

Full Length Research Paper

Determinants of Agricultural GDP Growth in Nigerian

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In the last thirty years, the performance of the agricultural GDP in Nigeria has been decimally, declining from 64 percent share of gross domestic product (GDP) in 1960 to 44 percent in 2010. In response to this scenario, this study evaluated the determinants of growth of agricultural sector in Nigeria and proffered recommendations based on research findings. Time series secondary data were used. The study adopts regression analysis on micro and macro economic variables to find the significant relationship between the different variables chosen. The result shows that 49% of the variations in the dependent variable were explained by the explanatory variables. The result further showed that agricultural labour, infrastructural development and total factor productivity had positive relationship with agricultural GDP (AGR); while agricultural land, inflation rate and agricultural GDP in the previous period were negatively related to agricultural GDP. The results concluded that agricultural labour, infrastructural development and total factor productivity were factors that contributed to Agricultural GDP in Nigeria. The study advocated for equipping labour with high yielding variety seeds and fertilisers and to initiate programs that offer scholarships and assistantships to deserving agricultural entrepreneurs to study agricultural related courses in Nigeria higher institutions. The study further recommended vigorous pursuit of infrastructures that promote massive agricultural production and improvement in nigerian agricultural resaerch institutes.

Keywords: Agricultural GDP growth, regression analysis, agricultural labour, Infrastructural development, Inflation rate, scholarship.

INTRODUCTION

Background to the study

Agriculture is the most important sector in the Nigerian economy given its contribution, over the past several decades, to employment, foreign exchange, food supply, poverty reduction and its linkages with other sectors of the economy. It can be said that, indeed, the sector's performance directly mirrors the performance of the overall economy. In 1960 for example, agriculture constituted as much as 64% of Nigeria's GDP (CBN, 1998 ; Ekpo and Umoh, 2010 ; Odhiambo et al., 2004 ; Emeka 2007).

Endowed with huge expanse of arable land, benef-

icial climate, abundant streams, lakes, forest and grassland, as well as large, active population that can sustain a highly productive agriculture, Nigeria has great potential to become the food basket of the West African Sub-region (FOA, 2003 ; Imodu, 2005).The sector is estimated to be the largest contributor to non-oil foreign exchange earnings. This means that agriculture holds abundant potential for enhancing and sustaining the country's foreign exchange.

Despite the enormous contribution of agriculture to the Nigeria economy over the years, the sector has,

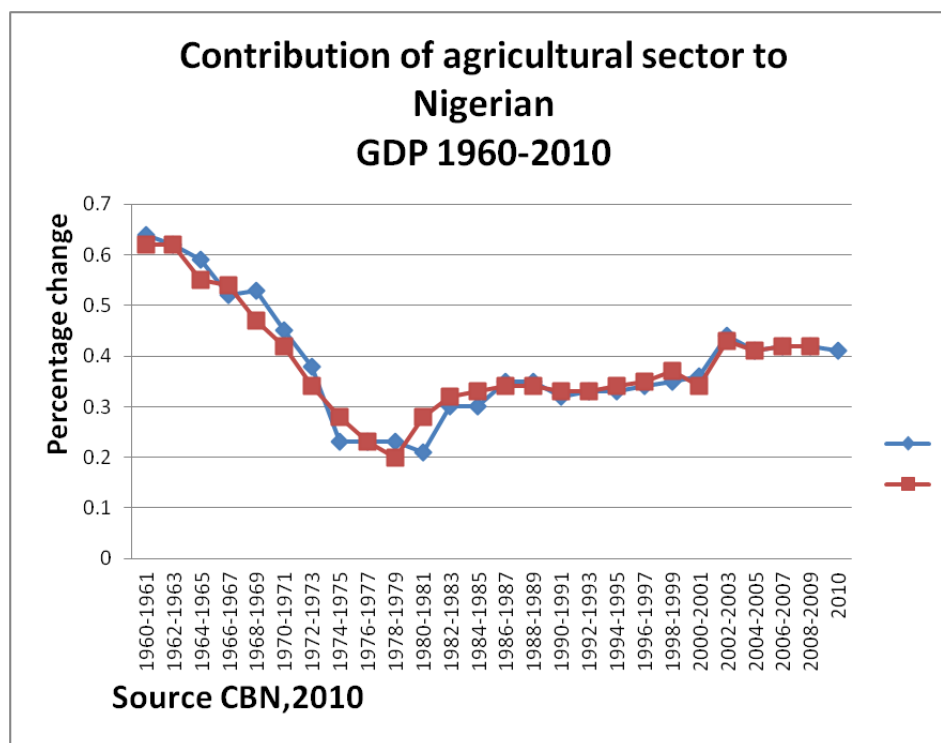


Figure 1: Contribution of agricultural sector to GDP in Nigeria, 1960-2010.

however, slipped into a systemic decline, particularly in the past four decades. Agricultural sector contributed 21 percent to GDP in 1980; 32 percent in 1990 and about 41 percent in 2010. This trend contrasts sharply with earlier years when agriculture contributed 64 percent to GDP in 1960 and 53 percent in 1968 (CBN, 2010). Figure 1 summarised the trend in agricultural sector growth. Agricultural sector output, proxied by its contribution to GDP, averaged 50.2% during the period 1960-70. However, its contribution declined persistently, reaching a low of 21.8% in 1976-1980 before an upward swing to 39.6% in 1981-1985. The contribution increased further to 41.2% in 1986-90 following the introduction of SAP in 1986, but declined to 38.7% in the subsequent period. Its contribution has remained at an average of 41.6 percent between 2001- 2010.

A major indicator of depressed performance in Nigeria agricultural sector is the food crisis experienced in the country in the contemporary years, forcing the country to resort to increasing food importation at high prices (Ogundari and Ojo, 2007). Thus, by 1975, Nigerian economy had become a net importer of basic food items (Ekpo and Umoh, 2010; Imoudu, 2005; CBN, 2000). N15.68 trillion was spent by Nigerians to purchase food items in 2010. The amount is about four times higher than the national

budget and contained in the 2010 report of households' consumer pattern (Onuba, (2012).

The general decline in agricultural share of GDP is, therefore, not because the industrial and manufacturing sector increased its share, but due to neglect of the agricultural sector as the country relied heavily on crude oil; amidst marginalization of agriculture by successive government in Nigeria since the 1970's. It was therefore not surprising that the neglect of the sector has undermined food security and exacerbated structural imbalances that have constrained economic growth and development in the country (Imoudu, 2005; CBN, 2010).

Giving the dismal performance of agricultural sector in Nigeria over the years as indicated above, it becomes necessary to examine the factors that determine its growth. This would provide appropriate information necessary to design sound macroeconomic policies to address the cause of the problem and pave way for sustained production and higher growth rates.

Statement of the problem

The Breton Woods supported structural adjustment programme (SAP) launched in 1986 tried to redefine

the state of the economy of Nigeria with the main aim of reversing the downward trend of the agricultural sector. The sector was deregulated by abolishing marketing board, eliminating price control, privatization of public enterprise, the devaluation of naira to aid the competitiveness of the export sector.

Before SAP was introduced, Nigeria economy was characterized by a weak economic structure arising from frequent changes in economic and financial policies, bad implementation of gigantic agricultural projects, rise in food importation, fall in oil price, increase in foreign debt, and others (Umebali and Akubuilu, 1992). The share of agricultural GDP to the overall GDP has fallen from 64 percent in 1960 to 23 percent in 1976 when operation feed the nation was launched; and 21 percent in 1980 when green revolution programme was launched (CBN, 2010). Despite the adoption of development plans, the economy behaved sluggishly and population grew by leaps and bounds unchecked, with Nigeria having one of the highest growth rates in the world (3-5.5%) (Umebali and Akubuilu, 1992).

Various policy regimes in Nigeria had launched Agricultural policies and programmes to boost food production. Some of them are: National Accelerated Food Production Programme (NAFPP), launched in 1972; Operation Feed the Nation, launched in 1976; River Basin and Rural Development Authorities, established in 1976; the promulgation of a Land Use Decree in 1978 which nationalized all land, and established new Commodity Boards; Green Revolution Programme, inaugurated in 1980.

The reason for deregulation as the policy trust of SAP and other aforementioned programmes was to put the agricultural sector and the economy on a sustainable growth path. This has not been achieved as intended since food supply could not meet up with demand. When SAP policies were executed as intended by the IMF, the Nigerian economy actually did grow as was expected. The growth manifested between 1986 and 1988, with the export sector performing especially well. However, the falling real wages in the public sector amongst the urban classes, along with a drastic reduction in expenditure on public services, set off waves of rioting and other manifestations of discontent that made sustained commitment to the SAP difficult to maintain (Umebali and Akubuido, 1992).

Post SAP projects, programs, and policies by Nigerian government also included the National Economic Empowerment and Development Strategies (NEEDS I and NEEDS II), the implementation of the Comprehensive African Agriculture Development Program (CAADP) and the National Food Security

Program (NFSP) (Diao et al., 2010). Despite all these efforts by various policy regimes, the agricultural sector has not been able to achieve the expected results as food supply is unable to keep pace with demand (Diao et al., 2010; Tanko et al., 2006; FAO, 2004). If N15.68 trillion could be spent by Nigerians to purchase only food items in 2010 (Onuba, 2012), there is definitely a need to determine the factor that affect agricultural growth in Nigeria in order to design appropriate policy for a sustained agricultural growth.

Justification of the study

Agriculture is the most important sector in the Nigerian economy. Since the sector's performance directly mirrors that of the overall economy, the results of the study are expected to assist researchers, policy makers, and relevant government agencies in their planning, research, development, and the use of agricultural product towards attaining food security (Ekpo and Umoh, 2010; Odhiambo et al., 2004; Ojiako, 2008).

For a proper design of growth enhancing policies, policy makers should know what accounts for variation in growth rates across periods and the roles of the various factors in agricultural growth. They should know the production structures and factors underlying them. With the necessary information, policy makers can evaluate the possible effects on productivity.

Analyzing the determinant of agricultural growth is an appropriate way of finding where policies can rightly respond to these issues. This work decomposed the agricultural sector and growth rates into different components and examine the role of the different factors in the sector in order to understand better the agricultural sector growth process. The outcome could therefore assist in gaining better understanding about the determinants of agricultural growth and provide useful information for more beneficial and appropriate public

RESEARCH METHODOLOGY

Study area

The study was conducted in Nigeria which is one of the largest countries in Africa and lies wholly within the tropics along the Gulf of Guinea on the western coast in Sub-Saharan Africa. Nigeria lies between 4° and 14° North of the equator and between longitudes 3° and 15° east of the Greenwich. Nigeria has a total land area of 923,768.622 km or about 98.3 million

Table 1: Determinants of Nigerian agricultural GDP growth (1970-2010)

Variable	Linear ^L	Exponential	Double-Log	Semi-Log
Constant	115.29(4.15)***	4.15(3.97)***	2.98(3.90)***	76.44(3.55)***
K _t	0.02(0.62)	0.004(0.67)	-0.003(-0.04)	-0.99(-0.50)
L _t	343.59(4.20)***	10.58(3.61)***	80.47(3.10)***	2621.52(3.44)***
La _t	-17.74(-2.83)***	-0.61(-2.70)**	-8.64(-2.31)**	-254.56(-2.35)**
CL _t	-0.27(-0.19)	0.01(0.26)	-0.11(-0.31)	-8.04(-0.77)
AE _t	-0.44(-0.57)	-0.03(-1.15)	-0.28(-0.78)	-1.18(-0.12)
IR _t	-0.45(-2.31)**	-0.06(-2.21)**	-0.02(-1.87)*	-0.59(-1.78)*
IF _t	28.70(1.77)*	0.95(1.64)	5.66(0.96)	189.90(1.10)
TFPG	0.36(2.50)**	0.01(2.32)**	0.07(27.30)*	1.90(-1.67)
AGR _{t-1}	-0.40(-2.42)**	-0.33(-1.88)*	-0.21(-1.31)	-0.27(-1.71)*
R ²	0.4857	0.6404	0.4858	0.4532
Adj.Rsq.	0.6232	0.2929	0.3262	0.2835
FStatistic	3.04	2.75**	3.04**	2.67**
	D-W 1.64	D-W 1.64	D-W 1.64	D-W 1.91

Note: Asterisk *, **and *** represent 10%, 5% and 1% significance level respectively. Figure in brackets are t-values and variables are as defined in the model specification L stands for lead equation.

Source: Regression results from various data

hectares, and population of 149,229,090140 million people (NPC, 2009; Lafiagi, 1984). Nigeria has a highly diversified agro-ecological condition, which makes possible the production of a wide range of agricultural products. Smallholder and traditional farmers who use rudimentary production techniques, with resultant low yields, cultivate most of this land (Manyong et al., 2003).

Sources of data

This study relied on the use of aggregate secondary data. Time series annual data on real agricultural GDP, agricultural capital, agricultural labour, agricultural land area harvested, rainfall, inflation rate, infrastructural development proxied by land and irrigation and other relevant information were obtained from Central Bank of Nigeria (CBN) several issues, National Bureau of Statistics (NBS) formally Federal Office of Statistics (FOS) several editions, World Bank Report; Food and Agricultural Organization Statistics etc.

Method of data analysis

In order to investigate the relationship that exist between the independent variable and explanatory variables, this research adopted the following procedures:

Unit root test

The paper conducted the unit root test on the variables by employing the Augmented Dickey Fuller

(ADF) to test the characteristics of the variables with a view to determining the order of integration.

Regression analysis

After determining the stationary levels of equation, ordinary least square method of analysis was used to determine the effect of the independent variables on agricultural GDP growth. Their regression results were presented in Table 1.

Model specification

$AGR_t = f(K_t, L_t, LA_t, CL_t, AE_t, IR_t, IF_t, TFP_t, AGR_{t-1}, e_{it})$
- Implicit function

Where

AGR_t = growth in Real agricultural GDP (₦/Million)

K_t = growth in Agricultural Capital (₦/million)

L_t = growth in Labour force in agriculture (proxy by agric. population) ('000)

LA_t = growth in Agricultural Land area harvested (HA)

CL_t = growth in Climate (proxied by average total rainfall) (mm)

AE_t = growth in Agricultural export (quantity tonnes)

IR_t = growth in Macroeconomic instability proxy by inflation rates (%)

IF_t = growth in Infrastructural Development (proxied by land & irrigation area) [1000ha]

TFP_t = growth in Total factor productivity

AGR_{t-1} = lagged growth in real agricultural GDP (₦/Million)

e_t = stochastic error term

t = time in year

β₀, β₁-β₉ - parameters to be estimated

Ln = Natural logarithm

Table 2: Results of the ADF Unit Root test for non-logged Variables used in the Analysis

Non-Logged Variables	Level	First difference	Order of integration
Agricultural GDP(AGR)	-6.352**	-	1(0)
Agricultural Capital (K)	-7.230**	-	1(0)
Agricultural Labour (L).	-1.902	-6.248**	1(1)
Agricultural Land(LA)	-6.077**	-	1(0)
Rainfall (Cl)	-8.044**	-	1(0)
Agricultural export (AE)	-8.413***	-	1(0)
Inflation rate (IR)	-7.098**	-	1(0)
Infrastructural develop (IF)	-6.365***	-	1(0)
Total factor productivity (TFPG)	-4.767**	-	1(0)

Note: At level, critical value at 5% = -3.53, and at 1% = -4.21; at first difference, critical value at 5% = -3.53 and at 1% = -4.21. Asterisks ** and *** represent 5% and 1% significance levels respectively. Variables are as defined in the model specification. These tests were performed by including drift and a deterministic trend in the regressions. Variables are in growth rates.

Table 3: Results of the ADF Unit Root test for logged Variables used in the Analysis

Logged Variables	Level	First difference	Order of integration
Agricultural GDP (AGR)	-6.059**	-	1(0)
Agricultural Capital (K)	-7.157**	-	1(0)
Agricultural Labour (L)	-1.910	-5.710**	1(1)
Agricultural Land (LA)	-6.079**	-	1(0)
Rainfall (CL)	-7.741**	-	1(0)
Agricultural Export (AE)	-8.345***	-	1(0)
Inflation rate (IR)	-7.700**	-	1(0)
Infrastructural development (IF)	-6.378***	-	1(0)
Total factor productivity growth (TFPG)	-5.398**	-	1(0)

Note: At level, critical value at 5% = -3.53, and at 1% = -4.21; at first difference, critical value at 5% = -3.53 and at 1% = -4.22. Asterisks ** and *** represent 5% and 1% significance levels respectively. Variables are as defined in the model specification. These tests were performed by including drift and a deterministic trend in the equation. Variables are in growth rates

The following production functions were explicitly fitted to the model:

i. Linear function

$$AGR_t = \beta_0 + \beta_1 K_t + \beta_2 L_t + \beta_3 LA_t + \beta_4 CL_t + \beta_5 AE_t + \beta_6 IR_t + \beta_7 IF_t + \beta_8 TFP_t + \beta_9 AGR_{t-1} + e_{it}$$

ii. Exponential function

$$L_n AGR_t = \beta_0 + \beta_1 K_t + \beta_2 L_t + \beta_3 LA_t + \beta_4 CL_t + \beta_5 AE_t + \beta_6 IR_t + \beta_7 IF_t + \beta_8 TFP_t + \beta_9 AGR_{t-1} + e_{it}$$

iii Cobb Douglas/ power /Double-log function

$$L_n AGR_t = \beta_0 + \beta_1 L_n K_t + \beta_2 L_n L_t + \beta_3 L_n LA_t + \beta_4 L_n CL_t + \beta_5 L_n AE_t + \beta_6 L_n IR_t + \beta_7 L_n IF_t + \beta_8 L_n TFP_t + \beta_9 L_n AGR_{t-1} + e_{it}$$

iii. Semi-log function

$$AGR_t = \beta_0 + \beta_1 L_n K_t + \beta_2 L_n L_t + \beta_3 L_n LA_t + \beta_4 L_n CL_t + \beta_5 L_n AE_t + \beta_6 L_n IR_t + \beta_7 L_n IF_t + \beta_8 L_n TFP_t + \beta_9 L_n AGR_{t-1} + e_{it}$$

Apriori expectations

The expected signs for the coefficients of the structural parameters are summarized as follows:

$$\beta_0 > 0; \beta_1 > 0; \beta_2 > 0; \beta_3 > 0; \beta_4 > 0; \beta_5 > 0; \beta_6 < 0; \beta_7 > 0; \beta_8 > 0; \beta_9 > 0.$$

β_0 is the intercept of the regression equation.

RESULTS AND DISCUSSION

Regression analysis

Table 1 shows the results of the ordinary least square (OLS). The linear regression analysis was chosen as the lead equation based on the econometric criteria with particular reference to the R² value, estimated parameters and the significance of the parameters estimated. This variable shows the relationship between the dependent and independent variables. The R² in the lead equation explained 48.57% of the total variations in the growth of agricultural sector. The F-statistic of 3.04% is significant at 5% level, indicating that R² in the lead equation is significant and this implied that the selected equation has goodness of fit. The significant variables in this analysis were agricultural labour, agricultural land, interest rate, infrastructural development, total factor productivity growth and agricultural GDP (AGR_{t-1}) lagged one period with t-statistics values of 4.20, -2.83, -2.31, 1.77, 2.50 and -2.42 respectively.

Augmented Dickey Fuller

The results of unit root test using Augmented Dickey-Fuller Root is presented in Table 2 and 3. The

variables under consideration include: Agricultural GDP (AGR), Agricultural Capital, Agricultural Labour, Agricultural Land, Rainfall, Agricultural export, Inflation rate, Infrastructural develop and Total factor productivity. The Augmented Dickey- Fuller (ADF) was used to determine the time series characteristics of variables used in the regression. The results of both logged and nonlogged variable showed that all the variables were significant (stationary) at level, except Agricultural Labour that was stationary at 1st difference.

SUMMARY OF FINDINGS

The study examined the determinants of growth in Nigerian agricultural sector. The results of the regression analysis, (Table 1) shows that 49% of the variations in dependent variable (Agricultural GDP) were explained by the explanatory variables. The result thus, shows the explanatory variables, agricultural labour, infrastructural development and total factor productivity, having positive relationship with agricultural GDP (AGR). This implies that a unit increase in these variables lead to a unit increase in agricultural GDP. Agricultural land, inflation rate and agricultural GDP in the previous period were negatively related to agricultural GDP, implying that a unit increase in these variables lead to a unit decrease in agricultural GDP.

CONCLUSION

The purpose of this study is to examine the factors that determine Nigerian agricultural GDP growth. The study concluded that agricultural labour, infrastructural development and total factor productivity were significant variables that affect agricultural GDP in Nigeria. The positive relationship of agricultural labour result is in line with Odhiambo et al. (2004) in Kenya and Mehdi (2011). The result is consistent with the fact that agricultural production in the country is still largely-labour intensive.

RECOMMENDATIONS

Based on the findings from the analysis, the following recommendations are made:

Establish programs that will motivate agricultural labour towards increased productivity.

Given the fact that agricultural GDP increases as

agricultural labour increases, productivity could further be enhanced by equipping labour with high yielding variety seeds and fertilisers. This is in addition to programs that offer scholarships and assistantships to deserving agricultural entrepreneurs to study agricultural related courses in Nigeria higher institutions.

Vigorous pursuit of infrastructures that promote massive agricultural production.

Such infrastructures should include good road network to easy transportation cost of physical distribution of agricultural commodities functional ports, telecommunication, agro allied industries and sound security outfit.

Improvement in Nigerian Agricultural Research Institutes

Given a positive significant relationship between total factor productivity growth and agricultural GDP growth as this work showed, it becomes necessary that the existing eighteen research institutions and all the Universities of agriculture and polytechnics be equipped and empower to always come up with new techniques of food multiplication in Nigeria.

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