latin countries is small; and it is common to see that agriculture accounts for over 20% of the GDP in most African nations. Subsequent research has showed that agriculture supplies labor to firms in the industrial sector, supplies food, provides a market for industrial output, supply of domestic savings and a source of foreign exchange earnings. These contributions of agriculture to growth were via inter-sectoral linkages. Timmer (1995) also argued that argued that agreed provided better nutrition, price stability of food, food security as well as property reduction.

On the other hand, other researchers did not believe in such linkages between agriculture and other sectors and they even rendered any existing link as a weak and insignificant link. Policy makers adopted anti-agricultural strategies with more emphasis being played on the industrial sector. In 1979, the Chinese traditional sector was under heavy tax burden and reserves were used to subsidize industrial development (Yao, 2000).

Another noticeable attempt was made to reconcile the relationship between agricultural productivity in the traditional sector and economic growth. This attempt was made by Matsuyama (1996). His theory is partially consistent with the evidence gotten from modern developing countries. Matsuyama’s theory believed that the degree of openness i.e. how open the economy is might be a detrimental factor to the growth of the agricultural sector which in turn does not allow for effective growth in the economy. However, it is important to know that this effect is not significant enough to cause any negative relationship between economic growth and agriculture in the long run. This occurrence is believed to take place in developing countries that are assumed tone open in nature. He argued that “the key to understanding these two conflicting views can be found in the difference in their assumptions concerning the openness of economies”.

Theoretical Framework

Harrod-Domar Growth Model

There are a number of theories that try to explain the importance of agriculture to an economy. One of these theories is the Harrod-Domar Growth Model. This model was propounded by two individuals named Sir Roy Harrod (in 1939) and Evsey Domar (1946). The main idea advocated for by this growth model is that for an economy to experience economic growth, there must be high levels of savings which in turn translates into high investment and also the need to reduce capital output ratio. They advocated that the major components or requirements for economic growth include not only savings and investment
but also implicit technological change or improvement. The idea that capital output ratio should reduce (i.e., less capital is required to produce a unit of output) is attainable through significant improvement in production technology. It is important to note that this model was originally developed to examine business cycles and then adopted to explain economic growth. In any event where an economy cannot achieve the previously mentioned requirement for economic growth, they can always result to borrowing from international financial institutions in order to “jump start” its economy. In order for firms to have investable funds to borrow, there is the need for higher levels of saving in the country. These firms can thus invest here funds back into the economy in order to generate economic growth through the increase in production of goods and services. If the capital output ratio decreases in an economy, it means that goods are produced with fewer input thus rendering the economy more productive. This leads to the growth of the economy. The Harrod-Domar growth model is one which is relevant in development economics. Its implications are therefore that economic growth can be achieved through improvements in technology and a reduction in the economies capital output ratio. Rate of growth (Y) = Savings (s)/ capital output ratio (k).

This model implicitly describes the importance of investment of funds into capital goods as an implication of economic growth. Capital goods are goods that are used and transformed into consumer goods, so in that sense capital goods are usually what we refer to as raw materials and the one and only sector in any economy that acts as a source of these raw materials is the agricultural sector. So the implication of this is that for an economy to experience growth, the levels of savings should be high in order to create investable funds for firms to turn invest back into capital goods and the sector which provides or produces these capital goods. But it is crucial to state that technological advancement is also important in order to reduce capital output ratio and thus achieve economic growth. In the absence of technological improvements, it is difficult for producers to reduce the cost per unit of production and as such making production more capital intensive and expensive. In a nutshell, there should be high saving habits in the economy which will promote investments in sectors such as the agricultural sector and as such gear the economy to growth. An algebraic expression of Harrod-Domar model is as follows:

i. Savings (S) is a (s) proportion of national income (Y):
   \[ S = sY. \]

ii. s can be seen as the Average Propensity to Save (APS) also called savings ratio when expressed as S/Y.

iii. Investment (I) is the change in capital stocks (ΔK): \[ I = \Delta K. \]

iv. Let k represents capital-output ratio: \[ k = K/Y. \]

v. In the original Harrod-Domar Model, both Average Propensity to Save (s) and capital-output ratio (k) are held constant, that is they are determined by the structural of the economy which does not change in the short run. Thus, we will also assume that both s and k are constant.

vi. If k is constant then \[ \Delta K/\Delta Y \] is also constant, and more precisely \[ k = \Delta K/\Delta Y. \]

vii. Thus, \[ I = \Delta K \] becomes \[ I = k \Delta Y. \] And for simplicity sake, let us assume that it is a close economy and when equilibrium level of national income is achieved:
   \[ S = I \]

viii. \[ sY = k \Delta Y. \] (By replacing I with k \( \Delta Y \))

ix. \[ s/k = \Delta Y/Y \] (rearranging from above) or

x. \[ \Delta Y/Y = s/k \]

xi. that is the rate of economic (national income) growth is the savings ratio \( (S/Y) \) over capital-output ratio \( (K/Y) \).

Although the Harrod-Domar model advocated for an improvement in the agricultural sector since it is the source of capital goods, it still had some gaps in its theory which are to be highlighted as follows. The model believes that if a country requires money to jump start its economy, it should resort to borrowing from financial institutions. But in recent times it has been observed that developing countries who borrowed such funds are still experiencing the effects of debt burden. Also, there was too much emphasis on technological advancement being a product of capital output ratio reduction. There was total negation of human capital (education, creativity, skill) which could also have the ability of improving technology.

Rostow's Stages of Growth Theory

After the Harrod-Domar growth model, other growth models came into existence. Some of which had their foundations in the Harrod Domar growth model. Another notable growth model that had its foundations in that of the Harrod-Domar growth model was the Rostow’s Stages of Growth Theory. This theory was propounded by Walt Whitman Rostov (1916-2003) and published in the year 1960. This theory argues that any economy experiencing growth must pass through five common stages. These stages are as follows: Traditional stage, Pre-condition for take-off stage, Take-off stage, Drive to maturity stage and then finally the High mass consumption stage.

I. Traditional Stage: This stage is the first stage any economy will find itself in before it begins to experience economic growth. This period is normally characterized by high dependency on agriculture and sometimes the use of the batter system in trade.

II. Pre-condition for Take-off stage: This is the second stage which an economy passes through and this stage is commonly characterized by the emergence of extracting industries such as mining industries. The commercialization and mechanization of the agricultural sector is another important feature of this
stage of growth. There is growth in infrastructure and technology which all aid to improve the process of trade. Rostov believed that at this stage, about 5% of GNP is invested.

III. Take-off stage: This is the third stage which contains features of rapid infrastructural development and improvements in manufacturing processes. It also comprises of significant political and social adjustments which will occur within the economy at this stage. Agriculture is at the decline at this stage and Rostov believes that 10%-15% of GDP is invested or capital is borrowed from foreign financial institutions.

IV. Drive to Maturity Stage: This is the post-take-off stage which has features of self-sustaining growth rate and manufacturing capacity increases or expands as technology advances. Rapid Urbanization is another common feature in this stage.

V. High Mass Consumption: This is the final stage of economic growth. In this stage there is robust growth in service industries and welfare facilities. His postulations showed clearly that agriculture is the key and a fundamental driving force to the growth of an economy.

METHODOLOGY

Model Specification

This study made use of secondary data in the analysis. The different annual time series data sets of observation were collected from the Central Bank of Nigeria, National Bureau of statistics, International Monetary Fund and World Bank Development Index. The data cover a period of thirty three years from 1981 to 2014. The study seeks to estimate the impact of the agricultural sector output on economic growth in Nigeria under the time series framework; the study also used the vector error correction model (VECM) approach. We seek to investigate the existence of a long-run relationship between the agricultural sector output and economic growth using the ARDL. Hence, the specification of the model is as follows:

\[ \text{RGDP} = \beta_0 + \beta_1 \text{AGV} + \beta_2 \text{GOVT} + \beta_3 \text{SAVING} + \beta_4 \text{CROP} \]

Graphical Test of the Unit Root Test

The graphical results from the test for stationarity are presented in Figure 1 which shows the data in level form and Figure 2 for first differenced data. The result shows that the variables are trending. We can therefore conclude that the series in levels are non-stationary. However, the differenced form of the series in Figure 2 appears to fluctuate around the zero mean. We can therefore temporarily conclude that they are stationary after their first difference. This conclusion is further ascertained using the ADF test.

RESULTS AND DISCUSSION

ADF Test Unit Root Test

The ADF test relies on rejecting the hypothesis that the series is a random walk in favour of stationarity. This requires a negative sign and significant T-test statistic. The tests for integration of order zero I (0) were carried out on the level of the variables and the tests for integration of order I (1) were carried out on the first of the variables. All variables were expressed in natural logarithm. The null hypothesis tested is that the series contains a unit root. The number of lags was determined by Schwartz Information Criterion-(SIC), and eight lags were selected. The result of the tests is presented in Table 1. The results show that all variables had a unit root in their levels, thus indicating that the levels were non-stationary. The first differenced series clearly rejects unit roots suggesting that the differenced variables were all stationary.

Co-integration Tests

Johansen’s maximum likelihood test was applied in order to test whether long run relationship exists among the variables. The first step in the co-integration test process is to test for the optimal lag length. This is presented in Table 2. All the information criteria indicate optimal lag length of 1. This was used in this analysis.

Co-integration Test Result

The co-integration test result is presented in Table 3 and Table 4. Table 3 contains the Trace test for the co-integration, while Table 4 contains the result of the maximum Eigen value test. The results show that both the trace test and maximum Eigen value test indicate at least one co-integrating equations exists at 5% significance level in each of the test. This means that there is significant long run relationship between the given variables. Given the presence of co-integration, we estimate the vector error correction model.
Vector Error Correction Model

As said earlier, the VECM establish, if the variables are co-integrated, indicating a long run relationship. We can also check for short run relationship and the dynamics which is the necessity of the VECM test. The VECM approach aid to know the speed of adjustment of the variable considered toward their long-run equilibrium path.

Long Run Effect of Agriculture on Economic Growth

The long run effect of agriculture sector on economic growth is presented in Table 5. This is presented in equation 1. The result shows positive relationship between economic growth and all the proxies for agriculture sector productivity. For instance, there is a positive relationship between economic growth and agricultural sector value added in the long run. A 1% increase in agricultural sector value added will increase economic growth by 0.9%. Also, a positive relationship exists between economic growth and crop production. There is also a positive relationship between expenditure on agriculture and economic growth. However, only agricultural sector value added and expenditure on agriculture are significant as given by the value of their T-statistics.

\[ LGDP = 16.51890 + 0.947961 LAGV + 0.247979 LGOVT + 0.2572 LSAVING + 0.101 LCROP. \]
Table 1: ADF Test Unit Root Test

<table>
<thead>
<tr>
<th>Variables</th>
<th>Intercept Level</th>
<th>First Difference</th>
<th>LAG Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T-Stat Prob.</td>
<td>T-Stat Prob.</td>
<td>SIC</td>
</tr>
<tr>
<td>LGDP</td>
<td>-1.014321 0.9958</td>
<td>-5.298142 0.0001</td>
<td>8</td>
</tr>
<tr>
<td>LAGV</td>
<td>0.324147 0.9762</td>
<td>-5.633983 0.0000</td>
<td>8</td>
</tr>
<tr>
<td>LGOVT</td>
<td>-0.119238 0.9391</td>
<td>-6.039068 0.0000</td>
<td>8</td>
</tr>
<tr>
<td>LSAVING</td>
<td>-1.470040 0.5360</td>
<td>-8.011294 0.0000</td>
<td>8</td>
</tr>
<tr>
<td>LCROP</td>
<td>-0.571131 0.8638</td>
<td>-6.053624 0.0000</td>
<td>8</td>
</tr>
</tbody>
</table>

***indicates stationary at 1%, **indicates stationary at 5% *indicates stationary at 10%

Source: Authors' computation 2017

Table 2: Lag order selection criteria

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-68.89913</td>
<td>NA</td>
<td>6.98e-05</td>
<td>4.618695</td>
<td>4.847717</td>
<td>4.694610</td>
</tr>
<tr>
<td>1</td>
<td>50.09173</td>
<td>193.3601*</td>
<td>2.00e-07*</td>
<td>-1.255733*</td>
<td>0.118394*</td>
<td>-0.80249*</td>
</tr>
<tr>
<td>2</td>
<td>70.46034</td>
<td>26.73381</td>
<td>3.03e-07</td>
<td>-0.966272</td>
<td>1.552962</td>
<td>-0.131217</td>
</tr>
</tbody>
</table>

Source: Author's Computation 2017

* indicates lag order selected by the criterion  
LR: sequential modified LR test statistic (each test at 5% level)  
FPE: Final prediction error, AIC: Akaike information criterion  
SC: Schwarz information criterion  
HQ: Hannan-Quinn information criterion

Short Run Effects of Agriculture sector on Economic growth

The result of the short run shows that the error correction term is negative as expected and significant at 1% level. It also indicates that it takes the economy a short period to adjust to equilibrium with speed of adjustment to equilibrium of about 86%. However, the findings show that all the proxies of agricultural productivity have negative effects on economic growth in the short run. This is against the expected result. Arguably, the result is not surprising as the country has been recording negative trade balance in agricultural products since 1975 (Nahanga and Bečvařova, 2016). This result is in line with the works of Anowo, Ukweni and Martins (2013) who also find a negative relationship between agricultural trade openness.
and economic growth in Nigeria. Another explanation of this result is that agricultural output in Nigeria is volatile at least in the short run, and as found out by Ogundabedo and Oladipo (2017) that agriculture output volatility has a negative impact on growth in short run. The result is also in line with the findings of Oluwatoyese and Applanaidu (2013) who found a negative relationship between agriculture output and economic growth. Also, Abu and Abdullah (2010) found a negative relationship between expenditure on agriculture and economic growth in Nigeria. However, only crop production is significant at 5% in explaining the variation in economic growth in the short run. The R squared shows that 55% of the variation in economic growth is explained in the model. The F-statistics shows that all the regressors are not jointly equal to zero. The DW also shows that there is no first order serial correlation.

**Granger Causality/Block Exogeneity Wald Tests**

Table 7 shows that GDP granger causes domestic saving but only at 10%, there is also a uni-directional causality running from agricultural sector value added to expenditure on agricultural sector. There is a unidirectional

<table>
<thead>
<tr>
<th>Table 3: Co-integration Rank Test (Trace)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesized No. of CE(s)</td>
</tr>
<tr>
<td>None*</td>
</tr>
<tr>
<td>At most 1</td>
</tr>
<tr>
<td>At most 2</td>
</tr>
<tr>
<td>At most 3</td>
</tr>
<tr>
<td>At most 4</td>
</tr>
</tbody>
</table>

*Source: Author’s Computation 2017*

Trace test indicates 1 co-integrating equation at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values

<table>
<thead>
<tr>
<th>Table 4: Co-integration Rank Test (Maximum Eigen value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesized No. of CE(s)</td>
</tr>
<tr>
<td>None*</td>
</tr>
<tr>
<td>At most 1</td>
</tr>
<tr>
<td>At most 2</td>
</tr>
<tr>
<td>At most 3</td>
</tr>
<tr>
<td>At most 3</td>
</tr>
</tbody>
</table>

*Source: Author’s Computation 2017*

Max-Eigen value test indicates 1 co-integration Eqn(s) at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values

<table>
<thead>
<tr>
<th>Table 5: Results of the long run impact of Agriculture on Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td>LGDP</td>
</tr>
<tr>
<td>LAGV</td>
</tr>
<tr>
<td>LGOVT</td>
</tr>
<tr>
<td>LSAVING</td>
</tr>
<tr>
<td>LCROP</td>
</tr>
</tbody>
</table>

*Source: Author’s Computation 2017*

<table>
<thead>
<tr>
<th>Table 6: Results of the Short Run Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>ECM</td>
</tr>
<tr>
<td>DLGDP(-1)</td>
</tr>
<tr>
<td>DLAVG(-1)</td>
</tr>
<tr>
<td>DLGOGV(-1)</td>
</tr>
<tr>
<td>DLSAVING(-1)</td>
</tr>
<tr>
<td>DLCROP(-1)</td>
</tr>
<tr>
<td>Constant</td>
</tr>
</tbody>
</table>

| R-squared | 0.553662 | F-statistic | 5.168557 | Prob (F-statistic) | 0.001411 | Durbin-Watson stat. | 2.299855 |

*Source: Author’s Computation 2017*
Table 7 Results of the Granger Causality/Block Exogeneity Wald Tests.

<table>
<thead>
<tr>
<th>Variables</th>
<th>DLGDP</th>
<th>DLAGV</th>
<th>DLGOVT</th>
<th>DLSAVING</th>
<th>DLCROP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLGDP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.613682</td>
<td>0.1059</td>
<td>0.188101</td>
<td>0.6645</td>
<td>2.875384</td>
</tr>
<tr>
<td>DLAGV</td>
<td>0.635844</td>
<td>0.4252</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.005576</td>
<td>0.9405</td>
<td>5.039618</td>
<td>0.0248</td>
<td></td>
</tr>
<tr>
<td>DLGOVT</td>
<td>3.702198</td>
<td>0.0543</td>
<td>2.063869</td>
<td>0.1508</td>
<td>2.824802</td>
</tr>
<tr>
<td>DLSAVING</td>
<td>4.207041</td>
<td>0.0403</td>
<td>3.995055</td>
<td>0.0456</td>
<td>0.084784</td>
</tr>
<tr>
<td>DLCROP</td>
<td>4.869917</td>
<td>0.0273</td>
<td>0.417494</td>
<td>0.5182</td>
<td>0.388331</td>
</tr>
</tbody>
</table>

NB: The numbers in parenthesis show the P-values for the corresponding Chi-square statistics
Source: Author's Computation 2017

Table 8: Diagnostics Checks

<table>
<thead>
<tr>
<th>TEST</th>
<th>Null Hypothesis</th>
<th>T-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>White(Chi-sq.)</td>
<td>No conditional Heteroskedasticity</td>
<td>0.567079</td>
<td>0.8221</td>
</tr>
<tr>
<td>I</td>
<td>There is normal distribution</td>
<td>3.437</td>
<td>0.17927</td>
</tr>
<tr>
<td>Langrange Multiplier (LM)</td>
<td>No Serial Correlation</td>
<td>0.839094</td>
<td>0.4449</td>
</tr>
</tbody>
</table>

Source: Author's Computation 2017

causality running from expenditure on agriculture to GDP, domestic saving and crop production. There is a unidirectional causality running from domestic saving to GDP, and agricultural sector value added. Also, a unidirectional causality exists running from crop production to economic growth. We therefore conclude that the only proxies of agricultural productivity that granger cause economic growth is expenditure on agricultural sector and crop production.

RELEVANT DIAGNOSTICS

The relevant diagnostic tests were also done. This includes the residual serial correlation, the normality test, and Heteroskedasticity. The Residual Serial Correlation Result shows that we do not reject the null hypothesis of no serial correlation. The normality test result also shows that we do not reject the null hypothesis that the residual is multivariate normal. Also, the VEC Residual Heteroskedasticity Tests indicate the null hypothesis of no Heteroskedasticity cannot be rejected. The results are presented in Table 8

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The results showed that there is significant long run relationship between the given variables. Our results from our VECM test showed that a positive relationship exists between economic growth and all the proxies for agriculture sector productivity. This can be illustrated as having a positive relationship between economic growth and agricultural sector value added in the long run. A 1% increase in agricultural sector value added will increase economic growth by 0.9%. Also, a positive relationship exists between economic growth and crop production. There is also a positive relationship between expenditure on agriculture and economic growth.

However, only agricultural sector value added and expenditure on agriculture are significant as given by the value of their T-statistics. However, the result of the short run shows that the error correction term is negative as expected and significant at 1% level. The result is in line with the findings of Oluwatoyese and Applanaidu (2013), who found a negative relationship between agriculture output and economic growth. From our Granger Causality test, it was concluded that the only proxies of agricultural productivity that ‘granger cause’ economic growth is expenditure on agricultural sector and crop production.

In view of findings, the following policy recommendations would be relevant to the government:

1. The Government of Nigeria should put in efforts to diversifying the Nigerian economy as the Nigerian Agricultural Sector currently suffers from Marginalization. This would ensure that the economy is non-dependent on the recently failing Oil sector, creating a better level of economic Growth and development.

2. The Nigerian Government should encourage agricultural practices round the country through the provision of Modern and affordable farm inputs and equipment to help develop a higher level of food security in the State. This will help Nigerians reduce...
their high levels of food importation, amongst other forms of agricultural commodities.

3. The Government should also, encourage agricultural research and development, providing modern research facilities which would help improve the quality of agricultural output in the Country. This also, will ripple to increase Foreign Exchange earnings of the country, increasing the overall economic Growth levels of the Nation.

4. Funding in forms of loans and grants should be given to Farmers, and other farm related operators to conduct their agricultural businesses. This will cause an increase in the number of Nigerians that are interested in agriculture, fostering a larger scale of farming and thus, an increase in agricultural output.

5. In the course of this study, it was discovered that a well-developed agricultural sector is required for an economy to experience Industrialization: given that agriculture is a source for raw materials which industries use in creation of goods with added value. Thus, the government should strive to develop the agricultural sector in order to transform the Nigerian economy from an Agro-Based economy to an industrialized economy.

REFERENCES


Nahanga V and Bečvařová B (2016). The Heckscher-Olohin Model and the Performance of Cocoa Production in Nigeria. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 64(6): 2161-2172


Accepted 15 July 2017


Copyright: © 2017 Afolabi et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are cited.