

Investment in Agricultural Sector: Implication for Poverty Reduction in Nigeria (1985-2012)

Oluwasegun Eseyin¹, S. Taiwo Toluyemi², Opeyemi Olusegun Oni^{2, *}

¹Self-Reliance Economic Advancement Programme, Ilorin, Nigeria

²Agricultural and Rural Management Training Institute (ARMTI), Ilorin, Nigeria

Abstracts

This paper is premised upon an attempt to empirically identify the various investment options in the agricultural sector and their implications on poverty reduction in Nigeria. The study adopted a time series econometrics analysis based on two models while Cobb-Douglas Production Function forms the theoretical underpinning. The two models have the Agricultural Sectors Share on GDP (Q_t) and the annual poverty rate (PR_t) as dependent variables respectively. Time series secondary data from 1985 to 2012 were used for this analysis. The test for stationarity (unit root test) indicates all the variables were stationary at first difference; this suggests a short-run disequilibrium among the variables. Hence, the Johansen cointegration test was conducted to ascertain the existence of long run relationship among them. Hence, Error Correction Model (ECM) was later introduced. The lag effects of Capital, Labour and ACGS were found to be statistically significant at reducing poverty level in the current year. The study therefore recommends that; private investment in agricultural sector should be given a considerable boost via the expansion of credit facilities under ACGS, public investment in the agricultural sector should be diverted toward provision of infrastructural facilities, procurement of fertilizers and agrochemicals and labour intensive method of production should be pursued because of the higher labour sensitivity to productivity which is also found to reduce poverty by one year lag period, this may not be unconnected to its capacity to curb the massive youth unemployment in the country.

Keywords

Investment, Agriculture, Sector, Poverty Reduction and Nigeria

Received: May 20, 2016 / Accepted: June 3, 2016 / Published online: June 28, 2016

© 2016 The Authors. Published by American Institute of Science. This Open Access article is under the CC BY license.

<http://creativecommons.org/licenses/by/4.0/>

1. Introduction

Nigeria is endowed with abundant land and water resources. This makes the agricultural sector to have potential for growth especially, if the value chains of the major commodities are fully explored to remove all forms of wastes and eliminate glut supply. Despite the huge potentials of agriculture in Nigeria, the impact of the sector on poverty reduction and self-sufficiency is perhaps very low. Although, several reasons could be deduced for this development, prominent among them are; the poor private investment in agriculture, inadequate access to assets and resource and poor technology as well as epileptic power supply in the country.

Historically, rates of poverty reduction have been very closely related to agricultural performance, particularly the rate of growth in agricultural productivity. In a simple term, this indicates that the countries that have increased their agricultural productivity the most have achieved the greatest reduction in poverty level. This is due to the potentials of agriculture in creating wealth and generating employment.

The neglect of agriculture is partly the result of an assumption that agriculture is inherently an inferior sector, whose share in the economy is certain to decline as the economy grows. While the falling share of agricultural GDP and employment are statistical facts that can be observed in the developed and developing economies, these facts do not

* Corresponding author

E-mail address: oluwaseguneseyin@gmail.com (O. Eseyin), Toluyemi2001@yahoo.com (S. T. Toluyemi), segunooni@gmail.com (O. O. Oni)

suggest that agriculture is inherently an inferior or losing sector [7].

According to [1], output level in the agricultural sector is low and in some cases stagnant, farming system mostly small scale is still predominantly subsistence-based and for the most part depend on the weather vagaries. The country's vast irrigation potential remains largely unexploited. Most farmers produce mainly food crops using the traditional extensive cultivation methods while the commercial agriculture based on modern technologies remains underdeveloped and the most limiting factor is access to investible fund. Investment in agriculture can be transformational especially as agriculture is still the single largest employer of labour in Nigeria today and holds the promise of sustainable reduction in poverty.

The concept of private investment is found to have a strong relationship with the output and growth. Investment does not only set the pace for output expansion alone, but as the second largest components of aggregate demand, it also has effect on the fluctuation and magnitude of overall demand. This investment has a double effect on economic growth [6].

Furthermore, the World Bank estimates that the growth in the agricultural sector is twice as effective at reducing poverty when compared to growth in the other sectors. The enormous potential of agriculture can be harnessed to alleviate poverty among Nigerians through the provision of food, income to the farmers, raw materials for industries, and generation of foreign exchange for the country, in addition to fuelling economic growth, investment in agriculture will also enable the country to withstand future shocks from the changing global commodity prices, weather patterns and financial crises.

The surge increase in the domestic production of crude oil in Nigeria coupled with the rise in its price at the international market in the early 1970s had brought about the neglect of the agricultural sector in the country. Hence, the fact that poverty is on the increase despite this development is no longer news.

While increasing agricultural productivity perhaps remains the single most important determinant of economic growth and poverty reduction, serious doubts are emerging as to whether agricultural productivity can be further increased; where it is most needed, and what part will any small-scale farming play in the future.

Previous works on this subject have not been able to provide an insight into the viable strategic investment financing which could guarantee an increased agricultural output. Also, the nexus between the progress in Nigerian agricultural sector and poverty reduction is yet to be ascertained. Thus,

development experts need greater understanding of various investment options in agriculture to achieve poverty reduction. The need for assessment of how investment plans could be strategized in order to achieve the expected agricultural production and poverty reduction becomes important. In addition, issues such as to what extent has agriculture remained a ladder out of poverty for millions of poor people living in the rural areas needed to be examined. Therefore, the objective of this study is to examine the investment options in agricultural production and their impacts on poverty reduction in Nigeria. However, the specific objectives are:

- i. To identify the various investment options in agricultural production;
- ii. To examine the impacts of investment options on production; and
- iii. To examine the impacts of agricultural investment options on poverty reduction.

The rest of the paper is structured as follows: literature reviews and conceptual issues are provided in section two; section three provides the research methodology, section four presents interpretation of results and discussion of findings. Policy recommendation and conclusion are contained in the last section.

2. Literature Reviews and Conceptual Issues

2.1. Global Incidence of Poverty

According to the [25], global poverty at US\$1.25 per day declined from 1.9 billion in 1981 to 1.4 billion in 2005, but there are significant differences between countries and regions. The East Asia and the Pacific were the world leader in lifting 750 million people out of extreme poverty. The number of the poor increases however in South Asia from 548million in 1981 to 596 million in 2005. In India, the number of the poor people increased from 420 million in 1981 to 456million in 2005 the second largest increase in the number of the poor people during these 24 years was in Sub-Saharan Africa, from 211 million to 388 million. There was virtually no change in the number of the poor people in the Latin America and the Caribbean [7].

A more recent account of the incidence of rural poverty in the developing country is provided by [10] in its Rural Poverty Report and in [11], agriculture pathways to prosperity in the Asia and the Pacific. According to [10], the number of people in poverty in the developing world is 2686 million in 2008 which increased from 2620 million in 1988. Within the developing world, South Asia had the highest poverty

number of the people in poverty in 2008 at 1149 million, whereas in 1988, this distinction went to East Asia which had 937 million poor as against 906 million in South Asia [7].

2.2. Poverty Profile in Nigeria

Among the Sub-Saharan African countries, Nigeria had the second largest export income after South Africa in 1994 when the country earned over US\$9 billion. On per capita income basis, Nigeria had the fourth largest income after South Africa, Angola and Zambia [15].

According to [22], events in 1992 actually eroded many of the positive changes that took place during the Structural Adjustment Programme era. Real GDP increased by 2 percent between 1992 and 1995 and real per capita private consumption fell by 1 percent. But the incidence of poverty (Po) declined from 43 percent in 1986-1987 to 34.1 percent in 1992-1993, although the size of the poor population declined only marginally from 35.8 million to 34.7 million. The trend in the overall decline in the actual size of the poor population brought clearly how urban poverty increased while rural poverty declined in Nigeria. Within the same year, it was considered that, the number of poor in rural areas declined from 26.3 million and in both areas, all households in extreme poverty are larger in number than the natural average.

According to the 2010 Harmonised Living Standard Survey (HNLSS) Report as conducted by [16] four different approaches were used in the computation of poverty indicators in Nigeria:

a) *Relative poverty Measurement* being defined by reference to the living standards of majority in a given society stood at 54.4 percent in 2004. But this increased to 69 percent (or 112,518,507 Nigerians) in 2010. The North-West and North-East geo-political zones recorded the highest poverty rates in the country with 77.7 percent and 76.3 percent respectively in 2010, while the South-West geo-political zone recorded the lowest at 59.1 percent. Among States, Sokoto had the highest poverty rate at 86.4 percent while Niger had the lowest at 43.6 percent in the year under review.

b) Using *Absolute Poverty Measure* which is defined in terms of the minimal requirements necessary to afford minimal standards of food, clothing, healthcare and shelter, 54.7 percent of Nigerians were said to be living in poverty in 2004 but this increased to 60.9 percent (or 99,284,512 Nigerians) in 2010. Among the geo-political zones, the North-West and North-East recorded the highest rates at 70 percent and 69 percent respectively, while the South-West had the least at 49.8 percent. At the State level, Sokoto had the highest at 81.2 percent while Niger had the least at 33.8 percent during the reviewed period.

c) The application of *The-Dollar-per-day measure* approach refers to the proportion of those living on less than US\$1 per day poverty line stipulates that 51.6 percent of Nigerians were living below US\$1 per day in 2004, but this increased to 61.2 percent in 2010. Although the World Bank standard is now US\$1.25, the old reference of US\$1 was the standard used in Nigeria at the time that the survey was conducted. The North-West geo-political zone recorded the highest percentage at 70.4 percent, while the South-West geo-political zone had the least at 50.1 percent. Sokoto had the highest rate among States at 81.9 percent, while Niger had the least at 33.9 percent.

d) *Subjective Poverty* which is based on self-assessment and "sentiments" from respondents shows that 75.5 percent of Nigerians considered themselves to be poor in 2004, and in 2010 the number went up to 93.9 percent. FCT recorded the most number of people who considered themselves to be poor at 97.9 percent. Kaduna recorded the least number of people who considered themselves poor at 90.5 percent.

[16] also forecasts the poverty rate in the country for 2011 using various economic models. However, the estimates are constrained by the assumption that the status quo in 2010 was maintained in 2011. Accordingly, it ignores the potential positive impact various poverty alleviation strategies implemented since 2011 may have had on reversing the poverty trend. Thus, using the relative, absolute and dollar-per-day poverty measures, it was estimated that poverty would further rise slightly to about 71.5 percent, 61.9 percent and 62.8 percent respectively in 2011. The survey also suggests a rising income inequality in the country as measured by the *Gini-coefficient*. By this measure, income inequality rose from 0.429 in 2004 to 0.447 in 2010, indicating greater income inequality during the period. The analysis of consumption expenditure distribution indicates that the top 10 percent income earners was responsible for about 43 percent of total consumption expenditure, the top 20 percent was responsible for about 59 percent of total consumption expenditure while the top 40 percent was responsible for about 80 percent of total consumption expenditure in the year under review.

2.3. Poverty Alleviation Attempts in Nigeria

Poverty alleviation programmes in Nigeria is as old as her national development plan. The First and Fourth National Development Plans emphasised the need to provide infrastructure such as education, health, and employments through River Basin Development Authority (*RBDA*). The Agricultural Credit Guarantee Scheme Fund (*ACGSF*), Agricultural Development Programme (*ADP*), Rural Electrification Scheme (*RES*), and Rural Banking Programme (*RBP*). While the Fourth National Development

Plan's main objective is to increase rural income as well as to bridge the gap between the rich and the poor.

Other poverty alleviation programmes that were introduced are the Operation Feed the Nation (*OFN*) in 1977 which was supplemented by the Green Revolution (*GR*) in 1980, and Low Cost Housing Scheme (*LCHS*) which was established to solve the housing problem of the majority of the civil servant in the country [17].

The Structural Adjustment era (1986-2003) also brought in lots of poverty alleviation programmes, these includes: Directorate For Food Road and Rural Infrastructure (*DFRRI*); National Directorate of Employment (*NDE*) (1986); Better Life Programme (*BLP*) (1987) later changed to Family Support Programme (*FSP*) in November 1994; Peoples' Bank (1989), Community Banks were later established in 1990; Petroleum (Special) Trust Fund (*PTF*) (1994).

2.4. Agricultural Sector Specific Poverty Alleviation Programme

Ilori (1999) cited in [4] classifies rural poverty related programme into three: developmental programme, palliative measures popularly called Social Dimension of Adjustment, and the sector specific poverty related programmes [4]. In Nigeria, Agricultural Credit Guarantee Scheme (*ACGSF*) was initiated in 1977 under the Agricultural Credit Guarantee Scheme Fund Decree. It was specially designed to provide cover in respect to loans granted for agricultural purposes. The rationale was that through this scheme, the commercial banks will be willing and encouraged to loan investment funds to the agricultural sector including the small-scale rural dwellers. However, according to [4], the main beneficiaries of this programme were the large scale and educated farmers. Other agricultural sector-poverty alleviation programmes are: The National Agricultural Land Development Authority (*NALDA*) (1991); The National Poverty Eradication Programme (*NAPEP*) (2001); [4] posits that thirty – seven (37) core poverty alleviation institutions, agencies and programme had so far been identified.

2.5. Overview of Agricultural Growth in Nigeria

The agricultural sector in Nigeria maintained its dominant position as the major foreign exchange earner as at independence in 1960. Being regarded as the mainstay of the Nigerian economy, it accounts for more than half of the GDP; more than three-quarter of her export earnings and as well as providing food for the teeming population. The agricultural sector contributed to 50 percent of the GDP in 1970 and was later reduced to 38.8 percent in 1991 and 32 percent in 1995. By mid 1980s, there was a noticeable decline in the relative share of agriculture in aggregate

output. This therefore shifts the country's self-sufficiency in basic foodstuff to one of the heavy importers. There was sudden neglect of the agricultural sector by the mid-1980s as a result of the windfall from the petroleum income. Farm production was depressed by the massive urban boom and the movement of rural workforce to the cities. This marks the genesis of the country's economic problem Abudu, (1999) cited in [2].

The major propelling force for overall economic growth is the export-oriented section of agriculture, petroleum production and the more or less manufacturing industry. This is not to say that the production of locally consumed food crops is to be overlooked. On the contrary, the overriding importance of food production for nutritional, health and political reasons cannot be over-emphasised. However, it is the insufficient and the low yield production for the domestic market that is the major cause of the growing scarcity and high price for food items [23].

[23] also argued that, agriculture is still the most important sector of the Nigeria's economy. Agriculture grew at an average rate of 7.8 percent around 1970 – 1974; which was the early year of the oil era. As oil becomes increasingly important in the economy, agriculture grew more slowly. By 1976, growth in the sector had slowed to about one percent. Between 1977 and 1979, agriculture had a growth rate of around 4.2 percent, contributing about 50 percent to GDP.

Furthermore, [20] revealed that the agricultural output of the Nigerian economy is economically unimpressive. The growth rate in the agricultural output lags behind that of food import in the country. In 1980, the growth rate in the agricultural output was 8.67 percent. It increased to 20.99 percent and 33.71 percent in 1990 and 2001 respectively. And by 2008, it dipped to 18.10 percent. The growth rate in food import in Nigeria for this same period above was 14.61, 64.75, 538.51, 40.99 and 30.77 percent, respectively CBN, (2009) cited in [20]. The average growth rates for agricultural output and food import throughout the period covered was 27.68 and 40.89 percent respectively; revealing a gap of about 13.00 percent. This means that agricultural output of the Nigerian economy is not growing sufficiently enough to meet its local demand, hence the huge food import into the country.

2.6. Models of Capital Formation/Investment

From the Keynesian terminology, investment refers to the accumulation of capital equipment. Poverty reduction through increase in income is achieved through production expansion, which is said to be achievable through the acquisition of capital goods. Investment is meant to be an addition to capital goods in order to expand the production

base of the economy. A slowdown in investment is translated to a slowdown in output and growth.

[6] posits that investment determines the productive capacity of any sector and also the size of labour utilisation in making the capacity operational in the entire economy as a whole. The level of investment has a great impact on the economic activities. An increase in the volume of investment over several periods of time makes it possible to maintain growth cycle with outcomes to an end as a result of decline or stagnation in investment level.

2.7. Cobb-Douglas Production Function

Several economic theories have identified the role of capital accumulation (investment) and other inputs in accelerating the overall productivity. Prominent among them is the Cobb-Douglas Production Function, which had been used as the theoretical base for this study.

$$Q = AL^{\beta_1}K^{\beta_2} \quad (1)$$

Where the Total Output level (Q) is said to be explained by factor inputs Labour (L) and Capital (K), β_1 and β_2 measures the output elasticity of labour and capital respectively and (A) measures the production efficiency as usually determined by the state of technology.

[21] postulates that economic growth is as result of the accumulation of physical capital and an expansion of the labours force in conjunction with an “exogenous” factor, technical progress, that makes physical capital and labour more productive [18].

However, Mankiw et al. (1992) extends the Solow aggregate production function to include educational capital

$$Y_t = A_{(t)}K_t^{ak*} H_{(t)}^{ah*} L_{(t)}^{al} \quad (2)$$

Where Y = output; A = level of technology; H = stock of human capital and L = labour force.

2.8. The Role of Agricultural Growth in Poverty Reduction

Subscribing to the stand point of [7], the rural concentration of poverty in the developing countries such as Nigeria highlights the importance of agriculture in poverty reduction strategies, because most of the rural population relies directly or indirectly on agriculture. [3], also reports that, at the micro-economic level, growth in agriculture which could only be enhanced by its appropriate investment expenditure has been consistently shown to be more beneficial to the poor than the growth in other sectors. Their analysis also reveals that increasing agricultural productivity has probably been the single most important factor in determining the speed and

extent of poverty reduction during the last 40 years.

Based on the simulation of [10], meeting the Millennium Development Goal of halving the poverty (at US\$2 per day) in Asia and the Pacific region would require 28 percent increase in agricultural expenditure, 23 percent increase in fertilizer use and 24 percent increase in agricultural investment during 2007 – 2013 together with 56 percent increase in Agricultural Overseas Development Assistance.

The importance of agriculture in reducing poverty in Nigeria is derived from the following facts:

- (a) The incidence of poverty is disproportionately high in Nigeria, in which the country still relies heavily on agriculture for employment and income generation.
- (b) The poorest households typically rely more on agriculture as source of income and employment.
- (c) Nigeria today is reported to be largest importer of food items globally; the proper mobilization of the country's natural resources can guarantee domestic production of all the imported food items.
- (d) Because most of the poor people have no skill other than manual labour to sell, they generally face many obstacles in connecting with non-agricultural economy, whereas, agricultural growth can provide them jobs where they live.
- (e) Social and economic factors further exclude the larger population of the youth and women from other white collar job opportunities in the country; this is a gap in which agricultural growth can fill.

Millions of those who are just above the poverty line also remain vulnerable to exogenous shocks, such as sudden fall in food supply due to natural disaster like flood. Hence, this leads to the spike in food prices and perhaps unemployment rate. The [24]'s report for instance, shows the tendencies of poverty in the developing countries to rise due to loss of jobs brought about by global financial crisis. Meanwhile, the Nigeria case may be because of unfavourable change in government policy. The direct impact of agriculture on poverty reduction depends on the interaction of several effects. According to [7], the first of these to be ascertained is the effect of agricultural investment which raises the income level of those employed in the sector. Secondly, how much the poor people benefit from agricultural investment and growth. This depends on the rate of participation of the poor in agriculture.

The indirect contributions that agricultural sector make to the growth of the rest of economy are based on the demand of its products from the non-agricultural sectors of the economy. Engel's law stipulates that, as income rises, peoples' spending of income on agricultural products such a meat, eggs, vegetables and fruits rise.

2.9. Empirical Evidence

The investment in agricultural sector is important for poverty reduction is supported by [17]. Investment favours agricultural sector not only because of its low skill and competence requirements, but also because of its potential for stimulating growth in the secondary and tertiary sectors. For example, increased commercial agricultural activities through induced investment may lead to expansion of small food processing industries. This will in turn increase labour mobility from rural to urban areas [7].

[4] investigated the link between government spending on agriculture and poverty reduction in Nigeria's economic growth in the period 1980-2009. Using poverty level as the dependent variable, while the independent variables are government expenditure on agriculture and agricultural credit guaranteed scheme (ACGS), it was discovered the one percent increase in agricultural credit guaranteed scheme fund (ACGSF) will on average lead to 0.06 percent decrease in poverty level. It was also recommended that effort should be made by the government to see that the rural farmers benefit from the opportunities surrounding her expenditures in the agricultural sector; in an attempt to reduce the poverty level in Nigeria. Meanwhile, the study also suggests that government funding on agriculture should be channeled to farm mechanization.

[5] Found out that agricultural research, education and rural infrastructure are three most effective public spending items in promoting agricultural growth and poverty reduction. Return to public investments vary significantly across different types on investment and region within the same country, investment targeting regions with highest return can yield much greater success in poverty reduction. The study also discovered that the number of poor lifted out of poverty in rural India per unit of investment in agriculture varies from 1.6 in irrigated areas to 3.5 in high potential rain-fed areas to 9.5 in low potential rain-fed areas. Similarly, the number of poor lifted out of poverty in rural China per unit of investment in agricultural research varies from 2 in coast provinces to 4.4 in Central region to 33 in Western region. Fan also notes that very few studies include all or most type of public investment when assessing their impact on growth and poverty reduction. Government spending on anti-poverty programmes is generally found to have small impact on poverty reduction.

Also, [19] empirically investigated the relationship between foreign private investment in agriculture and poverty reduction in Nigeria from 1975–2003. It was found that foreign direct investment and foreign loan in the Nigerian agricultural sector significantly alleviated poverty. They also maintained that government expenditure and the continuous rise in petroleum profit tax would aggravate poverty levels in the country. The study of uncertainty of foreign direct

investment (FDI) in the of agriculture in Nigeria which was conducted by [1], revealed a positive and significant impact of FDI on agricultural growth both in short run and long run. They therefore recommended that, engendered domestic income diversification will boost the agricultural sector.

The Central Bank of Nigeria (CBN) national survey (CBN, 1999) showed that there was an increase in agricultural production. This was however attributed to favourable weather conditions (enough rainfall), increased investment to the sector by the government. Also, efforts of the National Land Development Authority (NALDA) which made land available to small farmers coupled with the intensive activities of Agricultural Development Projects (ADPs). The development could also be attributed to the relevant agencies of governments' comprehensive policies to boost agricultural production; production of credit facilities to small farmers and more research activities to improve the sector's productivity.

Similarly, [12] investigated the impact of agricultural sector on poverty reduction in the country over the period 1986 to 2012. Among econometric techniques employed for the research, the error correction mechanism (ECM) model reveals that food production index and government spending had negative impact on poverty headcount ratio in the country.

Finally, [17] examines the role of agriculture in poverty reduction in Nigeria between 1980 and 2011. The results from the Augmented Dickey-Fuller (ADF) unit root test and Error Correction Mechanism revealed that per capita agricultural GDP, physical infrastructure per capita and social infrastructure per capita were positively and significantly related to poverty reduction while per capita non-agricultural gross domestic product (GDP) and inflation rate were negatively and insignificantly related to poverty reduction in Nigeria. The study therefore recommends among others that government should provide the needed assistance to Nigerian farmers to transform and adopt the use of modern technology so as to stimulate higher productivity in agriculture and reduce the level of poverty in the country.

3. Research Methodology

This study is carried out within the context of the Nigerian economy for the period from 1985–2012. The choice of the selected period is not unconnected with the noticeable decline in the relative share of agriculture in aggregate output starting from the period under study. Secondary data were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and World Bank data, which was later recomputed by the author for analysis' sake.

This study adopted Cobb-Douglas Production function to analyse the data collected. However, some other instrumental

variables were included in order to achieve the research objectives.

Two models have been developed for this work; the first one investigates the impact of agricultural investment options on agricultural productivity in Nigeria. Meanwhile, the second equation examines the impact of the identified agricultural investment options in agriculture on poverty reduction in Nigeria (i.e. equation 4a).

$$Q = \ln Q_t = \alpha + \alpha_1 \ln K_t + \alpha_2 \ln L_t + \alpha_3 \ln M_t + \alpha_4 \ln N_t + \alpha_5 \ln O_t + \varepsilon_t \quad (3)$$

$$PR_t = \beta + \ln Q_t + \beta_1 \ln K_t + \beta_2 \ln L_t + \beta_3 \ln M_t + \beta_4 \ln N_t + \beta_5 \ln O_t + \varphi_t \quad (4)$$

Where:

PR_t represents the annual poverty rate in Nigeria within the period under study

$\ln Q_t$ represents the natural log of the annual total agricultural sector's share of the Gross Domestic Product GDP;

$\ln K_t$ denotes the natural log of the total volume of capital input injected into the Nigerian agricultural sector which is measured by the total annual agricultural tractors and machinery available in the country;

$\ln L_t$ stands for the natural log of available agricultural labour input, this is measured through the annual working population between age 15 to 65 years old.

Other instrumental variables include in this study are:

$\ln M_t$ which depicts the natural log of the volume of domestic private investment directed towards agricultural sector, and this is measured by the total annual loans granted under the Agricultural Credit Guaranteed Scheme (ACGS) as opined by [4];

$\ln N_t$ represents the natural log of public investment into agricultural sector, this is measured by the annual federal government appropriation into agricultural sector in Nigeria;

$\ln O_t$ stands for the volume of foreign direct investment (FDI) into the Nigeria agricultural sector.

α_0 is the intercept which accounts for the technical efficiency in the sector. While, $\alpha_1 - \alpha_5$ are the parameters estimate which

measures the degree of elasticity of various factor inputs on the total output of the sector; and ε_t is the error term which takes care of other variables that cannot be captured by the model. The a priori theoretical expectations of all the parameters are to be positive (i.e. $\alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 > 0, \alpha_5 > 0$). The parameters for the second model is however expected be negative (i.e. $\beta_1 < 0, \beta_2 < 0, \beta_3 < 0, \beta_4 < 0, \beta_5 < 0$)

4. Analysis and Interpretation of Results

4.1. Unit Root and Cointegration Tests

The empirical analysis began with data pre-testing work. The unit root test is conducted to determine the stationarity or non-stationarity of the variable under study. The literature has established that most time series variable are usually not stationary at level. Hence, results obtained from such analysis are considered spurious. Both the Augmented-Dickey Fuller (ADF) and Phillips-Perron test are used to achieve this. The augmented Dickey Fuller is by "augmenting" the preceding equations by adding the lagged value of the dependent variable. It is an extended work on τ (tau) statistics also known as Dickey Fuller (DF) test [8].

Taking y_t as the variable under study, x_t as a vector of exogenous variable and ε_i as the white noise error term.

$$\Delta y_t = \varphi y_{t-1} + \delta x_t + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \dots + \beta_p \Delta y_{t-p} + \varepsilon_t \quad (5)$$

Hence;

$$\Delta y_t = \varphi y_{t-1} + \delta x_t + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \varepsilon_t \quad (6)$$

where

The null hypothesis (H_0) is that there exists a unit root in the time series (non-stationary) in which $H_0: \varphi = 0$, against the alternative hypothesis (H_1) that the time series is stationary (no unit root), $H_1 > 0$. In both tests, if the calculated statistics is less (in absolute terms) than [13] and [14] critical values then the null hypothesis is accepted and therefore means that there is unit root. The result as obtained through *Eviews7* application software is presented in Tab. 1 below the result.

Table 1. Unit Test Result.

Variable	ADF	Order of Integration	Phillips- Peron	Order of Integration
$\ln Q^{***}$	-3.717507	I(1)	-3.734383	I(1)
$\ln K^{***}$	1.734607	I(2)	-4.377771	I(1)
$\ln L^{***}$	-5.804689	I(1)	-3.614664	I(1)
$\ln M^{***}$	-5.203366	I(1)	-5.275065	I(1)
$\ln N^{***}$	-5.794171	I(1)	-23.74527	I(1)
$\ln O^{***}$	-10.63761	I(1)	-10.75378	I(1)
PR^{***}	-4.459323	I(1)	-4.380791	I(1)

Source: Author's computation, 2014 *** Statistically significant at 1 percent level of Significance

4.2. Regression Result for the First Model

In the first model, having discovered that all the variables are not stationary at level, it depicts that there is short run disequilibrium among the variables, hence the need to ascertain the existence of long run relation among the variable was examined using Johansen cointegration test. The result as shown in the Table A1 of the appendix reveals the existence of 5 cointegrating equations in the long run at 5 percent level of significance. The existence of cointegration is therefore a sufficient condition for the formulation of the Error Correction Model (ECM) which is given as below:

$$\Delta \ln Q_t = \alpha_0 + \alpha_1 \Delta \ln K_t + \alpha_2 \Delta \ln L_t + \alpha_3 \Delta \ln M_t + \alpha_4 \Delta \ln N_t + \alpha_5 \Delta \ln O_t + \alpha_6 \Delta \ln Q_{t-1} + \alpha_7 \Delta \ln K_{t-1} + \alpha_8 \Delta \ln L_{t-1} + \alpha_9 \Delta \ln M_{t-1} + \alpha_{10} \Delta \ln N_{t-1} + \alpha_{11} \Delta \ln O_{t-1} + \alpha_{12} ecm_{t-1} \quad (7)$$

$$\Delta PR_t = \beta_0 + \beta_1 \Delta \ln K_t + \beta_2 \Delta \ln L_t + \beta_3 \Delta \ln M_t + \beta_4 \Delta \ln N_t + \beta_5 \Delta \ln O_t + \beta_6 \Delta PR_{t-1} + \beta_7 \Delta \ln K_{t-1} + \beta_8 \Delta \ln L_{t-1} + \beta_9 \Delta \ln M_{t-1} + \beta_{10} \Delta \ln N_{t-1} + \beta_{11} \Delta \ln O_{t-1} + \beta_{12} ecm_{2t-1} \quad (8)$$

Table 2. Result of Error Correction (Parsimonious) Model I. for Equation 7
Dependent variable: $\Delta \ln Q_t$.

Variable	Coefficient	t-Statistics	P-Value
C	0.235580	1.0317491	0.3265
$\Delta \ln K_t$	9.108400*	2.101747	0.0619
$\Delta \ln L_t$	207.8818**	2.831477	0.0178
$\Delta \ln M_t$	0.410465**	2.888800	0.0161
$\Delta \ln N_t$	0.040004	1.106955	0.2942
$\Delta \ln Q_{t-1}$	0.603313**	2.925466	0.0152
$\Delta \ln K_{t-1}$	-15.17707**	-2.259910	0.0474
$\Delta \ln L_{t-1}$	-195.8028**	-2.437869	0.0350
$\Delta \ln M_{t-1}$	-0.064633	-0.595816	0.5645
$\Delta \ln N_{t-1}$	0.009408	0.256747	0.8026
ecm_{t-1}	-0.584437**	-2.926187	0.0151
R^2	0.776111		
F-Statistics	3.466505**		0.031320

*** statistically significant at 1 percent level of Significance; ** statistically significant at 5 percent level of Significance; * statistically significant at 10 percent level of Significance
Source: Author’s computation, 2014

Table 3. Result of Error Correction (Parsimonious) Model II. for Equation 8
Dependent variable: ΔPR_t .

Variable	Coefficient	t-Statistics	Prob. value
C	31.72569**	2.999648	0.0121
$\Delta \ln K_t$	138.2130	0.712869	0.4908
$\Delta \ln L_t$	10174.51***	3.172613	0.0089
$\Delta \ln M_t$	16.75133**	2.924174	0.0138
$\Delta \ln N_t$	1.358701	0.85113	0.4123
$\Delta \ln K_{t-1}$	-1027.449***	3.916144	0.0024
$\Delta \ln L_{t-1}$	-9904.635**	-2.912604	0.0141
$\Delta \ln M_{t-1}$	-10.84863**	-2.578679	0.0257
$\Delta \ln N_{t-1}$	-0.365813	-0.219485	0.8303
ecm_{2t-1}	-0.317004**	-3.1217644	0.0488
R^2	0.747937		
F-Statistics	3.626649**		0.024100

*** Statistically significant at 1 percent level of Significance; ** statistically significant at 5 percent level of Significance; * statistically significant at 10 percent level of Significance
Source: Author’s computation, 2014.

4.3. Interpretation of Results and Discussion of Findings

The Error Correction Model (ECM) tight up the speed of adjustment between the short run disequilibrium and long run equilibrium among the variables. The ECM does not only provide solution to the problem of spurious regression associated with the presence of unit root in time series analysis, but it also reveals the speed of adjustment from short run disequilibrium to long run equilibrium.

In the first model, the coefficient of the error correction term (ECT_{-1}) is 0.584437 which satisfies the condition of having negative sign and statistically significant shows that, about 58 percent of the error is corrected every year, hence the speed of adjustment is relatively high. The R^2 is 0.776111; this indicates that about 78 percent of the factors responsible for change in the dependent variable ($\ln Q$) have been captured by the model; hence only less than 22 percent is explained by the variable not captured i.e. error term. The F-statistics is 3.466505, with the probability value of 0.031320. Thus, the statistical significance of the overall model has been established. The Durbin-Watson statistics is 2.614863 indicates the absence of first order serial correlation in the error term.

Subsequently, the coefficient of the error correction term (ECT_{-1}) in model II is -0.317004 which also satisfies the condition negative sign and statistical significance, thereby depicting that about 32 percent of the error is corrected every quarter from short run disequilibrium to long run equilibrium. The R^2 is 0.747937 indicating that about 75 percent of the factors responsible for the variation in the Poverty Rate (PR) have been captured by the model; hence about 25 percent is explained by the variable not captured i.e. error term. The F-statistics is 3.626649, with the probability value of 0.024100. Thus, the statistical significance of the overall model has been established.

The coefficients $\beta_1, \beta_2, \beta_3, \dots, \beta_7$ signifies the weight that measures the average speed of adjustment of the independent variables towards the estimated long run equilibrium position see Nziramasanga, (2003) as quoted in [9]. From the first model, out of all the analysed factors in agricultural productivity, the supply and availability of labour inputs is discovered to adjust faster than capital input. Thereby agricultural productivity is more sensitive to labour inputs than capital input. This is not unconnected with the fact that in Nigeria, methods used in livestock production, forestry and fishing require larger proportion of workers over tractors and other machineries for a significant output to be guaranteed. Meanwhile, it is only in crop production that the usage of tractors and other machineries are employed for mechanised and large scale production. In most part of the country, the level of agricultural mechanisation is still very

low; as such draught animal powers are used for cultivation, while harvesting remained largely labour-intensive. This assertion conforms to the argument of [2] that in most Sub-Saharan African (SSA), agriculture is mostly characterised by relatively low capital intensity and high labour intensity for both large scale and small scale agricultural production.

In the same vein, out of all the investment options for boosting agricultural productivity, only the private investment financing through the Agricultural Credit Guaranteed Scheme Fund (ACGSF) is found to be statistically significant in explaining agricultural productivity at 5 percent level of significance. Owing to this fact, the bulk of government budgetary provision into agricultural sector does not translate into improvement in productivity on account of misappropriation of resources and high level of corruption. This is also in agreement with the finding of [4] that a unit increase in Agricultural Credit Guaranteed Scheme Fund (ACGSF) will on the average lead to improved agricultural productivity thereby alleviating the poverty level by 0.06 percent.

Furthermore, for an investment option to result in reduction in poverty level, such variables must be statistically significant and must also have negative speed of adjustment. These conditions are only satisfied by the lag values of investment in capital inputs, investment in labour inputs and private investment in to agricultural sector through Agricultural Credit Guaranteed Scheme (ACGS). This implies that, the contemporaneous effect of agricultural investment expansion through labour force enhancement and ACGS do not guarantee poverty reduction. However, according to the analysed result; the lag effect of increased agricultural labour force and capital expansion on poverty reduction in Nigeria is highly substantial.

5. Policy Recommendations and Conclusion

This paper is premised upon how to identify the various investment options; and ascertain the most effective one that could guarantee a robust agricultural output which could lead to poverty reduction in Nigeria. Based on the findings from the results outcomes, productivity in agricultural sector is best explained by expansion in agricultural labour force, physical capital accumulation and private investment through Agricultural Credit Guaranteed Scheme (ACGS).

The Federal Ministry of Agriculture, Ministry of Finance, Bank of Agriculture, and other relevant agencies should increase the total credits made available under the agricultural credit guarantee scheme (ACGS); as a way of enhancing the agricultural sector's output and poverty reduction. However, the recovery of such loans may be challenging because of absence

of adequate collateral cover under the scheme.

The larger share of the federal government budgetary provision to the agricultural sector should be directed toward infrastructure, procurement of fertilizer and agrochemicals and credit facilities for private investors. This is because; the effect of direct public investment in the sector has not been found to be significant.

Labour intensive method in agriculture should be encouraged so as to curb the ever increasing youth unemployment and also reduce the rate of food importation in the country and poverty will be reduced to the barest minimum in the country. Also, the quality and quantity of human capital in agricultural sector should be enhanced, because such will not only lead to increased agricultural productivity, but can also significantly alleviate poverty in Nigeria.

In the same vein, government should make available the provision of investment outlets both in production and distribution aspects of agriculture that will make agricultural investment lucrative and attractive especially for the educated youths.

Conclusively, the establishment of marketing boards is also recommended to absorb excess produce in order to avert the drawbacks resulting from unfavourable price fluctuation.

Appendix

Table A1. Result for Cointegration Test.

Date: 06/16/14 Time: 12:52				
Sample (adjusted): 1987 2007				
Included observations: 21 after adjustments				
Trend assumption: Linear deterministic trend				
Series: LNQ LNK LNL LNM LNN LNO				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.999517	265.2992	95.75366	0.0000
At most 1 *	0.887457	104.9386	69.81889	0.0000
At most 2 *	0.619834	59.06579	47.85613	0.0031
At most 3 *	0.565363	38.75571	29.79707	0.0036
At most 4 *	0.472229	21.25759	15.49471	0.0060
At most 5 *	0.311454	7.836628	3.841466	0.0051
<i>Trace test indicates 6 cointegrating eqn(s) at the 0.05 level</i>				
<i>* denotes rejection of the hypothesis at the 0.05 level</i>				
<i>**MacKinnon-Haug-Michelis (1999) p-values</i>				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.999517	160.3606	40.07757	0.0001
At most 1 *	0.887457	45.87285	33.87687	0.0012
At most 2	0.619834	20.31008	27.58434	0.3201
At most 3	0.565363	17.49811	21.13162	0.1498
At most 4	0.472229	13.42097	14.26460	0.0676
At most 5 *	0.311454	7.836628	3.841466	0.0051

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table A2. Result for Parsimonious Error Correction Model (ECM) I.

Dependent Variable: D(LNQ)				
Method: Least Squares				
Date: 12/26/14 Time: 12:45				
Sample (adjusted): 1987 2007				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNK)	9.108400*	4.333728	2.101747	0.0619
D(LNL)	207.8818**	73.41815	2.831477	0.0178
D(LNM)	0.410465**	0.142089	2.888800	0.0161
D(LNN)	0.040004	0.036139	1.106955	0.2942
D(LNQ(-1))	0.603313**	0.206228	2.925466	0.0152
D(LNK(-1))	-15.17707**	6.715784	-2.259910	0.0474
D(LNL(-1))	-195.8028**	80.31723	-2.437869	0.0350
D(LNM(-1))	-0.064633	0.108477	-0.595816	0.5645
D(LNN(-1))	0.009408	0.036645	0.256747	0.8026
ECM1(-1)	-0.584437**	0.199727	-2.926187	0.0151
C	0.235580	0.228330	1.031749	0.3265
R-squared	0.776111	Mean dependent var		0.261442
Adjusted R-squared	0.552223	S.D. dependent var		0.184520
S.E. of regression	0.123473	Akaike info criterion		-1.039900
Sum squared resid	0.152457	Schwarz criterion		-0.492769
Log likelihood	21.91895	Hannan-Quinn criter.		-0.921159
F-statistic	3.466505	Durbin-Watson stat		2.614863
Prob(F-statistic)	0.031320			

Note: *** Statistically significant at 1 percent level of significance,
 * Statistically significant at 5 percent level of Significance, * Statistically significant at 10 percent level of Significance
 Source: Author's computation, 2014

Table A3. Result for Parsimonious Error Correction Model (ECM) II.

Dependent Variable: D(PR)				
Method: Least Squares				
Date: 12/26/14 Time: 13:08				
Sample (adjusted): 1987 2007				
Included observations: 21 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNK)	138.2130	193.8827	0.712869	0.4908
D(LNL)	10174.51***	3206.980	3.172613	0.0089
D(LNM)	16.75133**	5.728567	2.924174	0.0138
D(LNN)	1.358701	1.594508	0.852113	0.4123
D(LNK(-1))	-1027.449***	262.3624	-3.916144	0.0024
D(LNL(-1))	-9904.635**	3400.611	-2.912604	0.0141
D(LNM(-1))	-10.84863**	4.207048	-2.578679	0.0257
D(LNN(-1))	-0.365813	1.666685	-0.219485	0.8303
ECM2(-1)	-0.317004**	0.160342	-3.127644	0.0488
C	31.72569	10.57647	2.999648	0.0121
R-squared	0.747937	Mean dependent var		0.847619
Adjusted R-squared	0.541703	S.D. dependent var		8.111327
S.E. of regression	5.491176	Akaike info criterion		6.549916
Sum squared resid	331.6831	Schwarz criterion		7.047307
Log likelihood	-58.77411	Hannan-Quinn criter.		6.657862
F-statistic	3.626649	Durbin-Watson stat		2.817754
Prob(F-statistic)	0.024100			

Note: *** Statistically significant at 1 percent level of significance,
 * Statistically significant at 5 percent level of Significance, * Statistically significant at 10 percent level of Significance
 Source: Author's computation, 2014

References

- [1] Ajuwon, O. S. & Ogwumike, F. O (2013). Uncertainty and foreign direct investment: A case of agriculture in Nigeria. *Mediterranean journal of social sciences*. 4(1), 155-163.
- [2] Deininger, K. & Binswanger, H. P. (1995). Rent Seeking and the Development of Large Scale Agriculture in Kenya, South Africa and Zimbabwe. *Economic Development and Cultural Change*, 1995, 43, (3): 493-522.
- [3] Department for International Development (DFID) (2004). *Agriculture, growth and poverty reduction*, DFID policy paper. London, October.
- [4] Enyim, O. B. (2013). Government spending and poverty reduction in Nigeria's economic growth. *International Journal of Social Sciences and Humanity review*. 4(1),103-115
- [5] Fan, S. (2006). Public investment and poverty reduction: Case studies from Asia and implications for Latin America. Paper presented at seminario internacional santo domingo, República Dominicana.
- [6] Gnansounou, S. U. (2010). *The determinants of private investment in Benin: A panel data analysis*. African Economic Research Consortium (AERC) research paper 209. Nairobi: AERC.
- [7] Grewal, B. & Ahmed, A. (2011). Agriculture and poverty reduction: Literature review and outstanding issues. International workshop on the role of agriculture in poverty reduction. Centre for Strategic Economic Studies Victoria University, Melbourne.
- [8] Gujarati, D. N & Porter, D. C. (2009). *Basic econometrics*. Boston: McGraw-Hill.
- [9] Ijaiya, G. T. & Akanbi S. A. (2009). An empirical analysis of the long run effect of infrastructure on industrialisation in Nigeria. *Journal of International Economic review*. 2(1&2), 135-149.
- [10] International Fund for Agricultural Development (IFAD) (2011a). *Rural poverty report 2011*. Rome: IFAD.
- [11] International Fund for Agricultural Development (IFAD) (2011b). *Agriculture – pathways to prosperity in Asia and the pacific*. Rome: IFAD.
- [12] Kolawole, B. O & Omobitan, O. A. (2014). Raging Poverty and Agricultural Output in Nigeria: An Empirical Investigation *Journal of Economics and Sustainable Development*, 5, (6).
- [13] MacKinnon, J. G. (1991). Critical values for cointegration tests. In chapter 13 in Engle, R. F. & Granger, C. W. J. (eds.) *Long-run economic relationships: readings in cointegration*. Oxford: Oxford University Press.
- [14] MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*, 11, 601-618.
- [15] Mahmoud, M. (2003). *Privatization and poverty reduction in Nigeria*. in *pro-poor growth in Nigeria*. Proceedings at a two-day meeting held in London.
- [16] National Bureau of Statistics (2012). *Poverty profile for Nigeria 2012*. Abuja: NBS.

- [17] Oni, Lawrence Babatunde (2014) An Assessment of Agriculture and Poverty Reduction Nexus in Nigeria, *Journal of African Macroeconomic Review*. 4,(1).
- [18] Odusola, A. E. (1998). Rekindling investment and economic development in Nigeria. *NES Selected paper for the 1998 conference*. 1998.
- [19] Okpe, I. J. & Abu, G. A. (2009). Foreign direct investment and poverty reduction in Nigeria. *Journal of Social Science*. 19(3) 205-211.
- [20] Omigie, O. C., Rahji, M. A. Y., Okoruwa, V. O. & Adeoti A. I. (2013). Linkages amongst government spending, Stock market development and output in Nigeria agriculture. *Asian Journal of Business and Management*. 5(2), 238-251.
- [21] Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly Journal of Economics*. 70(1), 65-94.
- [22] Thomas S. & Canagarajah, T. (2002). Poverty in a wealthy economy: The case of Nigeria. *IMF working paper* no. 02/114: Washington.
- [23] Udabah, S. I. (2000). Productivity and economic growth. *Departmental seminar paper, Department of Economics, Enugu State University of Science and Technology, Enugu, Nigeria*.
- [24] United Nations (2009a). *Rethinking poverty*, United Nations, New York.
- [25] World Bank (2007). *World development report 2008: Agriculture for development*. Washington, DC. World Bank.