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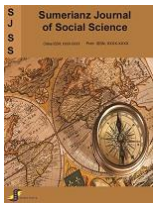

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Federal Government Expenditure on Agriculture and Agricultural Outputs in Nigeria

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Abstract

Every industrialised country today passed through the agrarian era. In fact, the industrial sector takes its root from the agricultural sector. In a developing nation, government expenditure power is very central to all facets of development including agriculture. In view of this the study empirically evaluated the nexus between Federal Government Spending on the four sectors (crops, livestock, forestry and fishery) of agriculture as its determined agricultural output. The study employed secondary data spanning from 1981 – 2019 sourced from the CBN Statistical Bulletin, 2019 and World Bank Development Indicators, 2019. ADF and Unit Root testing technique, Johanson co-integration test, error correction model (ECM) and Granger causality test were employed as analytical tools in the course of the study,. Each of the four sectors of Agriculture was explained by total government expenditure on agriculture, interest rate, Annual Rainfall, official exchange rate and population growth. Federal government capital expenditure was found to be positively related to agricultural output, because an increase in government expenditure on agriculture is likely to lead to a multiple increase in agricultural output. The ECM model showed that interest rate on bank loan has significant positive impact on each agricultural output, annual rainfall also has a significant positive impact on each agricultural output while official exchange rate has a negative but significant impact on each agricultural output. The policy imports of this study is that governments at all levels should seek more productive ways to invest in the agricultural sector by upgrading to mechanised farming, providing fertilizers for improved yields, providing high-yield seedlings to ensure self-sufficiency; The commercial banks should complement government's effort in ensuring that interest on loans to the agricultural sector are favourable as this would encourage more investors in the sector, among others.

Keywords: Federal, Expenditure, Agricultural, Nigeria.

1. Introduction

The Nigerian economy during the first decade after independence was described as an agrarian economy because agriculture served as the engine of growth (Ogen, 2003). Agriculture was the mainstay of the economy. In the early 60's, contributions from this sector accounted for about 70% of the Gross Domestic Product. This was a period when the nation was not only virtually self-sufficient in production of food crops to feed its population but also provided raw materials for industries and major crops for export (Ekerete and Ogen, 2000). Indeed, agriculture provided the main stimulus to our national economic growth despite the small farm holdings and primitive productive systems. These contributions of agriculture to the nation overshadowed all other economic sectors in the early 1960's (Abayomi, 1997). During this period, Nigeria was the world second largest producer and exporter of palm oil (Ogen, 2003). Nigeria was also a leading exporter of other major commodities such as cotton, groundnut,

rubber and hide and skins (Lawal, 1997). Despite the reliance of Nigerian peasant farmers on traditional tools and indigenous farming methods, these farmers produced 70% of Nigerian's exports and 95% of its food needs.

However, the reverse was the case of the agricultural sector in the seventies when its share of the GDP declined to only 34% by 1974 (Ekerete and Ogen, 2000). Ever since then Nigeria has been witnessing extreme poverty and the insufficiency of basic food items, the agricultural sector as at 1996 accounted for less than 5% of Nigeria's GDP (Olagbaju and Falola, 1996). Over the past two or three decades, the dormant role of agriculture in the economy, especially in terms of ensuring food security, gave way to massive importation of basic food items such as rice, beans and wheat (Egbuna, 2003). This is a clear indication of the failure of the agricultural sector to keep pace with the demand for its products. This blatant neglect of agricultural sector and the attendant dependency of the economy on a mono-cultural product (petroleum) have not augured well for the wellbeing of the economy as a whole.

In a bid to correct this anomaly, the government, from the year 1975 decided to directly participate in commercial production of food crops. Many large scales agricultural projects specializing in the production of grains, livestock dairies, animals' feeds and others were established (Fasipe, 1990). Sugar factories were set up at Numan, Lafiagi and Sunti (Lawal, 1997). The Nigerian Agricultural and Corporative Bank (NACB) was also established in 1973 as part of government's effort to channel oil fund into agriculture through the provision of credit facility to prop agriculture and agrobased ventures (Olagunju, 2000). Various agricultural development programmes were also adopted as part of efforts to revitalize agricultural performance. These were backed up by substantial budgetary allocations, but agricultural output is still very low (Ojo and Balogun, 1991).

Inadequate funding of the agricultural sector has been re-echoed by several experts as an obstacle to increased agricultural output (Bernard, 2009; CBN, 2007). However, from a nominal point of view, it is evident that in Nigeria, government spending on agriculture has continued to increase over the years while empirical evidence have revealed that the performance of the agricultural sector has been inadequate (CBN, 2007; Ekerete and Ogen, 2000). The agricultural sector in Nigeria which was the main stay of the economy is no longer performing the lead role it was known for. By mid-1970's Nigeria's agriculture started to experience problems, agricultural exports began to decline and food shortages started emerging. From 1975, emboldened by considerable increased revenue from petroleum, government assumed heavier responsibilities for agricultural production, input supply and marketing; in addition to adopting credit control and other allocative policies in favour of agriculture (Ojo and Balogun, 1991). Agricultural production stagnated at less than 1 percent annual growth rate between 1970 and 1982. There was a sharp decline in export crop production, while food production increased only marginally. Thus, domestic food supply had to be augmented with large imports. Food import bill rose from a mere N113.88 million annually in 1970-1974 to N1,964 million in 1991 (CBN, 2007). Since 1990 and until recently, Nigeria has been spending an average of 60 million US dollars on importation of rice annually (Akhali, 1997). Indeed in 1994, the agricultural sector performed below the projected 7.2% of budgetary output (Lawal, 1997).

Theoretically, input-output theory in economics posits that input determines output. More so, Keynes postulated that increased government spending boosts economic growth. In the case of Nigeria, there has been a conflicting view about spending on agriculture just as we can see from various scholars cited above. Therefore, there is need to examine the extent to which government expenditure as an input has affected agricultural production as an output. It is in the light of this that this research was carried out to examine the effect of government expenditure on agricultural output in Nigeria from 1981 – 2019, using a sub-sectoral analysis. The study seeks to examine the following objectives:

- Examine the relationship between government expenditure and crop output in Nigeria.
- Examine the relationship between government expenditure and livestock output in Nigeria.
- Examine the relationship between government expenditure and forestry output in Nigeria.
- Examine the relationship between government expenditure and Fishery output in Nigeria.

The findings of this study would enrich the existing body of literature on the relationship between government expenditure on agriculture and agricultural output in Nigeria. The study is also relevant to the government and policymakers as it would fully explore the reasons for past failures of agricultural policies and ways to mitigate them with due consideration to theoretical foundations. It would have a direct effect on the efficiency and effectiveness of the use of policy instruments to stimulate agricultural output in the country. Finally, the research findings would serve as a foundation for further research in this aspect and other similar areas.

The study was investigated empirically with the data spanning from 1981 to 2019. This 41-year period is no doubt sufficient to examine the relationship between government expenditure on agriculture and agricultural output in Nigeria. The conduct of the study was constrained by accessibility to well-coordinated data. This is because various statistical organizations publish data with differing figures.

Following the introduction, the second section reviews the literature of the study. The third section comprises the methodology of the study. The fourth section analyses the data used for the study and section five concludes the study.

2. Related Literature Review

There have been several theoretical and empirical studies carried to investigate the impact of public spending on agriculture both in developed and developing nations. This section therefore, shows a brief review of the related literature.

2.1. Conceptual Review

Conceptually, agriculture is the production of food, feed, fibre and other goods by the systematic growing and harvesting of plant and animals. It is the science of making use of the land to raise plants and animals. It is the simplification of natures food webs and the rechanneling of energy for human planting and animal consumption (Akinboyo, 2008). Until the exploration of oil reserves in the early 70s. Nigeria's economy was largely dependent on agriculture.

Nigeria's wide range of climatic variations allows it to produce a variety of food and cash crops. The stable food crops include cassava, yam, corn, cocoyam, cowpeas, beans, sweet potato, millet, plantains, bananas, rice, sorghum and a variety of fruits and vegetables. The leading cash crops are cocoa, citrus, cotton, groundnut, peanuts, palm oil, palm kernel, bean-seed and rubber. They were also Nigeria's major exports in the 1960s and early 1970s. Chief among the export destinations for Nigerians agricultural exports were Britain, the United States, Canada, France and Germany (Emeka, 2007).

Prior to the attainment of independent, agriculture was identified as a potential factor, capable of catapulting Nigeria's economic development. The colonial administration on realizing this set up marketing boards for the major cash crops. Heillener (1996), stressed that export production accounted for about 57% of Nigeria's GDP in 1929. The contributions of the sectors to the GDP continued to increase. For example, agriculture became the leading sector of the economy in 1950s and 1960s. For these periods, agricultural output accounted for 63% and 54% of GDP (Aigbokha, 2001). However, with the advent of oil in the 1970s, this dropped to 33.2%. This marked an epoch in Nigeria's economic history through the 1973/1974 (crude oil price shocks). It further went down to 30.2% for the period 1975 – 1979. On annual average, its contributions to GDP from 1997 – 2006 was 4.1% (CBN, 2006).

Over the years, government has almost been the sole provider of financial and other capital resources to support agriculture. Government has attempted to increase her expenditure on agriculture through budgetary allocation and through the provision of cheap and readily available credit facilities (Nwosu, 2004). Akpokodjie and Nwosu (1993) found that over the years, the government budgetary allocation has become an important determinant of agricultural outputs in Nigeria.

2.2. Theoretical Review

2.2.1. Keynessian Theory

The Keynessian theory was adopted as the framework of this study. Keynes regards public expenditure as an exogenous factor which can be utilized as a policy instruments to enhance output. According to the Keynessian school of thought, increase in government spending leads to a multiple rise in total output of the economy (Jhingan, 2010).

This as posited by Keynes is the multiples effect of government expenditure

$$Y = C + I + G(x – m) \quad (2.1)$$

Where Y = output, C = consumption, I – investments, G = Government, exp, x – m = net export. The change in output will be equal to the multiplier times the change in government expenditure

$$\Delta Y = \frac{(\Delta G)}{1-b} \quad (2.2)$$

Where $= \frac{1}{1-b} = k$

$$\Delta Y = k\Delta G$$

Therefore, change in output all over change in government expenditure is equal to the multiplier

$$\frac{\Delta Y}{\Delta G} = k \quad (2.3)$$

Hence, expansionary fiscal policy can be used to influence macroeconomic performance and hence increase output growth. This theory suggests that government spending can contribute positively to sectoral growth (like the agricultural sector) in an economy.

In this theory, we assume that the agricultural sector output comprising of the output of the four sub-sectors (Crops, Fisheries, Forestry and Livestock) is a function of the consumption of agricultural output, investment on agriculture and net export of agricultural output.

$$Y_A = C_A + I_A + G_A + (X_A – M_A) \quad (2.4)$$

Where: C_A = consumption of agricultural output

I_A = investment in agriculture

G_A = Government expenditure on agriculture

Thus, an increase in government expenditure on agriculture is likely to lead to a multiple increase in agricultural output. The relevance of the theory to the Nigerian economy is that it describes how the government of the country can help bring about growth in the agricultural sector through its expenditure on the sector.

2.2.2. Neoclassical Growth Model

The Neoclassical growth model also serves as the theoretical foundation of the study, credit to Solow (1956). This theory states that output (growth) is a function of capital stock and labour given the state of technology. This technology is a factor which improved upon by investment in research, education and training. The result is meant to produce the capital stock and the quality of labour force. The Solow model focuses on a closed economy where output Q is produced by the factors Labour L, Technology, A and Capital K. The production function takes the form:

$$Qt = Af (K_tL_t) \quad (2.5)$$

Where t denotes time

The critical assumption of the production is that it shows constant return to scale; (Solow, 1956), departs here from the classical assumption of scarce land or any non-augmentable resources. Okozie *et al.* (2013), interpret that the economy under consideration is big enough that the gains from specialization have been exhausted. Technically speaking, the neoclassical production function is homogenous of degree one and implies that both factors must be available, or else output equals zero (i.e. the economy would not exit). The function allows for an unlimited substitutability between capital and Labour, which means that to produce any given output, any amount of capital can be efficiently used with the appropriate amount of labour. To make this model amendable for this present study, we embarked on a model specification which specifies sectoral agricultural output as a function of total government expenditure on agriculture as a core independent variable and other factors that spur agricultural growth.

2.2.3. Musgrave Theory of Public Expenditure Growth

Musgrave (1997) Theory of public expenditure growth argued that what matters most for government spending is how effective it is. If the productive capacity of government spending is not effective, it can have a negative impact on growth. This theory posits that at low levels of per capita income, demand for public services tend to be very low, such income is devoted to satisfying primary needs and that when per capita income starts to rise above these levels of low income, the demand for service supplied by the public sector such as agriculture, health, education, transport etc. starts to rise thereby forcing government to increase expenditure on them implying that increased government spending on agriculture boost agricultural production.

2.2.4. Input-Output Theory

To sum of theoretical review, input-output theory enunciated by Leontief posit that input determines output, which is needed to increase government spending in order to boosts economic growth. This theory, therefore underpinned the extent to which government expenditure (input) has affected agricultural production (output) which in turn boosts economic growth in Nigeria.

2.3. Empirical Review

The issue of rising increase in public expenditure on Agricultural output has generated a lot of controversy and public debate among academic, economists, policy makers, researchers and as well as public office holders in recent time.

Nwosu (2004), in their study stressed that government allocation to agriculture is relatively low and the actual expenditure falls short of budgeting expenditure and the rate of under spending is usually higher for agriculture than for other economic sectors.

Ekpo (1995), examined government capital expenditure on private investment using OLS approach with an annual data from 1960 – 1990. The result indicates that capital expenditure on transport and communication, agriculture, health and education positively influence private investments in Nigeria. Hence, the study focuses in covering the research gap by investigating the actual relationship between agriculture spending and economic growth in Nigeria.

Kawagoe *et al.* (1998), compared estimated Cobb-Douglass coefficient from studies that estimated equation for developed countries and developing countries. Kawagoe, Hayemi and Ruttan investigated effects of investments in agriculture to agricultural productivity and economic growth. They split their sample of forty-three countries into twenty one developed countries and twenty-two less developed countries. They found all the convectional variables as well as technical education to be important in explaining output levels for the developed countries. For the less developed countries, land and fertilizers were not found to be significant explanatory variables, but livestock was more important when compared to the developed countries.

Omaukwe (2005) reported that a large proportion of the funds allocated to agriculture does not go directly to Farmers (DFIB, 2005) reported that the largest category of private investors in Nigeria agriculture consists of the multitude of small holder Farmers, scattered across the country. Thus, agricultural production in Nigeria is dominated by small-scaled farms characterized by small uneconomic, and often fragmented holdings. The use of simple implement (hoes and knives) and unimproved storage and planting materials. The results have been a viscous web of low productivity, low income and low capital investment. Ogwuma (1981), studied on public expenditure in agricultural sector using econometric analysis. Based on his report, Agricultural Financing in Nigeria shows positive relationship between interest rate and loanable funds on the level of Agricultural output.

Iganaga and Unemhili (2011), examined the impact of Federal Government agricultural expenditure on agricultural output in Nigeria from 1970 – 2008. Using ECM Technique, findings shows that the federal government capital expenditure was positively related to agricultural output. However, with one year lag period, it showed that the impact of government expenditure on agriculture is not instantaneous. Though the study observed that the investment in agricultural sector is imperative and that it should be complemented with monitored credit facilities, and food importation should be banned to encourage local producers.

Udoh (2011) examined the relationship between public expenditure, private investment and agricultural output growth in Nigeria over the period 1970 – 2008, the bounds tests and autoregressive distributed lag (ARDL) modeling approach was used to analysed both short-run and long-run impacts of public expenditure, private investment (both domestic investment and FDI) on agricultural output growth in Nigeria. Result of the ECM showed that public expenditure has a positive influence on the growth of agricultural output. However, foreign investment has insignificant impact in the short-run. Hence, he recommended that policy makers should combine

both private and public investment in the complementary manner to ensure that both short-run and long-run productivity of the agricultural sector is not undermined.

Irodo *et al.* (2012), examined the input of government expenditure on agricultural and agricultural output in Nigeria from 1975 – 2010 using Cobb-Douglass production function and OLS econometric techniques to estimate a multiple regression of agricultural output against some variables. The result revealed a positive but insignificant relationship between government expenditure to the agricultural sector and agricultural output within the scope of the research. As noted by Samuelson and Nordhause (2013), no where can the changes in government's role are seen more clearly than area of government spending. They stressed that a sound public expenditure policy produces food effects both on production and distribution. For many developing countries, agriculture remains the gateway to several desired ends which include poverty reduction, rural transformation, employment generation, food security and improved national health profile of the citizenry (Okpanachi, 2004). Indeed agriculture provides the main stimulus to our national economic growth despite the small farm holdings and primitive productive system (Ekerete and Ogen, 2000; Ogen, 2003)

Yusuf *et al.* (2013) carried out a study on the Effectiveness of government annual budgetary allocation to agriculture and the role of monetary policy instruments in the growth of agricultural GDP in Nigeria using the OLS technique showed that agricultural credit guarantee scheme fund, previous year GDP and consumer prize index contributed positively to the growth of agricultural GDP, other variables of interest like the interest rate, exchange rate and government expenditure on agriculture GDP growth. The study therefore recommended that government should increase her spending to agricultural sector, monitor the fund allocation and provide the necessary infrastructural facilities like good road network, electricity health and water.

Analysing the relationship between Nigeria's government expenditure on the agricultural sector, and its contributions of economic growth, Okozie *et al.* (2013) employed the Engel Granger two step modeling (ECM) procedure to co-integration based on unrestricted ECM model and pair wise Granger causality tests, they found that agricultural contributions to GDP and total government expenditure on agriculture are co-integrated. The speed of adjustment to equilibrium was 88% within a year when the variables moved away from their equilibrium values. Based on the result of the Granger causality, the paper concluded that a very weak causality exists and that any reduction in government expenditure on agriculture would have a negative repercussion on economic growth in Nigeria.

Ewubare and Eyitope (2015), examined the effects of government spending on the agricultural sector in Nigeria. The OLS of multiple regressions, the Johansson co-integration techniques, and the error correction model were used for the analysis. The results showed that the coefficient of determination is 0.9468 and the coefficient of the ECM appeared with negative sign and statistically significant. The two lag and three terms of the explanatory variables. GEA are positive and statistically significant. Based on the above findings, the study recommends for an increase funding of the Agricultural sector in Nigeria. FAO (2008) reported that in terms of capital allocation to agriculture in Nigeria, it was an average of 4.74% from 1970 – 1980. But, from 1980 – 2016, it rose to 7.00% and 10% from 2011 – 2015, but still fall shorts of FAO recommendations that 25% of government capital budget be assigned to the agricultural development. Francis (2013), examined the impact of federal government's expenditure on agricultural sector. He used a simple regression with the view of analyzing the data which indicated the impact of agricultural expenditure on its output from 1991 to 2010. R^2 was 1%, indicating a weak relationship between the variables as a result of inadequate funding. He recommended that government should reinforce its budgetary allocations to the agricultural sector, ensure proper release of funds, monitor agricultural input distribution to farmers and create commodity markets.

Aina and Omojola (2017), examined the impact of government expenditure on agricultural sector performance in Nigeria for the period 1980 – 2013 using secondary data from the CBN statistical bulletin. The result of ECM shows that there is a significant and positive relationship between government expenditure on agricultural and agricultural production output.

The study by Apata (2019) investigated the drivers of public spending mechanisms that accounts for growth in the agricultural sector output in Nigeria and china using time series data for the period 1970 – 2016. The result of the Random effects model shows that the policy of public expenditure (PUEXP) and intervention (INTEV) variables were significant but negative for Nigeria, while the variables were significant but positive for china. De and Dkhar (2018), examine the short and long run relationship between government expenditure on agriculture and its allied sector and agricultural output of Malaysia for the period of 1984 – 85 to 2013 – 14. Bound test co-integration was used to test for long-run relationship. The result of ARDL estimate shows that in the long-run, the effect of public expenditure through agriculture and allied activities agricultural output is significantly negative while expenditure on education and transport on agricultural output are significantly positive.

Examined the effects of electricity consumption and government agricultural spending on agricultural output (AGOP) in Nigeria for the period 1981 – 2017. The Philip Peron's unit root test showed that the time series – data were not stationary at levels. The ARDL results shows that poor electricity supply has significantly retarded the level of agricultural output in Nigeria while public agricultural spending indicates a weak positive lag effect on agricultural sector performance.

Osabohien *et al.* (2020), used co-integration equations to examine the output of agro-financing impacts on food production in Nigeria for the period 1981 – 2018. After testing the time series data for stationarity, the canonical co-integration regression approaches showed that agro-financing is statistically significant in explaining the level of food production in Nigeria. One percent increase in farmer's access to agricultural finance is associated with an increase in food production by 0.002% - 0.006%.

2.4. A Review of Federal Government Expenditure on Agricultural and its Contributions to GDP

Food and Agricultural Organisation (FAO) recommended that 25% of government capital budget allocation be assigned to the agricultural development capital budget. In Nigeria, this has not been achieved by the government thereby affecting government programmes and policies for the sector. In terms of capital allocation to agriculture, it was average of 4.74% from 1970 – 1980. But from 1980 – 2000, it rose to 7.00% and 10% from 2001 – 2007 though revealing an increase, but still falls short of FAO recommendation of 25% (FAO, 2010).

The ratio of agricultural budget to total government expenditure from 1970 – 1980 was an average of 2.66%. It rose from to 8.34% from 1981 – 1984; however by 2000, it nosedived to a ridiculous value of approximately 2 percent and was 2.10 percent in 2007. This fell short of the Maputo resolution that government of member states of African Union (AU) to allocate at least 10% of national budgeting resources for the implementation of the Comprehensive Africa Agricultural Development Programme (CAADP) which Nigeria is a signatory.The result of the unstable expenditure in the agricultural sector by the government over the years was the dismal performance of the sector (Iganaga and Unemhili, 2011).

The performance of agricultural output could be measured by its contributions to GDP, until the Nigerian Civil war 1967 – 70, agriculture dominated Nigeria's economy, contributing some 53% to GDP in 1965. By 1984, it percentage share had almost halved. On an annual average, its contributions to GDP from 1997 – 2008 was 41%. But on a more recent parlance, the sector contributes an average of 24% to the nation's GDP over the past seven years (2013 – 2019), see figure 1. In addition, the sector employed more than 36% of the country's labour force, a feat which rank the sector as the largest employer of labour in the country (Taiwo, 2019).

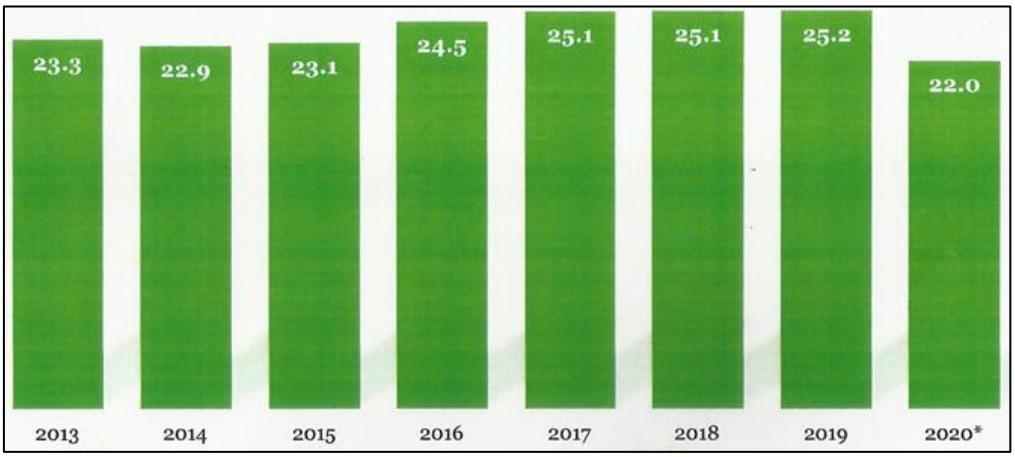

Figure-1. Agriculture's contribution to GDP (%)

Source: NBS, PwC analysis

2.5. Stylized Facts on the Nigerian Agricultural Sector

2.5.1. Crop Production Subsector

The crop production subsector is arguably the largest subsector of the Nigerian agriculture sector as it account for 87.6% of the sector growth. According to CBN (2012), from 1960 – 2011, the crop production subsector, has remained the largest as its account for over 80% of the sectors GDP on the average. Odetola and Etumnu (2013) accorded giant stride to the peasant or small holder farmers who are engaged largely in the production of food staples such as rice, maize, beans, yam, etc, It was further stated that the subsistent farmer produced 90% of our food product produced within Nigeria. Two notable crops that Nigeria is known for in this subsector are rice and cassava. FAO (2018), rated Nigeria not only Africa's first in rice consumption but also ranks it among the largest if not the first in both production and importation of rice. Rice is the first major revenue earner to the farmers than any cash crop in the country. Empirics from FAO (2018), have shown that, production hit approximately two million metric tons during the year 2018 whereas importation dwarfed this number as the global champion in cassava farming. Several challenges have been identified as bottleneck to the sector, among which are: seasonality reliance, lack of fertilizer, shortage in extension services, low capital and financial exclusion of farmers, etc.

2.5.2. Livestock Subsector

The country's livestock profile from World Bank (2017) revealed that, the livestock sub-sector has been growing at a rate of 12.7% higher than agricultural growth rate of 6.8% annually and it contribute 8.1% of the sector's total output. The sub-sector is real in socio-economic development and key to nutritional security, providing 26.5% of the proteins consumed by the populace in Nigeria. Majority of Nigerian livestock owners are the rural poor and a significant proportion of the urban poor as well, and evidence indicate that livestock development would positively contribute to poverty alleviation. Despite the herd size, apart from eggs, livestock subsector's production does not meet the current need. The difference between domestic demand and supply is projected to widen in future (World Bank, 2017). Nigeria currently imports more than 70% of its poultry and 25% of its beef requirement to meet its domestic demand (World Bank, 2017). The northern region has the largest population of livestock in the country, about 90% of the country's cattle population and 70% of country's sheep and goat population (World Bank, 2017).

On the other hand, poultry is distributed across Nigeria with a greater concentration in the southwest and southeastern Nigeria. The livestock sector in Nigeria is highly exposed to a number of natural and humanly induced risk. Major risks include: (a) drought, which are increasing in frequency and intensity, have significant negative implications for pastoral communities; (b) insecurity and conflict especially in Northern Nigeria and Boko Haram insurgency, increase the fragility of pastoral community and livestock sub-sector, (c) pest and disease leads to high mortality and lower productivity, and (d) excessive rainfall and flooding hampered the performance of the sub-sector.

2.5.3. Fisheries

According to FAO (2017), Nigeria is ranked 1st in sub-Saharan Africa in fisheries production and it contribution to the sector's total output was 3.2%. It production was estimated at 21,700 tons during the year before the millennium but steadily increased to 316,700 tons in 2015. The FAO statistics further revealed that, an estimate of over a million tons of fishes were produced in the year 2015 out of which catches from marine and inland coastlines had 36% and 33% respectively whereas the remaining 31% was from aquaculture. Although the fishery subsector is a very good source of the proteins to Nigeria, however, it has remained at the bottom of the list in terms of its share to the GDP as it contributed only 0.5% in 2015. With a total bill of USD 284 million and USD 1.2 million for imports and exports respectively, Nigeria is regarded as a net importer of fish in 2013 (FAO, 2017). This is largely attributable to the fact that almost 80% of the domestic production is generated by low-skilled, poor and subsistent artisan fishermen within the inland water ways as opposed to a high-tech, capital intensive aquaculture mode of production. Rondon and Nzeka (2010) as sited in Oyaklulowen and Zibah (2013) reported Nigeria's fish demand amounting to nearly $1.8 billion in 2009. The subsector is a major occupational hub particularly to the rural dwellers in the riverine area such as the Niger Delta region. As at 2018 (FAO) put the number of inland fishermen to be over 700,000 out of which 20% were women, whereas the Nigeria Fishery industry employs 490,000 in 1990, but as the millennium enters, employment increases to 1.1m, 1.4m, 1.5m in 2010, 2015, 2016 respectively (FAO, 2018).

2.5.4. Forestry

Forest is important in the sense that it houses pharmaceuticals, regulates the atmosphere as it neutralised the solar heat, protect the soil, provides wax, pulp, oils and other essential industrial input of economic value. But it contribute only 1.1% to the sector's total output (See Figure 2). It is regarded as a national economic resource production. The trees found here, are not only a source of wood for our furniture or fuel in both the rural and semi-urban cities they are more importantly a primary source of inputs to the pharmaceutical industries. In Nigeria, there exists general reserves and national parks; a total of 32 and 7 general reserves and national parks, respectively with an estimated coverage of over a total of about 4 million as at the year 2000 (FAO, 2000). Additionally, Larinde and Chima (2018) reported that the Nigeria forest repository are: Olokemeji forest reserves, Gambian Forest reserve, Omo forest reserves Akure/Oofu Forest reserve, Idare Forest reserves, Ifion/Owo Forest reserves, Eba forest reserves, etc.

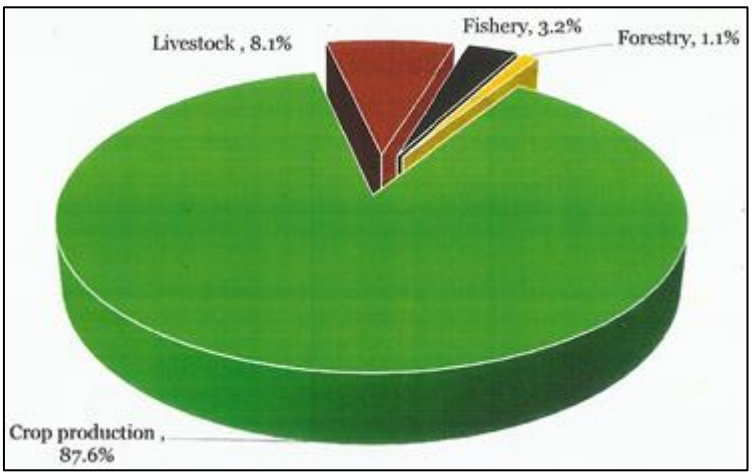

Figure-2. Size of the different segment of the agricultural sector
Source: NBS, PwC analysis

Table-1. Distribution of Forest reserves in Nigeria by Geopolitical zone (NBS, 2016)

S/N	Geo-political zone	Area of forest reserve (H)	Area of forest plantation (H)	% of forest plantation to reserve
1.	North East	1,443,112	432,985	30.28%
2	North West	1,971,206	58,925	2.99%
3.	North Central	2,220,291	24,990	1.13%
4.	South West	1,045,653	322.942	30.88%
5.	South-East	51,206	16,041	31.33%
6.	South-south	1,277,539	197,081	16.05%

As seen from table 1, there exist a large area of forest reserves across the country but to a very large extent they are not utilized optimally in terms of plantation. The highest percentage area utilized stood at 31.33% in the southeast whereas in the Northwest and North central the utilization is 2.99% and 1.13% in respective order. This is to say, the forestry subsector has suffered serious neglect from a lot of deforestation activities. The lost incurred by Nigeria to deforestation is estimated to be N180 billion annually (Eboh, 2005, in Oriola (2009))

2.6. A Brief Review of Agricultural Policies in Nigeria from Independence – 1960

New policies were formulated in the post-independence era to actualize more equitable growth in agriculture. The earlier surplus were extraction policies were quickly translated into the pursuit of an export led growth (Ayiola, 2001). This led to the demarcation of the country into the western region (cocoa), Northern Region (Groundnut), and Eastern region (palm oil). In this era, there was also an import substitution policy which saw industrialization as the best strategy to achieve economic growth. It emphasized on establishment of domestic industries behind tariff and quota barriers. Manufacturing industries were considered as the most appropriate tool to initiate the process. In this policy, it was hoped that imports would be replaced and internal growth fostered; and that the costs of the strategy would be mostly borne by the advanced countries supplying the manufactured consumers' goods (Pearce, 1986).

2.6.1. Agricultural Policies from 1966 – 1999: Military Era

The agricultural policies that existed within this time were agricultural policy for Nigeria 1988 and Agricultural (control of importation, 1990) (The Washington Times, 1999). There were also River Basin Development Decree and Land Use Decree promulgated under the military regime of Gen. Obasanjo in 1978, which was later changed to Land Use Act aimed at ameliorating the problem of land tenure that existed mainly in Eastern Nigeria. However, several other programmes/projects were initiated within this period which includes:

(a) National Accelerated Food production programme (NAPP): This was an agricultural extension programme initiated in 1972. The programme focused on bringing about a significant increase in the production of maize, cassava, rice and wheat in the Northern states through subsistent production within a short period of time.

(b) Agriculture Development Projects (ADP): Established in 1974 in the North East (Funtua) North West (Gusua), North Central (Gombe) states as pilot scheme but later spread to other states of the Federation. The important features of the programme were reliance on the small scale farmers as the main people that would bring about increase in food production and the feedback information which is a decentralized decision making process that allowed farm families/households to give their responses to an innovation/technology, incentive, subsides, etc. according to their judgment. The objectives of the programme were to bring about solution to the decrease found in agricultural productivity by sustaining domestic food supply, through massive infusion of World Bank fund, the ADPs were established to provide extension services, technical input support and rural infrastructure (Ayiola, 2001) to the Farmers/rural dwellers

(c) Operation Feed the Nation (OFN): Evolved in 1976 to bring about increase in food production in the entire nation through the active involvement and participation of everybody in every discipline thereby making every person to be capable of partly or wholly feeding him or her self.

(d) River Basin Development Authorities (RBDAs): Eleven river Basin Development Authorities were established in 1976 to boost economic potentials of the existing water bodies particularly irrigation and fishery with hydroelectric power generation and domestic water supply as secondary objectives. The objectives of the programme was later extended to other areas most importantly to production and rural infrastructural development.

(e) Green Revolution (GR): GR was a programme inaugurated by Shehu Shagariin 1980 aimed at increasing food production and raw materials in order to ensure food security and self sufficiency in basic staples.Secondly, it aspired to boost production of livestock and fish in order to meet home and export needs and to expand and diversify the nation's foreign earnings through production and processing of export crops.

(f) Directorate for Food and rural Infrastructure (DFRRI): Initiated in 1986 as a kind of home grown social dimension of adjustment (SDA) that was embarked upon in most sub-saharan Africa by the World Bank, ADB and UNDP. The programme was designed to improve the quality of life (improvement innutrition, housing, health, employment, road, water and industrialization, etc), and standard/level of living of the rural dwellers through the use of many resources that existed in the rural areas and mass participation of the rural people.

(g) Better Life Programme for rural Women: Founded by Mrs. Maryan Babangida (wife of the then President in 1987) aimed at stimulating and motivating rural women towards achieving better living standards and sensitizing the rest of Nigerians to their problems. Others include to raise consciousness about their rights/self esteemed and to inculcate the spirit of self development particularly in the fields of education, business, arts and agriculture (Obasi and Oguche, 1995).

(h) National Agricultural Land Development Authority (NALDA): Established in 1992 aimed at giving strategic public support for land development assisting and promoting better uses of Nigeria's rural land and there resources, boosting profitable employment opportunities for rural dwellers, raising the level/standard of living of rural people, targeting and assisting in achieving food security through self reliance and sufficiency

(i) National Fadama Development Project (NFDP): The 1st NFDP was designed in the early 1990s to promote simple low-cost improved irrigation technology under World Bank Financing. The main objectives of NFDP-1 was to sustainably increase the incomes of the Fadama user's through expansion of farm and non-farm activities with high-value-added output (http) www.fadama.org/. The programme covered twelve states of Adamawa, Bauchi, Gombe, Imo, Kaduna, Kebbi, Lagos, Niger, Ogun, Oyo, Taraba, including the FCT. NFDP adopted community Driven Development (CDD) approached with extensive participation of the stakeholders at early stage of the project. This approach is in line with the policies and development strategies for Nigeria which emphasizes poverty

reduction, private sector leadership and beneficiary participation. Overall appraisal of the first and second phases of the project show remarkable success, hence, the invention of the current third phase.

2.6.2. Agricultural Policies from 1999 to 2003

Since 1999, Nigeria has embarked on an ambitious economic reform programme that is yielding impressive results in budget discipline and implementation. Therefore,this programme is also leading to less waste as many government benefits are now monetized (The Washington Times, 1999). The thrust of current Nigerian government policy against poverty is to enable the poor and more vulnerable sections of the society to achieve sustainable livelihood. Government programmes in this era that are related to Agriculture includes:

(a) National Economic Empowerment and Development Strategy (NEEDS)

Needs was initiated by Gen. Obasanjo in 1999. The key element of this development strategy includes poverty eradication employment generation, wealth creation, and value re-orientation. NEEDS provided help to agriculture, industry, small and medium scale enterprise and oil and gas. It set up a series of performance targets that government wanted to achieve by 2007. These include 6% annual growth in agricultural GDP of USD 3 billion per year on agricultural exports and 95% self-sufficiency in food. NEEDS offered Farmers improved irrigations, machinery and crop varieties which would help to boast agricultural productivity and tackle poverty head on, since half of Nigeria's poor people are engaged in Agriculture. Its activity with states SEEDS would help to implement integrated rural development programme to stem rural-urban migration. NEEDS differ from other reforms by its participatory process that will ensure ownership, sustainability, encompassing scope, coordination, attractiveness problem solving and achievement oriented. NEEDS/SEEDS has been commended for bringing about cordial relationship between Federal and State level planning.The plan enumerate strategic roles for the private sector in agriculture.

(b) **National Social Programme on Food Security (NSPFS)**

Launched in all the 36 states of the federation in 2002 by Gen.Obasanjo. The broad objectives of the programme was to increase food production and eliminate rural poverty. Other specific objectives of the programme were assisting farmers in increasing their output, productivity and income, strengthening the effectiveness of research and extension service training and educating farmers of farm management for effective utilisation of resources; supporting government efforts in the promotion of simple technology for self sufficiency.

(c) **Root and Tuber Expansion Programme(RTEP)**

Initiated in 2003 under Olusegun Obasanjo's administration to cover the26 states in the Federation aimed at addressing the problem of food production and rural poverty. At the local farmers' level, the programme hopes to achieve economic growth, improve access of the poor to social services and carryout intervention measures to protect poor and vulnerable groups. At the national level, the programme was designed to achieve food security and structure demand for cheaper stable food such as cassava garri, yam, potato, etc, as against more expensive carbohydrate such as rice. Small holder farmers with less than two hectares of land per household were the targets of the programme while special attention is being paid to women who play a significant role in rural food production, processing and marketing. RTEP also targets at multiplying and introducing improved root and tuber varieties to about 350,000 Farmers in order to increase productivity and income.

2.6.3. Recent Agricultural Policies in Nigeria

During the Umaru Musa Yar'Adua administration, he made food security and agriculture one of his seven point agenda. At the inception of his administration, he earmarked on a seven-point agenda so that the nation can move forward and be among the 20 largest economies by the year 2020. This also led to the ambitious vision 20:20 – a twenty-year plan for Nigeria. Like the Obasanjo administration (1999 – 2007), the thrusts of the policy direction for agriculture, and food security within the seven point agenda includes:

- Creating the conducive macro-environment to stimulate greater private sector investment in agriculture.
- Rationalizing the roles of the tiers of government in their promotional and supportive activities to stimulate growth.
- Reorganizing the institutional framework for government intervention in sector to facilitate smooth and integrated development of agricultural potentials.
- Increasing agricultural production through increased budgetary allocation and promotion of the necessary developmental, supportive and socio-oriented activities to enhance production and productivity and marketing opportunities.
- Promoting increased use of machinery and inputs through favourable tariff policy, etc.

Arising from the redefined role of the federal government, it thrust of activities will be directed to obviate the technical and structural problem of agriculture on the following aspects: development activities, animal vaccine production, veterinary drug manufacture, agro chemical manufacture, water management, agricultural development, input supply, distribution, credit and macro-credit (available at www.noveltyjournals.com).

The Jonathan administration came up with Agricultural Transformation Agenda (ATP) anchored by the then Minister of Agriculture, Mr. Akinwumi Adesina (Agricultural Expert). Their policy thrust focuses on supplying fertilizers directly to the rural farmers and not through middle men, provided seeds with high yield directly to small holding farmers, provided telephones to the rural farmers for ease of communication and encourage value chain in such a way that agric product are being processed locally to finished products for export. The regime further has the programme of providing storage facilities and exporting perishable goods such as tomatoes, etc, by the provision of infrastructure such as perishables shed at major airports in Nigeria. The youth empowerment in agriculture programme was also initiated by this regime (available at www.noveltyjournal.com).

The succeeded administration led by Muhammadu Buhari pledged to continue the agricultural polices of the past regime, improve on seed yield and fertilizer distribution, emphasizes export and make agriculture a business by mechanization, the value chain of transformation, marketing and also funding research institutes. The regime also continue on implementing the policy thrust of youth empowerment in agricultural programme (YEAP). So far about 30,000 youth have been empowered. This administration earmarked on a school feeding programme. A plan model adopted from Brazil national smart agricultural school feeding programme. Brazil School feeding programme is second only to that of the United States of America in size and depth; 40million school children are fed daily at an estimated annual cost of 2 billion USD, shared by Federal, State and Local Council, communities and private sector (www.fmard.gov.org.). The Nigeria government is interested in how to increased productivity and yield of small holders farmers using cooperative model and technological advancement. Brazil has achieved self sufficiency in rice production and export 20% of her rice to more than 65 other countries.

Another agricultural policy thrust of the Buhari administration is the Anchor Borrowers programme designed to assist small scale farmers to increase the production and supply of feedback to agro-processors. The CBN has set asideN20 billion from the N220 billion micro, small and medium enterprises development fund (MSMEDF) for farmers at single-digit interest rate of nine percent. Implementations are hinged on three pronged approach. These are out-grower support programme, training of farmers, extension workers and bank as well as risk mitigation (Leadership Newspaper, 2015).

3. Methodology

3.1. Research Design

The research design adopted for the study was quasi experimental. This enabled the researcher obtain, analyze and interpret data relating to the objectives of the study. The choice of this type of design allowed the researcher the privilege of observing variables over a long period of time. Econometric technique was used for data analyses.

3.2. Model Specification

This study used the components of Agricultural output such as crop production output, forestry output, livestock output and fishery output as dependent variables. The study used total government expenditure on agriculture as the core independent variable. Moreover, it was necessary to include other variables to capture critical sectors of the economy. The study included in the model interest to the agricultural sector to capture the monetary sector. The study used the exchange rate to capture the external sector. The study included in the model the growth in population and annual rainfall. In order to examine the relationship between governments agricultural expenditures and agricultural outputs, the functional relationship of the models are stated thus:

MODEL 1

CROP = F(TGEXA, INT, ANRFL, OEXCH, POPG)……(1)

The econometric equation of the functional relationship of the model is stated thus:

$CROP_t = \beta_0 + \beta_1 TGEXA + \beta_2 INT_t + \beta_3 ANRFL_t + \beta_4 OEXCH_t + \beta_5 POPG_t + U_t$ - - - - - - (2)

MODEL 2

LIVE = F(TGEXA, INT, ANRFL, OEXCH, POPG) ……(3)

The econometric equation of the functional relationship of the model is stated thus:

$LIVE = \beta_0 + \beta_1 TGEXA + \beta_2 INT_t + \beta_3 ANRFL_t + \beta_4 OEXCH_t + \beta_5 POPG_t + U_t$ - - - - - - (4)

MODEL 3

FOREST = F(TGEXA, INT, ANRFL, OEXCH, POPG) ……(5)

The econometric equation of the functional relationship of the model is stated thus:

$FOREST_t = \beta_0 + \beta_1 TGEXA + \beta_2 INT_t + \beta_3 ANRFL_t + \beta_4 OEXCH_t + \beta_5 POPG_t + U_t$ - - - - - - (6)

MODEL 4

FISHERY = F(TGEXA, INT, ANRFL, OEXCH, POPG)……(7)

The econometric equation of the functional relationship of the model is stated thus:

$FISHERY_t = \beta_0 + \beta_1 TGEXA + \beta_2 INT_t + \beta_3 ANRFL_t + \beta_4 OEXCH_t + \beta_5 POPG_t + U_t$ - - - - - - (8)

Where:

CROP = Crop Output
LIVE = Livestock Output
FOREST = Forestry Output
FISH = Fishery Output
TGEXA = Total Government Expenditure on Agriculture
INT = Interest Rate
ANRFL = Annual Rainfall
OEXCH = Official Exchange Rate
POPG = Population Growth

Where *t-k* signifies previous years and ECM represents the error correction coefficient.

3.3. A Priori Expectation

It was expected that a significant and positive relationship exist between total government expenditure and crop, fishery, forest and livestock outputs. This is so because the more the government allocate funds to the agriculture sector, the more the farmers will have sufficient funds for operations. The increase in farmers operations will lead to increase in agricultural productions, thereby increasing its output to satisfy the country's needs. It is also expected that interest rate to the agricultural sector contributes positively and significantly to agricultural outputs. This is because the lower the interest rate, the higher the investment portfolio by farmers ,which can increase agricultural production and outputs.

It was also expected that annual rainfall have a positive and significant relationship with the agricultural output. This is so because rainfall increases farmers yields, vis a vis an increase in agricultural production and outputs. Moreover,it was expected that growth in population affect agricultural output since an increase in population means more decisions on how to cater for their agricultural needs. This will prompt more agriculture production.

3.4. Data

The data used for the study were data on crop, fishery, forest and livestock output as a share of GDP, total government expenditure on agriculture as a share of total expenditure, official exchange rate data, data on growth in population and data on agricultural land. The data covers from 1981 to 2019. Data were sourced from the CBN Statistical Bulletin, 2019, and World Development Indicators, 2019.

3.5. Technique of Data Analysis

Short Run Dynamics: The study applied the Error Correction Mechanism to the models to ascertain the short run dynamics on the effects of government agricultural expenditure on agricultural output. This is necessary because the ECM reconciles the long and short run behaviours of the variables in the model so its estimation can be useful in both the short run and the long run. Moreover, below are some diagnostics tests that were carried out to ensure robustness in the model:

Unit Root Test: The unit root test was carried out to ensure stationarity of variables in the model. This is done by using the Augmented Dickey-Fuller (ADF) and the Phillip-perron tests.

F-Bounds Cointegration: Test: The F-bound cointegration test was used to ensure that long run relationships existed among variables in the model.

Autocorrelation Test: The Durbin Watson test was used to test for the presence of autocorrelation in the model.

Heteroscedasticity Test: The Breusch-Godfrey heteroscedasticity test was used to ascertain if the error variance of each observation is constant or not.

Normality Test: The Jacque-bera test was used to test if the variables in the model follow the normal distribution.

Causality Test:The granger causality test was used to determine the direction of causality between the dependent variable and the independent variables.

4. Data Analysis

4.1. Trend Analysis

The trend analysis involved the analysis of the components of agricultural output namely, crop, fishery, forestry and livestock over time. The trend analysis also included government expenditure in agriculture. Figure 1 shows the trend in components of agricultural output in Nigeria from 1981 to 2019.

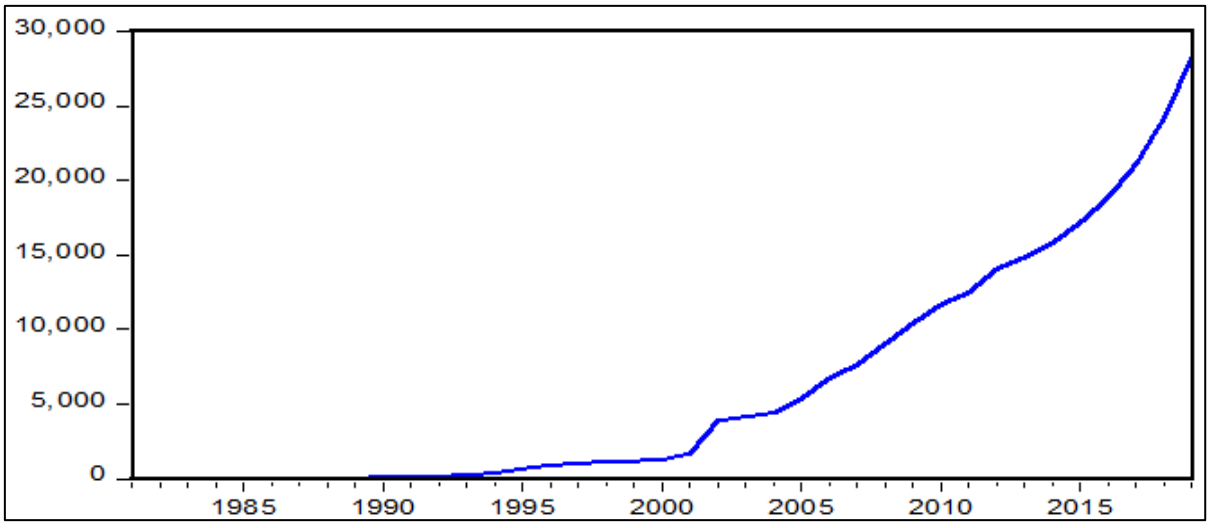

Figure-3. Crop production output in Nigeria, 1981-2019

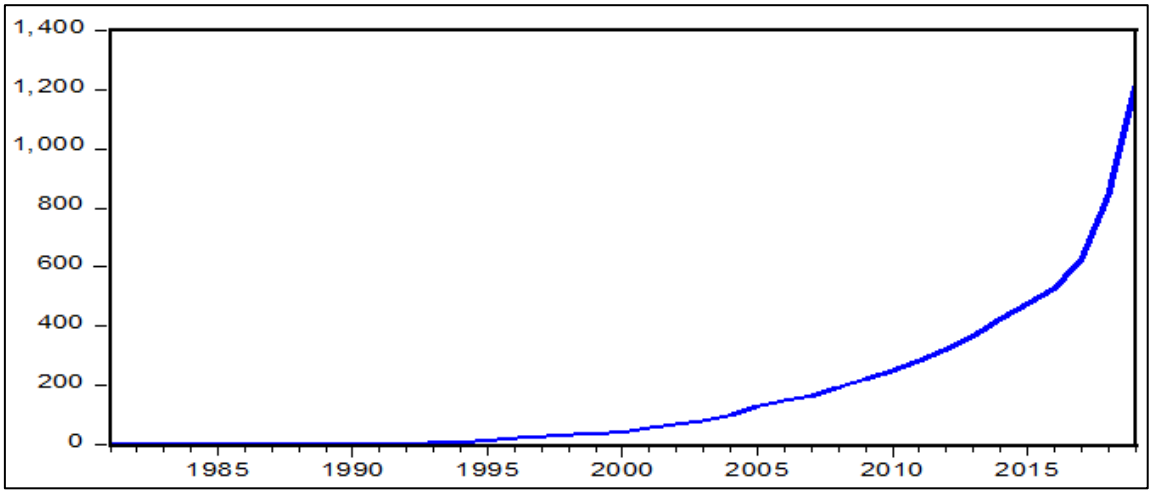

Figure-4. Fishery production output in Nigeria, 1981-2019

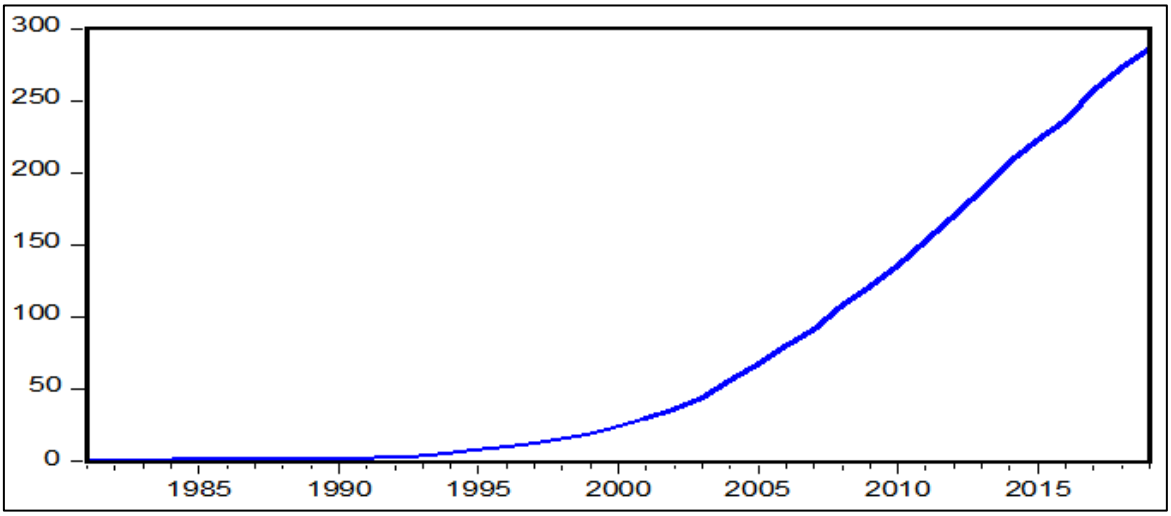

Figure-5. Forestry production output in Nigeria, 1981-2019

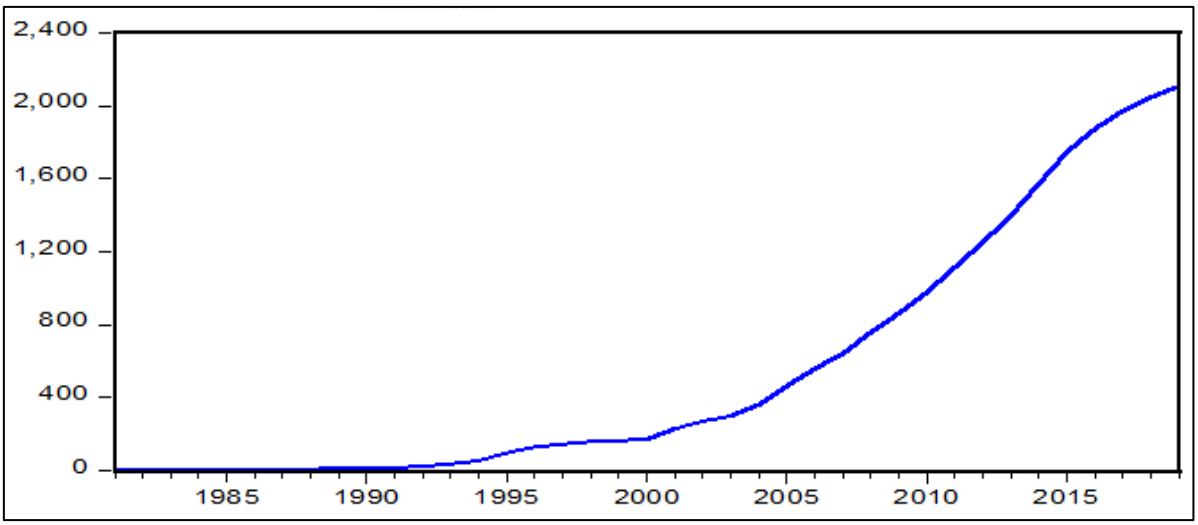

Figure-6. Livestock production output in Nigeria, 1981-2019

The trend analysis of the components of agricultural output shows increase in crop production from 12.81721 billion in 1981 to 28296.93 billion in 2019 as shown in Figure 1, increase in fishery production from 0.550365 billion in 1981 to 1212.390 billion in 2019 as shown in figure 2, increase in forestry production from 1.159573 billion in 1981 to 285.8787 billion in 2019 as shown in figure 3, and increase in livestock production from 2.525025 billion in 1981 to 2108.945 billion in 2019 as shown in figure 4.

The trend in government expenditure in agriculture shows series of fluctuations in figure 5. Total government expenditure on agriculture was 0.01 billion naira in 1981. The trend increased gradually until 1999 when it climax

59.32. It suddenly reduced to 6.34 billion the next year and rose steadily until it climax at 65.40 naira in 2008. Since 2008 the trend in government expenditure on agriculture fluctuated upwards. It was 70.27 billion naira in 2019.

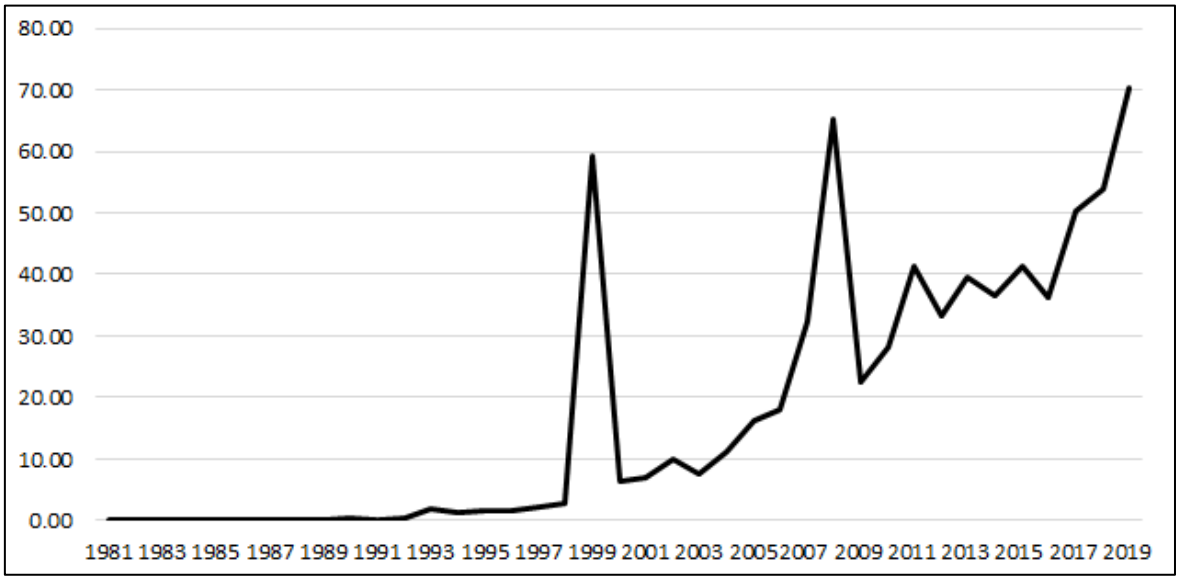

Figure-7. Government Agricultural Expenditure, 1981-2019

The trend analysis shows that government expenditure on agriculture and agricultural output have shown increasing trends since 1981. Having analyse the trend diagrams, it is imperative to estimate the relationship using the ARDL technique of data analysis. Before estimating such relationship, it is vital to determine the stationarity of the variables.

4.2. Unit Root Results

Table-2. ADF and PP Unit Root Tests

Variable	ADF Stat.	Order of Integration	PP Stat.	Order of Integration
CROP	-7.11	I(2)	-7.11	I(2)
FISHERY	2.37	I(2)	2.54	I(2)
FOREST	-6.96	I(2)	-9.34	I(2)
LIVE	-4.88	I(2)	-4.90	I(2)
ANRFL	-3.96	I(0)	-10.55	I(0)
INT	-2.91	I(0)	-7.17	I(0)
OEXCH	-4.26	I(0)	-4.16	I(0)
POPG	-4.95	I(0)	-4.36	I(0)
TGEXA	-6.88	I(0)	-14.61	I(0)

Source: Extraction from E-views 10.0 Output.

The table 1 showed the Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) unit root tests. The Augmented Dickey Fuller (ADF) statistics showed that INT, ANRFL, OEXCH, POPG and TGEXA were stationary at levels; while all components of Agricultural output such as CROP, FISHERY, FOREST, and LIVE were stationary at second differences. Similarly, the Phillip-Perron (PP) statistics show that INT, ANRFL, OEXCH, POPG and TGEXA were stationary at levels; while all components of Agricultural output such as CROP, FISHERY, FOREST, and LIVE were stationary at second differences.

It is important to note that the stationarity tests ensured that there are no spurious regressions in the model. Moreover, the diagnostics test is important to ensure robustness checks in the models. The diagnostics tests are the normality tests, the heteroscedasticity tests the autocorrelation tests, and the F-bounds tests for co-integration in the models.

Table-3. Cointegration Tests Results

Hypothesized	Model 1		Model 2		Model 3		Model 4	
No of CE(s)	Elgenvale	Prob	Elgenvalue	Prob	Elgenvalue	Prob	Elgenvalue	Prob
None	0.852239*	0.0000	0.936730*	0.0000	0.912025*	0.0000	0.905159*	0.000
At most 1	0.716014*	0.0000	0.790958*	0.0000	0.746354*	0.0007	0.795800*	0.000
At most 2	0.554734*	0.0015	0.641841*	0.0011	0.428433	0.2848	0.499482	0.198
At most 3	0.416592*	0.0288	0.406403	0.1695	0.264326	0.5880	0.203810	0.773
At most 4	0.207804	0.1623	0.136518	0.7560	0.157117	0.6546	0.144780	0.616
At most 5	0.084585	0.0706	0.001309	0.8257	0.000600	0.8815	0.023774	0.345

* denotes rejection of the hypothesis at the 0.05 level

Source: Authors

Table 2 showed the cointegration test results for models 1 to 4. As the results indicated, there were the existence of long run relationships in the models at varying magnitudes. All models can therefore be investigated of their nature of the long run relationships. Table 3 presents the diagnostics tests for the models in the study.

Table-4. Diagnostics Results for Model 1- 4

Diagnostics tests	Model 1	Model 2	Model 3	Model 4
Autocorrelation	1.87	1.81	2.03	2.13
Heteroscedasticity	0.71	0.77	0.30	0.67
Normality	0.80	0.24	0.85	0.77
Adjusted R-Squared	0.42	0.68	0.47	0.80
F-statistics	2.91	3.99	3.58	9.89
Prob.	0.01	0.004	0.000005	0.002

Source: Authors, extracted from E-views 10.0 Output.

Table 3 showed the diagnostics tests for the model. The autocorrelation figures of 1.87, 2.03, 2.13 and 1.81 showed that there are no serial correlations in the errors in the models. The observed r-squared of the White's heteroscdasticity tests show that there are equal spreads in the variances of the model. Also, the Jarque-bera statistics of 0.80, 0.85, 0.77 and 0.24 for the models showed that the models follow the normal distribution.

The adjusted coefficient of determination showed that 42% variation in crop output is explained by the variations in the government expenditure on agriculture and other independent variables in model 1; 47% variation in fishery output is explained by the variations in the government expenditure on agriculture and other independent variables in model 2; 80% variation in forest output is explained by the variations in the government expenditure on agriculture and other independent variables in model 3; and 68% variation in livestock output is explained by the variations in the government expenditure on agriculture and other independent variables in model 4.

The F-statistics of 2.91, 3.99, 3.58 and 9.89 for models 1, 2, 3 and 4, respectively showed that the models were statistical significant at the 5% level of significance.

4.3. Error Correction Mechanism

The Error Correction Mechanism (ECM) was applied to each model to reconcile the short and long run behaviours of the variables and showed how government expenditure on agriculture affects crop, fishery, forestry and livestock outputs in Nigeria since 1981.

Table-5. Error Correction Regression Model 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.187150	0.052871	3.539767	0.0018
DLOG(CROP(-1))	0.389233	0.145753	2.670486	0.0140
DLOG(TGEXA)	0.208627	0.056054	3.721873	0.0012
DLOG(TGEXA(-1))	-0.059605	0.044958	-1.325788	0.1985
D(INT)	0.139588	0.094914	2.470676	0.0055
D(INT(-1))	-0.308698	0.146189	-2.111636	0.0463
DLOG(ANRFL)	0.894162	0.312827	2.681097	0.0029
DLOG(ANRFL(-1))	-0.361941	1.184254	-0.305628	0.7628
DLOG(OEXCH)	-0.315959	0.129769	-2.434787	0.0235
DLOG(OEXCH(-1))	-0.046936	0.120113	-0.390766	0.6997
DLOG(OEXCH(-2))	-0.132406	0.103177	-1.283293	0.2127
D(POPG)	9.314510	3.009657	3.094874	0.0053
D(POPG(-1))	-1.862536	2.155145	-0.864228	0.3968
ECM(-1)	-0.841402	0.196880	-4.273686	0.0003

Table-6. Error Correction Regression Model 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.196240	0.067545	2.905304	0.0080
DLOG(FISHERY(-1))	0.340284	0.157456	2.161138	0.0413
DLOG(TGEXA)	0.056290	0.041304	3.362819	0.0361
DLOG(TGEXA(-1))	0.007841	0.050136	0.156398	0.8771
D(INT)	0.033130	0.106865	2.310022	0.0593
D(INT(-1))	-0.302078	0.146289	-2.064945	0.0504

D(INT(-2))	-0.168017	0.141772	-1.185120	0.2481
DLOG(ANRFL)	1.227567	0.228703	2.999075	0.0282
DLOG(ANRFL(-1))	-2.127749	0.345419	-1.581476	0.1274
DLOG(OEXCH(-1))	-0.250746	0.129304	-1.939207	0.0648
DLOG(OEXCH(-2))	0.190897	0.108489	1.759597	0.0918
D(POPG)	2.520076	1.828738	1.378041	0.1815
ECM1(-1)	-0.585541	0.139109	-4.209237	0.0003

Table-7. Error Correction Regression Model 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.187698	0.040484	4.636362	0.0002
DLOG(FOREST(-1))	0.370718	0.110130	3.366172	0.0032
DLOG(TGEXA)	0.063402	0.016728	3.790193	0.0012
D(INT)	0.042323	0.027819	1.521362	0.1446
D(INT(-1))	-0.263479	0.070691	-3.727166	0.0014
D(INT(-2))	-0.197696	0.062711	-3.152500	0.0052
D(INT(-3))	-0.059351	0.033242	-1.785409	0.0902
DLOG(ANRFL)	-1.313639	0.521784	-2.517590	0.0209
DLOG(ANRFL(-1))	0.585334	0.502961	1.163777	0.2589
DLOG(ANRFL(-2))	0.635254	0.403782	1.573263	0.1322
DLOG(OEXCH)	-0.074190	0.036361	-2.040380	0.0555
DLOG(OEXCH(-1))	-0.101945	0.049975	-2.039944	0.0555
D(POPG)	8.915340	1.981896	4.498390	0.0002
D(POPG(-1))	-3.268183	3.181617	-1.027208	0.3172
D(POPG(-2))	1.040502	1.562313	0.666001	0.5134
ECM2(-1)	-0.571369	0.118197	-4.834029	0.0001

Table-8. Error Correction Regression Model 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.091446	0.039361	2.323257	0.0294
DLOG(LIVE(-1))	0.502017	0.153448	3.271578	0.0034
DLOG(TGEXA)	0.081801	0.038446	2.127696	0.0443
DLOG(TGEXA(-1))	-0.071326	0.027799	-2.565797	0.0173
D(INT)	0.147094	0.067354	2.183894	0.0394
D(INT(-1))	-0.143509	0.097716	-1.468641	0.1555
DLOG(ANRFL)	0.752917	0.783740	0.960671	0.3467
DLOG(ANRFL(-1))	0.226563	0.788290	0.287411	0.7764
DLOG(ANRFL(-2))	-0.812306	0.787116	-1.032003	0.3128
DLOG(OEXCH)	-0.134943	0.094015	-1.435335	0.1647
DLOG(OEXCH(-1))	0.037186	0.075721	0.491093	0.6280
D(POPG)	3.656119	1.605288	2.277547	0.0324
ECM3(-1)	-0.501634	0.149698	-3.350974	0.0028

Source: E-views 10.0 Output.

Tables 4, 5, 6, 7 showed the effect of government expenditure on crop, fishery, forest and livestock outputs in the Nigeria economy from 1981 to 2019. The co-integrating coefficients showed the speed of adjustment of the present values of crop, fishery, forest and livestock outputs to the past values of the outputs, the past and present values of the government expenditure on agriculture, interest rate on bank loan to the agricultural sector, annual rainfall, exchange rate, and growth in population.

The immediate past values of crop, fishery, forest and livestock outputs supported present values of crop, fishery, forest and livestock outputs positively and significantly. The positive relationship between the immediately past value of crop, fishery, forest and livestock outputs and present value of crop, fishery, forest and livestock outputs implies some policies have been put in place to ensure such relationship.

The coefficient of government expenditure on agriculture for each agricultural output are 0.21 for crop output, 0.06 for fishery output, 0.06 for forest output and 0.08 for livestock. These coefficients signify that positive relationships exist between government expenditure on agriculture and crop, fishery, forest and livestock outputs respectively. Hence, one unit increase in government expenditure on agriculture increased crop output by 21% on average, increased fishery output by 6% on average, increased forest output by 6% on average, and increased livestock output by 8% on average. The relationship that exists between government expenditure on agriculture and these agricultural outputs were significant at the 5% level. The implication of this positive and significant relationships between government expenditure on agriculture and crop, fishery, forest and livestock outputs are that,

the government has provided resources for agricultural activities which have resulted to increased in crop, fishery, forest and livestock outputs to not just satisfy the needs of the growing population in Nigeria but for exports. In other words, the Nigeria government over the years have invested in the agricultural sector through its expenditures in previous years. These investments through expenditures have increased crop, fishery, forest and livestock outputs during the period under review.

Another factor must have contributed to the transformation of the outputs of crop, fishery, forest and livestock, is the interest rate. There is a positive and significant relationship between crops, fisheries, livestock output and interest rate. This implies that a favourable interest rate increase crops, fisheries and livestock outputs by 14%, 3% and 15% respectively, on average, vice versa. What this means is that interest rate over the years has encouraged investors to borrow loans approved by commercial banks for agriculture, which has been more effective and utilized in the livestock segment of agricultural sector.

Another factor that supported crop, fishery, forest and livestock outputs during the period under review was annual rainfall. A positive and significant relationship existed between crops, fisheries and annual rainfall. But in the case of forestry it was negative but significant, implying that a unit increased in rainfall, increased forestry outputs by 0.75 on average.

The rate at which the Naira exchanges for the Dollar did not support crop, fishery, forest and livestock outputs during the period under study. These imply that the rate at which the naira exchanges with the Dollar is high which directly affect the inputs in the agricultural production process. These include fertilizers, high-yield seeds and other materials imported for inputs into the agricultural production process. The growing population has made it possible for the government to ensure that they increase funds to support agricultural activities which will cater for the population.

It is necessary to show the causal relationship between government expenditure on agriculture and crop, fishery, forest and livestock outputs in Nigeria during the period under study. The causal relationships are displayed in Table 8.

Table-9. Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
CROP does not Granger Cause TGEXA	37	8.17410	0.0014
TGEXA does not Granger Cause CROP		0.02734	0.9731
LIVE does not Granger Cause TGEXA	37	6.68051	0.0038
TGEXA does not Granger Cause LIVE		3.83128	0.0322
FISHERY does not Granger Cause TGEXA	37	6.60734	0.0040
TGEXA does not Granger Cause FISHERY		1.15776	0.3270
FOREST does not Granger Cause TGEXA	37	7.85601	0.0017
TGEXA does not Granger Cause FOREST		0.09227	0.9121

The granger causality test showed that one directional relationships exist between total government expenditure on agriculture and crop, fishery and forest outputs flowing from crop to government expenditure on agriculture; flowing from fishery to government expenditure on agriculture; flowing from forest to government expenditure on agriculture. A bi-directional causality relationship exists between total government expenditure on agriculture and livestock.

5. Summary, Conclusion and Recommendations

In investigating the effect of federal government expenditure and agricultural output in Nigeria for the period of 1981 – 2019, we modelled each agricultural output against the total government expenditure on agriculture (TGEXA), interest rate on bank loan to agriculture (INT),annual Rainfall (ANRFL), official exchange rate (OEXCH) and Population Growth (PopG). The study employed the ADF-test, Johanson co-integration test and error correction model (ECM) to estimate the long run relationship between government expenditure on agriculture and agricultural outputs. It revealed that there is a positive relationship between government expenditure and agricultural outputs; that, a positive but insignificant relationship exist between agricultural outputs and interest rate on bank loan; that, the coefficient of rainfall is positive but not significant. Exchange rate was negative but significant implying that high exchange rate reduces agricultural output.

On the basis of the result, we conclude that government should continue to invest more on agriculture, commercial bank should continue to give out loan to farmers but on a favourable terms and conditions with a close monitoring.

We also made the following recommendations:

1. Governments at all levels should seek more productive ways to invest in the agricultural sector by upgrading to mechanised farming, providing fertilizers for improved yields, providing high-yield seedlings to ensure self-sufficiency.
2. The commercial banks should complement government's effort in ensuring that interest on loans to the agricultural sector are favourable as this would encourage more investors in the sector.
3. The Central Bank of Nigeria should ensure that there are waivers for most agricultural materials used for the agricultural process. This would help farmers purchase such materials like fertilizers and others at rate that would not impede the agricultural output.
4. The Federal government should ensure that there is transparency and accountability in allocating funds to the agricultural sector through the appropriate monitoring agencies.

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