

# Determinants of Agricultural Production and Agricultural Sector Output in Nigeria

Ewubare Dennis Brown<sup>1\*</sup>, and Asimiea Iyabode<sup>2</sup>

<sup>1</sup>Department of Agricultural and Applied Economics, Rivers State University, Port Harcourt, Nigeria

<sup>2</sup>Department of Agricultural and Applied Economic Rivers State University, Port Harcourt, Nigeria

## Abstract

The study examined the determinant of agricultural production and agricultural sector output in Nigeria. The objective of the study is to determine the impact of agricultural production determinants on agricultural output. The study was carried out based on secondary data collected through the CBN statistical bulletin unit root test was conducted and granger causality test were used as the main statistical tests. The findings from the study based on the OLS results shows that agricultural funding, agricultural credit/loan as well as exchange rate have positive relationship with agricultural production output. Also, the granger causality test shows that agricultural funding, agricultural credit loan as well as exchange rate impact on agricultural production output. In view of the findings, it is recommended for adequate budgetary provisions for the agricultural sector in order to provide infrastructural facilities to the rural areas where farm produce are concentrated in order to boost production. Also, provision of credit facilities to the agricultural sector through the farmers in rural areas should be encouraged.

**Corresponding author:** Ewubare, Dennis Brown, Department of Agricultural and Applied Economics, Rivers State University, Port Harcourt, Nigeria. Tel: +234-8037068750; E-mail: dennisewubare@yahoo.com

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## Introduction

Nigeria occupies an important position in the sub-Sahara Africa as the largest country in the region, having a landmark of 923.768 square kilometers. The country's economy is agrarian in nature, which implies that agriculture is the backbone of Nigeria economy. Nigeria is an agricultural power house with over 84 million hectares of arable land, of which no more than 40% is cultivated. The sector is fundamental to improving the living standard of the population by providing

access to adequate and nutritious food which are essential for human development and industrial raw materials [1]. It therefore became obvious to postulate that key developmental objectives in Nigeria can be met through improved performance of the agricultural sector. It is worth noting that the performance of the agricultural sector in the 1960's and up to the early 1970's was highly impressive as the sector's contribution to GDP reached a remarkable height. The country was one of the world's highest producers of some agricultural products including palm oil, cocoa, groundnut, rubber and

cotton amongst others. Consequently, these formed basis for government revenue and foreign exchange, thus, helping to meet the infrastructure and other social needs of the state.

Evidences from existing literature indicate that Nigeria has indeed reaped some benefits from the improved performance of agricultural sector. This has, in some instances, taken the form of sectoral linkage. For instance, the revolutionary free education programme in the western region was believed to be powered completely from the proceeds of cocoa, rubber and palm oil. Again, it is on record that some universities and other government agencies had their initial funding from the proceeds from agricultural sector. But the utter neglect of agriculture started as a result of the oil-boom of the mid-70s which would have ensured a better developed agricultural sector. Rather it was noticed that as oil price went up, our interest in agriculture went down, such that between 1970 and 1982, cash crops for exports plummeted. For instance, Nigeria transcended from being the world's largest exporter palm oil to being a net importer of the product from Malaysia.

However, a cursory look at Nigeria's Agricultural sector indicates that farming is carried on by marginal farmers (small holder farmers) who employ traditional methods of farming. This implies that the sector is characterized by large number of small family operated farms, who are defined as those who cultivated less than 2 hectares of land. These poor farmers who are stuck with their old ways, get very little or no assistance from government. Be that as it were this traditional system of farming fed us and we were self-sufficient in respect of basic food needs because millions of small holder farmers produced enough food for themselves and their families as well as surplus for sales.

Annual Economic Report revealed that farmers at the subsistence level produced 70 percent of Nigeria's exports and 95 percent of the country's food requirements in the 1960s, thus, removing the country from the list of net importers of food until the early 1970s, when crude oil took the center stage in driving economic activities in the country [2]. Despite the boom in oil, the efforts directed towards diversifying the Nigerian economy has effective. The exploitation of crude petroleum in the early 1970s and the huge inflows of foreign exchange revenues that accompanied it diverted the attention of the government and agricultural producers into other activities aimed at reaping the economic boom created by the huge oil revenue (more than 75%) depend on oil [3]. The utter neglect of agriculture and over dependence on oil had created disincentives to millions of farmers who has

abandoned their farming implements and migrated into cities in search of jobs outside the farms. This has resulted to sharp decline in agricultural production.

Undoubtedly, no nation which cannot feed its citizens ever hope to achieve sustainable economic growth. That is, virtually all the world's civilizations have been based on agriculture. Since the days of the historic early man, there is no record that any group of people had been able to survive without food [4]. Again, it is noteworthy that the capacity of a country to overcome the problem of food security depends on the productivity its agricultural sector. Thus, the task of promoting food security is very crucial since no government can sustain the support of people who live in poverty and hunger.

### Statement of the Problem

The contribution of agriculture to the Nigeria economic growth is very low compared to what is used to be in the past prior to crude oil discovery in the Niger Delta commercial quantity. Also, the determinants of agricultural production such as are availability of arable land, distribution of fertilizer, value of food import and agriculture funding through loans from Banks and exchange rate amongst others have not been adequately harnessed to increase the output of the sector and economic growth at large. Among the major the principal constraints to the growth of the agricultural sector are the crude structure and methods of production, poor funding, limited access to farming inputs and poor extension services. For instance, in Nigeria, subsistence farming with rudimentary farming tools is the common practice that has constrained the development of the sector. Furthermore, the problem of poor transportation network can never be wished away, as transport cost escalates the prices of food stuff. Moreover, majority of the farmers are in the rural areas and due to inaccessible roads, many of them are unable to transport their produce to the market. Even when those that eventually get to the market through the efforts of middlemen, are sold at outrageous prices in order to maximize profit [5].

Moreover, the budgetary allocation of agricultural sector falls short of the 10% of public expenditure pledge by the leaders of the African, Caribbean and Pacific states to be spent on agriculture within five years as contained in their Maputo Declaration. Thus, under funding in this regards is central to decline in agricultural output in Nigeria. This has made food importation a reoccurring government action in order

As a follow up, the Nigeria Agricultural Development and Cooperative Bank Limited which is meant to provide credit facilities to farmers, have its major challenges in effective delivery of its duties. Whereas the presidential directive of 2006 instructed the bank to charge an interest rate of 8%, the bank claims that the rate is insufficient for it to generate good income needed to cover its cost. The farmers used credit as a catalyst to accelerate their adoption of improved agricultural technologies, finance procurement, maintenance and purchase of inputs to meet their working expenses, Obi and Obayori [7]. Hence, financial access in rural Nigeria where farmers predominant has however, remained largely far and apart with high level of financial exclusion.

In response to the poor performance of agriculture in Nigeria, successive governments has evolved and implemented numerous policies and programs geared towards restoring the agricultural sector to its pride of place in the economy. Some of these programmes include Agricultural Development Project (ADP), Operation Feed the Nation (OFN), Agricultural Credit Guarantee Scheme Fund (ACGSF), Rural Banking Scheme (RBS), Green Revolution (GR), Structural Adjustment Programme (SAP), National Directorate of Employment (NDE) and Nigeria Export Import Bank (NEX-IM), In spite of these programmes and other intervention measures, decline in agricultural production has continued to grow unabated, thus, appealing for an empirical evidence. This is the main motivation of the study on the determinant of agricultural production and output of the agricultural sector in Nigeria. Therefore, the specific objectives were to: examine the effect of government funding, agricultural credit/loan on agricultural and the effect of exchange rate on agricultural sector output in Nigeria.

## Literature Review

### Theoretical Literature

#### The Production Function Based Model

The production function defines the technical relationship between output and inputs in a production system. Specifically, it defines the output of goods and services as a function of the input of factors of production. This can be shown algebraically:

Assuming Q represents National Output, K = Capital Input, L = Labour Input, N = Land Input, E = Entrepreneur Input: the production function can thus be defined as:

$$\frac{dQ}{dK}, \frac{dQ}{dL}, \frac{dQ}{dW}, \frac{dQ}{dE}$$

$Q_k > 0; Q_{kk} < 0$	2.2
$Q_L > 0; Q_{LL} < 0$	2.3
$Q_N > 0; Q_{NN} < 0$	2.4
$Q_E > 0; Q_{EE} < 0$	2.5

Differentiating totally of Q,  $\Delta Q$  we then have  $\Delta Q = Q_K \Delta K + Q_L \Delta L + Q_N \Delta N + Q_E \Delta E$

Equation 2.6 indicates that change in output  $\Delta Q$  is equal to the sum of the products of factors marginal product and increase in factor inputs i.e the total increase in national output is equal to the marginal product of capital times increase in capital plus the marginal product of labour times increase in labour plus marginal product of land times increase in land plus the marginal product of entrepreneurship times increase in entrepreneurship.

The above is an indication that economic growth from the perspective of the production function based model is a function of quantity of inputs of factor services and factor productivities. Consequently, economic growth and development rest on two sets of elements and these are quantity of inputs of factors services and the quality of productivity of these factor inputs. Thus the more the quantity and quality of factor input the more the growth of national income and vice visas.

From the stand point of the production function based model, underdevelopment and lack of growth will reflect a state of affairs where a particular society lacks these inputs and or where their quality is poor. In such a society the emphasis should be on boosting factor supply and stimulating their productivity in order to attain rapid economic growth.

### Empirical Literature

Imahel and Alabi assessed the productivity of agricultural sector in Nigeria using the Ordinary Least Squares regression technique [8]. The measurement of the productivity of the sector followed agricultural gross domestic product, aggregate index of agricultural production, output of major agricultural commodities

and other output of major agricultural commodities excluding staples. It was observed from the results that six selected predictor variables are significant in explaining the systematic variation in the measures of agricultural productivity. The results are indicative that the Nigerian agricultural sector provides pathways to the prosperity of the country in the new millennium. The recommendation provided by the study is that governments and the private investors should prioritize effective procurement and timely distribution of fertilizer.

Fasoranti studied the predictors of agricultural production and profitability in Akoko Land, Ondo-State, Nigeria using descriptive statistics, gross margin analysis and production function analysis [9]. The estimation of the model followed OLS criterion. The instrument for data collection is questionnaire administered distributed to 100 respondents selected through random sampling techniques. Results indicate that farming was mainly traditional in nature as most farmers are concerned majorly with meeting subsistence needs. The result also shows that stage II is the predominant farming operation in the study area with return to scale estimated as 0.62. It was further gathered from the result that that age, education, labour and cost of non-labour inputs were positively related to output while farm size and years of experience are associated with negative sign.

Kareem, Bakare, Raheem, Ologunla, Alawole and Ademoyewa explored the factors affecting agricultural output in Nigeria from macroeconomic spectrum [10]. Data analysis was carried out using multiple regression, descriptive statistics and the Granger causality tests. The results shows fluctuations in the trend of variables considered over the study period. The coefficient of determination shows that 95 percent of the variations in the dependent variables were attributed to changes in the explanatory. It was further deduced from the results that FDI, rate of interest of Deposit money Banks are positively related to agricultural output. The test for causal relationship reveals that at 10 percent level, food Granger cause agriculture output and GDP. Similarly, at 1 percent level, food also granger causes loan at 1 percent level of significance whereas FDI granger cause food at 5 percent level. The study concluded that

food import, interest rate, commercial loan and foreign direct investment were factors that contributed to Agricultural output in Nigeria.

Nwaiwu, Ohajianya, Orebiyi, Eze and Ibekwe employed descriptive statistics and regression techniques in analyzing the determinants of agricultural sustainability in Southeast Nigeria [11]. The study sample of 312 cassava based food crop farmers was selected using “Multi-stage sampling technique”. The data collection instrument is questionnaire. The findings show that farm size, annual income, family size, educational attainment and climate change contracted the sustainability farmers’ level. On the contrary, the cost of labour is found to directly influence agricultural sustainability.

Ugwumba, and Omojola, empirically explored the socio-economic predictors and profitability of yam farming in Ipao-Ekiti, Nigeria [12]. The data used for the analysis were collected from 70 respondents through the use of survey questionnaire. The respondents were randomly and purposively selected. The process of analysis followed both parametric and non-parametric statistical tools. The determination of the net income followed the indicators of sex, farm size, and educational level, farming experience, production cost, marital status and household size. It found from the analysis that gross profit margin is N3.418.560 while net farm income and net investment are respectively N3.299.710 and 0.92. This however, implies existence of profitable enterprise.

Adeyemo studied the determinants of palm oil output in Nigeria covering the period of 1971 to 2010 [13]. The palm oil gross domestic product (PGDP) was employed in measuring palm oil productivity with the predictor variables comprising exchange rate, crude oil price, palm oil price and Structural Adjustment Programme (SAP). The study used co-integration and error correction techniques in analyzing the datasets and the results reveal that exchange rate and palm oil price are important in influencing agricultural productivity in the long-run. The showed that price of crude oil is the most important influencing palm oil productivity in the short-run. It was also observed from the error

correction coefficient that feedback effect in the short run is corrected in the long run at a speed of 99.8 percent. Thus, the study concluded that the crude oil price in actual fact exerts a negative influence on the output of on palm oil in Nigeria.

Amusa, Enete and Okon analyzed using descriptive statistics and multiple regression tools the predictors of cocoyam production among smallholder cocoyam farmers in Ekiti State [14]. Sample of 90 cocoyam farmers were selected from a strata of six communities across the three agricultural zones. Evidence from the demographic distribution of the respondents indicates that they have an average age of 54years, with male dominating the population. It was also gathered from the result that about 30 percent of the farmers lack formal education, while 41 percent of them only stopped at the primary school level. As observed from the result, mix farming is a common practice with cocoyam being predominantly intercropped with cassava, maize and vegetables. From the regression analysis, it was found that cocoyam farming depends mainly on factors such as gender, household size, farming experience and land ownership status of the farmer. The study also identified high cost of farm input and inadequate extension contact, techno-infrastructure and socio-financial factors as bottlenecks to cocoyam production.

Kelechi and Cynthia critically explored the determinants of agricultural output in Abia State [15]. The study particularly looked at how government spending affects agricultural output in the study area (Abia State). Secondary data adapted from the Abia State Agricultural Development Programme, National Root Crops Research Institute, Umudike in Abia State and the CBN were used for the empirical analysis. The popular OLS regression analysis was utilized for the empirical investigation. From the results, it was found that aggregate land area cropped, total annual rainfall and aggregate population size are key predictors of total crop output in the state. However, aggregate population was found to negatively influence agricultural output.

The study shares the view that agricultural sector has the greatest potential to free the country from its heavy

dependence on oil wealth. Government articulating a blue spirit is about creating a value chain drive for agriculture. The value chain platform is about looking at various capacity, with a view of affecting a comprehensive re-engineering of the policy to reflect the realities of the time. In this case, agriculture should be treated as a money making business and not a charitable development project [16]. However, for value chain approaches to agriculture, it is a departure from the policy that tended to emphasis so much on agricultural inputs in support of production to one that sees the promotion of agricultural business in a holistic manner.

## Methodology

The research design used in this is the quasi experimental design.

The data required for this study are secondary data from the publication of NBS, CBN bulletin such as Exchange rate (EXR) data, Agricultural credit/loan (AGL) data, Agricultural sector funding (ASF) data and Agricultural sector production output (ASO) data from 1980-2014. The study is basically time series based. Data adopted in the study were generated from the CBN Statistical Bulletin and NBS. The data which are thus secondary in nature used annual data that covered the period between 1980–2014.

## Data Analysis Techniques

The study adopted the Ordinary Least Square (OLS), Tests for stationarity and causal relationship between the series. The econometric software of E-view 8.0 is use in running the model.

## Unit Root Test

Test for unit root is primarily designed to check if the series are stationary and their respective order of integration. The test procedure utilized in this paper is the ADF approach. The major concern lies in testing the null hypothesis of unit root at 5 percent level. The model for the test is conducted with and without a deterministic trend for each of the series. The model for ADF is specified in the general form as:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum \alpha_i \Delta y_t + \delta_1 + U_t \quad 3.1$$

Where: y = time series, t = linear time trend, Δ = first difference operator, α<sub>0</sub> = constant term and U = random error term.

### Method of Estimation

The OLS was utilized to capture the short run behavior of the variables in terms of the relationship existing among the underlying variables. This use of the OLS is prompted by its Best Linear Unbiased and Efficient (BLUE) properties. The tests for the parameters are highlighted as follows:

1. The T-test: This test is applied to determine whether parameters of the regressors significantly differ from zero or not.
2. The F-test: This test is utilized in validating the overall significant of the model based on the joint significance of the regressors.
3. The R2 test: The coefficient of determination measure the goodness of fit.
4. Durbin-Watson test: The Durbin Watson test is applied to check if the residuals are uncorrelated.

### The Granger Causality Test

This test is applied to determine the direction of causality between two variables. This can be bidirectional, unidirectional and independent causality. Formal specification of the model is provided as:

$$ASO_t = \sum_{t=1}^n \psi_1 EXR_{t-1} + \sum_{t=1}^n \Omega_1 ASO_{t-1} + \varepsilon_{1t} \quad 3.2$$

$$EXR_t = \sum_{t=1}^n \psi_2 ASO_{t-1} + \sum_{t=1}^n \theta_1 EXR_{t-1} + \varepsilon_{2t} \quad 3.3$$

Where: ε<sub>1t</sub> and ε<sub>2t</sub> are residual terms.

### Model Specification

The models for the study are specified in the equations below:

$$ASO = f(CASE, AGL, EXR) \quad 3.4$$

$$ASO = \beta_0 + \beta_1 ASF + \beta_2 AGL + \beta_3 EXR + u \quad 3.5$$

Where:

EXR = Exchange rate

AGL = Agricultural credit/loan

ASF = Agricultural sector funding

ASO = Agricultural sector production output

βs are parameters

U = Error term

## Results

### Analysis of Results

Variable	T-stat	Critical Value	Critical Values			Order of integration
			1% critical value	5% critical value	10% critical value	
ASO	-5.204447	-3.639407	-2.951125	-2.614300	I(0)	
ASF	-9.660607	-3.653730	-2.957110	-2.617434	I(1)	
AGL	-5.545235	-3.639407	-2.951125	-2.614300	I(1)	
EXR	-5.455726	-3.646342	-2.954021	-2.615817	I(1)	

Source: Calculated by the Author using E-View 8.0

### Dependent Variable LOG (ASO)

Variable	Coefficient	Sid Error	t-Statistic	Prob.
C	9490176	1990841	4766919	00000
LOG(ASL)	0 165483	0 156027	1 060608	02971
LOG(AGL)	0014914	0154394	0096596	09237
LOG(EXR)	0.220559	0 198553	1110831	02752
R-squared	0 660774	Durbin-Watson stat		1.710507
F-statistic	20 12820			
Prob(F-statistic)	0 000000			

Source: Calculated by the Author using E-View 8.0.

Null Hypothesis	Obs	F-Statistic	Prob
ASF does not Granger Cause ASO	33	8 10739	0 0017
ASO does not Granger Cause ASE		4 06083	0 0283
AGL does not Granger Cause ASO	33	187.574	6 E-17
ASO does not Granger Cause AGL		0 08778	09162
EXR does not Granger Cause ASO	33	3 72891	0 0367
ASO does not Granger Cause EXR		0 04841	0 9528

Source: Calculated by the Author using E-View 8.0.

### Analysis of the Trends

Evaluations from Table 4.1 reveals that agricultural output (ASO) rose from N6501.8 million 1980 to N65748.40 in 1985. In 1990, it increased to N 84344.60 million while it attained the values of N96220.70 million and 117945.1 in 1995 and 2000 respectively. There was a surge in agricultural output in 2002 to the tune of N1901334 million. Further growth in tune of N 231463.6, 317281.7 and 365332.8 was attained in 2005, 2010 and 2014 respectively.

Moreover, government funding on agriculture was N435,6000 million in 1980, increases to N985,400 million in 1985. It further increases to N1758.500 million N4691.700 million and N5761.700 in 1990, 1995 and 2000 respectively. In 2005, 2010 and 2014 government capital spending on agricultural stood at N79939.40, N29121.94 and N31139.08 respectively.

Also, credit/loan to agriculture witnessed an ups and downs movement over the period. It was N945 million in 1980 and increase to N3337 million and N30704 million in 1985 and 1990 respectively. It then fell to N1787 million N244495 million and N38733 million in 1995, 2000 and 2005 respectively, it later rose to N44488.9 in the year 2014.

Furthermore, the table also revealed that the exchange rate moved from its level of N0.54 US\$ 1.00 in 1980 to N0.89us\$

in 1985. Between 1986 and 1993 when structural adjustment program (SAP) was introduced, it rose from N2.02US\$1.00 to N22.05US\$1.00 from 1994 to 1998, there was a stable exchange rate of N21.89: US \$1.00 this is as a result of exchange rate policy that was completely revised in 1994 with the re-introduction of fixed exchange rate regime. Further between 1992 and 2014 the exchange rate rose again from N102.11: US\$1.00 to N161.00: US\$1.00.

### Discussion of the Results

Given that most regression results tend to be spurious, stationarity is considered as a step in the estimation process. In this study, the ADF test was applied for testing whether the variables are stationary or not. As showed in Table 4.2, ASO and AGL have no unit root at levels whereas ASF and EXR are first difference stationary. Furthermore, the coefficient of government funding on agriculture (ASF) appeared with the expected positive sign, but statistically insignificant at 5 percent level. The result also shows that public funding of agriculture does not significantly drive productivity of agricultural output in Nigeria. This is based on the finding that the T-calculated (1.06) is less than the t-table (2.0423). Furthermore, the coefficient of agricultural credit/loan (AGL) appeared with positive sign, but statistically insignificant at 5 percent level. This is suggestive that a percentage increase in agriculture credit/loan will increase agricultural production output in Nigeria during the studied period. Also, the results show that agriculture credit/loan does not significantly impact on agricultural production output in Nigeria during the period of study.

More so, the coefficient of exchange rate (EXR) appeared with the expected positive sign, but fails to meet the statistical criteria at 5 percent level. This is an indication that a percentage increase in exchange rate enhances increase of agricultural output in Nigeria during the period studied. Also, the result shows that exchange rate does not significantly impact on agricultural production output in Nigeria during the period of study. Thus, it is concluded that there is no significant relationship between exchange rate and agricultural production output.

### Conclusion

The study examined determinants of agricultural production and agricultural sector output in Nigeria. Thus, the study affirms that agriculture offers necessary channel to the Nige-

ria's prosperity in the new millennium if the government(s) and relevant stakeholders give necessary attention to the sector. This is because agricultural development will provide the economy with the opportunity to diversify the productive and export base of its economy. Notably, this study was carried out using secondary data collected through the CBN statistical bulletin through the application of some econometrics techniques. The findings from the analysis show that agricultural funding, agricultural credit/loan as well as exchange rate have positive relationship with agricultural production output. Therefore, accelerated growth in agricultural productivity and other major agricultural commodities output requires adequate budgetary allocation in the annual budget to boost infrastructure and output in the long term. The conclusion drawn from the findings is that adequate funding places agricultural sector at the position of driving desired and intended growth in the Nigerian economy [17-20].

## Recommendations

### Recommendation for Policy

1. Government should provide adequate fund to the agricultural sector in the yearly budget so as to ensure the needs of the rural farmers are met vis-a-vis the provision of infrastructural facilities to the rural areas where farm produce are concentrated in order to boost production.
2. Government should provide credit/loan to the agricultural sector via the rural farmers through community banks, and promote micro-credits as specialized options of financing rural farmers.
3. Government monetary policy should be well tailored to achieve stable exchange rate in order to encourage exportation of agricultural produce. This in turn will help to increase foreign exchange earnings
4. Re-activation of the irrigation scheme should be promoted by the government as part of policy reforms geared towards boosting the productivity of the agricultural sector.

### Recommendation for Further Study

The study recommends that other econometrics techniques such as Error Correction Mechanism and Vector Auto Regressive methods should be used to carry out the determinants of agricultural sector in Nigeria.

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