

**IMPACT OF GOVERNMENT EXPENDITURE ON AGRICULTURAL OUTPUT  
IN NIGERIA**

**BY**

**ABIODUN EMMANUEL AJIBADE**

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UNIVERSITY, MALETE**

**SUPERVISOR: DR. OLATUNJI SHASI**

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# CERTIFICATION

This project has been read and approved as meeting the partial requirements for Masters of Science degree in Economics of Kwara State University Malete, Ilorin, Nigeria.

.....

Dr. O. Shasi  
Project Supervisor

.....

Date

.....

Dr. M. I. Biala  
Co-Project Supervisor

.....

Date

.....

Prof. M. Odedokun  
H.O.D

.....

Date

.....

External Supervisor

.....

Date

## **DEDICATION**

This project is dedicated to God and my parents Late Chief Peter Ademola Ajibade and Mrs. Lydia Tunrayo Ajibade.

## ACKNOWLEDGMENT

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## ABSTRACT

*Despite government huge spending on agricultural sector, the agricultural output is still in a poor state; Nigeria still consumes more of imported agricultural products. This undesirable state has to be corrected. But to correct this, policy makers need to know those factors they can consider to bring this about. Hence, the need to know the factors affecting agricultural output has prompted many researchers before now to look into this. But, despite their large number, there are still some gaps waiting to be filled and the present study is an attempt to fill the gaps. Accordingly, we try to identify a number of determinants of agricultural output in Nigeria. Specifically, we have primary interest in the role of government expenditure and intervention variables like commercial bank loans to agriculture (CBLA) and Agriculture Credit Guarantee Scheme Fund (ACGSF) facility on agricultural output. To accomplish these objectives, we use time series data from 1980 to 2016, obtained from the Central Bank of Nigeria's Annual Report. The study employs the unit root test and co-integration test in order to identify stable long run relationship between the set of variables and provide a guide on the final model to specify for estimation. Based on the outcome of the tests, we adopted the unrestricted Error Correction Model as the final model. The findings from the application of this methodology are as follows: The speed of adjustment to equilibrium ranges from 75% to 79% within a year when the variables wander away from their equilibrium values. Also, government expenditure on agricultural sector has no effect on agricultural output, commercial bank loans to agriculture have a positive impact on agricultural output, just as the Agriculture Credit Guarantee Scheme Fund facility too. Based on the findings of the study, we make appropriate recommendations, among others, that government should investigate why it is so that government expenditure has no effect on agricultural output (e.g. whether due to some bottlenecks, inefficiency or corruption) and that the government should put on hold any further disbursement to agriculture for the time being and take measures to address the outcome of the investigation. We also recommend that agricultural loans or credits should be encouraged.*

Keywords: Government Expenditure, Agricultural Output, Agriculture Credit Guarantee Scheme Fund, Error Correction Model.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Background to the Study

The Nigerian economy during the first decade after independence could be described as an agrarian economy because agriculture served as the engine of growth of the overall economy (Ogen, 2003). From the point of occupational distribution of labour force and contribution to GDP, agriculture was the leading sector. In the early 1960s, contribution from this sector accounted for about 70% of the Gross Domestic Product (GDP). This was a period when Nigerian economy was not only virtually self-sufficient in production of food crops to feed ourselves but it also provided raw materials for industries and major crops for exportation (Ekerete, 2000). Indeed, agriculture provided the main stimulus to national economic growth despite the small farm holdings and primitive systems. The contribution of agriculture to the nation over shadowed all other economic sectors in the early 1960s (Abayomi, 1997).

During this period, Nigeria was the world second largest producer of cocoa, largest exporter of palm kernel and 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).

Agriculture has been an important sector in the Nigerian economy not only in the past decades, but it still constitutes a major sector despite the oil boom. Basically, it provides employment opportunities for the teeming population, eradicates poverty and contributes to the growth of the economy. Economic history provides us with sufficient evidence that agricultural revolution is a fundamental pre-condition for economic growth, especially in developing countries (Oluwasanmi, 1966; Eicher and Witt, 1964). Ukeji (2003) submits that agriculture has a stronghold in an economy, for without it, a country will always depend on foreign countries to feed its population. The potential contribution of agriculture to economic growth has been an on-going subject of much controversy among development economists, and several authors argue that growth in the overall economy depends on the development of agricultural sector (Schultz, 1964, Gollin, Parente and Rogerson 2002).

However, the crisis that developed in Nigerian economy during the civil war became more serious in the early 1970s, which coincided with the rising fortunes of the petroleum sector. From that period to date, agriculture's contributions to the economy became relatively insignificant. This development is reflected in rising food prices and inflation, increased imports of food and agricultural raw materials for local industries, a relative decline in agricultural export earnings and deteriorating living conditions in the rural areas. The sector, which employed about 71% of the total labour force in 1960, employed only 56% in 1977. The number stood at 68% in 1980, falling to 55% in 1986, 1987 and 1988; and 57% annually from 1989 to 1992, and has continued to date.

## **1.2 Statement of the Research Problem**

Average total annual expenditure on agriculture has been on the increase over the years. According to the CBN Statistical Bulletin total annual expenditure on agriculture increased on the average from N0.02 billion in the 1981 to 1986 and it increases to N1.84 billion in 1993 to 1998. Total annual expenditure on agriculture increased significantly on the average during President Olusegun Obasanjo's regime (1999-2006) to N16.97 billion and further to N37.13 billion during the Late President Umar Yar'adua's administration, but fell to N36.19 billion during President Goodluck Jonathan's administration 2011-2014 (CBN Statistical Bulletin 2014). Despite these huge sums of money allocated to the sector over the years, the state of agriculture in Nigeria still remains poor and largely underdeveloped.

Also, according to the CBN, agricultural output has fluctuated widely and productivity has also declined. In terms of contribution to GDP, available statistics from the CBN shows that the agricultural sector's share of GDP increased from 28% in 1985 to 32% in 1988, dropped to 31% in 1989, rose to 37% in 1990 but fell significantly to 24% in 1992 before it increased again to 37% in 1994. It was 32% in 1996 and rose to 40% in 1998, dropped again to 27% in 2000, increased to 37% and fell to 31% in 2002 and 2006 respectively. The percentage contribution of the agricultural sector to GDP fell persistently from 0.37 in 2009 to 0.22 in 2012 and to 0.20 in 2014 (C.B.N Statistical Bulletin, 2014).

Also, government intervened through commercial bank loans to agriculture and Agriculture Credit Guarantee Scheme Fund (ACGSF) in order to increase agricultural output but despite all these interventions agricultural output still remain in a poor state.

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. While some scholars like Okene (2001) and Ganiga and Unemhilin (2011), argue that government expenditure has impact on agricultural output, others like Yusuf, Adesope and Okoruwa (2013), Enyim, Ewno and Okoro (2013) believe that government expenditure has no impact on agricultural output. Therefore, there is the need to examine the extent to which government expenditure has affected agricultural output.

Realization of this importance has prompted many researchers to conduct many studies based on this topic, including the likes of Oguanmanam (1996), Isijola (2000), Udoh (2011) Iganiga(2011) and so on, which are fully reviewed in chapter 2. However there are still some gaps to fill, some of which are also highlighted in chapter 2, but before then we like to point out some of these gaps.

Firstly, some of these researchers adopted the use of nominal data instead of real data; because nominal data does not address the effect of price level movement therefore it brings about inaccurate or spurious results. Secondly, the periods on which most of the studies are based are not recent. Thirdly, some of these studies adopted growth theories for the theoretical framework, instead of adopting production theories. Lastly, some other government intervention variables like agriculture credits, which are vital ones, are omitted. So, it is our attempt in the present study to fill these gaps.

### **1.3 Research Questions**

The main research question of this study centers on the impact of government expenditure on agricultural output in Nigeria from 1980 to 2016. Following from this, the specific research questions of the study are as follows:

- i. What is the impact of government expenditure on agricultural output?
- ii. What is the impact of commercial bank loan to agriculture on agricultural output in Nigeria?
- iii. What is the impact of agricultural labour force on agricultural output?

#### **1.4 Research Objectives**

The primary objective of this study is to assess the impact of government expenditure on agricultural output in Nigeria from 1980 to 2016, without losing sight of the desirability of examining the impact of other government intervention variables like Agriculture Credit Guarantee Scheme Fund (ACGSF) and commercial bank loans to agriculture (CBLA). Following this, the specific objectives of the study are to:

- i. Examine the impact government expenditure on agricultural output.
- ii. Examine the impact of commercial bank loan to agriculture on agricultural output in Nigeria.
- iii. Examine the impact of agricultural labour force on agricultural output.

#### **1.5 Research Hypotheses**

The hypotheses of this research work are as stated below:

**H<sub>0</sub>**: Government expenditure does not have a significant impact on agricultural output in Nigeria.

**H<sub>A</sub>**: Government expenditure does have a significant impact on agricultural output in Nigeria.

**H<sub>0</sub>**: Commercial bank loan does not have a significant impact on agricultural output in Nigeria.

**H<sub>A</sub>**: Commercial bank loan does have a significant impact on agricultural output in Nigeria.

**H<sub>0</sub>**: Agricultural labour force does not have a significant impact on agricultural output in Nigeria.

**H<sub>A</sub>**: Agricultural labour force does have a significant impact on agricultural output in Nigeria.

#### **1.6 Significance of the Study**

Expenditure on agriculture has been on the increase. Despite this, food insecurity is on the increase and agricultural raw material is still limited in supply, in the same manner that importation of agricultural output is also on the increase. The discouraging performance is reflected in environmental degradation, mounting food deficits and decline in both gross domestic product and export earnings, while retail food prices and import bills have been

increasing. Hence, there is the need to evaluate the outcome of what the government is spending on agriculture.

In this regard, if government spending has a positive effect on agricultural output, then the government should increase spending on agriculture so as to further increase the output. But if it has a negative effect or it has no effect on agricultural output, that would be a good reason for the government to investigate why it is so (e.g. whether it is due to some bottlenecks, inefficiency or corruption) and this will enable government to take corrective measures.

Also, if commercial bank loan is found to have a positive effect on agricultural output, this would provide a basis for the government to encourage the commercial bank loans to agriculture. But if it has a negative or no effect on agricultural output, then government should not boarder commercial banks to be using depositor's money to finance something that is not productive.

Lastly, if agriculture labour force (being a factor whose effect on output is tested for) has a positive effect on agricultural output, then government should encourage more labour force to be used in agricultural sector. But if the labour is found to have a negative or nil effect, this would imply the prevalence of inefficiency in the use of labour force due to existence of diminishing returns. This would be a basis for the government to take measures to transfer labour from agriculture for productive employment in the industry and other sectors of the economy.

In conclusion, the result of the project research work would be useful in assisting government to determine its future actions in respect of funding for agriculture development. And also for other scholars who wants to carry out similar or related research.

### **1.7 Scope of the Study**

This study covers a period of 37 years, from 1980 to 2016. This period is considered because 1980 is a landmark of government attention in funding agricultural sector, in order to revive it after being neglected due to discovery of oil. Also, during this period of 1980, proper and accurate data started to be available.

## **1.8 Organization of the Study**

The study is in five chapters. The first chapter entails the general introduction, which includes background to the study, statement of the research problem, research objective, research hypothesis, significant of study as well as the scope and organization of the study. Chapter two is the literature review, which entails the conceptual review, theoretical and empirical review and statement of gaps. In Chapter three, we discuss the research methodology, which involves the theoretical framework, model specification, estimation technique and nature and source of data. Chapter four includes presentation and interpretation of the empirical results, while chapter five is on the summary, conclusions and recommendations.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

This Chapter comprises of four sections. In the first section, we look at conceptual review. In Section 2, we carry out a theoretical review while section 3 is on the empirical review, which paves way for Section 4 that addresses the gaps in the existing empirical studies.

#### 2.1 Conceptual Review

Here, we review the following four concepts: government expenditure, agricultural output, production function and Agriculture Credit Guarantee Scheme Fund.

##### **Government Expenditure**

Government expenditure on agriculture includes spending by local, regional and national governments on agriculture from annual budgetary allocation. It is the money spent on crop development, seed production and distribution, fertilizer procurement, agricultural mechanization, extension services, control of pests and diseases, soil conservation, irrigation, research etc.

##### **Agricultural Output**

Agriculture is the production of foods, feeds, fibre and other goods by the systematic growing and harvesting of plants and animals. It is the science of making use of land to raise plants and animals (Akinboyo, 2008). Nigeria's wide range of climate variations allows it to produce a variety of food and cash crops. The staple food crops include cassava, yams, corn, cocoyam, cow-peas, beans, sweet potatoes, millet, plantains, bananas, rice sorghum, and a variety of fruits and vegetables. The leading cash crops are cocoa, citrus, cotton, groundnut, palm oil, plan kernel, benni seed, and rubber.

##### **Production Function**

Production is a process in which goods and services, called inputs are transformed into other goods and services called output. The production function refers to the relationship between the input of factor services and the output of the resultant product. The production function is based on the idea that the amount of output in a production process depends upon the amount of inputs used in the process.

In algebraic form, it can be expressed as:

$$Y = f(x) \dots\dots\dots (1)$$

Where Y represents the output, x represent the input and ‘f’ means is a function of, or ‘depends upon, or is determined by’. Here, it is assumed that output depends upon a single factor. However, it must be understood that in actual life, agricultural output (and for that matter, any output) is never a function of a single factor. It rather depends upon a variety of factors, such as seeds, amount of fertilizers used, irrigation, nature of soil and so on. This can be written as:

$$Y = f(x_1, x_2, x_3 \dots\dots\dots x_n) \dots\dots\dots (2)$$

where:

Y = output

x<sub>1</sub>, x<sub>2</sub>, x<sub>3</sub> = various input

### **Agricultural Credit Guarantee Scheme Fund (ACGSF)**

Established by the Federal Military Government under the Agricultural Credit Guarantee Scheme Fund Decree of 1977 (Decree No. 20), and as amended on the 13th of June, 1988. The purpose of the scheme was to provide security for loans granted by banks to the agricultural sector.

## **2.2 Review of Theoretical Literature**

This section gives a review of three production functions. These are the Cobb Douglas production function, Leontif production function and CES production function.

### **2.2.1 Cobb–Douglas Production Function**

This is a particular functional form of the production function, widely used to represent the technological relationship between the amounts of two or more inputs (particularly physical capital and labor) and the amount of output that can be produced by those inputs. The Cobb–Douglas form was developed and tested against statistical evidence by Charles Cobb and Paul Douglas and, hence, its name.

In its most standard form for production of a single good with two factors, the function can be stated as:

$$Y = AL^{\alpha}K^{\beta} \dots\dots\dots (3)$$

where:

Y = total production (the real value of all goods produced during a period)

L = labor input (the total number of person-hours worked during a period)

K = capital input.

A = total factor productivity.

$\alpha$  and  $\beta$  are the output elasticity with respect to capital and labor, respectively. These values are constants that are determined by the available technology.

### **2.2.2 Leontief Production Function or Fixed Proportions Production Function**

This is a production function that implies the factors of production will be used in fixed (technologically pre-determined) proportions, as there is no substitutability between factors. It was named after its proponent, Wassily Leontief, and represents a limiting case of the constant elasticity of substitution production function.

For the simple case of a good that is produced with two inputs, the function is of the form.

$$Q = \min(z_1/a, z_2/b) \dots \dots \dots (4)$$

where  $q$  is the quantity of output produced,  $z_1$  and  $z_2$  are the utilised quantities of input 1 and input 2 respectively, and  $a$  and  $b$  are technologically determined constant

### **2.2.3 Constant elasticity of substitution (CES)**

The CES production function is a neoclassical production function that displays constant elasticity of substitution. In other words, the production technology has a constant percentage change in factor (e.g. labour and capital) proportions due to a percentage change in marginal rate of technical substitution. The two factor (capital, labor) CES production function introduced by Solow, and later made popular by Arrow, Chenery, Minhas, and Solow is:

$$Q = F \cdot (a \cdot K^r + (1-a) \cdot L^r)^{1/r}$$

where

Q = Quantity of output

F = Factor productivity

a = Share parameter

K, L = Quantities of primary production factors (Capital and Labor)

## **2.3 Empirical Review**

This study can be divided or categorized into two segments, viz: the early studies and the recent studies. The early studies are those carried out during the period of 1996 to 2001 while the recent ones occurred after 2010. We classify the empirical review on this basis just to distinguish the more recent ones that are rooted in the latest and more sophisticated methodologies from the earlier ones.

### **2.3.1 The Early Studies**

One of such is that reported by Oguamanam (1996), who did an empirical work on the impacts of government expenditure and commercial bank credit to agriculture sector on agricultural output in Nigeria. Employing Ordinary Least Square method. The author found that commercial bank loans and advances have a positive effect on the level of agricultural output, just as the Federal government capital expenditure too contributed positively to the growth of agricultural output in Nigeria. But because of the dynamics in the economics structure, the findings reported need to be validated by more recent data sets.

Isijola (2000) examined the impact of credit on agriculture. He adopted error correction model (ECM) and reported a significant positive effect of credit supply on agricultural output in. In the view that government spending enhances the growth in agricultural productivity. His analysis also shows that additional government expenditures on agricultural research and extension services have the largest impact on agricultural productivity growth. Despite the good fit of the model, he fails to consider some other factors that determine agricultural output.

Okene (2001), in his work on the impact of government expenditure on agricultural output in Nigeria, adopted a single equation Ordinary Least Square regression model to verify the relationship between agricultural output and policy instruments in Nigeria and he concluded that the effect of government expenditure on agricultural output is statistically significant. Funds allocated to the agricultural sector in the budget do not commensurate with the trend of expenditure in the economy. However he adopted growth theory as theoretical framework, instead of production functions and theories.

### **2.3.2 Recent Studies**

Ganiga and Unemhilin (2011) also examined the impact of federal government agricultural expenditure on agricultural output in Nigeria. The study covered the period 1970 to 2008, employing the error correction model technique. Their findings show that the federal government capital expenditure was positively related to agricultural output. However, the impact of government expenditure on agriculture is not instantaneous, as it was found to be effective with a lag of one year. The study recommended that investment in agricultural sector is imperative and that it should be complemented with monitored credit facilities, and that food importation should be banned to encourage local producers. A snag with this study, however, is that the authors failed to consider some other factors that determine agricultural output.

Udoh (2011) examined the relationship between public expenditure, private investment and agricultural output growth in Nigeria over the period 1970-2008. The bounds test and Autoregressive distributed lag (ARDL) bound test modeling approach was used to analyze both short-run and long-run impacts of public expenditure, private investment (both domestic investment and foreign direct investment) on agricultural output growth in Nigeria. Results of the error correction model showed that public expenditure has a positive influence on the growth of agricultural output. However, foreign investment has no significant impact in the short run. Hence, it is recommended that policymakers should combine both private and public investment in a complementary manner to ensure that both short-run and long-run productivity of the agricultural sector is not undermined. But, because of the dynamics in the economics structure, the findings reported need to be validated by more recent data sets.

Iganiga (2011), examined the impact of federal government agricultural expenditure on agricultural output in Nigeria. The study covers the period 1970 to 2008, employing the Error Correction Model (ECM) technique. Their findings show that federal government capital expenditure was positively related to agricultural output. The impact of government expenditure on agriculture is not instantaneous but operates with a one-year lag. The study observed that the investment in agricultural sector is imperative and recommended that it should be complemented with monitored credit facilities, and that food importation should be banned to encourage local producers. However, because he adopted the whole government expenditure instead of using government expenditure in the agricultural sector, the reported finding is suspect.

Ogbanje, Yahaya and Kolawole (2012), examined the effect of commercial bank loans on the agricultural sector in Nigeria from 1981 to 2007. Growth in agricultural sector was expressed in terms of agricultural Gross Domestic Product (GDP). Secondary data for the study were obtained from the Central Bank of Nigeria sources. The Ordinary Least Square method was applied to the data, and it was revealed that commercial banks' loan positively affected agricultural GDP at 0.01 level of probability. Hence, it was concluded that commercial banks' loans have contributed significantly to agricultural development in Nigeria. However they adopted growth theory as theoretical framework and in specifying the estimated models, instead of production functions and theories that are more suitable in shedding light on the issues addressed in the present study.

Francis (2013), examined the impact of Federal Government expenditure on agricultural sector by using a simple regression method to analyse the data. However, the explanatory power of the model is very weak. On the whole, the author recommend that government should reinforce its budgetary allocations to the agricultural sector, ensure proper release of funds, monitor agricultural inputs distribution to farmers and create commodity markets. He adopted a simple regression technique that is unlikely to satisfy the conventional assumptions on which the OLS method is based. This is in addition to the low explanatory power of the model just mentioned above.

Yusuf, Adesope and Okoruwa (2013), examined the effectiveness of government annual budgetary allocation to agriculture and evaluated the role of monetary policy instruments in the growth of agricultural GDP in Nigeria, using Ordinary Least Square (OLS) technique. The finding shows that Agricultural Credit Guarantee Scheme Fund, previous year GDP and Consumer Price Index contributed positively to the growth of agricultural GDP, while other variables of interest (like the interest rate, exchange rate, and government expenditure on agriculture) exerted negative effects on agricultural growth. The study therefore recommended that government should increase her spending to agricultural sector, monitor the fund allocated to the sector, and provide the necessary infrastructural facilities like good road network, electricity, health facilities and water for the rural populace.

Obilor (2013) examined the impact of Agricultural Credit Scheme Fund, agricultural product prices, government fund allocation and commercial banks' credit to agricultural sector on

agricultural productivity. It covers between 1980 to 2013. He used multiple regression method in analyzing the data. The result revealed that Agricultural Credit Guarantee Scheme Fund and government fund allocation to agriculture produced a significant positive effect on agricultural productivity, while the other variables tested for (e.g government expenditure) produced significant negative effects.

Enyim, Ewno and Okoro (2013), examined the impact of banking sector credit on the performance of the agricultural sector in Nigeria. The study applied time series econometric tests such as unit root, co-integration and its implied error correction model and causality test, in which changes in agricultural output was regressed on commercial bank credit to agriculture. The result of the analysis shows that the effect of government expenditure on agriculture is not statistically significant. However, the result shows that commercial banks' credit to the agricultural sector has a positive effect on agricultural productivity. Despite the fact that the adopted Cobb Douglas production function, they failed to include agricultural labour force as an independent variable in the model they specified, thereby making the estimates of the explanatory variables tested for to be prone to the econometric error of omitted variables.

Obilor (2013), in his econometric study of the impact of commercial banks' credit to agriculture on agricultural development in Nigeria between 1970 to 2013, revealed that the Agricultural Credit Guarantee Scheme fund and government fund allocation to agriculture produced significant positive effects on agricultural productivity, while other variables (like commercial bank interest rate and population size) tested for in the model produced significant negative effects. He recommended on the basis of the findings that farmers should be encouraged to apply for loans from the participating banks to enhance their agricultural activities and productivity. Despite the good fit of the model he employed the total population as an independent variable instead of using agricultural labour force.

Ewubare and Eyitope (2014) examined the effects of government spending on the agricultural sector in Nigeria. The Ordinary Least Squares regressions, the Johansson co-integration technique, and the error correction model were used in the analysis. The results showed the coefficient of the Error Correction Model (ECM) appeared with negative sign and it was statistically significant. The coefficients of the second and third lags of the explanatory variable,

government expenditure on agriculture, were positive and statistically significant. Based on the findings, the study recommends that funding of the agricultural sector in Nigeria be increased. However, by employing the economy-wide labour force, instead of the labour force used in the agricultural sector, the reported findings are suspect.

Ewubare (2014) examined the effects of government spending on the agricultural sector in Nigeria. The ordinary least square regression, the Johansson co-integration techniques and the error correction model were used for the analysis. The results showed that the coefficient of the error correction model (ECM) appeared with negative sign and it was statistically significant. The coefficients of second and third lags of the explanatory variable, government expenditure to agricultural (GEA) sector were positive and statistically significant. Based on the findings, the study recommended for an increased funding of the agricultural sector in Nigeria.

Francis (2013) examined the impact of Federal Government's expenditure on agricultural sector. He used a simple regression technique with the view of analyzing the data to examine the impact of agricultural expenditure on agricultural output from 1991 to 2010. Error correction model were used for the analysis, he identified a weak relationship between the variables. Based on the findings, he recommended that government should reinforce its budgetary allocations to the agricultural sector, ensure proper release of funds, monitor agricultural inputs distribution to farmers and create commodity markets. However, the author adopted a simple regression technique which does not appear to satisfy the usual assumptions on which the OLS method is based so that the correctness of the reported estimates is likely to be impaired.

#### **2.4 Statement of Research Gaps**

Having highlighted the weaknesses or gaps of the empirical studies above, the main ones that need to be filled can be summarised as follows:

The first gap to be filled is the need to adopt a multiple regression analysis, because some the researchers conducted a simple regression analysis and omitting some explanatory variables which are vital to the research topic, committing the econometric error of omitted variables that affects the precision of the estimated coefficient of the explanatory variables tested for in the study.

Another gap to be filled is the use of nominal data because, some of the researchers adopted nominal data instead of real data and this nominal data adopted does not address the effect of price level movement, thereby making the result to be spurious.

In the same vein, most researchers adopted growth theories as the theoretical framework instead of adopting production functions and theories, and these affect the model specification. They specify and estimated output growth equations, instead of production functions.

Lastly, another gap to fill is the currency of the research work. The periods covered by most of these studies are not recent. Therefore, there is the need to carry out more recent research, based on more recent statistics.

# CHAPTER THREE

## METHODOLOGY

### 3.0 Introduction

This chapter is group into 4 sections. In the first section, we look at the theoretical framework. In Section 2, we discuss the model specification, while Section 3 is on the estimation technique. Lastly, section 4 is on the discussion of the nature and sources of data.

### 3.1 Theoretical Framework

The theoretical basis of this study is the Cobb-Douglas (CD) production function. Some authors have adopted this production function, most especially in the agricultural sector in Nigeria. The Cobb Douglas production function seems to have remained the most widely adopted for analyzing growth and productivity in theory and in practice. As a result of this, the present study follows the common practice by adopting this same production function, which can be stated thus:

$$Q = AK^{\alpha}L^{\beta} \dots\dots\dots(1)$$

where Q = output, A= index of productivity or production efficiency, K= capital stock, L= Labour, while  $\alpha$  and  $\beta$  are output elasticities with respect to capital and labour respectively.

Sometimes the term has a more restricted meaning, requiring that the function display constant returns to scale, meaning that doubling the usage of capital K and labor L will also double output Y. This holds if  $\alpha + \beta = 1$ , If  $\alpha + \beta < 1$ , it implies a decreasing returns to scale while, if  $\alpha + \beta > 1$ , this means returns to scale are increasing. Assuming perfect competition and  $\alpha + \beta = 1$ ,  $\alpha$  and  $\beta$  can be shown to be capital's and labor's respective shares of output.

### 3.2 Model Specification

The research adopted the Cobb Douglas production function as shown in the theoretical framework but in a modified form. The modification takes the form of being explicit on the factors that determine the productivity index, A, in the above equation (1).

#### 3.2.1 Determinants of the Productivity Index

The A in the above equation (1) is being posited here to be determined by a number of factors as follows:

**Government Expenditure on Agricultural Sector (GXPA):** This is one of the factors that should determine the productivity in the agricultural sector either positively or negatively. This is because government expenditure on things like crop development, seed production and distribution, fertilizer procurement, agricultural mechanization, extension services, control of pests and diseases, soil conservation, irrigation, research, etc is supposed to enhance efficiency in agricultural production, if the money is judiciously spent on such items. But if the money is squandered on them through corruption and other vices, increased productivity or efficiency may not result. We assume and, therefore, postulate tentatively a positive effect of GXPA on agricultural productivity, while still not ruling out the possibility of a negative or nill effect, depending on how government spending on agriculture is judiciously utilized.

**Commercial Bank Loan to Agriculture (CBLA):** This is another factor that should determine productivity in the agricultural sector. This is because commercial bank gives loans to farmers in order to acquire more machinery and tools, facility and inputs like seeds, fertilizer, crop, chemical, accompanied with adequate monitoring and evaluation to ensure judicious use of the loans, thereby improving agricultural productivity.

**Agricultural Credit Guarantee Scheme Fund Facility (ACGSF):** This is also another factor that is postulated to determine productivity, because ACGSF provides guarantee in respect of loans granted by banks for agricultural purpose under the auspices of the CBN. The ease of disbursement of the credits and the oversight role of the CBN are expected to increase efficiency in the utilization of the credit, which is thereby postulated to have a positive effect on agriculture productivity.

Following the above postulations, the index of agriculture productivity A can then be specified as a function of these factors (with the factors interacting with each other) thus:

$$A = f(GXPA, CBLA, ACGSF) = BGXPA^{\Omega}CBLA^{\pi}ACGSF^{\Theta}e^{u} \dots \dots \dots (2)$$

where B is a constant.

By substituting this equation (2) into the production function in equation (1), we have:

$$Q = BK^{\alpha}L^{\beta}GXPA^{\Omega}CBLA^{\pi}ACGSF^{\Theta}e^{u} \dots \dots \dots (3)$$

Log-linearising this equation (3), and denoting  $\ln B$  by  $k_0$  and also introducing the time (t) subscripts, yield: the econometric model in equation (4) below.

$$\ln Q_t = k_0 + \alpha \ln K_t + \beta \ln L_t + \Omega \ln GXPAt + \pi \ln CBLAt + \Theta \ln ACGSF_t + \mu_t \dots \dots \dots (4)$$

There is still a further modification to this equation (4) and this consists of replacing the capital stock (K) in the agricultural sector by the economy-wide investment or gross capital formation (denoted by I). Accordingly, this equation (4) now becomes the equation (5) below, which is the actual equation to be estimated. We have to replace K by I because there are no published or accessible statistics on K and we deem that the best proxy for it (though, far from being a perfect proxy) is I.

$$\ln Q_t = k_0 + \alpha \ln I_t + \beta \ln L_t + \Omega \ln GXPAt + \pi \ln CBLAt + \Theta \ln ACGSF_t + \mu_t \dots \dots \dots (5)$$

Q = Agricultural output

GXPA = Government Expenditure on Agricultural Sector

CBLA= Commercial Bank Credits to Agriculture

ACGSF= Agricultural Credit Guarantee Scheme Fund Facility

L = Agricultural Labour Force

I = Economy-wide gross capital formation

k<sub>0</sub> = Intercept term

α, β, Ω, π and Θ = Partial elasticity of output (Q) with respect to the variable having the parameter or the coefficient of the affected explanatory variables

μ<sub>t</sub> = Error term

### 3.3 Estimation Technique

#### 3.3.1 Examination of Stationarity of Variables: The Unit Root Test

In this study, macroeconomics time-series data are used for the estimation of the model. The usage of time series data, without any adjustments usually requires that the data be stationary to avoid the problem of spurious regression. Thus, stationary test is conduct in order to determine if the variables are stationary either at the level or first difference, I(0) or I(1). Unit root test is used to evaluate the behavior of an economic series whether it is trending or stationary. If a series has unit root, that means the series is unstable or unpredictable and therefore may not be valid for prediction or forecasting. Unit root test is also used to determine how series respond to shocks. If a series has unit root, the impacts of shocks to the series are more likely to be permanent. Consequently, if a series has no unit root, the impacts of shocks will be transient or transitory (i.e. temporary).

There are many test methodologies for examining the existence of unit root problem. Dickey and Fuller (1979, 1981) suggested a method for formal testing of non-stationarity. The Dicke –Fuller (DF) approach is suitable if the error term ( $\mu_t$ ) is not correlated and it becomes inapplicable if error terms ( $\mu_t$ ) are correlated. As the error term is unlikely to be white noise, Dickey and Fuller have extended their testing procedure by suggesting an augmented version of the test that incorporates additional lagged term of the dependent variable in order to solve the autocorrelation problem. The Philips and Perron (1988) also developed a generalization of the ADF test procedure that allows for fairly mild assumptions concerning the distribution of the error terms.

### **3.3.2 Co-integration Test**

Granger (1981) introduced the concept of co-integration. Co-integration is the statistical implication of the existence of long run relationship between the variables which are individually non-stationary at their level form but stationary after differencing (Gujarati (1995)). The theory of cointegration can therefore be used to study series that are non-stationary, in so far as a linear combination of them is stationary. Two main procedures are used to test for cointegration: the Engle and Granger (1987) test and the Johansen (1988) cointegration test. The co-integration in multiple equations can be examined only by Johansen (1981) and Johansen–Juselius (1990) approach. The Johansen test uses the likelihood ratio to test for co-integration. Up to (r-1) cointegrating relationships may exist between a set of r variables. The hypothesis of co-integration is accepted if the number of cointegrating relationships is greater than or equal to one. The decision rule compares the likelihood ratio to the critical value for a hypothesized number of cointegrating relationships. If the likelihood ratio is greater than the critical value, the hypothesis of co-integration is accepted, if not it is rejected.

### **3.3.3 Heteroskedastic Test**

The existence of heteroskedastic is a major concern in the application of regression analysis, including the analysis of variance, as it can invalidate statistical tests of significance that assume that the modelling errors are uncorrelated and uniform, hence, that their variances do not vary with the effects being modeled. For instance, while the Ordinary Least Squares estimator is still unbiased in the presence of heteroscedasticity, it is inefficient because the true variance and covariance are underestimated. Similarly, in testing for differences between sub-populations

using a location test, some standard tests assume that variances within groups are equal. Because heteroscedasticity concerns expectations of the second moment of the errors, its presence is referred to as misspecification of the second order.

One of the assumptions of the classical linear regression model is that there is no heteroscedasticity. Breaking this assumption means that the Gauss–Markov theorem does not apply, meaning that OLS estimators are not the Best Linear Unbiased Estimators (BLUE) and their variance is not the lowest of all other unbiased estimators. Heteroscedasticity makes Ordinary Least Squares coefficient estimates to be biased, although it can make Ordinary Least Squares estimates of the variance (and, thus, standard errors) of the coefficients to be biased, possibly above or below the true or population variance. Thus, regression analysis using heteroscedastic data will still provide an unbiased estimate for the relationship between the predictor variable and the outcome, but standard errors and therefore inferences obtained from data analysis are suspect. Biased standard errors lead to biased inference, so results of hypothesis tests are possibly wrong. For example, if OLS is performed on a heteroscedastic data set, yielding biased standard error estimation, a researcher might fail to reject a null hypothesis at a given significance level, when that null hypothesis was actually uncharacteristic of the actual population (making a type II error).

There are several methods for testing for the presence of heteroscedasticity, such as Breusch-Pagan-Godfrey, ARCH and Harvey but Breusch-Pagan-Godfrey is adopted in this research because it is commonly adopted by many researchers.

### **3.3.4 Jarque Bera Normality Test**

This test is conducted in order to confirm if the error terms from regression model are normally distributed. However if the error terms are not normally distributed, then any inference made concerning the parameter estimates may be incorrect. The decision rule in conducting this test is as follows: if the Jarque Bera statistics has a probability value that exceed 0.05, this implies that the error terms from this regression model are normally distributed.

### 3.3.5 Serial Correlation Test

Serial correlation test is conducted, based on Durbin-Waston (DW) statistic, in order to know whether the successive error terms are intercorrelated.

### 3.4 Nature and Sources of Data

The nature and source of data in respect of each variable are as discussed below:

**Government Expenditure on Agricultural sector (GXPA):** This is time series data, between the years 1980 to 2016. The variable is in nominal (in ₦ billion) terms, and it is obtained from the 2016 issue of the CBN's Statistical Bulletin. The nominal variable is converted into real one by dividing GXPA by the GDP implicit price deflator. (1980 = 100)

**Commercial Bank Loan to Agriculture (CBLA):** This in nominal term (₦ Billion) is from the CBN's Statistical Bulletin, 2016 issue. It is converted into real terms by dividing CBLA by the GDP implicit price deflator. (1980 = 100)

**Agricultural Credit Guarantee Scheme Fund (ACGSF):** In the same vain, this is also time series data, between the years 1980 to 2016. The variable is in nominal (in ₦ billion) terms, and it is obtained from 2016 issue of the CBN's Statistical Bulletin. The nominal variable is converted into real one by dividing ACGSF by the GDP implicit price deflator (1980 = 100).

**Agricultural Labour Force (L):** This is total agricultural labour force (in millions of people) and it is obtained from 2016 issue of the CBN's Statistical Bulletin.

**Gross Capital Formation (I):** The variable is got from the source in nominal (in ₦ billion) terms, and the source is the 2016 issue of the CBN's Statistical Bulletin. The nominal variable is converted into real one by dividing it by the GDP implicit price deflator (1980 = 100).

## CHAPTER 4

### PRESENTATION AND EVALUATION OF THE EMPIRICAL RESULTS

#### 4.0 Introduction

This chapter is divided into five sections. The first section is on the descriptive statistics that show the values of the mean, median, standard deviation, and so on. The second section is on the unit root test, which is followed in Section 3 by the cointegration test. In Section 4, we present and discuss the estimates of the error correction model, ECM. Lastly, in Section 5, the result of the residual diagnostic tests are presented and evaluated so as to show the robustness of the parameter estimates.

#### 4.1 Descriptive Statistics

In table 4.1 below, we present descriptive statistics on the mean, median, standard deviation, Jarque-Bera statistics, and so on. The reason why we present this table is to assist the reader to have an impression at a glance on what these values are and to better appreciate the results presented and discussed later. In the first column, we have the agricultural output (Q), followed by GXPA, CBLA, ACGSF and L in that order.

**Table 4.1: Descriptive Statistics**

	Q	GXPA	CBLA	ACGSF	L	I
Mean	170959	26935.35	10836.5	2628.271	121021	217168.7
Median	487113	10047.30	33264.10	241.000	11638	108814.1
Maximum	1743224	107463.9	268423.5	10193.00	186989	1901334
Minimum	2201	285.500	462.200	44.000	75469	55918.2
Std. Dev.	306918	30319.35	10781.3	3558.408	3320	30688
Skewness	3	0.772	0.240	0.939	0.25	1.800
Kurtosis		2.376	1.274	2.159	1.879	1.068
Jarque-Bera	522.950	4.280	4.947	6.535	2.443	3.507
Probability	0.000	0.017	0.084	0.038	0.094	0.000
Sum	63255100	996608.1	4009634.	97246.04	4368101	8035241
Sum Sq. Dev.	3.391	3.311	4.181	4.560	4.025	3.391
Observations	37	37	37	37	37	37

*Explanatory note: The following are the meanings of the acronyms used in the table: Q = Agricultural output, GXPA = Government expenditure on agricultural sector, CBLA = Commercial bank loans to agriculture, ACGSF = Agriculture Credit Guarantee Scheme Fund, L = Agricultural labour force and I = Gross capital formation*

The mean Agricultural output (Q) is relatively small with a value of 170959, considering that the value for Q ranges from 2201.700 to 1743224 for the period under consideration. Furthermore, the standard deviation is 306918 which show an element of volatility in the series. The Jarque-Bera probability statistics (0.00) suggests that the agricultural output is normally distributed as the probability value is below the level of significance at 5%.

The table also shows that mean value of government expenditure to agriculture (GXPA) is 26935. The standard deviation is 30319, which suggests the existence of high variability in the series and the Jarque-Bera probability value (0.017) shows that the series is normally distributed, with a probability value above the significance level of 5%.

Commercial bank loan to agriculture (CBLA) has a mean value of 10836.5. The standard deviation is 10781 which suggest the existence of high variability in the series and the Jarque-Bera shows that the series is normally distributed, with a probability value of 0.084 which is above the significance level at 10%.

The mean agriculture credit guarantee scheme fund (ACGSF) is 2628.271, which indicates the average loans guarantee by the ACGSF. The standard deviation is 3558.408, indicating that the series is volatile over the years and the Jarque-bera probability statistics (0.03) suggests that agricultural credit guarantee scheme fund is normally distributed.

The average of the total agricultural labour force (L) is approximately 121021. The jarque-bera statistic shows that agricultural labor force series is normally distributed with the probability value of 0.094, which is below the significance level at 10%.

Lastly the average of the gross capital formation (I) is approximately 217168.7. The jarque-bera statistic shows that agricultural labor force series is normally distributed with the probability value of 0.00, which is below the significance level at 5%.

#### **4.2 Unit Root Test for Stationary**

In this study, macroeconomics time-series data are used for the estimation of the model. The usage of time series data, without any adjustments, usually requires that the data be stationary to avoid the problem of spurious regression. Thus, stationary test is conducted in order to determine if the variables are stationary either at the level or first difference,  $I(0)$  or  $I(1)$ .

In practice, the choice of the most appropriate unit root test is difficult. Enders (1995) suggested that a safe choice is to use both types of unit root tests—the Augmented Dickey–Fuller (ADF) (1981) test and the Phillips–Perron PP (1988) test. If they reinforce each other, then we can have confidence in the results. Therefore, to test for the stationarity, these two widely used methods of unit root tests—the ADF and the Phillips–Perron (PP) tests - were applied to the data.

This is adopted in order to evaluate the behavior of an economic series whether it is trending or stationary. And this is determined by looking at the probability value (P.V) and T-statistic. If the probability value is less than the significant level of 5% therefore we reject null hypothesis and conclude that the variables are stationary at level or first difference. Also, if T calculated is less than the T tabulated, we reject null hypothesis and conclude that the variables are stationary at level or first difference.

**Table 4.2: Results of the Unit Root Test**

	Augmented Dickey-Fuller (ADF)			Phillip Perron (PP)		
	Level	First Difference	<i>I(d)</i>	Level	First Difference	<i>I(d)</i>
LOG(Q)	-0.989	-9.882***	<i>I(1)</i>	-1.071	-11.399***	<i>I(1)</i>
LOG(GXPA)	-0.597	-7.704***	<i>I(1)</i>	-1.042	-10.562***	<i>I(1)</i>
LOG(CBLA)	-1.966	-5.240***	<i>I(1)</i>	-1.966	-5.893***	<i>I(1)</i>
LOG(ACGSF)	0.698	-3.576***	<i>I(1)</i>	-0.550	-8.206***	<i>I(1)</i>
LOG(L)	1.766	-6.479***	<i>I(1)</i>	1.200	-6.503***	<i>I(1)</i>
LOG(I)	1.459	-3.858***	<i>I(1)</i>	1.582	-3.818***	<i>I(1)</i>

*Explanatory note: The following are the meanings of the acronyms used in the table: \*\*\*, \*\* and \* imply statistical significance at 1%, 5% and 10% levels respectively ADF = Augmented Dickey-Fuller, PP = Phillip Perron, Q = Agricultural output, GXPA = Government expenditure on agricultural sector, CBLA = Commercial bank loans to agriculture, ACGSF = Agriculture Credit Guarantee Scheme Fund and L = Agricultural labour force. LOG = Logarithms, I = Gross capital formation.*

As it can be seen in Table 4.2, ADF and PP tests show that Agricultural output (Q) have a t-statistics of -9.882 and -11.399 respectively. Therefore, Q is stationary at the first difference.

In the case of government expenditure (GXPA), the ADF and PP test have a t-statistics of -7.704 and -10.562 respectively. Therefore, GXPA is stationary at the first difference.

The commercial bank loan to Agriculture (CBLA) also is stationary at the first difference, because it has the value of -5.240 and -5.893 for ADF and PP respectively.

ACGSF and Agricultural labour force (L) are stationary at first the difference, with the value of -6.479 and -6.503 respectively.

Gross capital formation (I) is stationary at first difference with the value of -3.858 and -3.818 respectively.

Thus, we conclude that all the variables are stationary at first difference.

### 4.3 Cointegration Test Results

Having conducted unit root test, the way is now paved for a cointegration test and this test is conducted in order to determine the existence of a long run relationship between the variables. In conducting this cointegration test, the decision rule is that if the probability value is less than the significant level of 5%, we reject null hypothesis and conclude that the variables are cointegrated.

In presenting the table, the upper part of the table entails the tau-statistic and z-statistic with their probability values. In the lower part of the table, we display the residual variance, long-run residual variance, number of lag and so on.

**Table 4.3 Cointegration Test Results**

Series: Q GXPA CBLA ACGSF L I							
Null hypothesis: Series are not cointegrated							
Cointegrating equation deterministic: C							
Automatic lags specification based on Schwarz criterion (maxlag=8)							
	Dependent	tau-statistic	Prob.*	z-statistic	Prob.*		
	LOG(Q)	-6.939	0.013	-41.060	0.014		
	LOG(GXPA)	-6.266	0.064	-47.176	0.099		
	LOG(CBLA)	-3.365	0.067	-17.151	0.019		
	LOG(ACGSF)	-4.087	0.044	-22.422	0.031		
	LOG(L)	-2.921	0.058	-12.917	0.047		
	LOG(I)	-7.980	0.021	-26.000	0.035		
*MacKinnon (1996) p-values.							
Intermediate Results:							
				LOG(CBLA			
		LOG(Q)	LOG(GXPA)	)	LOG(ACGSF)	LOG(L)	LOG(I)
	Rho - 1	-1.140	-1.957	-0.476	-0.622	-0.357	-1.270
	Rho S.E.	0.164	0.311	0.141	0.152	0.122	0.167
	Residual variance	3.412	1.198	1.009	1.568	7.613	6.210
	Long-run residual variance	3.412	5.909	1.009	1.568	7.613	6.261
	Number of lags	0	0	0	0	0	0
	Number of observations	36	36	36	36	36	36
	Number of stochastic trends**	6	6	6	6	6	6
**Number of stochastic trends in asymptotic distribution							

*Explanatory note: The following are the meanings of the acronyms used in the table: \*\*Number of stochastic trends in asymptotic distribution Q = Agricultural output, GXPA = Government expenditure on agricultural sector, CBLA = Commercial bank loans to agriculture, ACGSF = Agriculture Credit Guarantee Scheme Fund, L = Agricultural labour force and I = Gross capital formation.*

From the table 4.3 above, the probability value of Q, GXPA, CBLA, ACGSF, L and I are 0.014, 0.099, 0.019, 0.031, 0.047 and 0.035 respectively, which are lower than 10% significant levels. Therefore, we reject the null hypothesis and conclude that the variables are cointegrated.

#### 4.4 ARDL Bounds Test Procedure

The condition for carrying out this test is that if the variables are not stationary at level, we need to conduct the ARDL bounds test to verify the existence of long-run relationship among them. The test states a null hypothesis that no long-run relationships exist among the variables. The decision rule is to reject the null hypothesis if the F-statistic value is greater than both the I(1) bound and accept null hypothesis if the value is less than I(0) bound. On the other hand, the test is inconclusive if the F-statistic value falls in-between the bounds. To summarise, the decision rule is as tabulated below.

##### Decision rules

If F-statistic value > I(1) bound	We reject $H_0$ and conclude that there exists a long term relationship between the variables.
F-statistic value < I(0) bound	We fail to reject $H_0$ and conclude that there is no long term relationship between the variables.

Table 4.4 below presents the result of the ARDL Bounds test which shows the values of the F-statistic, I(0) and I(1) Bounds.

**Table 4.4 ARDL Bounds Test Procedure**

Test Statistic	Value	K
F-statistic	17.080	4
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.56	3.41
5%	2.72	4.10
2.5%	3.40	4.98
1%	3.71	5.48

*Note: Null Hypothesis ( $H_0$ ): No long-run relationships exist*

As it can be seen from the table 4.4 above, the F-statistic value is 17.080, while the I(0) and I(1) bounds at 5% significance level are 2.72 and 4.10 respectively. This shows that the F-statistic is greater than the I(1) bound. This indicates that the test is significant and suggests the rejection of null hypothesis. Therefore, a conclusion can then be arrived at that there exist long-run relationships among the non-stationary series.

## **4.5 The Error Correction Model (ECM) Estimates**

### **4.5.1 Presentation of the Estimates**

This section presents the results from the estimated error correction model equivalent of equation (5) in Chapter 3. Error correction model captures the short-run relationship and also shows the speed of adjustment to long-run equilibrium in case there is any shock to the model. Using the differenced variables for regression would imply a loss of valuable information about the long run relationship among the variables. In order to cater for such loss of information, the error correction estimation is used so as to integrate short-run dynamics with long run relationship.

Table 4.5 below present the results of the error correction model. The upper side of the Table shows the values of the coefficient, t-statistic and probability values of the variables while the lower side displays the values of R-squared, adjusted R squared, F-statistic, Durbin-Waston statistic, and so on.

**Table 4.5 Error correction model**

Dependent Variable: D(Q(-1))			
Sample (adjusted): 1982 2016			
Included observations: 35 after adjustments			
Variable	Coefficient	t-Statistic	Prob.
D(GXPA(-1))	-23.817	-1.1266	0.124
D(CBLA(-1))	14.080	1.124	0.045
D(ACGSF(-1))	17.779	6.162	0.092
D(L(-1))	10.122	-5.315	0.047
D(I(-1))	23.176	-7.229	0.082
ECM(-1)	-0.302	6.163	0.050
R-squared	0.799	Mean dependent var	123177.1
Adjusted R-squared	0.752	S.D. dependent var	3848186.
S.E. of regression	1919924.	Akaike info criterion	31.953
Sum squared resid	1.034	Schwarz criterion	32.261
Log likelihood	-552.137	Hannan-Quinn criter.	32.057
F-statistic	18.098	Durbin-Watson stat	1.760
Prob(F-statistic)	0.007		

*Explanatory note: The following are the meanings of the acronyms used in the table: Q = Agricultural output, GXPA = Government expenditure on agricultural sector, CBLA = Commercial bank loans to agriculture, ACGSF = Agriculture Credit Guarantee Scheme Fund and L = Agricultural labour force, I = Share of investment or gross capital formation and D: first difference.*

#### 4.5.2 Evaluation of the Empirical Results

From above table 4.5, it could be observed that the result of the estimated parsimonious error correction model shows that the coefficient of determination -  $R^2$  - is 0.79. Thus, systematic variation in agricultural output explained by government expenditure on agricultural and other explanatory variables is 79 percent. The  $R^2$  of the model is significant at 5 percent level of significance, as shown by the F-statistic of 18.089 with the probability of 0.000, this indicate that the model is a good fit.

The Durbin Watson value of 1.76 is close to 2.0 enough that an absence of serial correlation of the residuals is suggested.

Concerning the Jarque Bera normality test results, it would be recalled that this test is conducted in order to determine if the error terms from this regression model are normally distributed. However if the error terms are not normally distributed, then any inference made may be incorrect and also violate the Central Limit Theorem. This test is conducted by studying the probability value, if the probability value is less than the significant level of 5%, therefore we reject null hypothesis and conclude that the error terms in the model are normally distributed. The Jarque–Bera statistic has a probability value of 0.00, which is less than 5% significant level. Therefore, following the decision rule earlier described, we reject null hypothesis ( $H_0$ ) and conclude that the error terms are normally distributed.

On the issue of heteroscedasticity test, as pointed out in Chapter 3, there are various tests that can be adopted to conduct a test for heteroscedasticity such as Breusch-Pagan-Godfrey, ARCH and Harvey. But Breusch-Pagan-Godfrey is the one adopted in this research and this is because it is the one that is commonly adopted by researchers. This Breusch-Pagan-Godfrey is conducted by studying the probability value, if the probability values of the chi square. Specifically, the decision rule is that if the probability value is less than the significant level of 5%, we reject null hypothesis and conclude that there is heteroscedaticity. The R-squared value for Breusch-Pagan-Godfrey is 7.5810 and the probability value of Chi-Square is 0.108, these imply that the probability values are greater than 5% significant level. We therefore fail to reject the null hypothesis and conclude that there is no heteroscedaticity.

Also on the issue of serial correlation test, as pointed out in Chapter 3, Breusch-Pagan-Godfrey serial correlation test method is the one adopted in this research. This test is conducted by considering the probability value. The decision rule is that if the probability value is less than the significant level of 10%, we reject null hypothesis and conclude that there is serial correlation. The R-squared value for the Breusch-Pagan-Godfrey serial correlation is 5.279 and the probability value of the Chi-Square is 0.145. This implies that the probability value is greater than 10% significant level. We therefore fail to reject the null hypothesis and conclude that there is no heteroscedaticity.

Having evaluated the overall performance of the model in preceding paragraphs or pages, we now proceed below to an evaluation of the specific performance of each explanatory variable.

**Error Correction Model (ECM):** As can be seen from Table 4.5, the coefficient of ECM is -0.302, with the probability value of 0.050. This means it is statistically significant at 5%. Thus, it corrects any deviation from short run into long-run equilibrium. This means that 30% adjustment or correction is made from short-run to long-run annually.

**Government Expenditure on Agricultural (GXPA):** The coefficient of government expenditure on agricultural (GXPA) is -23.817, with the P-value of 0.124, meaning that the coefficient is statistically not significant. Therefore, we conclude that GXPA has no effect on the dependent variable (Q) i.e. agricultural output. This result contradicts the positive effect that we earlier posited in Chapter 3 and the findings reported by a number of researchers, as reviewed in Chapter 2, e.g. the likes of Isijola (2000), Ganiga and Unemhin (2011) and Francis (2013). As speculated in Chapter 3, this lack of a positive effect suggests that government spending on agriculture has not been judicious, probably due to corruption and other similar factors such as inflation rate and also diversification of agricultural funds by farmers into other activities.

**Commercial Bank Loans to Agriculture CBLA:** The coefficient of commercial bank loans to agriculture, CBLA, is 14.080, with P-value of 0.045. This means that the coefficient is statistically significant. Therefore, we conclude that CBLA has a positive effect on agricultural output Q. This is in line with what we postulated earlier in Chapter 3 and it also conforms with what other researchers like Eyim, Ewno, and Okoro (2013), Obilor (2013), Okene (2011), and so on have reported.

**Agriculture Credit Guarantee Scheme Fund (ACGSF):** In the same vein, the coefficient of Agriculture Credit Guarantee Scheme Fund (ACGSF) facility is 17.779, with the probability value of 0.092, implying that the coefficient is statistically significant at 10% significant level. Therefore, we conclude that ACGSF has a positive effect on the dependent variable, i.e. agricultural output. This is also in line with what we postulated in Chapter 3 and what other researchers like Isijola (2000), Obilor (2013), Okene (2011) and Ewubare (2013) have reported.

**Agricultural Labour Force (L):** Agricultural labour force has a coefficient of 10.122, with a P-value of 0.047. This means that the coefficient is statistically significant, at least, at 5% significance level. Therefore, we conclude that agricultural labour force has a positive effect on

agricultural output, Q. This is also in line with our expectation, as expressed in chapter 3, as well as what other researchers have reported.

**Gross Capital Formation (I):** Gross capital formation has a coefficient of 23.176 with a P-value of 0.082. This means that the coefficient is statistically significant, at least, at 10% level of significance. Therefore we conclude that gross capital formation has a positive effect on agricultural output Q. This is also in line with what other researchers have reported and it is in conformity with what we posited in Chapter 3.

## **CHAPTER FIVE SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.0 Introduction**

This chapter is divided into three sections. The first section is the summary, which concisely highlights the research problem, objectives, the methodology adopted and findings from the study. This is followed in Section 2 by a statement on the conclusion. Finally, in Section 3, we discuss the recommendations that are based on the findings.

### **5.1 Summary**

Agriculture has been an important sector in the Nigerian economy not only in the past decades, but it also at present, despite the oil boom. Despite government spending on agricultural sector, its output has fluctuated widely and productivity has also declined even in terms of its relative contribution to GDP. This undesirable state has to be corrected. But to correct this, policy makers need to know those factors they can consider to bring this about. Hence, there is the need to know the factors affecting agricultural output. This need has prompted many researchers to look into this. But, despite the large number of studies on this issue, there are still some gaps waiting to be filled. Accordingly, we attempt to fill the gaps by identifying a number of determinants of agricultural output in Nigeria. Specifically, we have a primary objective of examining the role of government expenditure on agriculture and intervention variables, like commercial bank loans to agriculture (CBLA) and Agriculture Credit Guarantee Scheme Fund (ACGSF), on agricultural output.

To accomplish these objectives, we use time series data from 1980 to 2016, obtained from the Central Bank of Nigeria's Annual Report, to estimate an econometric model that is based on the Cobb Douglas production function. To address the time series features of the annual data used (which covers 1980 to 2016), we first carry out the unit root test, followed by a cointegration test. Based on the outcomes of these tests, an error correction model was estimated in order to capture short run relationship and also the speed of adjustment to equilibrium, and the explanatory variables featuring (with varying lagged values) in the model include government expenditure (GXPA), commercial bank loans to agriculture (CBLA), Agriculture Credit Guarantee Scheme Fund facility (ACGSF), agricultural labour force (L) and economy-wide gross capital formation (I).

The highlights of our findings from the application of the above methodology are as follows:

- i. The coefficient of government expenditure (GXPA) is not significant contrary to the expectation of a statistically significant positive coefficient.
- ii. Also the coefficient of commercial bank loans to agriculture (CBLA) is positive and statistically significant, in line with the expectation.
- iii. The coefficient of Agriculture Credit Guarantee Scheme Fund (ACGSF) is positive and statistically significant, in line with the expectation
- iv. The coefficient of agricultural labour force is positive and statistically significant, in line with the expectation.
- v. The coefficient of economy-wide gross capital formation is positive and statistically significant, in line with the expectation.
- vi. The coefficient of the error correction term is negative, absolutely less than 1 and statistically significant, in line with the expectation.

## **5.2 Conclusion**

Base on the findings above, we conclude that government expenditure has no effect on agricultural output. In contrast, commercial bank loan to agriculture and Agriculture Credit Guarantee Scheme Fund facility are both found to have positive effects on agricultural output. Similarly, agricultural labour force and economy-wide gross capital formation are found to have positive effects on agricultural output.

### **5.3 Recommendations**

Based on the findings of the study, we make appropriate recommendations below:

- i. In view of the finding that government expenditure on agricultural sector (GXPA) has no effect on agricultural output, we recommend that government should put on hold further disbursements to agricultural sector for the time being and first find out the reason for this finding.
- ii. Also, in view of the finding that commercial bank loans to the agricultural sector have a positive impact on agricultural output, the government should encourage flow of commercial bank loans to the sector so as to further boost agricultural output.
- iii. Based on the finding that ACGSF have a positive effect on agricultural output, Agriculture Credit Guarantee Scheme Fund facility should also be encouraged and measures should be taken to deepen it.
- iv. Given the finding that agricultural labour force has a positive effect on agricultural output, the government should encourage more people (including youths) to take to employment in the agricultural sector so as not only to reduce unemployment but to also boost agricultural production.
- v. Lastly based on the findings that gross capital formation has a positive effect on agricultural output, gross capital formation should also be encouraged.

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## Appendix

### Unit Root Test Results

Null Hypothesis: Q has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-0.989371	0.7463
Test critical values:				
	1% level		-3.632900	
	5% level		-2.948404	
	10% level		-2.612874	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(Q)				
Method: Least Squares				
Date: 06/29/18 Time: 07:49				
Sample (adjusted): 1982 2016				
Included observations: 35 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Q(-1)	-0.064763	0.065458	-0.989371	0.3299
D(Q(-1))	-0.461676	0.154182	-2.994360	0.0053
C	1.067165	0.838967	1.271999	0.2125
R-squared	0.266064	Mean dependent var		0.170645
Adjusted R-squared	0.220193	S.D. dependent var		0.985967
S.E. of regression	0.870675	Akaike info criterion		2.642720
Sum squared resid	24.25839	Schwarz criterion		2.776036
Log likelihood	-43.24760	Hannan-Quinn criter.		2.688741
F-statistic	5.800277	Durbin-Watson stat		2.189259
Prob(F-statistic)	0.007088			

Null Hypothesis: D(Q) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-9.882699	0.0000
Test critical values:				
	1% level		-3.632900	
	5% level		-2.948404	
	10% level		-2.612874	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(Q,2)				

Method: Least Squares  
Date: 06/29/18 Time: 07:51  
Sample (adjusted): 1982 2016  
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Q(-1))	-1.492278	0.150999	-9.882699	0.0000
C	0.250345	0.149141	1.678578	0.1027
R-squared	0.747451	Mean dependent var		0.008746
Adjusted R-squared	0.739798	S.D. dependent var		1.706324
S.E. of regression	0.870396	Akaike info criterion		2.615708
Sum squared resid	25.00044	Schwarz criterion		2.704585
Log likelihood	-43.77489	Hannan-Quinn criter.		2.646388
F-statistic	97.66774	Durbin-Watson stat		2.203457
Prob(F-statistic)	0.000000			

Null Hypothesis: GXPA has a unit root  
Exogenous: Constant  
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.597606	0.8582
Test critical values:		
1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation  
Dependent Variable: D(GXPA)  
Method: Least Squares  
Date: 06/29/18 Time: 07:52  
Sample (adjusted): 1983 2016  
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GXPA(-1)	-0.034026	0.056937	-0.597606	0.5546
D(GXPA(-1))	-0.346540	0.162452	-2.133184	0.0412
D(GXPA(-2))	-0.461880	0.159562	-2.894679	0.0070
C	0.542311	0.519956	1.042995	0.3053
R-squared	0.283175	Mean dependent var		0.122628
Adjusted R-squared	0.211492	S.D. dependent var		0.682102
S.E. of regression	0.605693	Akaike info criterion		1.945243
Sum squared resid	11.00591	Schwarz criterion		2.124815
Log likelihood	-29.06914	Hannan-Quinn criter.		2.006483
F-statistic	3.950401	Durbin-Watson stat		2.178366
Prob(F-statistic)	0.017355			

Null Hypothesis: D(GXPA) has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-7.407854	0.0000
Test critical values:	1% level		-3.639407	
	5% level		-2.951125	
	10% level		-2.614300	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(GXPA,2)				
Method: Least Squares				
Date: 06/29/18 Time: 07:52				
Sample (adjusted): 1983 2016				
Included observations: 34 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GXPA(-1))	-1.838159	0.248136	-7.407854	0.0000
D(GXPA(-1),2)	0.472708	0.156877	3.013236	0.0051
C	0.238544	0.108302	2.202588	0.0352
R-squared	0.709854	Mean dependent var		-0.007187
Adjusted R-squared	0.691134	S.D. dependent var		1.078493
S.E. of regression	0.599380	Akaike info criterion		1.898254
Sum squared resid	11.13693	Schwarz criterion		2.032933
Log likelihood	-29.27032	Hannan-Quinn criter.		1.944183
F-statistic	37.92129	Durbin-Watson stat		2.187318
Prob(F-statistic)	0.000000			

Null Hypothesis: CBLA has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-1.966686	0.2995
Test critical values:	1% level		-3.626784	
	5% level		-2.945842	
	10% level		-2.611531	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(CBLA)				
Method: Least Squares				
Date: 06/29/18 Time: 07:53				

Sample (adjusted): 1981 2016  
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CBLA(-1)	-0.041697	0.021202	-1.966686	0.0574
C	0.600000	0.220250	2.724178	0.0101
R-squared	0.102141	Mean dependent var		0.176787
Adjusted R-squared	0.075733	S.D. dependent var		0.292919
S.E. of regression	0.281609	Akaike info criterion		0.357358
Sum squared resid	2.696322	Schwarz criterion		0.445331
Log likelihood	-4.432439	Hannan-Quinn criter.		0.388063
F-statistic	3.867854	Durbin-Watson stat		1.939367
Prob(F-statistic)	0.057425			

Null Hypothesis: D(CBLA) has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.240687	0.0001
Test critical values:		
1% level	-3.632900	
5% level	-2.948404	
10% level	-2.612874	

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation  
Dependent Variable: D(CBLA,2)  
Method: Least Squares  
Date: 06/29/18 Time: 07:53  
Sample (adjusted): 1982 2016  
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CBLA(-1))	-0.911173	0.173865	-5.240687	0.0000
C	0.158767	0.059703	2.659269	0.0120
R-squared	0.454228	Mean dependent var		-0.006042
Adjusted R-squared	0.437689	S.D. dependent var		0.400385
S.E. of regression	0.300238	Akaike info criterion		0.486965
Sum squared resid	2.974722	Schwarz criterion		0.575842
Log likelihood	-6.521893	Hannan-Quinn criter.		0.517646
F-statistic	27.46480	Durbin-Watson stat		1.998572
Prob(F-statistic)	0.000009			

Null Hypothesis: ACGSF has a unit root				
Exogenous: Constant				
Lag Length: 6 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			0.698183	0.9901
Test critical values:				
	1% level		-3.670170	
	5% level		-2.963972	
	10% level		-2.621007	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(ACGSF)				
Method: Least Squares				
Date: 06/29/18 Time: 07:57				
Sample (adjusted): 1987 2016				
Included observations: 30 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ACGSF(-1)	0.037197	0.053277	0.698183	0.4924
C	0.005050	0.452932	0.011150	0.9912
R-squared	0.595790	Mean dependent var		0.149618
Adjusted R-squared	0.467178	S.D. dependent var		0.633237
S.E. of regression	0.462230	Akaike info criterion		1.517668
Sum squared resid	4.700437	Schwarz criterion		1.891321
Log likelihood	-14.76503	Hannan-Quinn criter.		1.637203
F-statistic	4.632448	Durbin-Watson stat		1.816046
Prob(F-statistic)	0.002587			

Null Hypothesis: D(ACGSF) has a unit root				
Exogenous: Constant				
Lag Length: 5 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.576672	0.0125
Test critical values:				
	1% level		-3.670170	
	5% level		-2.963972	
	10% level		-2.621007	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(ACGSF,2)				
Method: Least Squares				
Date: 06/29/18 Time: 07:56				
Sample (adjusted): 1987 2016				
Included observations: 30 after adjustments				

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ACGSF(-1))	-1.841556	0.514880	-3.576672	0.0016
C	0.310792	0.114383	2.717115	0.0123
R-squared	0.837776	Mean dependent var		-0.005738
Adjusted R-squared	0.795457	S.D. dependent var		1.010583
S.E. of regression	0.457050	Akaike info criterion		1.472917
Sum squared resid	4.804586	Schwarz criterion		1.799863
Log likelihood	-15.09376	Hannan-Quinn criter.		1.577510
F-statistic	19.79660	Durbin-Watson stat		1.755652
Prob(F-statistic)	0.000000			

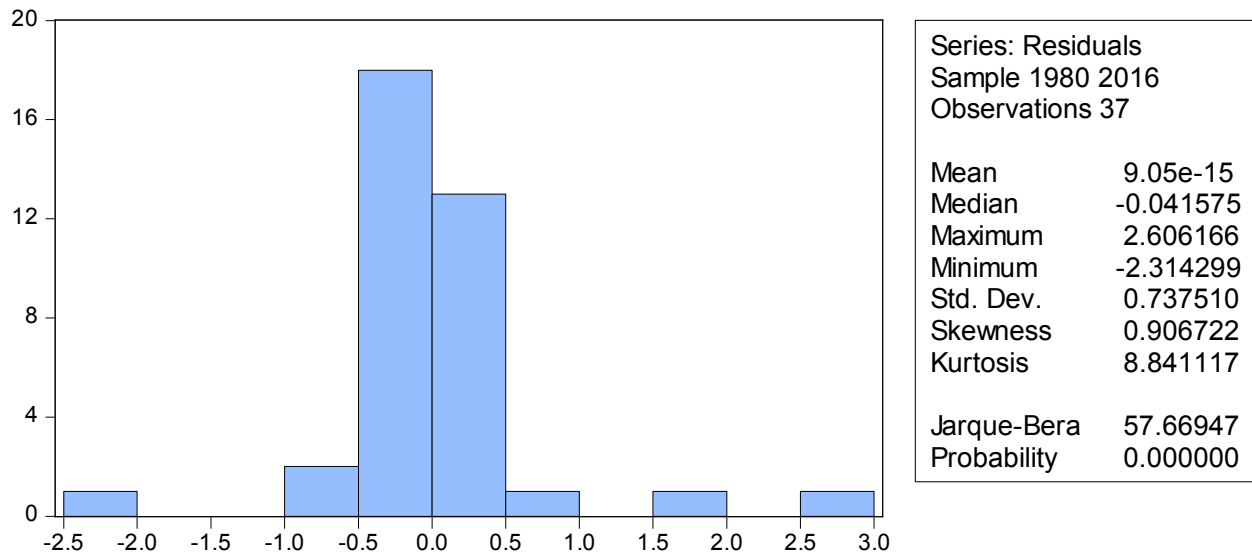
#### 4.6 Residual diagnostic test for the Error Correction Model

Residual diagnostic test are carried out in order to confirm appropriateness of the error correction model, and some of the test are normality test and heteroscedasticity test.

##### Jarque-Bera Normality Test

The Table below present the result of Jarque-Bera Normality Test, the left side shows the histogram while the right side entails the value of mean, median, skewness Jarque-Bera and so on.

##### Jarque-Bera Normality Test Table



Note: the Jarque-Bera has value of 57.669,  $H_0$ : error term are not normally distributed.

**Table 4.7 Heteroscedasticity Test Results**

Heteroscedaticity Test	Obs*R-squared	Prob. Chi-Square
Breusch-Pagan-Godfrey	7.581	0.108

**Table 4.8 Serial Correlation Test Results**

<b>Serial Correlation Test</b>	Obs*R-squared	Prob. Chi-Square
Breusch-Pagan-Godfrey	5.279	0.145