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Investments in agriculture, agriculture sector performance and economic growth nexus in Nigeria: ARDL bound testing evidence

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Abstract

This research examined the federal government and private sector investments in agriculture, agriculture sector performance and economic growth nexus in Nigeria and widens the scope of the research by including more explanatory variables. Annual series data for the period 1980–2019 were obtained and ARDL approach to cointegration was utilized to examine the issue. Results revealed positive and negative relationships; but the variables were cointegrated, thereby fulfilling the mandatory requirement for estimating long run relationship among the variables. The error correction term is negative and significant but less than 1; thereby indicating that the speed of adjustment towards long run equilibrium was very high at 97% annually, if any shock(s) occurred. Findings showed that in the long run, government capital expenditure on economic services (lnGCEES), non-oil export (lnNOE), and agriculture, real GDP (lnAGDP) had positive relationships and statistically significant impact while, agriculture, value added %GDP (lnAGV) and value of loans guaranteed under ACGSF (lnACGSF) had negative relationships but significant impact on economic growth in Nigeria over the period of study. However, non-oil revenue (lnNOR) exhibited positive but insignificant relationship; while commercial bank loans and advances to agriculture (lnCBLA), government recurrent expenditure on agriculture (lnGEA) and agricultural output (lnAGOU) exhibited negative and insignificant relationships with economic growth.The model passed the entire diagnostic tests comprising serial correlation, normality, and heteroscedasticity. Stability tests of cusum and cusum squares were stable, which show the fitness, strength and reliability of the model. The policy implication of these findings is that commercial bank loans and advances to agriculture, the value of loans guaranteed under the ACGSF and other agricultural funding options such as the current Central Bank of Nigeria (CBN) driven Anchor borrowers programme, Agriculture credit to small and medium enterprises scheme (AGMEEIS) amongst others; and the recently revitalized National land development programme should be broadened, vigorously promoted and monitored to enhance the efficacy and performance of investments in agriculture and the agricultural sector; through increased value addition, agricultural exports and non-oil revenue and increased agricultural budgetary allocation for Nigeria's economic growth and development.

Keywords: Agriculture sector performance, Bounds test, Economic growth, Government expenditure, Private investment.

1. Introduction

Public spending is motivated by the desire to reduce economic inefficiencies caused by market failures and inequality in the distribution of goods and services caused by differences in initial allocation of resources across different groups and members of society; while different types of public expenditures have different effects in reducing economic inefficiencies and inequality, via different but interdependent pathways that materialize over time at different rates (Fan, 2008). The general view however is that public

expenditure either recurrent or capital expenditure, notably on social and economic infrastructure can be growth-enhancing and as noted by Samuelson & Nordhaus (2003), nowhere can changes in government's role be seen more clearly than in the area of government spending while, a sound public expenditure policy produces food effects both on production and distribution.

Chandio, Jiang, Rehman and Jingdong, (2016) assert that, in today's world, the agriculture sector acts as a catalyst, accelerating the pace of restructuring and diversified economy that depends less on supply of foreign agricultural products or raw materials thereby contributing mainly to a nation's development in aspect of enhancing government revenue; infrastructural growth, living standards, gross national product (GNP) and sustainable development. Udoh, (2011) also notes that a country's agricultural sector is expected to play a particularly important role in development performance; the sector, being the largest segment of economic activity hence its performance determines the well-being of a large fraction of the population and a source of various resources that can be transferred to other faster growing sectors in the economy.

Moreover, as Woolf & Jones, (1969); Oluwasanmi, (1966); and Eicher & Witt, (1964) indicate, economic history provides ample evidence that agricultural revolution is a fundamental pre-condition for economic growth especially in developing countries like Nigeria while Diao, et al. (2007) contend that, agriculture is essential for advancement in Africa since larger part of the populace dwells in rural regions, and no less than 70 percent of its workforce is occupied with agriculture and in numerous nations in Africa, hence development in farming remains the best technique of reducing poverty and advancing general growth of the economy.

It is therefore logical that in economies where majority of the population depends on agriculture for its livelihood, government agricultural spending is one of the most important instruments of government for promoting overall economic development and the alleviation of poverty (Diakosavvas, 1990; Uptal & Dahun, 2018) and as Binswanger, Khandker & Rosenzweig, (1993) note, agricultural spending by the government can directly increase agricultural output by shifting upward the production frontier thereby implying that agricultural spending by the government increases the rate of return to private agricultural investment leading to greater investment and output in the agricultural sector of the economy (Kelly, 1997; Uptal & Dahun, 2018).

However, reducing poverty, improving nutrition and general well-being of the population would hinge critically on the performance of the agricultural sector (Idoko & Sunday, 2018) and as the World Bank (2006) indicates sustained economic development cannot be achieved without economic growth because high poverty level will lead to low growth and low growth will result to high poverty level.

Several studies attempted to determine the effect of government expenditure on economic growth; some country specific and others cross country (Dinca & Dinca, 2013; Loto, 2011; Shuaibu, Igbinosun & Ahmed, 2015; Maku, 2009; Ayunku and Etale, 2015; Idoko & Sunday, 2018; Oji Okoro, 2011; Izuchukwu, 2011) with most of these studies showing mixed results and neglecting the sector specific performance of the economy. Some authors contend that the link between public expenditure and economic growth is weak while others report varying degrees of causality relationship in Nigeria. A number of studies also revealed that there were mixed results in the relationship between public expenditure and agriculture output/performance (Chandio, et al., 2016;

Kipruto & Nzai, 2018; Ebere & Osundina, 2012; Agri, Haruna & Dowchem, 2019; Okpara, 2017; Itodo, Apeh & Adeshina, 2012; Fan & Rao, 2003; Uptal & Dahun, 2018; Diakosavvas, 1990; Njoku, Ihugba & Chinedu, 2013; Rufus & Oyewole, 2018).

Despite the large number of studies that have been undertaken to understand the relationship between government expenditure and economic growth in Nigeria, it is worth noting that most of these studies disaggregate the sectors of the economy from the few sector-specific studies, with none of the sector specific studies comprehensively addressing agricultural expenditure and agricultural performance beyond public expenditure on agriculture and output growth respectively and their economic growth linkage. The question which arises therefore is what is the relative contribution of public and private sector investments in agriculture and agricultural development/performance to economic growth in Nigeria?

In view of the foregoings, this study widens the scope of the research to include private sector investments in terms of commercial bank loan and advances to agriculture (CBLA) and the value of agricultural loans guaranteed under the agricultural credit guarantee scheme fund (ACGSF) and other agriculture performance indices which include agriculture value added as percentage of GDP (AGV), non-oil export (NOE), non-oil revenue (NOR), and agriculture, real GDP to enable broader examination of the complementarity of public and private investments in agriculture, agriculture sector performance and economic growth nexus in Nigeria.

The main objective of this study therefore, is to examine the nexus between public and private investments in agriculture, agricultural sector performance and economic growth in Nigeria for the period 1980 – 2019, while the specific objectives are to:

i) Examine the long run relationship between public and private investments in agriculture and economic growth in Nigeria.
ii) Examine the long run relationship between agriculture sector performance and economic growth in Nigeria.

2. Review of Related Literature

2.1 Conceptual Framework

2.1.1 Public and Private Investments in Agriculture and Nigeria's Economic Growth

According to Scott (2010), "Public expenditure is money extended by the government to pay for defense, development project in agriculture, health, infrastructure, agriculture, law and order, etc.'' and Samuelson & Nordhaus (1988), considered capital and recurrent expenditure as the major items of public expenditure components. Also, CBN, (2001) described public expenditure as the cost or expenses, which the government incurs for its own maintenance as well as the general welfare of the society and can be seen as an outflow of resources from government to other sectors of the economy whether it is required or not; and it is generally categorized into capital and recurrent expenditure; and incurred by the government at various levels which include the federal, state and local government levels in Nigeria (Siyan, 2000).

Public expenditure is therefore an important instrument for government to control the economy and used to fill the gaps that are untouched in the market economy through the provision of public utilities, healthcare, and social security. Government uses its expenditure and revenue activities to effect the desired change in income, production, price and employment (Nurudeen & Usman, 2010; Sareen, 1990) and as Ewubare & Eyitope (2015) indicate, it is the main instrument used by governments especially in developing countries to promote economic growth which is an essential ingredient for sustainable development.

Udoh, (2011) also notes that public spending is an important factor for self – sustaining productivity gains and long term growth, can contribute to agricultural growth (and hence poverty alleviation), and has indirectly created rural non – farm jobs and increased wages while, Uptal & Dahun, (2018) assert that, government spending can specifically or indirectly influence farm income and where it is correlative to private investments would to some degree influence productivity of farming sector as public expenditure like access or provision of credit to farmers, spending on animal health, veterinary, research, extension services and access to roads in rural areas had a significant effect on the output of the agricultural sector in the Meghalaya region in India.

But more importantly, as Fan, Zhang & Zhang, 2000; Van de Walle, 1996; & Galal, 2003 indicate, the real significance of government development lies in the fact that it imparts a greater amount of "trickle-down" benefits for the poor in the growth process than growth alone; given that economic growth alone often reduces poverty only by increasing mean consumption, while government expenditure on agriculture reduces poverty both by increasing mean consumption and improving distribution of income.

The Food and Agriculture Organization [FAO], (2010) recommendation that 25% of developing countries' budgetary expenditure be channeled/allocated to agricultural sector development has not been achieved by the various administrations in Nigeria, thereby affecting government programmes and policies for the agricultural sector (Agri, et al, 2019) and as Olamola & Moques, (2018) indicate, budgetary allocation to agriculture compared with other key sectors is also low despite the sectors role in the fight against poverty, hunger, and unemployment, and in the pursuit of economic development. FAO, (2010) further notes that public underinvestment in agriculture, and the sector's importance to economic growth and poverty alleviation, particularly in Africa, was acknowledged in the African Union's Maputo Declaration of 2003, under which signatory nations committed to allocate 10% of government expenditures to agriculture and rural development and because several countries were unable to attain this goal, signatory nations re-committed to the 10% goal in the Malabo Declaration of 2014.

While agricultural spending expressed as a share of total spending is generally low in African countries compared to other developing countries, Nigeria fares unfavourably even within the context of African/developing countries. For example, during 2012–2016, on average, Malawi (16.4%), Bhutan (13.0%) and Uzbekistan (11.9%) had the highest share of agriculture in the central government expenditure (FAO, 2020). In terms of capital allocation to agriculture in Nigeria, it was 4.74% from 1970 -1980, but rose to 7.0% and 10% from 1980 – 2000 and 2001 -2007 respectively thereby indicating an increasing trend but falling far short of the FAO's 25% threshold (FAO, 2010); and when public spending in agriculture in Nigeria is benchmarked relative to public spending in other sectors, the value of the indicator for agriculture is lower than the values of all other sectors, such as industry, construction, trade, and services (Mogues, et al., 2008). The share of central governments' expenditure by regions from 2001-2017 is as shown on the figure 1 below.

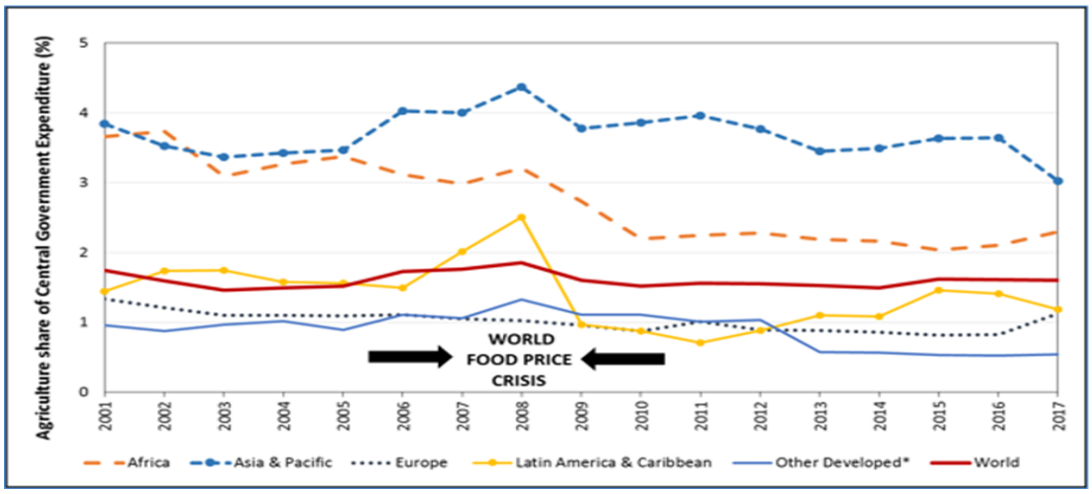


Chart 1: Share of Central Government Expenditure on Agriculture
Source: Food and agriculture Organization (2020)

Therefore, the share of government expenditure on agriculture in total government spending can be taken as an indicator to measure how much attention the government gives to the sector.

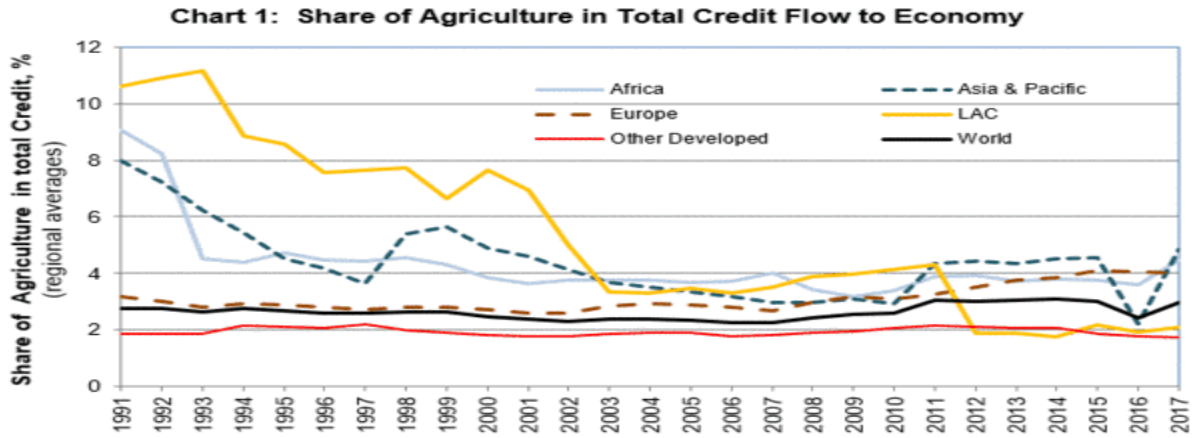
At the global level, agriculture orientation index (AOI) for government expenditures which compares the central government contribution to agriculture with the sector's contribution to GDP consistently declined from 0.42 (2001) to 0.26 (2017). (FAO, 2020).

In Nigeria, total expenditure on agriculture as a percentage of overall expenditure fluctuated from 4.57 per cent between1986-1993, to an average of 4.51 per cent per annum between 1994-1998, to 3.53 per cent between 1999 and 2005; thus, reflecting intensified efforts by the government to reduce its size (Udoh, 2011), a reduction which led to inadequate funds for the sector over the years. However, Nurudden, (2018) indicates that, in 2018, the federal government of Nigeria spent N172.8 billion on agriculture, representing 2% of its total budget of N8.6 trillion for the year (N53.8 billion was for recurrent, while N118.9 billion was for capital votes) while in 2017, of the N7.3 trillion budget for the year, the federal government voted only N123 billion (1.6 percent) for agriculture out of which salaries and overheads got N31.7 billion while the remaining N91.6 billion was for capital projects. The government spent N75.8 billion (1.26 percent) on agriculture in 2016 out of its total budget of N6 trillion with N29.6 billion of the amount for bureaucratic expenses, leaving N46.17 billion for agricultural capital expenditure thereby indicating an insignificant rising trend in federal government expenditure on agriculture.

Agri, et al., (2019) assert that the government expenditure resulted in more inefficiency and wasteful allocation of resources as it has not succeeded in solving the problem of low agricultural productivity in Nigeria due to poor incentives in public sector, lack of information, bureaucracy and high administration costs in the public sector and decision taken for political reasons. And as pointed out by Onokaya & Somoye, (2013), the mismatch between the performance of the Nigerian economy and massive increase in government total expenditure over the years therefore, raises a critical question on the role of public expenditure in promoting economic growth and development. The question which arises then is what is the relative contribution of government expenditure to agricultural performance/development and economic growth in Nigeria?

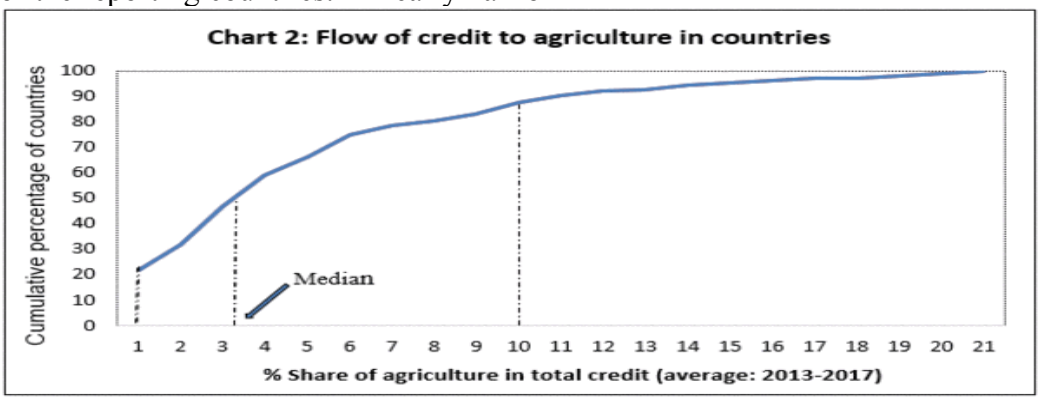
FAO (2020) also notes that, from 2003 onwards, the agriculture sector in most

regions received between 2 to 4% of total credit and following the food price crisis of 2007-08 and the increased policy attention to food security and agriculture, most regions witnessed a slow revival of credit to agriculture, with higher growths observed in Asia and the Pacific and Africa regions.



Source: Food and agriculture Organization (2020)

FAO, (2020), further notes that the highest level of credit given to agriculture in any country was 21% of total credit, irrespective of its share in the GDP. Countries having less than 10% flow of credit to agriculture constituted nearly 88% of the reporting countries. In nearly half of the countries in the world, agriculture receives less than 3.2 % of total credit flows in the economy, with nearly 25 countries receiving below 1% of formal credit disbursements.



Source: Food and agriculture Organization (2020)

The total credit to agriculture disbursed by commercial banks operating in the countries increased from 2.4% in 2016 to 2.9% in 2017; but given that the agriculture sector globally contributed over 4% of gross domestic product (GDP), the situation indicates that agricultural producers face a negative bias in access to credit (FAO, 2020).

The trend of private sector investment in agriculture in Nigeria proxied by the value of commercial bank loans and advances to agriculture (CBLA) in Naira billion, and the value of loans guaranteed under the agricultural credit guarantee scheme fund (ACGSF) in Naira billion from 1980 -2019 is as shown in Chart 3 below.

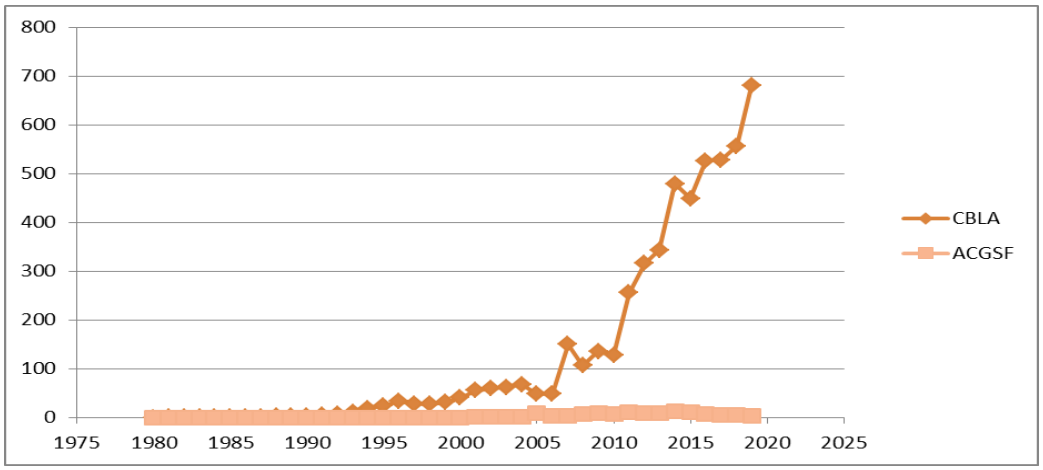


Chart 3: Trend of private sector investment in agriculture in from 1980 – 2019
Source: Author's computation using variables data obtained from CBN, Nigeria.

2.1.2 Agriculture Sector Performance and Nigeria's Economic Growth

Agriculture is the simplification of nature's food webs and the rechanneling of energy for human planting and animal consumption (Akinboyo, 2008) and involves crop production, forestry, fishing, processing and marketing of these agricultural products (Aminu & Anono, 2012). The role of agriculture in reforming both the social and economic framework of an economy cannot be overemphasized. In effect, it serves as the main source of gainful employment, from which the nation can feed its teeming population, a regenerative source of foreign exchange earnings, a means of providing the nation's industries with local raw materials and a reliable source of government revenue (Usman & Tahir, 2020; Adamu, Tahir, Iliya, & Bello, 2020).

Osagie (1985), assert that subsistence agriculture on small plots of land was the way of life of the vast majority of Nigerian farmers as it is for the most of the other developing nations of the world and Dalhatu (1991) observed that 90% of the nation's farming population which was responsible for about 95% of the aggregate food and fiber output in Nigeria were in actual fact small holder farmers. However, there has been a gradual transformation from subsistence type of agriculture all over the country to the commercial and the plantation agriculture. (Courtenary 1965; Hasselman, 1981; La- Anyang, 1961; Rothenberg 1971, Symon 1966; Udo, 1982) as cited in Anyanwu, Oaikhenan, Oyefusi & Dimowo, (1997).

Idoko & Sunday (2018) observe that, the importance of agriculture to the Nigerian economy is evident in the nation's natural endowments in production sectors – extensive arable land, water, human resources, and capital; hence exploring the nation's productive advantage in this sector remains the fastest way to stimulate growth in the economy. However, Olajide, Akinlabi & Tijani, (2012) indicate that in spite of Nigeria's rich agricultural resource endowment, there has been a gradual decline in agriculture's contribution to the nation's economy. In the 1960's, agriculture contributed up to 64% to the total GDP which gradually declined in the 70's to 48% and continued in 1980 to 20% and 19% in 1985, as a result of oil glut of the 1980's (Ukeje, 2003). The situation got worse in the late 1990s by less than 2% largely due to the rise in crude oil revenue in the early 1970s (Ijaiya, 2000; Iwayemi, 1994; Ukpong & Malgwi, 1991, Olajide, et al., 2012). The percentage contribution of the agricultural sector to GDP fell

persistently from 37% in 2009 to 22% in 2012 and to 20% in 2014 (Matthew & Mordecai, 2016). The sector accounted for 25% of GDP in 2017, and grew by 4.23% in Q4 2017 while the federal government estimated 3.5% growth of the sector in 2018 (Agri, et al., 2019).

The key challenge for the government in Nigeria therefore, has been to increase productivity of all agriculture and horticulture crops in the country to keep pace with the growing need of the population (Agri. et al., 2019). In order to overcome these challenges, various administrations in Nigeria since the 1970s, have embarked on and pursued various policies and programmes aimed at reforming and accelerating the development of the agricultural sector and diversifying the country's economy. These policies and programmes include the establishment of specialized agricultural development banks; agricultural rural and land development projects; universities of agriculture, agricultural research institutes and training centres; and the central bank of Nigeria (CBN) driven agriculture credit support and guarantee schemes in collaboration with the commercial banks the federal ministry of agriculture and water resources and other stakeholders. (see Manyong, 2003; Evbuomwan, 2003 and Okpara, 2017).

However, Okolo, (2004) indicates that in spite of these plethora of programmes and policies put in place and the supposed priority accorded the agricultural sector by the federal government, none of them can be described as wholly successful nor has the sector produced the desired outcome; partly due to instability and inconsistency in the policies which tended to be mutually antagonistic rather than mutually complementary, poor funding and implementation, lack of synergy between public and private expenditure in boosting agricultural production, poor managerial capacity, bureaucratic bottlenecks, corruption and lack of commitment on the part of those saddled with the responsibility of implementing the policies which turned the lofty objectives of good agricultural projects into mirage(Manyong 2003; Ogen, 2007; Agri, et. al, 2019; Usman & Tahir, 2020).

The Central Bank of Nigeria (CBN) in line with its developmental function among other programmes, established the Anchor Borrowers' Programme (ABP) on November 17, 2015 which is intended to create a linkage between anchor companies involved in the processing and small holder farmers (SHFs) of the required key agricultural commodities. The programme thrust of the ABP is provision of farm inputs in kind and cash (for farm labour) to small holder farmers to boost production of these commodities, stabilize inputs supply to agro processors and address the country's negative balance of payments on food (CBN, 2015).

The programme seem to be yielding the desired results given the significant increase in the domestic production output of the required food commodities and decline in the food import bill over the past four years. The Food production plan for Nigeria (Perspective Plan for Agricultural Development - 1990-2005) under which the Nigerian agricultural land development agency (NALDA) has also been revitalized in 2020 under the current federal government's youth empowerment Programme.

2.2 . Theoretical Framework

Agricultural development literature is rife with a plethora of theoretical models that describe and explain the paradigmatic options for agricultural development and the variants of agricultural development strategy while several hypotheses have been put forward to explain government expenditure effects on sector output performance and by extension, economic growth.

The conservation model had bearing with the English agricultural revolution of the 18th century. It is based on the presumptions

that agricultural land will become scarce and scarcer. The model was supported by the economic theories of classical English economists – Thomas Malthus, David Ricardo and John Stuart Mill and proposed that as land scarcity increases, poorer land is used, causing the marginal productivity of labour and of land to decline. To forestall this situation, emphasis was attached to maintaining soil productivity at its present level, or returning it to its original productive level. Over time, the relevance of the conservation model has diminished because of the increased scope for increasing the productivity of land through more efficient modern inputs. The model failed to take into account the potential impact of technological change on the demand for land in agriculture as evidenced by the agricultural development framework used by the People's Republic of China in the late 1950s and early 1960 (Jhingan, 2006).

The industrial fundamentalist model places industrial sector at the center and agriculture at the periphery. This logic, which followed the industrial revolution in Europe, the United States and Japan, sees agriculture as having little prospects of accelerating growth and capital accumulation. But, critics of the industry first model showed that a lagging agricultural sector would slow economic growth, as experienced by India and other countries. In this regard, it has been posited that "any underdeveloped economy which attempts to force the pace of industrialization while disregarding the need for a prior or at least simultaneous revolution in its agricultural sector will find the going most difficult". The industry model gave way to the balanced growth approaches, when by early 1970s; the green revolution demonstrated very high returns from investment in agriculture (Jha, 2003).

Several hypotheses have been put forward to explain government expenditure effects on sector output performance (Kipruto and Nzai, 2018). However, Mitchell (2005) indicates that economic theories do not automatically generate the accurate result about the effect of government expenditure on economic performance. But, most of economists agree that there are some circumstances in which low level of government spending would enhance economic growth and other huge level of government spending would be desirable (Anning, Haisu, & Riti, 2017; Udoh, 2011; Oyinbo, Zakari & Rekwot, 2013)

Wagner's law and the Keynesian theory have two opposing views in examining the relationship between government spending and growth. Wagner's model sets to elaborate that causality spans from growth to government spending while the Keynesian model holds an opposing view that causality spans from government spending to economic growth in the periods of recession. Wagner (1883) explains that growth in an economy can cause an expansion in government spending. Keynes (1936) on the other hand initiates a model that during a period of recession, economic activities can be spurred up by the use of fiscal policies. In other words, an increase in government spending, expansionary fiscal policy among others can spur economic growth (Anning, et.al., 2017; Zagler & Dürnecker, 2003; Loizides & Vamvoukas, 2005; Shafuda, 2015).

Wagner (1883) hypothesized that as per capita income increases due to industrialization; there is a secular growth in public sector economic activity which is attributed to three factors namely: (i) increased urbanization implying a much larger per capita expenditure on civil amenities that are needed to deal with the increased population and urbanization. (ii) a growing population which leads to the increase in 'cultural and welfare' expenditures; and (iii) rise in public investment activity because of market failure and because of monopolistic trends. However, Bird (1971) pointed out that "the conditions under which one might expect the 'Law' to operate would therefore, seem

to be (i) rising per capita income; (ii) technological and institutional changes of a particular sort; and (iii) at least implicitly, democratization in the sense of wider political participation of the polity" and hence asserts that Wagner's model, while containing many insights, suffered from the drawback that it did not contain a well-articulated theory of public choice.

But in spite of the criticism of Wagner's Law, it continues to play an important role in the study of public expenditure behaviors.

On the other hand, Keynes (1936) hypothesized that when government change tax collection level and government expenditure in the economy, it impacts the aggregate demand and the levels of financial action with main goal of accomplishing macroeconomic destinations of value steadiness, full employment and growth of an economy. Keynes proposed that increasing government spending and decreasing tax rates are the most ideal approaches to fortify aggregate demand, and decreasing expenditure and expanding charges after the economic boom starts.

The theory continues to gain wide acceptance by governments in driving their fiscal policy objectives for economic growth and development in both developed and developing countries.

Endogenous Growth model postulated by Romer and Barro holds that economic growth is basically the aftereffect of endogenous and not outer powers; hence economic growth is primarily the result of endogenous and not external forces and that investment in human capital, innovation, and knowledge are significant contributors to economic growth. (Ayunku & Etale, 2015).

Lee et al. (2019) also indicates that the theory of Barro (1981) states that when the main agent of economic activity accumulates real capital, the government puts same into the production process which prevents the marginal productivity of private capital from falling. Where government expenditure increases private productivity, continued economic growth is envisaged. However, before government expenditure reaches a steady state, it has a positive and maximized effect on growth but if the proportion of government expenditure increases over the steady state, then the economic growth rate will decrease, due to crowding-out effect.

Furthermore, Barro, (1990) indicates that some components of government expenditure are productive and some are unproductive and hence, postulated that a society with incredible work efficiency has a high level of aggregate factor productivity since all firms are identical and each produces some output and further expressed human capital investment, development and knowledge as great contributors for growth of an economy.

Chandio, et al. (2019) therefore, concludes that in the sense of economic growth, government expenditures on health are essential to human capital and agricultural growth. Good investment in the agriculture sector especially in the form of food security is important for human existence, while the financial sources of public expenditure in the form of taxation decreases the taxpayer’s benefits and reduces benefits associated with economic growth.

However, Kelly (1997) explored the effects of public expenditures on growth among 73 countries over the 1970–89 periods. While much of the literature on endogenous growth model attributes weak growth to public investment and social expenditures which inhibit growth through crowding-out and rent-seeking (Stiglitz, 1988; Krueger, 1990, Krueger 1974, Buchanan 1980, Tullock 1980, Bhagwati 1982 and Srinivasan 1985), Kelly’s article highlights the contributions that public investment and social expenditures may make to growth. The article's econometric analysis suggests that crowding-out and rent-seeking concerns may have been overstated in the

literature and argues in favour of complementarity of public and private actions and particularly important in the case of developing countries where such factors as severe income disparity, asset concentration, the disparate nature of production in the agricultural and industrial sectors, land tenure system and fragmented financial markets are key features of the economy. In such economies, public investment program is likely to be the central determinant of successful private sector activity and economic growth over the long run (Gunning & Collier, 1999).

This study therefore, relied on Kelly's proposition of complementarity of public and private actions, in examining the relationship between public and private investments in agriculture, agriculture sector performance and economic growth in Nigeria.

2.3 Empirical Literature Review

Lee, et al. (2019) broadly categorized into three (3); studies on public expenditure and economic growth to include; First, studies on the causal relationship between government spending and economic growth (See Loizides & Vamvoukas, 2005; Ono, 2015; Kolluri, Panik, & Wahab, 2000; Keynes, 1936, Wagner, 1890; Nasiru, 2012; Kunofiwa & Odhiambo, 2013). Second, studies on the correlation between government expenditure and economic growth (See Kipruto, 2018; Muthui et al., 2013; Bulkiewick & Yanikkaya, 2011; Wahab, 2011; Hseih & Lai, 1994; Udoh, 2011; Attari & Javed, 2013; Sáez, Álvarez-García & Rodríguez, 2017) in which overall, advanced research has shown that the relationship between government expenditure and economic growth exhibit a positive relationship; and the third type of study is on the correlation between functional classification of government expenditure (FCOGE) and economic growth (See Lee, et al., 2019; Iganiga & Unemhilin, 2011; Ram, 1988; Devarajan, Swaroop & Zou, 1996;) in which research shows that investment expenditure, such as economy, social security, and education have positive effects, while consumer expenditure has negative effects. Some studies relevant to this research were reviewed and presented as follow.

Laudau (1986) examined the relationship between government expenditure, revenue, and economic growth using a cross section data of 96 countries covering 1961-1976 using ordinary least square (OLS) method. Results indicated that each type of government expenditure had either significant negative or insignificant positive effect on economic growth.

Diakosavvas (1990) estimated the impact of government expenditure on agriculture on the performance of the agricultural sector. An inter-country production function was estimated for a sample of thirty five (35) developing countries, pooling cross-section and time series data over 1974-1984 period. The influence of instability in government expenditure on agriculture and agricultural growth was also assessed. Results show that government expenditure policies were of vital importance in influencing the performance of the agricultural sector and instability in government expenditure constrained agricultural output growth. It was recommended that public expenditure policies should be pruned with care if the ultimate outcome is not to reduce further economic growth.

Devarajan, et al. (1996) studied the relationship of public expenditure and economic growth using a sample of 43 developed and developing countries over the period 1970-1990. Results indicated that public capital expenditure had a negative effect on economic growth for developing countries, and the effect gets dramatically reversed for developed countries due to the fact that expenditures normally considered productive could become unproductive if there is an excessive amount of them. It was concluded that policymakers have been

misallocating their resources by excessive public investment.

Gunning & Collier (1999) empirical results of econometric investigation of five sub-Saharan African countries showed that there was statistical evidence of a long-term relationship between agriculture expenditure and economic growth and concluded that agriculture expenditure had a positive impact on economic growth; hence, it was emphasized that for developing countries to develop and foster economic growth, there is need for increasing agriculture expenditure which facilitates investments on agriculture technology which would increase agricultural productivity thus output and help boost economic growth and development.

Fan and Rao (2003) analyzed the impact of different types of government spending on overall GDP growth across 43 developing countries between 1980 and 1998 using OLS method and found mixed results. In Africa, government spending on agriculture and health were particularly strong on promoting economic growth, government expenditures on agriculture, education and defense contributed positively to economic growth in Asia while in Latin America, health spending had a positive growth promoting effect.

Iganiga and Unemhilin (2011) examined the effect of federal government agricultural expenditure on the value of agricultural output using co-integration and error correction methodology. It was found that federal government capital expenditure was positively related to agricultural output and recommended that investment in the agricultural sector is very imperative and should be complemented with monitored credit facilities.

Udoh, (2011) examined the relationship between public expenditure, private investment and agricultural output growth in Nigeria over the period 1970-2008 using the bound testing ARDL approach to analyze both the short- and long-run impacts of public expenditure and private investment (domestic investment and foreign direct investment) on agricultural output growth in Nigeria. Results of the error correction model showed that increase in public expenditure had a positive influence on the growth of the agricultural output while foreign investment had an insignificant impact in the short run. It was recommended that policymakers should combine both private and public investment in a complementary manner to ensure that both short run and long run productivity of the agricultural sector is not undermined.

Itodo, et al. (2012) examined the impact of government expenditure on agriculture and agricultural output in Nigeria from 1975 – 2010 adopting the linear Cobb-Douglas production function. Results revealed a positive but insignificant relationship between government expenditure on the agricultural sector and agricultural output. It was recommended that farmers should be encouraged to access loans and advances by minimizing long procedures and conditions in obtaining loan to enable them (farmers) go into commercial farming which will in turn increase output.

Okezie, et al. (2013) empirically analyzed the relationship between Nigerian government expenditure on the agricultural sector and its contribution to economic growth, using time series data from 1980 to 2011, by employing the Engle-Granger two step modeling (EGM) procedure to co-integration based on unrestricted error correction model and pairwise Granger causality tests. Findings indicated that agricultural contribution to GDP (Gross domestic product) and total government expenditure on agriculture were cointegrated while the speed of adjustment to equilibrium was 88% within a year when the variables wander away from their equilibrium values but a very weak causality existed between the two variables used in the study. It was concluded that any reduction in government expenditure on agriculture would have a negative

repercussion on economic growth in Nigeria.

Shuaibu et al. (2015) employed secondary data in exploring the possible links between government agricultural expenditure and economic growth. Results revealed that government agricultural expenditure had a direct relationship with economic growth and statistically significant. It was recommended that government should ensure that credit is made available to farmers at relatively low interest rate, intensify effort on how to control inflation rate and increase the budgetary allocation to agricultural sector to 25% as recommended by the FAO if the Nigerian economy is to be diversified.

Okpara (2017) examined the impact of government expenditure on agriculture and agricultural output on Nigeria's economic growth for the period of 1980 – 2014. Results revealed that the variables had long run relationship while the speed of adjustment of the ECM result was 90.9% per annum thereby indicating that government expenditure on agriculture and agricultural output significantly impacts Nigeria's economic growth. It was therefore recommended that the government should ensure that a higher percentage of allocations are invested on agricultural sector in order to enhance economic growth in Nigeria.

Uptal and Dahun (2018) examined the short and long run relationship between government expenditure on agriculture and its allied sector and agricultural output of Meghalaya, India based on a time series data of 30 years from 1984-85 to 2013-14. ARDL approach to co integration and an error correction representation of the ARDL model were used. Results revealed that in the long run, the effect of public expenditure through agriculture and allied activities on agricultural output was significantly negative, while expenditures on education and transport on agricultural output were significantly positive but public expenditure in healthcare did not significantly affect agricultural output. It was therefore concluded that judicious use of government spending have significant potential to accelerate agricultural development and improve its efficiency.

Idoko and Sunday (2018) empirically examined the impact of government expenditure on agriculture on economic growth in Nigeria using OLS technique. Findings showed that agricultural output, government expenditure and GDP were positively related. The study recommended that it is imperative for the country to develop its agricultural sector through sufficient government spending, enlightening farmers, improving and providing infrastructures, according priority attention to the sector in budget allocation and enthroning adequate and appropriate extension services, among other measures.

Kipruto and Nzai (2018) examined the effect of government expenditure on agriculture output performance in Kenya by adopting annual time series data for the period 1980 to 2016 and ARDL model to achieve the objective of the study. The study found out a positive relationship between government expenditure and agriculture output performance.

Chandio, et al. (2018) examined the impact of government expenditure on agricultural sector and economic growth in Pakistan over the period 1983 - 2011 and employed ADF Johansen co-integration test and the OLS techniques. Empirical results revealed that agricultural output and government expenditure had significant influence on economic growth of Pakistan. It was therefore recommended that government of Pakistan should increase its expenditure in the development of agriculture sector since it would enhance agricultural productivity and economic growth.

Kenny (2019) examined the role of agricultural sector performance on economic growth in Nigeria. Findings indicated that there was a significant long run relationship between agricultural

domestic production and its explanatory variables (Agricultural credit guarantee scheme fund-ACGSF, federal government current expenditure on agriculture, total employment and effect of trade liberalization). The VECM result found 35 percent speed of adjustment of the endogenous growth model. Therefore, policy consistency and commitment of government is required before such intervention can yield the desired results.

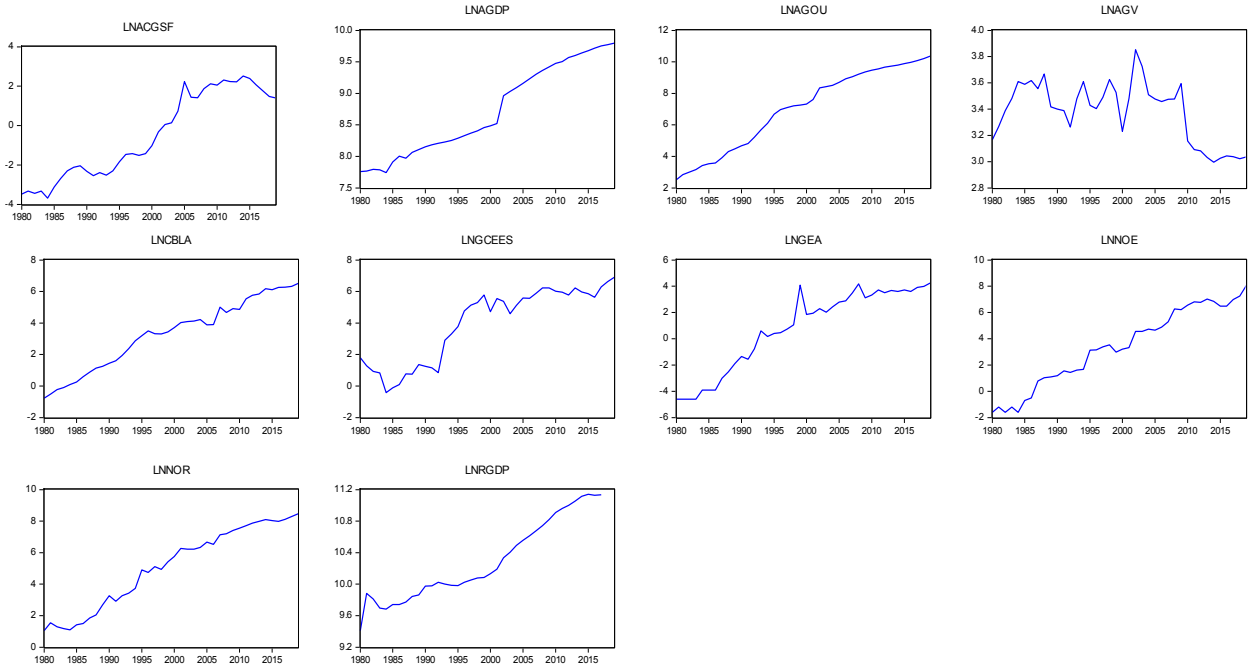
Muthge, C., Jibir, A. & Abdu, M. (2021) investigated the impact of Nigerian government expenditure (disaggregated into capital and recurrent) on economic growth using time series data for the period 1970-2019 and employing ARDL model. Findings of the study revealed that capital expenditure had positive and significant impact on economic growth both in the short run and long run while recurrent expenditure did not have significant impact on economic growth both in the short run and long run. It was recommended that government should increase the share of capital expenditure especially on meaningful projects that have direct bearing on the citizen's welfare and improve the spending patterns of recurrent expenditure through careful reallocation of resources toward productive activities that would enhance human development in the country.

It is worth noting that most of these studies disaggregate the sectors of the economy from the few sector-specific studies, with none of the sector specific studies comprehensively addressing agricultural expenditure and agricultural performance beyond public expenditure on agriculture and output growth respectively and their economic growth linkage. This study therefore, widens the scope of the research to include proxies for private sector investments and more agriculture performance indices to enable broader examination of the complementarity of public and private investments in agriculture, agriculture sector performance and economic growth nexus in Nigeria.

3. Research Methodology

3.1 Data and Data Source

This research utilized secondary data obtained from Central Bank of Nigeria (CBN) statistical bulletin and the World Bank database, World development indicators covering the period 1980 -2019 which formed the basis for analysis. To examine public and private investments in agriculture, agriculture sector performance and economic growth nexus in Nigeria, value of loans guaranteed under the agricultural credit guarantee scheme fund (ACGSF) and commercial bank loans and advances to agriculture (CBLA), proxies for private investment; government recurrent expenditure on agriculture (GEA) and government expenditure on economic services (GCEES), proxies for public investment; agricultural sector output (AGOU), agriculture value added, % GDP (AGV), non-oil export (NOE), non-oil revenue (NOR and agriculture, real GDP (AGDP)), proxies for agriculture sector performance; were the explanatory variables while, real gross domestic product (RGDP) was the dependent variable (CBN, 2020; WDI, 2020). E-views, 9.0 version, econometrics-statistical software was utilized for analysis of data of study. The level graphs/trend of variables of study are as depicted below.



Level Graphs/Trends of variables of study
Source: Authors computation using E-views 9.0.

3.2 Model Specification

To model the relationship between private and public investments in agriculture, agriculture sector performance and economic growth, a functional form model is constructed as:

From equation (1) above, we generate an econometric model by incorporating intercept (β_0), the coefficient of variables $\beta_1 - \beta_9$ and error term μ as follows

$$RGDPt = f(ACGSFt, CBLAt, GEAt, GCEESt, AGOUt\ AGVt\ NOEt\ NORt\ AGDPt \ldots\ldots\ldots (1)$$

:

$$RGDPt = \beta 0 + \beta 1 ACGSFt + \beta 2 CBLAt + \beta 3 GEAt + \beta 4 GCEESt + \beta 5 AGOUt + \beta 6 AGVt + \beta 7\ NOEt + \beta 8\ NORt + \beta 9\ AGDPt + Ut \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Following Katircioglu, (2010), equation 2 was further converted into natural log to enable efficient estimation as shown below.

$$\ln RGDP_t = \beta_0 + \beta_1 lnACGSF_t + \beta_2 lnCBLA_t + \beta_3 lnGEA_t + \beta_4 lnGCEES_t + \beta_5 lnAGOU_t + \beta_6 \ln AGVt + \beta_7 lnNOEt + \beta_8 lnNOR_t + \beta_9 lnAGDP_t + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where: lnRGDP. lnACGSF, lnCBLA, lnGEA, lnGCEES, lnAGOU, lnAGV, lnNOE, lnNOR and InAGDP represent the natural logs of the variables while μ stands for error term in the long term growth model.

3.3 Method of Data Analysis

3.3.1 Unit Root Test

To determine the order of integration of the variables of study, i.e. to check for the presence of a unit root in the variables, the Augmented Dickey Fuller (ADF) and the Phillips Perron(PP) techniques were employed. The null hypothesis is that there is no unit root and the rule is that if the ADF test statistic/Adj. t-Stat. is greater than the 1%, 5% and 10% critical value, we accept the null hypothesis i.e. the variable is

stationary. However, if the ADF test statistic is less than the 1%, 5% and 10% critical value, we reject the null hypothesis and go ahead to difference i.e. the variable is non-stationary.

Decision Rule: Ho: $\delta = 0$, $\rho = 1$ (presence of unit root, the data is non-stationary); H_1: $\delta < 0$, $\rho \neq 1$ (the data is stationary and does not need to be differenced).

3.3.2 Cointegration Test

Cointegration test is used to check if a long run relationship exists among the variables in a model (Banerjee& Carrion-i-Silvestre, 2015) This was carried out using the autoregressive distributed lag (ARDL) bounds testing to cointegration technique.

Decision Rule: Ho: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$ (there is no co-integration among the variables); H_1: $\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq 0$ (there is co-integration among the variables)

If the value of the F-test statistics is below the I(0) we cannot reject Ho. However, if the F value is higher than the I(1) bound, then we reject Ho, indicating that there is co-integration among the variables of study.

3.3.2.1 LAG Length for the ARDL Model

Where a long-run relationship exists between the underlying variables, while the hypothesis of no long-run relations between the variables in the other equations cannot be rejected, then ARDL approach to cointegration can be applied. Finding the appropriate lag length for each of the underlying variables in the ARDL model is very important because we want to have Gaussian error terms (i.e. standard normal error terms that do not suffer from non-normality, autocorrelation, heteroskedasticity etc.). To select the appropriate model of the long run

$$Yt = \gamma 0j + \Sigma pi = 1\ \delta jYt - I\ + \Sigma qi = 0\ \beta iXt - 1 + \mu it \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where; **Y** is a vector and the variables in ($\mathbf{X_t}$) can be purely I(0) or I(1) or cointegrated; β and δ are coefficients; γ is underlying equation, it is necessary to determine the optimum lag length (k) by using proper model order selection criteria such as: the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), Hannan-Quinn Criterion (HQ) or Likelihood Ratio Criterion (LR). To use annual time series data, inclusion of time trend in the equation will produce better-approximated outcomes (Pesaran et al., 2001). The model with the smallest AIC, SBC and HQC estimates or small standard errors and high R^2 performs relatively better. The estimates from the best performing model become the long run coefficients (Pesaran et al., 2001). It is appropriate to embark on further analysis if it is determined that there is long-run relationship between the underlying variables to avoid spurious regression.

3.3.3 Autoregressive Distributed Lag Test

This study employed the Autoregressive Distributed Lag (ARDL) bounds testing approach to co-integration proposed by Pesaran, Shin and Smith (2001) to estimate the private and public investments in agriculture, agriculture sector performance and economic growth nexus in Nigeria given that, the ARDL approach offers some desirable statistical advantages over other co-integration techniques. ARDL test procedure provides valid results where the variables are integrated of different orders or are mutually cointegrated, and provides very efficient and consistent estimates in small and large sample sizes (Pesaran, Shin & Smith, 2001). This approach, therefore, becomes relevant to this study as all the series are I(1).

The generalized ARDL (p, q) model is specified as:

the constant; i=1, k; p, q are optimal lag orders; μit is a vector of error terms unobservable zero mean white noise vector process (serially uncorrelated or independent).

3.3.3.1 Co-integration model/equation.
Bounds test methodology takes its starting point in the auto-regressive distributed lag model (ARDL) of order (p, q_1, q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9) model with the ten variables in this study. Hence, the ARDL model of the study takes the form:

$$\Delta InARGDP_t = \alpha_0 + \alpha_1 InARGDP_{t-i} + \alpha_2 InACGSF_{t-i} + \alpha_3 InCBLA_{t-i} + \alpha_4 InGEA_{t-i} + \alpha_5 InGCEES_{t-i} + \alpha_6 InAGOU_{t-i} + \alpha_7 InAGV_{t-i} + \alpha_8 InNOE_{t-i} + \alpha_9 InNOR_{t-i} + \alpha_{10} InAGDP_{t-i} + \beta 0 + \Sigma^{P}_{t=1}\beta_1 \Delta InRGDP_{t-i} + \Sigma^{q}_{t=1}\beta_2 \Delta InACGSF_{t-i} + \Sigma^{q}_{t=1}\beta_3 \Delta InCBLA_{t-i} + \Sigma_{t=1}\beta_4 \Delta InGEA_{t-i} + \Sigma_{t=1}\beta_5 \Delta InGCEES_{t-i} + \Sigma_{t=1}\beta_6 \Delta InAGOU_{t-I} + \Sigma_{t=1}\beta_7 \Delta InAGV_{t-i} + \Sigma_{t=1}\beta_8 \Delta InNOE_{t-I} + \Sigma_{t=1}\beta_9 \Delta InNOR_{t-I} + \Sigma_{t=1}\beta_{10} \Delta InAGDP_{t-I} + \mu_t \quad (5)$$

3.3.3.2 Long Run Model
The test involved conducting F-test for joint significance of the coefficients of lagged variables for the purpose of examining the existence of a long-run relationship among them.

$$InARGDP_t = \alpha_0 + \alpha_1 InARGDP_{t-i} + \alpha_2 InACGSF_{t-i} + \alpha_3 InCBLA_{t-i} + \alpha_4 InGEA_{t-i} + \alpha_5 InGCEES_{t-i} + \alpha_6 InAGOU_{t-i} + \alpha_7 InAGV_{t-i} + \alpha_8 InNOE_{t-i} + \alpha_9 InNOR_{t-i} + \alpha_{10} InAGDP_{t-i} + u_t \quad (6)$$

3.3.3.2 Short-Run Estimation from Error Correction Model

The error correction model for the estimation of the short-run relationships is specified as:

$$\Delta InRGDP_t = \beta 0 + \Sigma^{P}_{t=1}\beta_1 \Delta InRGDP_{t-i} + \Sigma^{q}_{t=1}\beta_2 \Delta InACGSF_{t-i} + \Sigma^{q}_{t=1}\beta_3 \Delta InCBLA_{t-i} + \Sigma_{t=1}\beta_4 \Delta InGEA_{t-i} + \Sigma_{t=1}\beta_5 \Delta InGCEES_{t-i} + \Sigma_{t=1}\beta_6 \Delta InAGOU_{t-I} + \Sigma_{t=1}\beta_7 \Delta InAGV_{t-I} + \Sigma_{t=1}\beta_8 \Delta InNOE_{t-I} + \Sigma_{t=1}\beta_9 \Delta InNOR_{t-I} + \Sigma_{t=1}\beta_{10} \Delta InAGDP_{t-I} + \lambda ECM_{t-I} + \mu_t \quad (8)$$

Where: ECM_{t-1} = residual of the long run model and λ, the coefficient of the error term, ECM_{t-1}

A negative and significant ECM_{t-1} coefficient, (λ), implies that any short-term disequilibrium between the dependent and explanatory variables will converge back to the long-run equilibrium relationship.

3.4 Diagnostic Test
The econometric criteria determine the reliability of the statistical criteria, and in particular, the standard error of the parameter estimates. Econometric tests were used for empirical verification of the model. The tests were for autocorrelation, normality, heteroscedasticity and stability. To validate the stability of the estimates, the CUSUM test, the histogram normality test, the Breusch-Godfrey serial correlation LM test and Ramsey-Reset test were applied.

4. Results and Discussion

Unit Root Test
In order to avoid spurious result, ADF and the PP unit root tests were conducted on the log values of the variables of studyr LNRGDP, LNGEA, LNGCEES, LNAGOU, LNAGDP, LNAGV, LNNOR, LNNOE, LNACGSF and LNCBLA to determine the stationarity and order of integration of the variables using E-views 9.0 statistical software. Results of the unit root test are presented in table 4.1.and 4.1.1 below.

Table 4.1: ADF Unit Root Test Result

Variables	Order of integration	Augmented Dickey Fuller Test 1%	5%	10%	ADF Statistic	Prob.
ΔlnRGDP	I(1)	4.219126	3.533083	3.198312	5.992158	0.0001
lnGEA	I(1)	4.226815	3.536601	3.200320	6.720013	0.0000
ΔlnGCEES	I(1)	4.219126	3.533083	3.198312	6.345007	0.0000
ΔlnAGV	I(1)	4.226815	3.536601	3.200320	6.515166	0.0000
ΔlnAGDP	I(1)	4.219126	3.533083	3.198312	5.894094	0.0001
ΔlnACGSF	I(1)	4.219126	3.533083	3.198312	5.511018	0.0003
ΔlnCBLA	I(1)	4.219126	3.533083	3.198312	7.278035	0.0000
ΔlnAGOU	I(1)	4.219126	3.533083	3.198312	4.326271	0.0076
ΔlnNOE	I(1)	4.219126	3.533083	3.198312	6.974561	0.0000
ΔlnNOR	I(1)	4.243644	3.544284	3.204699	4.658521	0.0035

Source: Authors' Calculation using E-views 9.0 Econometrics Software

Table 4.1.1: PP Unit Root Test Result

Variables	Order of integration	Phillips Perron Test 1%	5%	10%	Adj t- Stat	Prob.
ΔlnRGDP	I(1)	4.219126	3.533083	3.198312	5.857010	0.0001
lnGEA	I(1)	4.219126	3.533083	3.198312	12.42739	0.0000
ΔlnGCEES	I(1)	4.219126	3.533083	3.198312	6.342408	0.0000
ΔlnAGV	I(1)	4.219126	3.533083	3.198312	12.57707	0.0000
ΔlnAGDP	I(1)	4.219126	3.533083	3.198312	5.893563	0.0001
ΔlnACGSF	I(1)	4.219126	3.533083	3.198312	5.511018	0.0003
ΔlnCBLA	I(1)	4.219126	3.533083	3.198312	8.567761	0.0000
ΔlnAGOU	I(1)	4.219126	3.533083	3.198312	4.246876	0.0003
ΔlnNOE	I(1)	4.219126	3.533083	3.198312	8.518356	0.0000
ΔlnNOR	I(1)	4.219126	3.533083	3.198312	7.421195	0.0000

Note:: Δ = Difference Operator; 2. I(d) = No. of times of integration; 3. Level = 10%, 5% and 1% level of significance.

Results obtained in tables 4.1 and 4.1.1 show the order of integration and stationarity of lnRGDP, lnGEA, lnGCEES, lnAGOU, lnAGDP, lnAGV, lnNOE, lnNOR, lnACGSF and lnCBLA series determined by the ADF test and the PP test. All the variables were stationary at first difference implying an integrated order I(1). It can also be observed that all the variables were stationary at all levels of significance, thereby implying that the estimated model would have a long run forecasting power and therefore reliable.
Result of the VAR Residual - Serial correlatoin LM test is presented in table 4.2. below.

Table 4.2: VAR Residual – Serial correlation Diagnostics Test Result

Test	Test Statistics	Probability
Serial Correlation LM Test	Lag 1 121.9550	0.0671

Result of the VAR residual test for autocorrelation as shown in table 4.2 indicates that the residuals of the VAR equation utilized to determine the lag order selection criteria were not auto correlated at 5% level of significance, given the p-value of 0.0671.

The result of the lag order selection criteria and the corresponding diagnostics; roots of characteristic polynomial and the inverse roots of AR characteristic polynomial are presented in table 4.3, table 4.3.1 and figure 1 below.

Table 4.3: Optimal Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-82.76466	NA	7.13e-11	5.014306	5.449689	5.167799
1	181.3293	371.1591*	1.21e-14*	-3.855640*	0.933576*	-2.167217*

Source: Author's computation using E-views 9

Table 4.3.1

Roots of Characteristic Polynomial
Endogenous variables: LNRGDP LNACGSF LNCBLA LNGCEES LNGEA LNAGOU LNAGV LNNOE LNNOR LNAGDP
Exogenous variables: C
Lag specification: 1 1
Date: 09/14/21 Time: 14:06

Root	Modulus
0.964351	0.964351
0.876023 - 0.140553i	0.887227
0.876023 + 0.140553i	0.887227
0.718419	0.718419
0.162869 - 0.239944i	0.289999
0.162869 + 0.239944i	0.289999
0.254174 - 0.085784i	0.268260
0.254174 + 0.085784i	0.268260
0.154528	0.154528
-0.004039	0.004039

No root lies outside the unit circle.
VAR satisfies the stability condition.

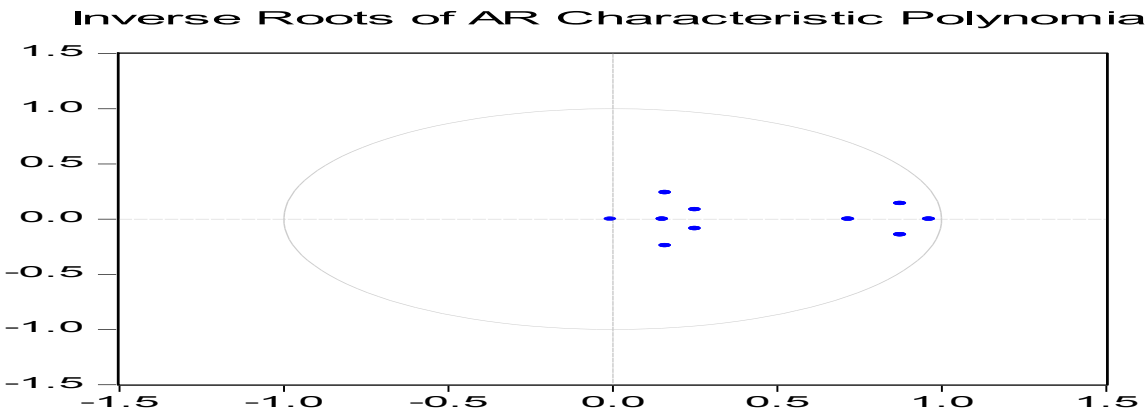


Fig 1: Inverse Roots of AR Characteristic Polynomial

From table 4.3 the optimal lag selected is lag 1, using the Akaike Information Criterion, given that it has the lowest value, conforms with and validates the maximum 1 lag selected for the analysis of the preceding VAR model used for the lag length order selection. The diagnostics checks of the lag length selection as presented in table 4.3.1 and figure 1 further confirm the stability of the VAR equation utilised.

Having selected the optimal lag, the ARDL bound test was conducted to find out if there was evidence of cointegration among the variables. The result of the bounds test is presented in table 4.4 below.

Table 4.4
Bounds Test Result

Model	F-statistics	Lag	Level of significance	Bounds critical values Constant(Level) I(0)	I(1)
F($lnRGDP_t$ $lnGEA_t$ $lnGCEES_t$ $lnAGOU_t$ $lnAGV_t$ $lnNOE_t$ $lnNOR_t$ $lnAGDP_t$ $lnACGSF_t$ $lnCBLA_t$	**21.84870**	9			
			10%	1.88	2.99
			5%	**2.14**	**3.3**
			2.5%	2.37	3.6
			1%	2.65	3.97

Source: Author's computation using E-views 9

Note: The bolded 5% significance level indicates the level of significance at which the F-statistic exceeds the upper bound critical value.

From table 4.4, the bounds test result shows that the computed F-statistic 21.84870 is greater than the upper bound critical value 3.3 at 5% significance level and even at all levels of significance. This indicates the presence of strong cointegration relationship among the variables and therefore we could safely reject the null hypothesis of no cointegration among RGDP, GEA, GCEES, AGOU, AGV, NOR, NOE, AGDP, ACGSF and CBLA; hence, accept the alternative hypothesis that

long run equilibrating relationship exists among the variables.

Sequel to the determination of cointegrating relationship among the variables, the long-run model is estimated and the result is presented in table 4.5 below.

Table 4.5: Estimated Long-Run ARDL Cointegration Result

Dependent Variable, lnRGDP

Regressors	Coefficient	Std. Error	t-Statistic	Prob.
lnGEA	-0.010947	0.012594	-0.869232	0.3968
lnGCEES	0.025225	0.014384	1.753669	0.0975
lnAGV	-0.332537	0.064810	-5.130933	0.0001
lnNOR	0.009845	0.041638	0.236452	0.8159
lnACGSF	-0.047168	0.025344	-1.861107	0.0801
lnNOE	0.041170	0.020730	1.986048	0.0634
lnCBLA	-0.044477	0.037802	-1.176585	0.2556
lnAGOU	-0.055227	0.050044	-1.103662	0.2852
lnAGDP	0.914920	0.089749	10.194170	0.0000

Source: Author's computation using E-views 9

Result from Table 4.5 reveals that in the long run, log of government expenditure on economic services (lnGCEES), log of non-oil revenue (lnNOE) and log of agriculture, real gross domestic product (lnAGDP) had a positive relationship and statistically significant impact on economic growth in Nigeria at 10% and 1% levels of significance given their respective coefficient and the probability values of 0.025225 and 0.0975; 0.041170 and 0.0634; and 0.914920 and 0.0000, while the log of agriculture value added, % of GDP (lnAGV) and log of value of loans guaranteed under the agricultural credit guarantee scheme fund (lnACGSF) had a negative relationship and significant impact on economic growth in Nigeria at 1% and 10% levels of significance given their respective coefficient and probability values of -0.332537 and 0.0001; and -0.047168 and 0.0801.

Specifically, a unit change in GCEES, NOE and AGDP would lead to 0.025, 0.041 and 0.915 respective unit increases in RGDP thereby underlining the relative importance and positive contribution of public investment on agriculture and the performance of agricultural sector in terms of non-oil export and especially the agricultural GDP to Nigeria's economic growth in the long run and over the period of study. On the other hand, a unit change in AGV and ACGSF would lead to -0.333 and -0.047 respective unit decreases in RGDP thereby indicating that agriculture value added as % of GDP and loans and advances guaranteed under the ACGSF negatively impacted Nigeria's economic growth in the long run a situation, which may be attributable to the low percentage contribution of the agricultural sector to the GDP and inadequacy of the loans and advances granted under the ACGSF and

implying the inefficacy of private investment in agriculture over the period of study.

However, the log of non-oil revenue (lnNOR) exhibited a positive but insignificant relationship with economic growth while the log of commercial bank loans and advances (lnCBLA), log of government recurrent expenditure on agriculture (lnGREA) and log of agricultural output (lnAGOU) exhibited a negative and insignificant relationship with economic growth given their respective coefficient and probability values of 0.009845 and 0.8159; -0.044477 and 0.2556; -0.010947 and 0.3968; and -0.055227 and 0.2852; thereby indicating that NOR, CBLA, GREA and AGOU were not important in explaining the economic growth of Nigeria over the period of study and implying that agricultural sector performance in terms of non-oil revenue; public investment in agriculture in terms of government recurrent spending on agriculture; and private sector investment in agriculture in terms of commercial banks loan to agriculture were not relevant in determining the growth of the Nigerian economy over the long run which might be attributable to the low performance of the agricultural sector and inadequate private and public investment in agriculture.

The findings are consistent with the findings of other researchers in Nigeria and elsewhere (Gunning and Collier, 1999; Fan and Rao, 2003; Udoh, 2011; Dinca and Dinca, 2013; Oji-Okoro, 2014; kipruto and Nzai, 2018; Shuaibu et al., 2015; Okpara, 2017; Uptal and Dahun, 2018; Idoko and Sunday, 2018; Chandio, et al., 2018; Kenny, 2019; Muthge, et al., 2021). Result of the short-run and cointegrating model as estimated is presented in table 4.6 below.

Table 4.6: Estimated Error Correction (Short-Run) Model Result

Dependent Variable, InRGDP				
Regressors	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ΔlnACGSF	-0.023946	0.018584	-1.288509	0.2148
ΔlnCBLA	-0.036179	0.032161	-1.124902	0.2763
ΔlnGCEES	0.001399	0.015346	-0.091134	0.9701
ΔlnGEA	-0.006388	0.010367	-0.616214	0.9286
ΔlnAGOU	0.022870	0.053592	0.426746	0.6749
ΔlnAGV	-0.115676	0.058468	-1.978445	0.0643
ΔlnNOE	0.002741	0.019034	0.143987	0.8872
ΔlnNOR	0.035745	0.033924	1.053665	0.3068
ΔlnAGDP	0.639893	0.113678	5.629004	0.0000
ECT_{t-1}	-0.972173	0.085568	-11.361475	0.0000

Source: Author's computation using E-views 9

From table 4.6 above, findings reveal that, the log of AGDP had a positive relationship and significant impact on economic growth at 1% level of significance, while the log of

AGV had a negative relationship but significant impact on economic growth at 10% level of significance given their respective coefficient and probability values of 0.639893 and 0.0000; and -0.115676 and 0.0643 thereby indicating that in the short run, a unit change in AGDP would lead to 0.640 unit increase in RGDP; while a unit change in AGV would lead to 0.012 unit decrease in RGDP, implying that agriculture, GDP had a positive and significant impact on economic growth in Nigeria while, agriculture value added, % GDP had a negative but significant impact on economic growth in Nigeria respectively and in both in the short run and over the long run.

However, ACGSF, CBLA, GEA had a negative relationship but insignificant impact on RGDP given their respective coefficient and probability values of -0.023946 and 0.2148; -0.036179 and 0.2763 and -0.008496 and 0.4485 while GCEES, AGOU, NOE and NOR had a positive relationship but insignificant impact on economic growth given their respective coefficient and probability values of 0.001399 and 0.9285; 0.022870 and 0.6749; 0.002741 and 0.8872; and 0.035745 and 0.3068 thereby indicating that ACGSF, CBLA, GEA, GCEES, AGOU, NOE and NOR were not important in explaining the growth of Nigeria's economy in the short run.

The error correction term (ECT) is negative, less than one (in absolute value) and significant with a coefficient of -0.972173 and probability value of 0.0000 thereby, confirming the earlier established long run relationship among the series with the coefficient indicating a very high speed of adjustment towards long run equilibrium at 97.2% in the first year. The speed of adjustment is very high because over 97% annually, of the short-term disequilibrium between the explained and the explanatory variables will converge towards equilibrium in the long-run.

To further ensure the reliability of the estimates, diagnostic tests of serial correlation, functional form, normality, and heteroscedasticity were conducted and reported in table 4.7 below.

Table 4.7: Diagnostics Test Results

Test Statistics	F(Prob)	Probability
Autocorrelation	F(1,16) = 0.365732	0.7447
Hetroskedasticity	F(19,17) = 1.544586	0.1861
Normality	2.7876636	0.248250
Stability	F(1, 16) = 4.874087	0.0422

Results of the diagnostic tests in Table 4.7 above reveal that the Breusch-Godfrey LM test has probability value of 0.7447 which is greater than 5% and thus indicating absence of serial correlation in the model. Breusch-Pagan Godfrey test for heteroskedasticity has a probability value 0.1861 which shows that the residuals in model are homoskedastic. The probability value of the Jarque-Bera (normality) test is 0.248250 which is also insignificant and indicates that the residuals in the series are normally distributed. This means that the model is free from serial correlation, heteroskedasticity and normality problem. As such, the model could produce reliable results. However, the model did not meet the requirement for passing the the Ramsey - Reset test for stability; thereby creating room for further investigation.

Cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests for stability of the model along the studied periods were conducted. It is suggested that

for a model to be stable along the sampled period, the residuals line must be within the straight lines of the critical bounds at a 5% significance level. Results of the CUSUM and the CUSUMSQ are depicted as Figure 2 and Figure 3 below.

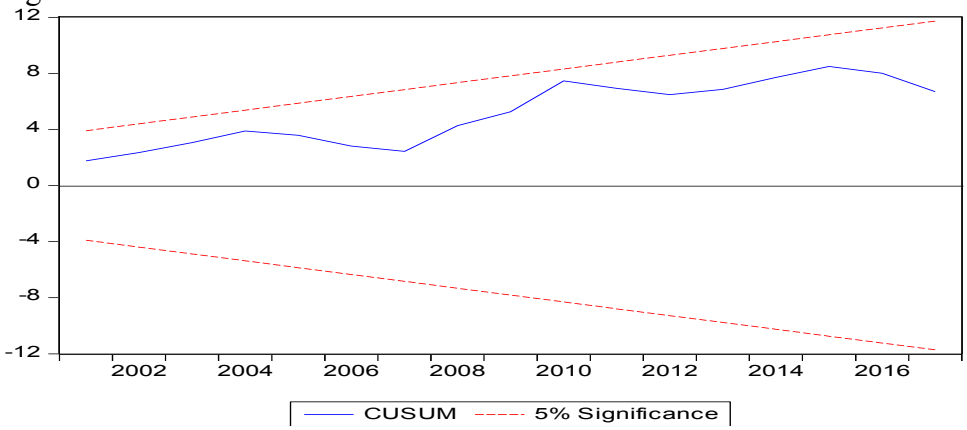


Fig. 2: Plot of cumulative sum of recursive residual.
Note: The straight lines represent critical bounds at 5% significance level.

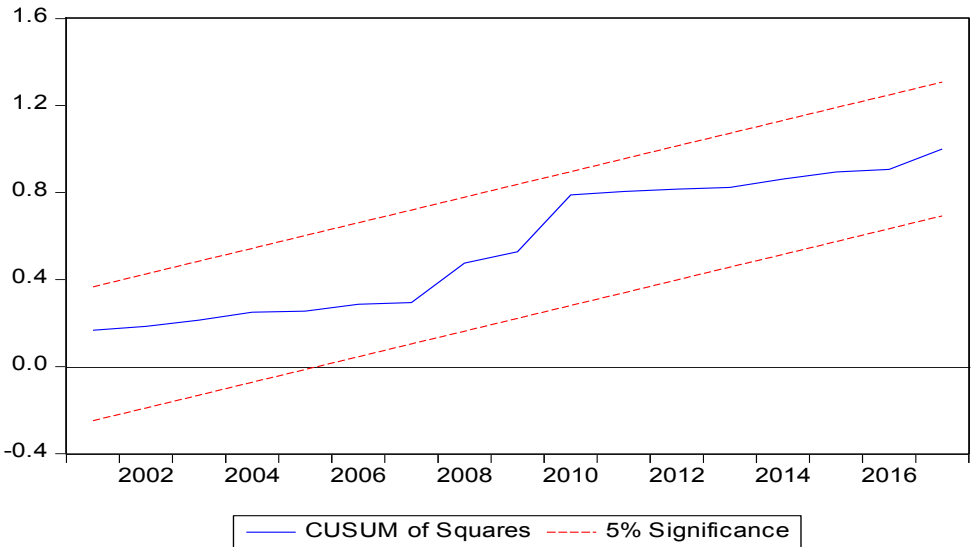


Fig. 3: Plot of cumulative sum of squares of recursive residual.
Note: The straight lines represent critical bounds at 5% significance level

Figures 2 and 3 show that the residuals lie within the critical bounds at 5% level of significance thus indicating that the model is reasonably stable.

5.Conclusion and Recommendations

The importance of private and public investments and the agricultural sector to the growth and development of nations particularly, developing countries cannot be overemphasized based on available evidence worldwide. Empirical studies on the link between investments in agriculture, agriculture sector performance and their impact of on economic growth yielded mixed results. Nevertheless, this research attempts to examine the federal government and private sector investments in agriculture, agriculture sector performance and economic growth nexus in Nigeria and widens the scope of the research by including more explanatory variables. Annual series data for the period 1980–2019 were obtained and ARDL approach to cointegration was utilized to examine the issue.

Results revealed positive and negative relationships; but the variables were

cointegrated thereby, fulfilling the mandatory requirement for estimating long run relationship among the variables. The error correction term is negative and significant but less than 1; thereby indicating that the speed of adjustment towards long run equilibrium was very high at 97.2% annually, if any shock(s) occurred.

Findings showed that in the long run, lnGCEES, lnNOE, and lnAGDP had positive relationships and statistically significant impact while, lnAGV and lnACGSF had negative relationships but significant impact on economic growth in Nigeria thereby, underlining the relative importance and positive contribution of public investment on agriculture and the performance of agricultural sector in terms of non-oil export and the real GDP to Nigeria's economic growth in the long run. But lnAGV and lnACGSF negative impact on Nigeria's economic growth in the long run is attributable to the low percentage contribution of the agricultural sector to the GDP and the inadequacy of the loans and advances granted under the ACGSF; implying the inefficacy of private investment in agriculture over the period of study. Findings also revealed that lnAGDP had a positive relationship and significant impact while, lnAGV had a negative relationship but significant impact on economic growth; and remained consistent in the short run and over the long run.

However, lnNOR exhibited positive but insignificant relationships; while lnCBLA, lnGREA and lnAGOU exhibited negative and insignificant relationships with economic growth thereby indicating that NOR, CBLA, GREA and AGOU were not important in explaining the economic growth of Nigeria over the period of study and implying that agricultural sector performance and in terms of non-oil revenue; public investment in agriculture in terms of government recurrent spending on agriculture; and private sector investment in agriculture in terms of commercial banks loan to agriculture were not significant in determining the growth of the Nigerian economy over the long run, a situation, which might be attributable to the low performance of the agricultural sector and inadequate private and public investments in agriculture.

The model passed the entire diagnostic tests comprising serial correlation, normality, and heteroscedasticity. Stability tests of CUSUM and CUSUM squares were stable, which show the fitness, strength and reliability of the model. However, the model did not meet the requirement for passing the Ramsey - Reset test for stability thereby creating room for further investigation.

The policy implication of these findings is that commercial bank loans and advances to agriculture, he value of loans guaranteed under the ACGSF and other agricultural funding options such as the current Central Bank of Nigeria (CBN) driven Anchor borrowers programme, Agriculture credit to small and medium enterprises scheme (AGMEEIS) amongst others; and the recently revitalized National land development programme should be increased, vigorously promoted and monitored to enhance the efficacy of investments in agriculture and the performance of the agricultural sector; through increased value addition, agricultural exports and non-oil revenue for Nigeria's economic growth and development. The current effort by the government of Nigeria to promote and widen the funding options to agriculture through the Central Bank of Nigeria (CBN) Financial Support Service (FSS) unit is a step in the right direction and should be sustained and improved upon. Efforts should also be geared towards enhancing public investment in agriculture through increased budgetary allocation.

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