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Understanding Agricultural Productivity Growth in Sub-Saharan Africa: An Analysis of the Nigerian Economy

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Abstract

In recent times, agricultural sector has returned to the forefront of development issues in Nigeria given its contribution to employment creation, sustainable food supply and provision of raw materials to other sectors of the economy. In lieu of that, this study examines the impact of agriculture on the economic growth in Nigeria using annual time series data covering the sample period of 1981 to 2018. To analyse the data collected, Autoregression Distributed Lag (ARDL) model through the bounds testing framework is employed to measure the presence of cointegrating relations between real GDP, agricultural productivity, labour force, and agricultural export. Results show the presence of both short-run and long-run relationship among the variables, and that agriculture has a positive and significant impact on economic growth in Nigeria. These findings inform the Nigerian government on the need to expedite labour force (human capital) and agricultural export (non-oil) development with the view to achieving sustainable growth and development. In addition, developing skills and competencies of labour force through capacity building in the agricultural sector will encourage research and development thereby increase the export size, hence essential for long-term growth.

Keywords: Agricultural productivity; Economic growth; Labour force; Agricultural export; ARDL model.

1. Introduction

Agriculture plays a significant role in accelerating economic growth and development particularly for developing countries through provision of industrial raw materials, employment creation, and expansion of domestic market. Before the discovery of oil in 1956, the Nigerian economy is renowned in agriculture and even termed as an agrarian economy through which cash crops like palm produce, cotton, rubber, timber, cocoa, and ground nuts were exported, thus making the country a major exporter in agricultural output and accounting for about 90% of foreign earnings; hence contributes to aggregate revenue and by extension; the economic growth. During the period of 1960s to 1970, Nigeria was the world leading producer and exporter of palm oil and the second world largest producer of cocoa after Ghana; until a major shift with new trend manifest in the economy. From 1970 to 1974, the percentage of agricultural exports in the share of country's total exports woefully decline from 43% to about 8%. The reason for this dismal performance of the agricultural sector was the oil price shock of 1973 to 1974 which resulted in large receipts of foreign earnings from oil revenue leading to a neglect of the agricultural sector. In the early 1980s, it became noticeable that the agricultural sector could no longer meet domestic food requirements, inadequate supply of raw materials to industries, and shortfalls in foreign earnings through export.

Consequently, food production became a key challenge in Nigeria while the huge oil proceeds are being employed to import foods and other consumable goods. As a result, food import bill increases and Nigeria became a net importer of basic food items it previously export. More worrisome is the fact that the country lost it role as one of the leading exporter of agricultural commodities in the global sphere. This poor trend was reversed in the late 1980s with the commencement of the Structural Adjustment Programme (SAP) in 1986. Average annual growth rate of agricultural products is over 5% between 1986 and 1995. Domestic food supply and agriculture exports also recorded remarkable improvements during this period. Indeed, apart from the rise in the share of traditional export crops in the total volume of agricultural exports during the SAP period, new commodities, including staple foods became part of the exportable commodities. The situation could be traced mainly to price incentives as farmers received more encouraging prices following the abolition of the commodity boards and the realignment of exchange rate which liberated exports and encouraged backward integration by local industries.

In spite of these feasible progressions, the agricultural sector in Nigeria remain poor and largely under-developed. Without efforts to add value to the primary farming commodities, the sector continues to rely and depends on primitive methods of cultivation to sustain a growing population. This has reflected negatively on the productivity of the sector, meagre contributions to economic growth and inability to perform its traditional role as

the supplier of adequate and safe food to the greater populace. Nevertheless, it is an undeniable fact that oil proceeds has contributed to the Nigeria's economic prosperity and growth, but also produced various economic uncertainties and volatilities with high degree of dependency. However, the declining oil price in 2015 to 2016 in addition to the oil fall aggravated by the Covid-19 pandemic in the year 2020, has immensely affected the Nigerian economy and other oil exporting nations. Another gigantic knockback to crude oil exporters is the United State of America's reduction in the number of barrels they import from nations. These multiple factors have created a massive challenge for Nigeria and consequently, trembling the economy.

In addition, the performance of Nigerian agricultural sector in the past three decades show little or nothing to be desired, in spite of numerous concerted efforts to promote output growth in the sector. An assessment of trend and patterns of activities in the agricultural sector in Nigeria revealed that despite the various policies, strategies and reform programmes, the contribution of the sector have been dismal and below its full potential. The share of non-oil export in the country's total export earnings has remained very low and it was 1% in 2008 (Central Bank of Nigeria, 2008) and up 4.8% in 2013 (Central Bank of Nigeria, 2013). In addition, agricultural output stagnated at less than 1% annual growth rate between 1970 and 1982 whereas population growth rate is about 2.5% and 3.0 % per annum. A sharp decline was also observed in export crop products, while food output increased only marginally during this period. Consequently, food supply had to be augmented with large volume of imports while the share of agriculture in total exports was reduced considerably. Subsequently, a considerable increase was recorded between 2015 to 2019 with improve output growth.

This scenario is deteriorating by the Nigeria's operating a mono-product economy and the desertion of agriculture, solid mineral development, tourism, entrepreneurship development and telecommunication among others, thereby reducing drastically the productive activities of citizenry and increase the nation's dependency on oil earnings. With the global decrease in oil demand and revenue, there is need to develop the economy through evaluating the contribution of other viable sectors such as agriculture with the view to accelerating sustainable growth and development. The question here is that did increased agricultural productivity produces surplus food and enhance economic growth in Nigeria? This, and many other issues are the concern of this study. Most of the literature on agricultural study are mainly concern with the sectoral analysis and their influence on economic growth, but a rigorous research on the aggregate sector productivity and its relations with economic growth are given limited attention; hence the need for this study.

As the global oil prices continue to fall drastically owing to the Covid-19 pandemic, a country like Nigeria that is largely dependent on oil proceeds needs to realise that tough times beckons, hence the need to recognise the urgency of the situation. Therefore, all efforts must be geared and directed towards revamping the agricultural sector as a means to set the nation's economy on a path of rebirth and recovery. This requires a radical and comprehensive shift of considerations back to the agricultural sector, solid mineral development, tourism, and entrepreneurship development as a means of circumventing from this conundrum. The need to correct the existing structural distortions and put the economy on the path of sustainable growth through sound and productive agricultural development is therefore compelling. It is however discouraging that despite various efforts by past and present administrations, there has been limited or no visible changes (in certain quarters) in agricultural sector. It is against this back drop that this study aims to examine the impact of agriculture on the Nigerian economic growth covering the period of 1981 to 2018 using annual frequencies.

The rest of the paper is therefore organised as follows: section 2 provides an overview of agricultural trend in relations to economic growth in Nigeria; section 3 deals with empirical literature across both developed and developing economies; section 4 presents the source of materials utilised and the technique of data analysis; section 5 presents the results and other findings from the study; and finally section 6 provides the conclusion and other policy recommendations.

2. Agricultural Sector in Nigeria: An Overview

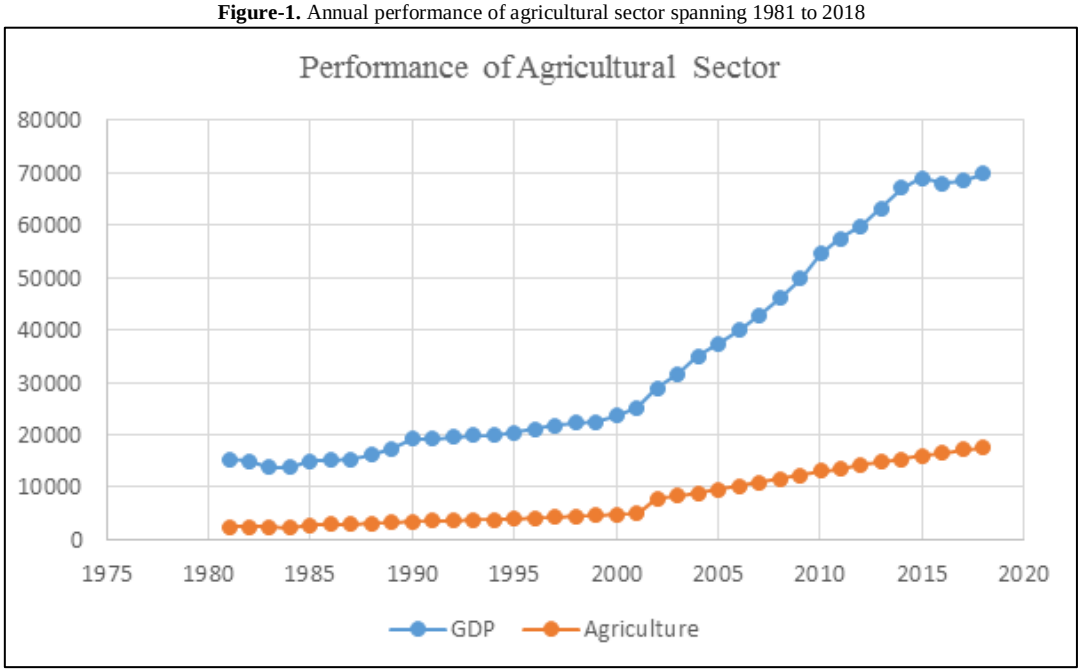
Agriculture involves the cultivation of land, raising and rearing of animals for the purpose of production of food for man, feed for animals and raw materials for industries (Ammani, 2012`). It involves cropping, livestock, forestry, fish processing and marketing of these agricultural products. Agriculture in Nigeria is a major sector of the economy providing employment for over 70% of the teeming population. The sector is being transformed by commercialisation at the small, medium and large-scale enterprise levels. Major crops include beans, sesame, cashew nuts, cassava, cotton, cocoa beans, groundnuts, kola nut, maize (corn), melon, millet, palm kernel, palm oil, plantain, rice, rubber, sorghum, soya beans and yams among others. The country's agricultural products fall into two main groups: food crops (produced for home consumption) and exports crops. The most important food crops are yam, cassava and plantain in the South while sorghum, millet, rice and maize in the North. Cocoa and rubber are among the leading non-oil foreign exchange earner but the dominance of small holders and lack of farm labour due to urbanisation retards production.

The essential benefits of agricultural sector to the Nigerian economy include the provision of food, contribution to the Gross Domestic Product (GDP), provision of employment, provision of raw materials for agro-allied industries, and generation of foreign earnings. Although the sector remains the mainstay of the economy, it has lost its prime position to the petroleum sector. It is increasingly evident that improved agricultural development and growth can offer a pathway from poverty; but evidence-based policies and strategies are needed. However, agricultural productivity refers to the output produced by a given level of inputs in the agricultural sector of a given economy. In other words, it is the ratio of the value of total farm outputs to the value of total inputs used in farm

production. While agricultural output refers to the total amount of agricultural commodity produced by an individual, group of individuals, state or nation in a given time period.

The annual performance of the sector taking into cognisance its various components are presented graphically in the following approach:

Figure-1. Annual performance of agricultural sector spanning 1981 to 2018



Available records presented in figure 1 shows the annual performance of agricultural sector in Nigeria covering the period of 1981 to 2018 as depicted in the 2018 CBN statistical bulletin. The analysis of the agricultural sector indicates about 15.49% of the GDP as the share of the sector in 1981 but recorded a considerable increase in 1985 as 18.26%. In the year 1990, the value stood as 17.94% and 19.54% in 1995. The aftermath of the Structural Adjustment Programme (SAP) and its associated challenges has produced enormous undesirable economic misfortunes. An analysis of the real GDP in 2006 indicated that the agricultural sector contributed to about 42% of the GDP compared with 41.2% in 2005 and 20.43 in 2000 (Central Bank of Nigeria, 2018). In 2013 to 2014 of the real GDP indicated that the agricultural sector contributed about 2.46%, 2.57%, 3.44%, 3.02%, 2.94%, 5.53% and 3.68% of the GDP in the first, second, third and fourth quarter of 2013 and first and second quarter of 2014 respectively, however, agriculture still constituted the smallest sector in the second quarter representing ₦3,360,450.48 million or 20.89% of GDP (Central Bank of Nigeria, 2018). The sector grew by 9.17% year-on-year which was higher than the growth rates recorded in the corresponding quarter of 2014 and the first quarter of 2015 by 2.50% points and 1.73% points respectively (National Bureau of Statistics, 2015). Over the past three years, the Federal Ministry of Agriculture and Rural Development has sought to increase foreign direct investment in agriculture as a strategy to increase national food production and ensure food sustainability. In line with this federal government initiative, numerous paths of agricultural lands have been identified by the government for large scale projects by foreign companies. However, this government initiative gave birth to increase in land seizure and decreased ability of local communities to cultivate food for sustenance.

Furthermore, agricultural sector has been the mainstay of the economy since independence and despite numerous hurdles, it remains a strong pillar to the greater population. In the 1960s, Nigeria was the world's largest exporter of groundnut, the second largest exporter of cocoa and palm produce and an important exporter of rubber, cotton (Sekunmade, 2009). Also, agricultural sector employs about two-thirds of Nigeria's labour force, contributes significantly to the GDP and provides a large proportion of non-oil earnings (CIA, 2013). The sector has several untapped potential for growth and development in the availability of land, water, labour and its large internal markets. It is estimated that about 84 million hectares of Nigeria's total land area has potential for agriculture; however, only about 40% of this is under cultivation (Federal Ministry of Agriculture and Rural Development (FMARD), 2012). Productivity in the cultivated lands is also low due to small farm holdings and primitive farming methods. Nigeria has therefore become heavily dependent on food imports. In addition to diverse and rich vegetation that can support heavy livestock population, it also has potential for irrigation with a surface and underground water of about 267.7 billion cubic meters and 57.9 billion cubic meters respectively (Chauvin *et al.*, 2012; Lipton, 2012). Nigeria's large and growing population provides a potential for a vibrant internal market for increased agricultural productivity. In spite of these opportunities, the state of agriculture in Nigeria remains poor and largely underdeveloped. The sector continues to rely on primitive methods to sustain a growing population without efforts to add value. This has reflected negatively on the productivity of the sector, its contributions to economic growth as well as its ability to perform its traditional role of food production among others. This state of the sector has been blamed on oil glut and its consequences on several occasions. In 1960, petroleum contributed 0.6% to GDP while

agriculture's contribution stood at 67%. However by 1974, shares of petroleum had increased to 45.5% almost doubling that of agriculture which had decreased to 23.4% (Yakub, 2008).

The sub-sectors of the agricultural sector in Nigeria have potentials that give the sector opportunity for growth. According to Central Bank of Nigeria (2012), between 1960 and 2011, an average of 83.5% of agriculture GDP was contributed by the crops production sub-sector making it the key source of agriculture sector growth. The food production role of the agricultural sector depends largely on this sub-sector as all the staples consumed in the nation comes from crop production, 90% of which is accounted for by small-scale, subsistent farmers. The major crops cultivated include yam, cassava, sorghum, millet, rice, maize, beans, dried cowpea, groundnut, cocoyam and sweet potato. The second largest is the livestock sub-sector contributing an average of 9.2% between 1960 and 2011. This sector is the largest source of animal protein including dairy and poultry products. The economic importance of the sub-sector is therefore evident through food supply, job and income creation as well as provision of hide as raw material.

Despite this, the sub-sector has been declining in its contribution to economic growth, according to Ojiako and Olayode (2008). Between 1983 and 1984, the share of livestock in agricultural GDP was about 19% but this dropped as low as 6% between 2004 and 2005. In the fishery sub-sector, local production is inadequate for domestic demand and consumption. Nigeria imports 700,000MT of fish annually which is 60,000 MT more than total domestic production (Ibru, 2005 in Essien and Effiong (2010)). However, the sub-sector has recorded the highest average growth rate of 10.3% (1961-2011) compared to the 6% recorded in crop production in the same period (Central Bank of Nigeria, 2012). With an average contribution of 4.3% to total agriculture GDP between 1960 and 2011 and provision of at least 50% animal protein, fisheries contributes to economic growth by enhancing food security and improving livelihood of fish farmers and their households (Essien and Effiong, 2010; Gabriel, 2007). Forestry is the smallest sub-sector in Nigerian agriculture contributing only 3.0% between 1960 & 2011; however, the sub-sector plays a major role in providing industrial raw materials (timber), providing incomes as well as preserving biodiversity. Today, agricultural sector in Nigeria is seen as a catalyst for diversification, competitiveness and a source of sustainable food supply.

3. Empirical Literature Review

There is widespread evidence in the literature supporting a positive relationship between increased agricultural productivity and economic growth. The sector is advocated as an essential element and fundamental segment for generating sustainable economic growth and development especially in developing economies. However, the relationship between agriculture and economic growth still remain a debatable subject area among scholars. Certain literature stresses the significance of increased agricultural productivity as a condition for economic growth particularly for developing economies. Others maintained that agricultural productivity alone cannot generate economic growth. Consequently, a good number of literature are reviewed across both developed and developing economies with the view to providing more insight and draw policy implications, and are synthesised as follows: Ogunleye *et al.* (2018) examine the effects of road transport infrastructure on agricultural sector development in Nigeria spanning 1985 to 2014, using annual time series data on agricultural development (proxy by gross domestic product in the Agricultural sector) road transport infrastructure (proxy by length of paved road per square kilometre of area) export and capital. To estimate the data collected, Granger causality and Ordinary Least Square (OLS) is adopted and the results show the existence of positive and significant relationship among the study variables, and also a unidirectional causality from agricultural sector development to transport infrastructure. More so, Cao and Birchenall (2013) investigate the role of agricultural productivity as a determinant of China's post-reform economic growth and sectoral reallocation. The study adopted microeconomic farm-level data and treating labour as a highly differentiated input. Using a calibrated two-sector general equilibrium model, result shows that agricultural productivity accounts for the majority of output and employment reallocation towards non-agriculture and also contributes to the aggregate and sectoral economic growth.

Furthermore, Ligon and Sadoulet (2018) evaluate whether agricultural growth in developing countries increases the expenditure of poorer households more than growth in other sectors. Using panel data across countries and years, result indicates that the estimated elasticities associated with growth in agricultural income are significantly greater than for non-agricultural income for all but the extreme top and bottom decile. Moreover, Parikh *et al.* (2018) evaluate the role of technical change in agriculture, irrigation and concern for food security in rapid economic growth in India using a multi-sector, inter-temporal optimising model with 20 expenditure classes, 10 rural and 10 urban, each with its own linear expenditure system derived from an underlying non-linear demand system. Result shows high gains from higher productivity growth in agricultural sector. Additionally, Katircioglu (2006) investigates the impact of agricultural sector on the economy of North Cyprus, which suffers from political problems and drought over the years. The study covers the period of 1975 to 2002 to determine the direction of causality between agricultural output growth and economic growth. Findings show the presence of long-run relationship between agricultural output growth and economic growth while Granger causality indicates a bidirectional causal relations.

In addition, Karimi *et al.* (2018) examine the effects of climate change on Iran's agriculture and the current adaptation efforts made by government and farmers. The study established that changes in rainfall and water endowments will have significant impacts on crop yield, crops' water requirements and income and welfare of farm families. The extent of the changes in yield depends on the crop type, assumptions related to the CO2 fertilization effect, climate scenarios and adaptation abilities. Likewise, Fayçal and Ali (2016) examine the impact of government support of the agricultural sector on the economic growth in Algeria by adopting the cointegrating relation and error

correction model according to Autoregressive Distributed Lag (ARDL) model. Findings establish that the total agricultural support regardless of its relationship with production and producers has a positive impact on agricultural production growth and economic growth in the long term.

Similarly, Jatuporn *et al.* (2011) examine the causality between agriculture and economic growth in Thailand covering the sample period of 1961 to 2009. To estimate the data collected, a Granger causality approach and the Wald ($\chi 2$) coefficient statistic are employed to establish a long-run causal relationship and impact transmission between the variables. Result shows the existence of a long-run relationship and size impact are detected running from agriculture to economic growth, and vice versa. Furthermore, results from the generalised variance decomposition reveals that agriculture is existed in a long-term stable in economic growth while economic development encourages the growth of agriculture as a whole. Also, Izuchukwu (2011) examine the impact of the agricultural sector on the Nigerian economic growth using panel of data collected from the official publications of Central Bank of Nigeria and World Bank's development indicators spanning 1986 to 2007. To estimate the data obtained, multiple regression is employed. Findings reveal the presence of a positive relationship between Gross Domestic Product (GDP), domestic saving, government expenditure on agriculture and foreign direct investment in Nigeria for the period under consideration.

In another development, Okosodo (2016) examines agricultural credit on the growth and development of the Nigerian economy taking into consideration banking policy on agricultural credit covering the sample period of 1980 to 2014. Using the bounds testing approach to cointegration, unit root test and error correction mechanism, findings reveal the existence of long-run relationship between agricultural sector and economic growth; and that government expenditure in agricultural sector contribute moderately to the growth of the Nigerian economy. Similar to that, Awan and Alam (2015) examine the impact of agriculture productivity on economic growth in Pakistan using secondary data sources spanning the sample period of 1972 to 2012. By employing the Autoregressive Distributed Lag (ARDL) model to estimate different variables on economic growth, results show that agricultural productivity has a positive and significant impact on economic growth for the period under consideration.

In the same vein, Olabanji *et al.* (2017) investigate the long-run relationship between agricultural output and economic growth in Nigeria using annual time series data spanning the period of 1981 to 2014. To estimate the data collected, Johansen maximum likelihood co-integration approach, vector error correction model and Granger causality test are employed. Findings reveal the evidence of long-run relationship between agricultural output and economic growth in Nigeria. Also, the Granger causality test shows the existence of causal relations between agricultural output and economic growth in Nigeria. Furthermore, Gbaiye *et al.* (2013) examine the long-run impact of agricultural exports and economic growth performance in Nigeria using annual time series data covering 1980 to 2010 by adopting the export-led growth hypothesis and the neo-classical growth model. Employing the Johansen maximum likelihood test of co-integration, result shows a long-run equilibrium relationship 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 GDP.

More so, Verter and Bečvářová (2016) examine the impact of agricultural exports on economic growth in Nigeria using OLS regression, Granger causality, Impulse Response Function and Variance Decomposition approaches. Both the OLS regression and Granger causality results support the hypothesis that agricultural exports encourage and enhances economic growth in Nigeria. The results, however, show an inverse relationship between the agricultural degree of openness and economic growth in the country. Impulse Response Function results fluctuate and reveal an upward and downward shocks from agricultural export to economic growth in the country. The Variance Decomposition results also show that a shock to agricultural exports can contribute to the fluctuation in the variance of economic growth in the long run. Besides, Ayeomoni and Aladejana (2016) examine the relationship between agricultural credit and economic growth in Nigeria by utilising annual time series data covering the sample period of 1986 to 2014. To estimate the data obtained, autoregressive distributed lag approach to cointegration is employed. Result shows the presence of short-run and long-run relationship between agricultural credit and economic growth in Nigeria.

According to Kadir and Tunggal (2015), agriculture sector plays a decisive role in economic growth and development. The authors further investigate the impact of macroeconomic variables toward agricultural productivity in Malaysia using annual data covering the period of 1980 to 2014 by adopting the Autoregressive Distributed Lag (ARDL) model. Findings show the presence of significant impact and a long-run relationship between agricultural productivity and macroeconomic variables comprising of government expenditure, inflation rate, nominal exchange rate, interest rate, money supply and net export. Equally, Matchaya *et al.* (2014) assess the performance of agricultural sector in Malawi for the period spanning 2000 to 2013 with particular reference to the significance of mapping the performance of the sector in the form of trends against the baseline sectoral performance targets enlisted in the ASWAP, CAADP Framework and SADC RISDP. Result shows that changes in agricultural sector have positive and significant impact on income, poverty and malnourishment within the period under consideration

Likewise, McArthur and McCord (2017) estimates the role of agronomic inputs in cereal yield improvements and the consequences for countries' processes of structural change and further estimate an empirical links between agricultural yields and economic growth, labour share in agriculture and non-agricultural value added per worker. The identification strategy includes a novel instrumental variable that exploits the unique economic geography of fertilizer production and transport costs to countries' agricultural heartlands. Finding establishes a strong role for agricultural productivity as a driver of structural change and suggest a clear role for fertilizer, modern seeds and water in boosting yield. Besides, Hamidov *et al.* (2016) review the impact of agricultural land use in the five

countries of Central Asia comprising of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan covering the period of 2008 to 2013. The authors utilise the Land Use Functions framework to analyse the type and relative shares of environmental, economic, and social topics related to agricultural land use. Findings show that research on land use in Central Asia received high levels of international attention, and the impacts of land use on abiotic environmental resources were the most explored.

According to Deborah *et al.* (2017), agricultural sector is seen to be an indispensable sector in establishing the framework for the nation's economic growth. Hence, increased agricultural production is expected to be a core pre-requisite for rapid economic growth in a developing nation like Nigeria. The authors further evaluate the impact of agricultural performance on inclusive growth in Nigeria by adopting the cointegration test and the fully-modified ordinary least square. Findings reveal the presence of a long-run relationship among the examined variables, while agricultural financing shows more long-run effect on economic inclusive growth proxy by the per capita income. As well, Gilbert *et al.* (2013) explore and quantify the contribution of agricultural exports to economic growth in Cameroon. It employs an extended generalized cobb-douglas production function model, using food and agricultural organisation data and World Bank data from 1975 to 2009. By adopting the cointegration test and the vector error correction model based on the Engle and Granger procedure, result shows that the agricultural exports have mixed effect on economic growth in Cameroon. Coffee export and banana export have a positive and significant relationship with economic growth while cocoa export established a negative and insignificant effect on economic growth within the study period.

As submitted by Richards *et al.* (2015), soybean sector (agricultural sector) has served as a motor to the state's economy by increasing the demand for services, housing, and goods, and by providing a source of investment capital to the non-agricultural sector. The authors further examine the impact of export-driven, soybean agriculture in Mato Grosso on regional economic growth. Results show that soybean production provides employment, non-agricultural GDP and regional economic growth. Similar to that, (McArthur and Sachs, 2018) constructs a geographically indexed applied general equilibrium model that considers pathways through which aid might affect growth and structural transformation of labour markets in the context of soil nutrient variation, minimum subsistence consumption requirements, domestic transport costs, labour mobility, and constraints to self-financing of agricultural inputs. Using plausible parameters, the model is presented for Uganda and result indicate an expansion in the primary tradable sector and positive permanent productivity and welfare effects.

Correspondingly, Matthew and Mordecai (2016) investigate the impact of agricultural output on economic development in Nigeria using annual time series data spanning 1986 to 2014. Economic development proxy by per capita income is explained by agricultural output and public agricultural expenditure. The authors adopt the multivariate Vector Autoregression (VAR) model to estimate the model coefficients. Findings reveal that agriculture plays an important role in Nigeria's economic development. This is supported by the results of both variance decomposition analysis and impulse response function which shows greater contribution to shocks in economic development and the per capita income responded positively to shocks in agricultural output during the ten-year period. Equally, Raza *et al.* (2012) examine the role of agriculture in the economic growth of Pakistan using annual data covering the sample period of 1980 to 2010. To estimate the data collected, simple regression model is applied to identify the significance relationship between agricultural sub-sectors and the GDP. Findings show the significance role of agriculture sub-sectors toward the economic growth in Pakistan.

In addition to that, Kemi (2016) examine the diversification framework through the agricultural production and its impact on the Nigerian economic growth by employing a descriptive statistics and correlational analysis. Using one-on-one interview as a method of data collection, findings reveal the presence of a positive relationship between economic growth and diversification into the agricultural sector in Nigeria. Similarly, Ahmed *et al.* (2015) examine and analyse the factors affecting economic growth of Iraq both agriculture and industrial sector related using secondary data covering the sample period of 1980 to 2014. The authors employ the OLS multiple regression-double log with economic analysis to estimate the contribution level of both agriculture and industrial sectors to economic growth. Findings reveal that political and security instability have negative effects on the agriculture and industrial sectors as well as on the economic growth. Furthermore, it is established that both agriculture and industrial sectors have positive effects on Iraqi's economic growth.

However, Onakoya (2013) evaluates the contributions of the agricultural sector to Nigeria's economy by estimating a macro-econometric model which is a system of simultaneous equations that seeks to explain the behaviour of key economic variables at the aggregate level based on the received theories of economics. Given the framework of inter-linkages of the various sectors of the real economy, this study integrate the linkages among agriculture, manufacturing, oil and gas and the service sectors, especially how the effect of other sectors influence the growth of agriculture. While the externalities generated by the linkages among the various sectors corroborate to the dynamic nature of the economy, result indicates that sectoral linkages are not always beneficial especially between agriculture and the oil sector. Likewise, Edeme *et al.* (2016) examine the impact of agricultural exports on the economic growth of fifteen (15) ECOWAS member countries using panel data for the period covering 1980 to 2013. Using panel data estimation technique on certain variables including agricultural exports, labour force participation rate, non-agricultural exports, inflation, capital stock, and economic growth. From the estimation, results of the fixed-effect model show that agricultural exports have not impacted significantly on the economic growth of ECOWAS member countries such as Côte d'Ivoire, Nigeria and the Republic of Benin.

In the same vein, Salako *et al.* (2015) investigate the nexus between agriculture, economic growth and development in Nigeria by adopting a multivariate VAR model with emphasis on the Variance Decomposition Analysis. Arising from the neglect of the viable sector, findings reveal that efforts directed to resuscitate the

agricultural sector have not translated commensurately to the desirable development of the sector as the positive change experienced in the sector is lopsided in favour of crop production. Also, Delincé *et al.* (2015) examine the long-term global impacts on crop productivity under different climate scenarios using the AgMIP approach (Agricultural Model Intercomparison and Improvement Project). The paper provides horizontal model intercomparison from 11 economic models and a more detailed analysis of the simulated effects from the Common Agricultural Policy Regionalized Impact (CAPRI) model to systematically compare its performance with other AgMIP models and specifically for the Chinese agriculture. Results indicate that, at the global level, the climate change will cause an agricultural productivity decrease (between −2% and −15% by 2050), a food price increase (between 1.3% and 56%) and an expansion of cultivated area (between 1% and 4%) by 2050. The results for China indicate that the climate change effects tend to be smaller than the global impacts.

Similar to that, Mehrara and Baghbanpour (2016) evaluate the contributions of industry and agriculture exports and its impact on economic growth in developing countries and further examine the role of manufacturing and agriculture as a driver of growth within the sample period of 1970 to 2014. By utilising a panel data approach for 34 developing countries, result shows that the relationship between industry exports and economic growth is positive and significant while for the agriculture and economic growth is weak. More so, Faridi (2012) investigate and measure the contribution of agricultural exports to economic growth in Pakistan and further evaluates the nexus GDP and agricultural and non-agricultural exports for Pakistan by adopting a Johansen co-integration approach for the period covering 1972 to 2008. Result shows that agricultural exports have negative and significant effect on economic growth while agricultural exports elasticity is 0.58. Moreover there is bidirectional causality in agricultural exports and real GDP. According to Caselli *et al.* (2012) even in an open economy, low agricultural productivity can constrain the process of structural transformation. The study utilised a multi-region multi-sector model, calibrated to data from Ghana, to argue that high domestic transportation costs can reduce the benefits of openness.

Using a descriptive analysis, (Rahman, 2017) describes the role of agriculture in the economy of Bangladesh with a focus on problems and challenges of the sector. The main reason behind the loss of agricultural land in Bangladesh is the growth of rural housing followed by urbanization and industrialization. Despite many prospects of agriculture sector, evidence shows the existence of critical challenges affecting the productivity growth of the sector. According to Kopsidis (2012), the potential for agricultural growth was much more restricted in Southeast than in Northwest Europe but Balkan peasants seem to have exploited their growth potential as far as possible. There is a lot of evidence that the reasons for sluggish growth before 1940 were definitely not rooted in any peasant traditionalism as often claimed by Balkan elites and many scholars.

As submitted by Lyatuu *et al.* (2015), agriculture's importance to poverty reduction goes far beyond its direct impact on farmers' incomes. Yet, the economic steady and fast grow has not shown significant reduction of poverty. The authors further assess the wider role of agriculture during economic growth and its impact on poverty reduction based on agriculture growth and development trend covering a period of 1965 to 2013. By adopting OLS and correlational analysis, results indicate that increase in population and poor public services in rural areas exacerbate poverty and accelerate shifting from agriculture to non-agriculture activities especially among educated youth. Also,Shah *et al.* (2015) examine the impact of agricultural exports on macroeconomic performance in Pakistan using annual data covering the sample period of 1972 to 2008. The authors further estimate the relationship between GDP and agricultural and non-agricultural exports for Pakistan by utilising a Johansen cointegration test. Results indicate that agricultural exports have a negative relationship with economic growth, while non-agricultural exports have a positive relationship with economic growth in Pakistan for the period under consideration.

From the foregoing empirical literature review and trend analysis, the relationship between agriculture and economic growth in Nigeria and other developing countries is still ambiguous and inconsistent, hence the need for further research with in-depth analysis to uncover major issues hindering the successful development of the sector and suggest feasible approaches through policy implications that would return-back its full potentials as an important determinant of economic growth in Nigeria.

4. Materials and Method

To examine the impact of agriculture on economic growth in Nigeria, this study utilises annual time series data covering the sample period of 1981 to 2018. Data on real GDP (proxy for economic growth) and agricultural productivity are sourced from the 2018 Central Bank of Nigeria's statistical bulletin. While, statistical data on labour force and agricultural export are sourced from the 2020 world development indicators of the World Bank. According to World Bank (2020), labour force comprises of people ages 15 and older who supply labour for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. Not everyone who works is included, however. Unpaid workers, family workers, and students are often omitted, and some countries do not count members of the armed forces. Labour force size tends to vary during the year as seasonal workers enter and leave. On the other hand, agricultural export (quantity index) refers to an aggregate agricultural and aggregate food product which represent the changes in the price-weighted sum of quantities of commodities traded between countries. Moreover, agricultural productivity is the aggregate contribution of the sector in the share of real GDP, and also expressed as the ratio of agriculture to GDP.

In order to achieve its objective, this study employs the Autoregression Distributed Lag (ARDL) model to measure the coefficients and further evaluates the short-run and long-run relationship among the variables. Since the previous literature concentrate more on Ordinary Least Square (OLS) technique, granger causality and vector autoregression model as techniques of analysis, there is needs to provide a clear departure from the preceding studies

and adopts a more relevant method. The ARDL model takes sufficient number of lags to capture the data generating process in a general-to-specific modelling framework. Another rationale for chosen the ARDL among other techniques in the literature is due to its flexibility and accommodation of variables that are of different order of integrations. To express a functional relationship for the model, real GDP is captured as a function of agricultural productivity, labour force, and agricultural export. The model is given as:

GDP= f (AGP, LBF, AEX) (1)

To express in econometric framework, the aforementioned equation 1 is stated as:

$$GDP_t = \alpha_0 + \beta_1 AGP_t + \beta_2 LBF_t + \beta_3 AEX_t + \varepsilon_t \quad (2)$$

Where, GDP_t is the real gross domestic product (proxy for economic growth); AGP_t is the aggregate output from the agricultural sector; LBF_t is the total labour force; AEX_t is the share of agricultural export from the country's total export; α_0 is the intercept; β_1, β_2 and β_3 are the model coefficients; while ε_t is the error term.

Furthermore, the ARDL model can estimate both the short-run and the long-run dynamics simultaneously and also provide useful information on their elasticities using the bound testing approach. The bound testing is fundamentally based on the unrestricted error correction model using the OLS estimator, and is presented as ARDL-ECM model as follows:

$$\Delta GDP_t = \alpha_0 + \sum_{i=0}^{n} \beta_{1i} \Delta GDP_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta AGP_{t-1} + \sum_{i=0}^{n} \beta_{3i} \Delta LBF_{t-1} + \sum_{i=0}^{n} \beta_{4i} \Delta AEX_{t-1} + \beta_5 GDP_{t-1} + \beta_6 AGP_{t-1} + \beta_7 LBF_{t-1} + \beta_8 AEX_{t-1} + \varepsilon_{it} \quad (3)$$

Where Δ is the first difference operator; β_{1i}, β_{2i}, β_{3i}, and β_{4i} are the short-run dynamics of the model; β_5, β_6, β_7, and β_8 are the long-run dynamics; n is the number of optimal lag length. To identify whether all variables have cointegrating relations, the F-statistic (Wald test) is computed to test the null hypothesis H_0: $\beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$ against the alternate hypothesis H_a: $\beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq 0$ using the critical bounds values obtained from the model. If the computed F-statistic exceeds the upper bound I(1), then, the null hypothesis of no cointegration can be rejected; implying the presence of long-run relationship among the variables. On the other hand, if the F-statistic falls between the upper and lower bounds, no conclusive inference can be made. Also, if the computed F-statistic falls below the lower bound I(0), the null hypothesis of no cointegration cannot be rejected.

Moreover, a dynamic Error Correction Model (ECM) can be derived from the ARDL model through a simple linear transformation. The ECM integrates the short-run dynamics with the long-run equilibrium without the losing long-run information. The general form of the ECM to be estimated for the impact of agricultural productivity on economic growth in Nigeria is given as follows:

$$\Delta GDP_t = \alpha_0 + \sum_{i=0}^{n} \beta_1 \Delta GDP_{t-1} + \sum_{i=0}^{n} \beta_2 \Delta X_{t-1} + \beta_3 ECM_{t-1} + \varepsilon_{2t} \quad (4)$$

Where, ECM_{t-1} is the error correction term which indicates the speed of adjustment parameters back to long-run equilibrium after short-run shock; X_{t-1} represent the vector of independent variables; ε_{2t} is the stochastic error term.

5. Results and Discussion

In time series analysis, the first step to analyse a model is to examine the stationarity property of the model with a view to avoiding spurious regression. Consequently, this study employs the Augmented Dickey Fuller (ADF) unit root test to check the order of integration for all series and further avoid spurious estimates.

5.1. Unit Root Test

The unit root test is a test of stationarity or non-stationarity of time series data. A time series data is said to be stationary if it mean, variance and auto-covariance (at various lags) remain the same no matter the point at which they are measured. Using the ADF test both at level and first difference in this study, the order of integration of the variables is evaluated and examined at 1%, 5% and 10% critical values. In the long-run, the feasibility of cointegrating relations among the variables largely depends on whether the variables are stationary or otherwise. Results for the ADF unit root test are presented in Table 1.

Table-1. ADF unit root test

Variables	ADF t-statistics	P-value
GDP	-6.33	0.0002*
AGP	-4.75	0.0005*
LBF	-3.12	0.0382*
AEX	-3.89	0.0133*

Source: Author's computation using Eviews 10.
*denotes the rejection of null hypothesis of a unit root test at 1%, 5%, and 10% level of significance

Table 1 presents the result of ADF unit root test estimated with intercept and no trend and also trend with intercept, with virtually no significant difference among the two approaches. The variables are all significant both at level and first difference in 1%, 5%, and 10% levels. It can be established that the order of integration is in mixed order for all variables, hence desirable for estimating the long-run relationship using the ARDL framework.

5.2. ARDL Bounds Test

After identifying the spurious nature of the series and their integrating order, it is imperative to determine the existence or otherwise of the long-run relationship between real GDP, agricultural productivity, labour force and agricultural export. Because ARDL framework is sensitive to any chosen lag length, an automatic lag length is selected by the model using Schwarz information criterion (SIC). Result for the bounds test is presented as follows:

Table-2. Bounds test

F statistics = 11.23**		
Critical Values	**Lower Bound**	**Upper Bound**
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61
R^2 = 0.874118		

Note: **denotes significance at 1%, 2.5%, 5% and 10% levels

Information presented in Table 2 is the result of Bounds test based on the automatic model selection as chosen by the SIC. From the Table 2, the value of F-statistic is found at 11.23 which is higher than all the critical values at various level of significance. The result indicates the presence of a long-run relationship between the real GDP, agricultural productivity, labour force and agricultural export in Nigeria for the period under consideration. Therefore, the null hypothesis of no long-run relationship shall be rejected based on this empirical result. Furthermore, the value of R-squared (R^2) which represent the coefficient of determination is found at 0.87. Meaning that, 87% of the total variation in economic growth is explained by agricultural productivity, labour force and agricultural export.

5.3. Long-Run Coefficients

The long-run coefficients for this ARDL model are estimated and the results are presented in a Tabular form for ease of reference.

Table-3. Long-run coefficients of the ARDL model

Variable	Coefficient	Std. error	t-Statistic	P-value
AGP	-0.499722	1.954070	-0.255734	0.8039
LBF	0.002793	0.001349	2.070139	0.0683**
AEX	4.698434	1700.192	2.763707	0.0220*
C	-9.8309	47722.265	-2.060038	0.0695**

Note: *denotes significance at 5% level
**denotes significance at 10% level

Results from Table 3 shows the long-run coefficients estimated from the ARDL model. The result shows that agricultural productivity (AGP) has a negative and insignificant impact on economic growth. In addition, labour force (LBF) has a positive and significant impact on economic growth as indicated by the p-value of 0.0683 at 10% level. This implies that, one percent increase in total labour force may lead a corresponding increase in economic growth by about 0.2%. This finding is consistent with the study of Gbaiye *et al.* (2013) who also found the presence of positive and significant relationship between labour force and economic growth in Nigeria. It has been observed in recent times that, labour productivity in Nigeria is very crucial and relevant to attaining sustainable development. Due to high labour force in the agricultural sector supported by various government initiatives to encourage farming undertakings, economic activities has remarkably increased thereby making provisions for sustainable food supply in the long-run. This is evidenced by the significant mobility of labour to farming activities, self-improvement and enhanced income among farmers, as well as a considerable increase in standard of living. Therefore, increased labour force results in higher farming output, increased individual income and sustained economic growth. However, labour force is a component of human capital development, and the human capital is another significant determinant of economic growth. The rationale for improved labour force over the period in Nigeria could be due to adequate government intervention in agricultural sector through Npower scheme, RIFAN and other agricultural development programmes.

More so, agricultural export (AEX) has a positive and significant impact on economic growth as revealed by the positive coefficient and p-value of 0.0220 at 5% level. This shows that one percent increase in agricultural export may lead to 4% increase in economic growth in the long-run. This finding is consistent with the works of Verter and Bečvářová (2016); Gilbert *et al.* (2013) who also affirm the presence of a positive and significant relationship between agricultural exports and economic growth in Nigeria. The possible reasons for the positive impact of agricultural exports on economic growth could be due to several presidential initiatives in recent times aimed at boosting the production and export of rice, cassava, sesame, palm oil and cocoa. In addition to the ongoing Agricultural Credit Guarantee Scheme Fund (ACGSF) backed by the CBN, there is concessionary interest rates for agricultural loans where commercial banks are mandated to extend credit to agriculture at a regulated rate of 9 percent per annum. These initiatives coupled with sound environmental factors have encourage flow of agricultural

output into domestic and international markets thereby increasing the export volume and accelerating sustainable growth and development of Nigeria.

5.4. Error Correction Model

The error correction model (ECM_{-1}) for this ARDL framework is estimated and results are presented. In absolute term, it value must lies between zero and one (greater than zero, but less that one). The rationale for estimating the ECM_{-1} is to capture the dynamics in the short-run period for the economic growth equation and to further examine the speed of adjustment as a response to departure from the long-run equilibrium. Result for the ECM_{-1} is given as follows:

Table-4. Result of the error correction model

Variable	Coefficient	Std. Error	t-Statistic	P-value
AGP	0.936782	0.346294	2.705164	0.0242*
LBF	0.003543	0.000832	4.256674	0.0021*
AEX	-340.1025	153.2794	-2.218840	0.0537**
CointEq(-1)	-0.264962	0.086839	-3.051178	0.0138*

Note: *denotes significance at 5% level
**denotes significance at 10% level

Table 4 presents the result of the ECM_{-1} for the estimated ARDL model. The coefficient of the ECM (CointEq(-1)) is found to be negative and statistically significant at 5% level, hence desirable. In other words, 26% of the long-run disequilibrium is adjusted from lagged period error shocks in the current period. In relation to that, the speed of adjustment shows a moderate convergence towards the equilibrium period. Unlike in the long-run period, the coefficient of agricultural productivity (AGP) is found to be significant. Therefore, labour force and agricultural export seem to be an essential variables affecting economic growth both in the short-run and the long-run period.

5.5. Diagnostic Test

To ensure the robustness of the model, various diagnostic tests are conducted and the results are presented with the view to ensuring reliability of the findings. Diagnostic tests for serial correlation and heteroskedasticity test using the Breusch-Pagan-Godfrey framework and the Normality test using the Jarque-Bera statistics are conducted. These results are given as follows:

Table-5. Results for diagnostic test

Diagnostic test	P-value
Serial correlation test: Breusch-Godfrey	F-statistic = 0.61 P-value = 0.7034**
Heteroskedasticity test: Breusch-Pagan-Godfrey	F-statistic = 2.42 P-value = 0.1081**
Normality test	Jarque-Bera = 0.79 P-value = 0.6713**

Note: **denotes insignificance at 1%, 5% and 10% level.

Table 5 shows the results of various diagnostic tests estimated from the ARDL framework stated in equation 3. The tests for serial correlation and the heteroskedasticity are based on the null hypothesis of no serial correlation and heteroskedasticity, respectively in the model. As such, if the p-values are significant, then there is a serial correlation and heteroskedasticity, otherwise there is none. As seen from the Table 2, all p-values are insignificant, indicating the non-existence of serial correlation and heteroskedasticity in the model residuals. Furthermore, the result of Normality test shows that the model is normally distributed since the Jarque-Bera statistic is not significant, hence desirable.

6. Conclusion and Recommendations

Improving the productive capacity of agriculture in developing countries of sub-Saharan Africa through various government initiatives is an essential policy target for the region, Nigerian economy is inclusive. More so, the prospects for sustainable growth and development in the Nigerian agricultural sector are optimistic, if the government can adopts feasible measures to curtail the shortages in the sector. In view of the foregoing, this study examines the impact of agriculture on the economic growth in Nigeria using annual time series data covering the sample period of 1981 to 2018. To analyse the data collected, ARDL model through the bounds testing framework is employed to measure the existence of cointegrating relations between real GDP, agricultural productivity, labour force, and agricultural export in Nigeria. Results show the presence of both short-run and long-run relationship among the variables, while labour force and agricultural export are positive and significant on economic growth only agricultural productivity do not have a significant impact in the long-run. It is therefore concluded that agricultural sector has a positive and significant impact on economic growth and also contributes to sustainable development in Nigeria.

It can be established that the performance of economic growth in the long-run seems to be influenced only by labour force and agricultural export in the long-run period. This finding informs the Nigerian government on the need to expedite labour force (human capital) and agricultural export (non-oil) development with the view to achieving sustainable growth and development. Developing skills and competencies of labour force through capacity

building in the agricultural sector will encourage research and development thereby increase the export size, hence essential for long-term growth. Moreover, given the insignificant coefficient of agricultural productivity in the model, government should diversify the economy and strengthen the agricultural value chain initiatives through increased spending and investment expenditures. As such, fiscal incentives and special agricultural credit that will promote food production and efficiency in resources allocation should be sustained in the economy. Both public and private partnership should be encouraged in the agricultural production. Government must look inward with regards to product development in agricultural production. The sector should be diversified to accommodate foreign investments in the form of technological inputs and mechanisation.

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