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# Macroeconomic Determinants and Forecast of Agricultural Growth in Nigeria

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## Abstract

The study analysed the trends of public external debt, domestic private investment, foreign direct investment and agricultural growth; ascertained the direction and growth rate of public external debt, private investment and agricultural growth; and forecast agricultural growth for five years. The result showed that on the average agricultural growth, public external debt, foreign direct investment, gross domestic private investment and labour were 59,869.64 metric tons, USD17.8 billion, USD29.6 billion, USD10.2 billion and 38,246,907 employed persons respectively. The result also showed that the direction of growth of agricultural output (-0.001), public external debt (-0.005) and foreign direct investment (-0.001) were decelerated while gross domestic private investment (0.003) was accelerated and labor stagnated. The result also showed that in the next half decade the agricultural growth will be estimated at 109,097.80 metric tons. Based on the findings from the analysis, it was recommended that the entrepreneurial spirit in the real sector of the economy should be developed to further strengthen private capital participation in agriculture.
**Keywords:** *Trend, Forecast, Growth Rate, Agricultural Growth*

## Introduction

Agriculture plays a critical role in promoting inclusive growth by stimulating economic growth, reducing poverty, and creating employment for a large number of people particularly in developing countries. It accounts for about 29 percent of the gross domestic product (GDP) and employs 65 percent of the labor force in poor developing economies. In addition, more than 75 percent of the poor in the developing world live in rural areas with most of them earning their livelihoods directly or indirectly from agriculture (Oboh and Adeleke, 2016). In Nigeria, the total labour force is made up of persons aged 15–64 years excluding students, home-keepers, retired

persons, stay-at-home parents, and persons unable to work or not interested in work (Kale and Doguwa 2015). It is generally expected that developing countries, facing a scarcity of capital will acquire external loan building up her external debt to supplement domestic saving (Aluko and Arowolo, 2010). External debt may be used to stimulate the economy (Albert *et al.*, 2005).

Economists hold the view that adequate investment is needed for economic growth and development in a nation. Hence domestic investment through capital formation is not just paramount but serves as a prerequisite for the geometric acceleration of growth and development of every economy as it provides domestic resources that can be used to fund investment effort of the economy. A lot of economies depend on investments to resolve several economic problems, crisis and challenges. Less developed countries in Africa such as Nigeria is introducing various economic policies that will attract as well as keep hold of private investors (Imoisi *et al.*, 2015). Foreign direct investment (FDI) inflows to Nigeria have remained low compared to other developing countries though the growth has remained positive. It has been hypothesized that the response of private investors depends on the stage of the economy's business cycle, the availability of financing and the level of public investment (Offiong and Atsu, 2014).

Although several studies have been directed at macroeconomic factors influencing agriculture such as Oyetade *et al.* (2016) who examined macroeconomic variables influencing agricultural growth considering exchange rate, commercial loan on agriculture, food import value, unemployment rate, inflation rate and interest rate; Kareem *et al.* (2013) determined the factors influencing agricultural production in Nigeria by modeling foreign direct investment (FDI), commercial Bank loan on agriculture, food import value, GDP growth rate; and Udah and Nwachukwu (2015), evaluated the determinants of growth of agricultural sector in Nigeria using growth in labour force in agriculture, growth in agricultural capital, growth in agricultural land area harvested, growth in climate proxied by annual total rainfall, growth in agricultural export, total factor product, inflation rate and growth in infrastructural development (land and irrigation) none of the authors considered domestic private investment and public external debt as macroeconomic determinants of agricultural growth. Also, the trend analysis, growth rates were not carried out.

In the light of these mentioned facts, the following questions were answered
  i.    What are the trends of agricultural growth, public external debt and domestic private investment, FDI and labour?
  ii.   What are the direction of growth and growth rate of agricultural growth, public external debt and domestic private investment, FDI and labour?

**Literature Review**
**Agricultural growth in Nigeria**
The agricultural sector has a multiplier effect on any nation's socio-economic and industrial fabric because of the multifunctional nature of the sector. It has the potential to be the industrial and economic springboard from which the country's development can take off. Agriculture employs about 70 to 80% of the country's labour force and contributes 60% of the nation's gross domestic product (GDP) and foreign exchange earnings (Ugwu and Kanu, 2012). Undoubtedly, agricultural production in Nigeria is dominated by small-scale farmers characterized by small, uneconomic and often fragmented holdings that make use of simple implements and unimproved planting

materials for farming. The attendant economic plight of these small household farmers has been aptly described as a vicious web of low productivity in output, income and capital investment. This self-perpetuating web is said to inhibit the participation of the traditional farmers in economic development (Akpaeti *et al.,* 2014). Several agricultural policies and programmes have been embarked upon and implemented by the Federal Government in order to revamp the agricultural sector.

## Public external debt in Nigeria

Many developing countries resort to external borrowing to bridge the domestic resource gap in order to accelerate economic development (Oke and Sulaiman, 2012). Ajayi (1989) traces the origin of Nigeria debt problem to the collapse of the international oil price in 1981 and the persistent suffering of the international oil market and partly due to domestic lapses. The problems associated with debt and debt servicing prompted Sanusi (2003) to warn that rising Nigeria's debt is an impediment to economic growth and development. Similar view was expressed by Campbell (2009) when he said that government debt can easily become a burden on the economy weakening its foundation, warning that the authorities should recognise that accumulating debt also means accumulating risks by increasing claims on unrealised future income.

## Foreign direct investment (FDI) in Nigeria

The Nigerian governments have recognized the importance of FDI in enhancing economic growth and development and various strategies involving incentive policies and regulatory measure have been put in place to promote the inflow of FDI to the country. Nigerian authorities have been trying to attract FDI via various reforms. The reforms included the deregulation of the economy, the new industrial policy of 1989, the establishment of the Nigeria Investment Promotion Commission (NIPC) in early 1990s, and the signing of Bilateral Investment Treaties (BITs) in the late 1990s (Obida and Abu, 2010). Others were the establishment of the Economic and Financial Crime Commission (EFCC) and the Independent Corrupt Practices Commission (ICPC). However, FDI inflows to Nigeria have remained low compared to other developing countries. According to Lall (2002), privatization was also adopted, among other measures, to encourage foreign investments in Nigeria. This involved transfer of state-owned enterprises (manufacturing, agricultural production, public utility services such as telecommunication, transportation, electricity and water supply), companies that are completely or partly owned by or managed by private individuals or companies.

## Domestic private investment in Nigeria

Tawiri (2010) posits one of the most important determinants of the rate of growth in an economy is the rate of investment. Countries with high rate of investments experience high rate of growth, while countries with low investment rate are slow in their growth process. It is generally agreed in the literature that investment stimulates growth within a market economy; as a result private sector investment no doubt remains the engine of growth with the public sector providing the enabling environment (Kalu and Mgbemena, 2015). Between 1987 and 1994, 50 percent of the private sector fund was in the form of call money, 32.5 percent went to lending maturity within

12 months; 12 percent for 1-5 years maturity (medium-Term) and only 4.80 percent for long-term commitments exceeding five years (Emenuga, 1996; Akpaeti *et al.,* 2014).

**Labour in Nigeria**
It is unarguable that one of the most fundamental problems in developing countries is that of unemployment. Unemployment is not a desirable concept in any given country's economic priorities because of the attendant social vices (Baba *et al.,* 2014). The goal of achieving full employment among other macroeconomic goals is an important one in many developing nations where unemployment and underemployment have been a major cause and consequence of widespread poverty (Kareem, 2015). Over the years various governments in Nigeria have tried to design policies and programmes to curb unemployment in the country. The outcomes of these policies and programmes have always been inconclusive (Awogbenle and Iwuamadi, 2010). In Nigeria, Iyoha (1978) opined that employment generation is a significant drive of the growth rate of GDP in Nigeria. However, in the Nigerian economy, most employment is in the informal sector. A large proportion of these people are under self-employment with very low income (Kareem, 2015).

**Methodology**
**Data Analysis Techniques**
Descriptive statistics was used to analyse the trends; exponential growth model was used to analyse growth rates and quadratic growth model was used to analyse direction of growth of agricultural growth, public external debt, foreign direct investment, gross domestic private investment which allows for the possibility of acceleration, deceleration or stagnation in growth during the period under study (Onyenweaku and Okoye, 2005; Udah *et al.,* 2015). Monte Carlo simulation technique was used to forecast agricultural growth.

**Model Specification**
**Trend Analysis**
$$Y_t = Y_0 + (1 + r)^t \tag{1}$$
Y= Agricultural growth, public external debt, domestic private investment, foreign direct investment and labour respectively
t= time trend measures in years
r = compound growth rate

**Exponential Trend Model**
Taking natural logarithm of both sides
$$\ln Y_t = \alpha + \beta t + \mu_t \tag{2}$$
where:
βt = coefficient of trend variable
$\mu_t$ = econometric error term
This growth model is specified specifically for agricultural growth, domestic private investment (DPI), foreign direct investment (FDI), labour and public external debt (PED) as:
Instantaneous growth rate = (trend x 100)
Compound growth rate = $[(e^{\beta i} - 1) \, 100]$

$\beta_i$ = the coefficient of the trend variable in the respective cases

## Quadratic trend model

In order to ascertain the direction of growth (acceleration, or stagnation or deceleration), the following general quadratic equation was applied.

$$LnY = \alpha + \beta_1 t + \beta_2 t^2 + \mu_t \tag{3}$$

Y= Agricultural growth, public external debt, domestic private investment, foreign direct investment and labour respectively

## Monte Carlo Forecasting Technique

$$AG^*_{it+5} = \alpha_{0i} + \alpha_1 * \left(PED_{it+5} + \vartheta_{1,it}\right) + \alpha_2 * \left(GDPI_{it+5} + \vartheta_{2,it}\right) + \alpha_3 * \left(FDI_{it+5} + \vartheta_{3,it}\right) + \alpha_4 L + \zeta_{it} \tag{4}$$

$AG^*_{it+5}$ = forecast value of agricultural growth in the next half decade (metric tons)

$PED_{it+5}$ = forecast value of public external debt in the next half decade (US$)

$DPI_{it+5}$ = forecast value of domestic private investment in the next half decade (US$)

$FDI_{it+5}$ = forecast value of foreign direct investment in the next half decade (US$)

$L_{it+5}$ = forecast value of labour (Millions)

## Results and Discussion
## Trend Analysis
## Trend of Agricultural Growth

The trend of agricultural growth is presented in Figure 1. The graph shows that agricultural growth ranged between 17074.40 metric tons and 46650.90 metric tons with a mean of 59869.64 metric tons during the period of study. Specifically, there was a steady increase in agricultural growth from 1980 (17132.2 metric tons) to 2005 (61703.5 metric tons), this could be attributed to the fact National Agricultural Land Development Authority (NALDA) cultivated 12984 hectares out of 16000 hectares with various crops. Also, the World Bank loans of US$ 67.5 million and US$ 100 million for first and second Fadama Development Projects respectively were used to procure 54,177 low cost petrol-driven pumps in developing small-scale irrigation through the extraction of shallow ground water, spillway and the main canals of the Watari irrigation Scheme were constructed to bring 678 ha under irrigation among others (World Bank, 2002, Africa Development Fund (ADF), 2003). Furthermore, Private capital participation in agriculture was strengthened through the establishment of Export and Import Bank (NEXIMB) to stimulate agricultural productivity (Shittu, 2017). From 2006-2007 there was a sharp increase in agricultural growth from 65681.8 metric tons to 605538.2 metric tons, this was attributed to increase in government capital expenditure on the agricultural sector from ₦77.96 billion in 2006 to ₦136.3 billion in 2007 associated with the various programmes such as National Economic Empowerment and Development Strategy (NEEDS), National Fadama Development Project and National Agricultural Policy (NAP) which sought to achieve a minimum annual growth rate target of 6 percent for the agricultural sector (Ojeka, Effiong and Eko, 2016).
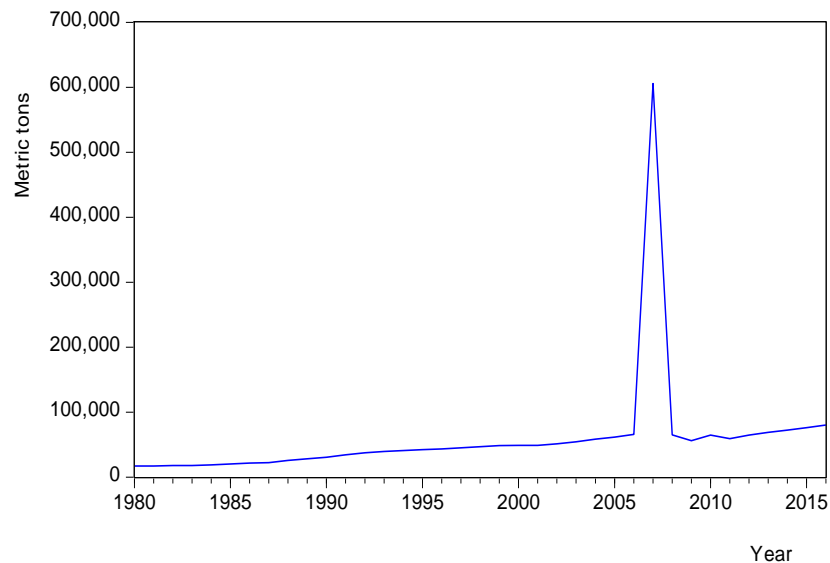
**Figure 1:** Trend of Agricultural Growth

**Trend of Domestic Private Investment**

The trend of domestic private investment is presented in Figure 2. The graph shows that the gross domestic private investment ranged from US$4.18 billion to US$21.9 billion with a mean of US$10.2 billion during the study period. There was a sharp increase in domestic private investment between 1980 (US$20.1 billion) and 1981 (US$20.5 billion). while from 1982 to 1987 there was decreasing domestic private investment in Nigeria from US$ 15.9 billion to US$ 4.18 billion which was as a result of successive Nigerian government investing in all spheres of human endeavor (social, physical and economic infrastructure) including areas traditionally reserved for the private sector such as manufacturing, construction and commercial activities (production of goods and services) which would have been profitably handled by private sector, given the enabling environment (Ojo, 1992; Udo, 2016).

Between 1988 and 1990, there was gradual increase in domestic private investment from US$4.36billion to US$6.18 billion due to the Structural Adjustment Program (SAP) whose thrusts included lessening the dominance of unproductive investments in the public sector and enhancing the growth potential of the private sector (Udo, 2016).

In 2011 domestic private investment decreased to US$ 15.38 billion. From 2012 – 2016 there was increase in domestic private investment from US$ 15.6 billion to US$ 18.38 billion which could be attributed to policies and programmes such as Subsidy Reinvestment and Empowerment Programmme (SURE-P), Youth Enterprise With Innovation in Nigeria (YOUWIN) set up aimed at the development of the entrepreneurial spirit in the real sector of the economy through their support for the creation of small and medium scale enterprise (Obafemi, Oburota and Amoke, 2016).
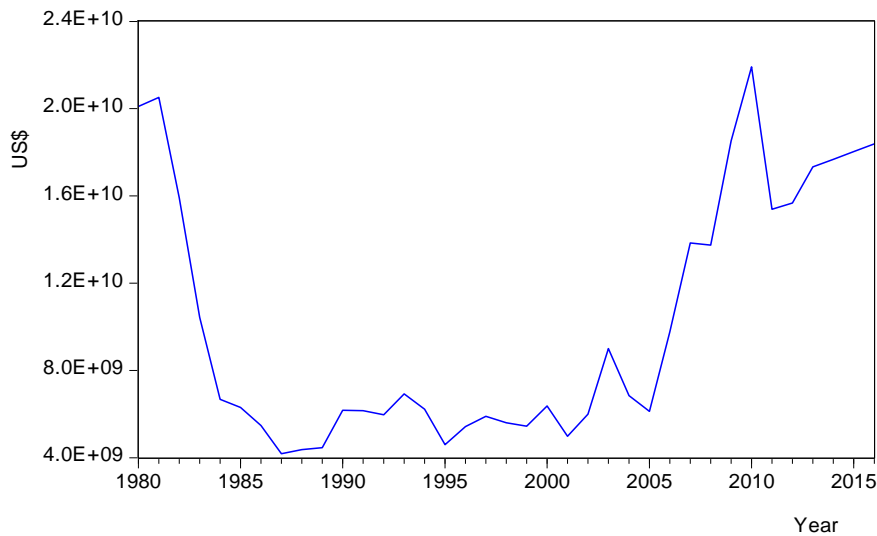
**Figure 2:** Trend of Domestic Private Investment

**Trend of Foreign Direct Investment**

The trend of foreign direct investment (FDI) is presented in Figure 3. The graph shows that FDI ranged from US$ 2.46billion to US$ 101billion with a mean of US$ 29.6 billion this was due to the different policies such as SAP policy which served to encourage trading and speculative activities rather than diversifying the economy from a monoculture economy, thus encouraging FDI inflows to other sector. Also, FDI-inducing institutions were established to sustain its continuous flows and boost foreign investors' confidence in the economy, these include Export Processing zones (1991), the Nigerian Export-Import Bank (1991), the Industrial Development Coordinating Committee (IDDC, 1988) which was replaced by the Nigerian Investment Promotion Commission in 1995 (Obida and Abu, 2010; Anyanwu, 2015) set up by different government administration during the period of study.
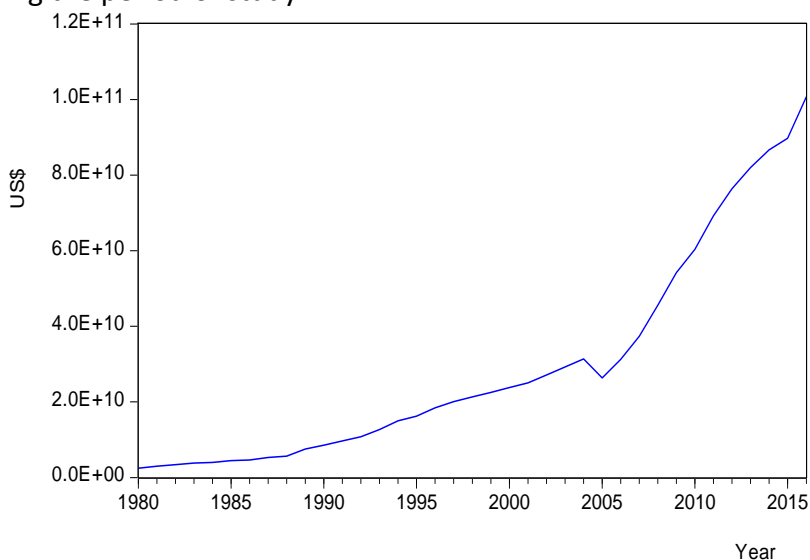


**Figure 3:** Trend of Foreign Direct Investment

**Trend of Labour**

The trend of labour is presented in Figure 4. The graph shows that labour force ranged from 23.37 million to 59.54 million with a mean of 38.25 million attributed to different policies and programmes such as establishment of National Directorate of Employment (NDE) and Graduate job creation loan guarantee scheme (Ekong and Ekong, 2016). It could also be attributed to expenditure by the various government administration on basic sectors (health, education and infrastructure) associated with the growth of the private sector and the inflow of foreign direct investors in form of externalities through employee training in managerial skills and introduction of new processes which also enhances job creation as well as transfer of technology. All of these contribute to economic growth and development (Obida and Abu, 2010). Specifically, there was increase in the labour force from 1980 (23.37 million) to 1996 (35.69 million), slightly decreased in 1997 (30million) and then increased from 1998 (37.42 million) – 2016 (59.54 million).
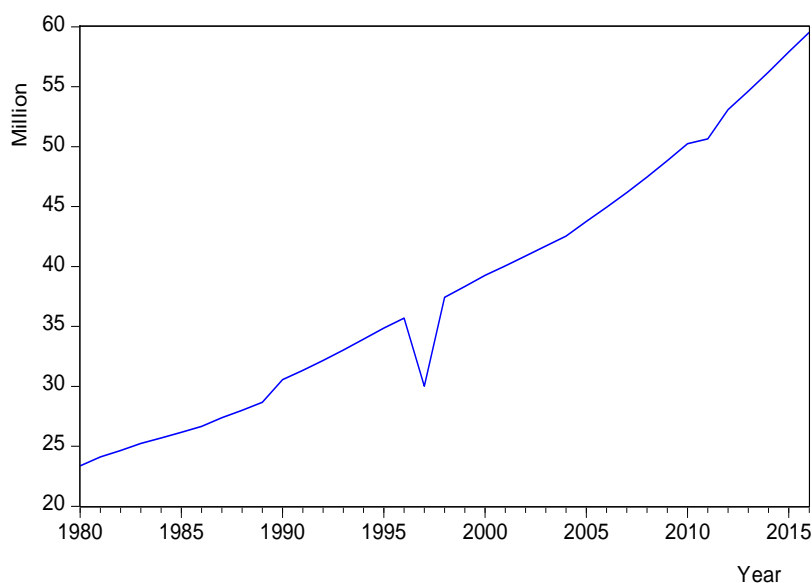


**Figure 4:** Trend of Labour force

**Trend of Public External Debt**

The trend of public external debt is presented in Figure 5. The graph shows that public external debt ranged from US$ 3.5 billion to US$ 32.6 billion with a mean of US$ 17.8 billion due to the fact that majorly most developing countries like Nigeria find it difficult in using borrowed fund judiciously such that it will regenerated better level of returns. It is also due to inefficient trade and exchange rate policies, adverse exchange rate movements, adverse interest rate movements, poor lending and inefficient loan utilization, poor debt management practices and accumulation of arrears and penalties (Utomi, 2014).
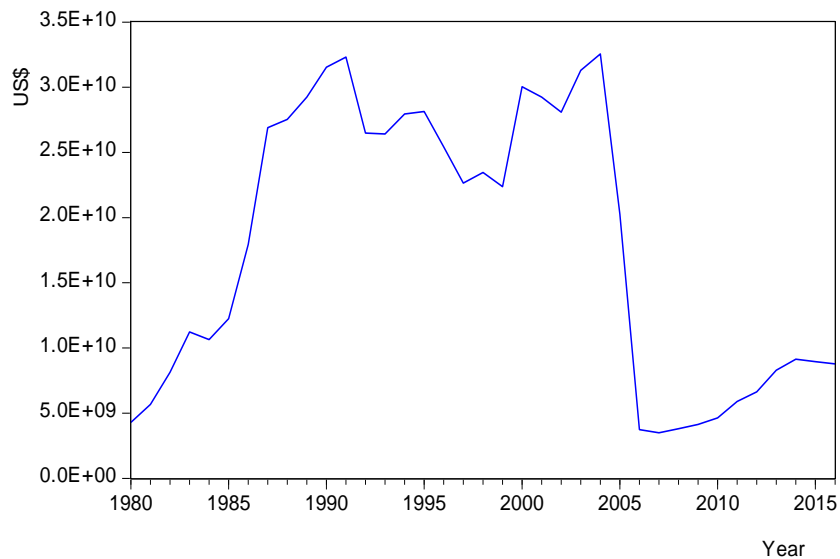
**Figure 5:** Trend of Public External Debt

**Growth Rate and Direction of Growth**

The growth rate and direction of growth are presented in Tables 1 and 2 respectively. If $\beta_2$ is positive and statistically significant there is acceleration in growth; if $\beta_2$ is negative and statistically significant there is deceleration in growth; if $\beta_2$ is positive or negative but not statistically significant there is stagnation in the growth process.

The result shows that there was deceleration in agricultural growth during the period of study with instantaneous growth rate and compound growth rate of 4.83% and 4.95% respectively. This result shows an increase in the Nigerian agricultural growth when compared to Tamba (2016) who found a negative (-0.87) growth rate in agricultural sector in Cameroon. This result is explained by high rural-urban labour force migration, low level of infrastructure in the agricultural sector and the inability of the country to meet up with the United Nation Food and Agriculture Organisation (FAO) and African Union (AU) mandates which stipulated that 20% and 25% respectively of government budget should be allocated to agriculture in Sub Sahara Africa (SSA) (Ighodaro, 2010).

The result also shows that gross domestic private investment was accelerated with instantaneous and compound growth rates of 2.13% and 2.15% respectively. This result is explained by the various policies set up by the government such as downsizing of public sector and privatization of public enterprises to encourage domestic private investment. The result shows that foreign direct investment (FDI) was decelerated during the period of study with instantaneous growth rate and compound growth rate of 10.03% and 10.55% respectively. This result is explained by the inability of the government to regulate the inflow and outflow of FDI. This result shows decrease in FDI when compared to the finding of CBN (2004) which found that the stock of FDI rose to 25.8% in 2001.

From the result, labour was stagnated during the study period with instantaneous growth rate and compound growth rate of 2.58% and 2.61% respectively. This result is explained by consistency in government programmes such as establishment of National Directorate of Employment (NDE) and Graduate job creation loan guarantee scheme to sustain and manage the labour force. This result shows a decline in labour when compared to the finding of National

Bureau of Statistics (NBS) (2016) which found the labour productivity of 12.2% growth rate between 2014 and 2015. The result further shows that public external debt was decelerated with instantaneous growth rate and compound growth rate of 2.18% and 2.20% respectively due to the inability of the previous government regimes to generate income which can cover for most of its activities. This result is below the finding of Ikudayisi, Akin-Olagunju, Babatunde, Irhivben and Okoruwa (2015) who found 26.9% (external debt) debt to GDP ratio.

**Table 1: Instantaneous and Compound Growth Rates**

|  | Instantaneous growth rate | Compound growth rate |
|---|---|---|
| Agricultural growth (AG) | 4.83 | 4.95 |
| Domestic private investment (DPI) | 2.13 | 2.15 |
| Foreign direct investment (FDI) | 10.03 | 10.55 |
| Labour force (L) | 2.58 | 2.61 |
| Public external debt (PED) | -2.18 | -2.20 |

Source: Author's computation of EViews 8 result, 2017

**Table 2: Quadratic Equation for Direction of Growth**

|  | Agricultural growth | Domestic private investment | Foreign direct investment | Labour force | Public external debt |
|---|---|---|---|---|---|
| Constant | 9.54814 | 23.33518 | 21.66899 | 16.96850 | 22.74221 |
| Trend$^2$ | -0.00123 | 0.00393 | -0.00062 | 0.00005 | -0.00480 |
| t-statistic | -1.96642 | 8.31783 | -3.23042 | 0.95466 | -5.24759 |
| $R^2$ | 0.67223 | 0.72914 | 0.98891 | 0.98683 | 0.49828 |
| F-statistic | 34.86486 | 45.76268 | 1515.284 | 1274.083 | 16.88359 |
| Prob(F-statistic) | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000008 |
| Decision | Deceleration | Acceleration | Deceleration | Stagnation | Deceleration |

Source: EViews computation, 2017

**Forecasting Agricultural Growth in the Next Half Decade**

Agricultural growth forecast in the next half decade is presented in Figure 6. The graph shows that in the next half decade (2021), agricultural growth will be estimated at 109 097.80 metric tons which represent 26.5% growth rate. This result is attributed to US$450 million invested in Fadama III (World Bank, 2010) and Agricultural Transformation Agenda (ATA) which created investment funds of ₦10 billion cassava fund and Fund for Agricultural Finance in Nigeria (FAFIN)/German Development Bank (KfW) facility of US$35 million (Federal Ministry of Agriculture and Rural Development, 2011). This result shows a decrease in the Nigeria's agricultural growth when compared with the findings of Iqbal, Bakhsh, Maqbool and Ahmad (2000) who found a growth rate of 30.6% for wheat production in Pakistan by 2022.
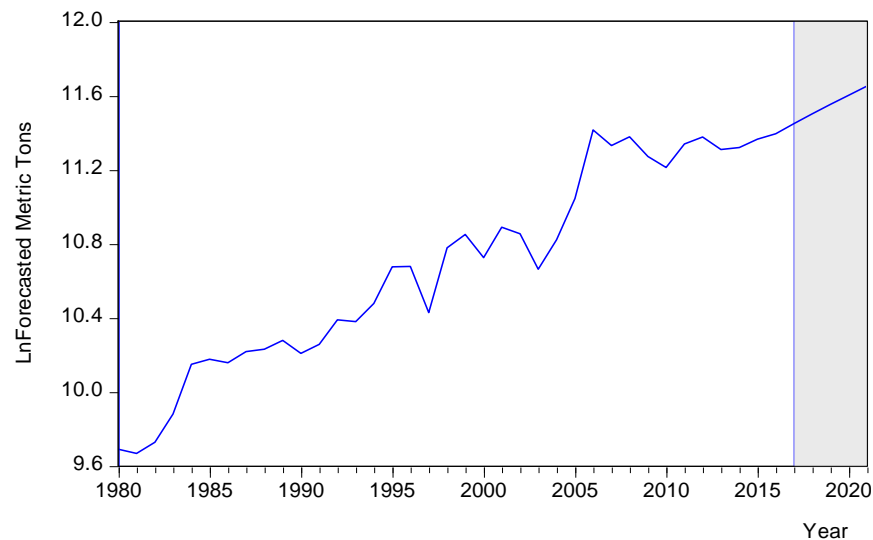
**Figure 6:** Forecast of agricultural growth by 2021

**Conclusion and Recommendations**

This study found that trends of agricultural growth, public external debt and domestic private investment, FDI and labour were fluctuated with peaks 605538.2 metrric tons, USD32.6 billion, USD21.9 billion, USD101 billion and 59540000 employed persons respectively during the period under review. The result also showed that the direction of growth of agricultural output, public external debt and FDI were decelerated while the gross domestic private investment was accelerated; the instantenous growth rates of agricultural growth, public external debt and domestic private investment, FDI and labour were 4.83%, 2.13%, 10.03%, -2.18% and 2.58% respectively. The study further showed that the agricultural growth will continue to grow to the tune of 109 097.80 metric tons by 2021.

Based on the findings from the analysis, it was recommended that the entrepreneurial spirit in the real sector of the economy should be developed to further strengthen private capital participation in agriculture. FDI-inducing institutions should be properly managed to sustain its continuous flows and boast foreign investors' confidence in the economy, and borrowed funds should be spent on capital investment.

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