

African Research Review

International Multi-Disciplinary Journal
Bahir Dar, Ethiopia

AFRREV Vol. 13 (2), Serial No 54, April, 2019: 64-80

ISSN 1994-9057 (Print) ISSN 2070-0083 (Online)

DOI: <http://dx.doi.org/10.4314/afrev.v13i2.6>

Market Size, Agricultural Reforms and Agricultural Productivity in Nigeria

Ubi, Peter & Udah, Enang

Department of Economics

University of Calabar, Calabar

Cross River State, Nigeria

E-mail: petersamuelubi@gmail.com

Abstract

This paper examined market size, agricultural reforms and agricultural productivity nexus in Nigeria with a view to finding out if market size and agricultural reforms can boost agricultural productivity in Nigeria. The study used time series variables that were estimated based on Autoregressive Distributed Bounds Testing approach (ARDL). The results indicated that market size has the capacity to drive agricultural productivity in Nigeria. In the light of this, reforms aimed at adequately financing agricultural sector by government should be pursued. Government should also continue to evolve reforms towards mobilising the private sector to invest in agriculture.

Key Words: Reforms, Government, incentives and Market

Introduction

Agriculture's positive contributions to the economy were instrumental in sustaining economic growth and stability before and after the discovery of oil in the late 50s. The bulk of agricultural products demand was satisfied from domestic output, thereby removing the need to utilize scarce foreign exchange resources on agricultural imports. Specifically, agriculture employed about 70% of Nigeria's labour force and contributed 60% of the nation's gross domestic product and foreign exchange (Falusi & Olayide, 1980). However, the problems which developed in Nigeria's agricultural sector in early 1970s coincided with the rising fortunes of the petroleum sector. From that period till date, agriculture's contributions to the economy in terms of output growth, employment, foreign exchange earnings and desirable linkages with the rest of the economy became relatively insignificant. As noted by Dim and Ezenekwe (2013), the sectors

share in gross domestic product fell in the post-oil boom period but maintained persistent increase in its contributions to real gross domestic product of 29.2 per cent between 1970 and 1980, 33.3 per cent between 1990 and 2000 and 41.2 per cent between 2001 and 2010 on the average. Though this performance depicts the relevance of the sector in restructuring Nigeria's productive base, evidence from received literature has shown that increase in agricultural output over the years was driven by expansion in cultivated agricultural land rather than increased productivity. This growth pattern that is mainly driven by land expansion is nominal in nature and merely addictive.

From 1970s till date, many agricultural reforms which involved mostly resource allocation have been introduced and include the River Basin Development Authority in 1979, National Accelerated Food Production in 1973, the agricultural concessionary interest rate policy of 60 per cent -120 per cent in 1980, the FADAMA project, to mention but a few. Despite these reforms, agricultural performance has continued to assume a sharp downturn that is much short of overall potential. The low productivity of agriculture is attributed to a host of factors including limited and ineffective market size, inefficient production techniques, agricultural reforms inconsistencies etc. Although there are potentials for economies of scale in the agricultural sector, it can be realized only when market size is sufficiently large and effective. Given that Nigeria has a relatively large domestic market which have expanded beyond a critical size, exploitation of scale economies is ordinarily supposed to set in motion a process of self-sustained growth and increased agricultural productivity. Iganiga and Unemhili, (2011) and Ochigbo, (2012) noted that the 25 per cent or 10 per cent government capital budget/expenditure on agriculture as advocated by Food and Agricultural Organisation (FAO) and in 2003 Maputo declarations respectively has not been achieved by any administration in Nigeria. Evidence suggests that government expenditure as a ratio of overall expenditure fell from 4.6 per cent between 1986 to 1993 to an average of 3.5 percent between 1999 to 2005(CBN, 2006).

This calls for appropriate reforms in the agricultural sector in Nigeria to boost productivity. These reforms combined with the existing domestic market size {(gross national product per capita which indicates economic size) and domestic population (which indicates the extent of demand)} may boost agricultural productivity through the profit maximisation actions of agricultural producers. This raises income per head which feedback by raising demand and increasing market size. These developments lead to further increase in agricultural production and so on with the process becoming cumulative and mutually reinforcing.

Agricultural productivity can be increased if appropriate agricultural reforms as well as the exploitation of scale economies induced by increased market size takes place simultaneously. Thus, the basic question is: Does domestic market size and agricultural reforms impact positively on agricultural productivity in Nigeria?

Literature Review and Theoretical Issues

This poor performance of agriculture in Nigeria has been attributed to a number of factors which include frequent changes in incentives to farmers, changes in agricultural policies/reforms, deteriorating quality of the soil etc. In view of this, increased agricultural productivity has become increasingly more difficult to achieve (Walkenhorst, 2007, Ogwumike & Ozughalu, 2014).

In order to boost agricultural productivity, Nigeria, like most developing economies, has adopted various policies/reforms since independence. These range from protectionism and

excessive government control of economic activity to the movement towards free market economy. The adoption and implementation of these reforms by the Federal government is based on neoclassical economic theorising that “reforms” is capable of putting the economy on the path of sustained economic development. Akpan (1995) stated that these reforms in the agricultural sector are expected to provide an enabling environment for agricultural activities to grow sustainably. This may be the reason why most of the reforms are usually indirectly in the form of increased budgetary allocation or increased incentives (credit) to agriculture.

Olarinde and Abdullahi (2014) employed Vector Autoregressive Model (VAR) to analyze the impact of macroeconomic policy on agricultural output and its implications on food security in Nigeria for the period of 1978 to 2011. The study revealed that macroeconomic policy tends to reduce agricultural output in Nigeria. In the light of this, the study recommended that an expansionary fiscal policy that is not inflationary should be pursued along with a realistic exchange rate that takes account of the prevailing internal macroeconomic environment.

Ojede et al (2013) employed a two-stage procedure to investigate the impact of macroeconomic policy reforms on the agricultural productivity growth of 33 African countries from 1981 to 2001. Their results indicate a strong positive correlation between the extent of SAP intensity and agricultural productivity, suggesting that the macroeconomic policy reforms improved agricultural productivity growth in the sampled countries. Also, Uдах and Obafemi (2011) were concerned with the impact of financial sector reforms on agriculture. They used VAR to analyze the data and the study provided a strong evidence to confirm that the reforms in the financial sector succeeded in deepening the financial system, albeit the success achieved so far is below the threshold needed to spur the development of agriculture. However, they emphasized that it is important to sustain the reform efforts.

Omojimite (2012) used fully modified ordinary least squares to analyse the impact of macroeconomic variables on agricultural growth in Nigeria. The results indicated that the volume of credit to the agricultural sector, deficit financing, income and institutional reforms positively and significantly accounted for innovations in agricultural output for the period studied thus confirming a direct relationship between growth in agricultural output and macroeconomic variables.

Zepda (2001) examined agricultural investment and productivity in developing countries using econometrics models to measure the changes in output and relative contribution of various outputs. This study reveals that reform/policy environment has a positive but insignificant relationship with growth in agricultural output. Zepda, (2001) further concluded that there are implementation leakages which divert benefits to unintended beneficiaries especially those outside agricultural dominated activities. Ugwu and Kanu (2012) carried out a critical examination of the reforms/policies in the agricultural sector and their implementation in Nigeria using non-parametric statistical analysis. Their findings show that policy instability as well as poor implementation constitutes major obstacles to the implementation and achievement of growth in agriculture.

On the other hand, studies lay less emphasis on market size as being necessary in improving agricultural productivity vis-à-vis economic performance. A good performance of the agricultural sector in terms of productivity cannot be completely divorced from the market size as it will provide a platform for effective demand for agricultural products.

However, Oyewole and Philip (2006) stated that in a developed country like USA, population growth could be favourable and in a developing country like Nigeria, it may be dangerous. This

is because in a developed country, increase in population adds to the labour force which in turn leads to increase in aggregate supply and this may further boost per capita GNP growth while in a developing country which is characterized by unemployment, increase in population may reduce aggregate supply and by extension per capita GNP growth. Sunday, Ini-mfon, Glory and Daniel (2012) opined that during the early stage of economic growth, the agrarian population could constitute a large proportion of the home market for both producer as well as consumer goods. A study by Akpaeti (2013) in Nigeria discovered that per capita income is one of the variables that positively and significantly determine agricultural output growth.

From the literature surveyed on reforms and market size, it very obvious that reforms and market size can promote private sector activity in the agricultural sector by removing restrictions in the sector and foster competitive markets that would enhance agricultural productivity. This study is motivated by the fact that in the literature surveyed, none of the Nigerian specific case examines, to the best of our knowledge, the issues of reforms and market size and their relative impact on agricultural productivity.

Theoretically, the augmented Solow growth model whose operational framework is the Cobb-Douglas production function is relevant to this study. The formal augmented neoclassical growth model allows the incorporation of other factors other than the traditional inputs of capital and labour. The simple neoclassical growth model is restrictive in the sense that capital and labour are the only factors of production, whose weight sum up to one. This is as shown below.

$$Y = AK^{\alpha}L^{1-\alpha}.$$

Where Y is output of the economy, A is technological progress assumed to be exogenously determined in the model and L is labour. This type of production function is described as displaying constant returns to scale and this does not approximate real world situation. The real-life situation is that today's productive units tend to display increasing returns to scale. Thus, the theoretical underpinning of this study is the neoclassical growth model. The augmented neoclassical model adopted in this paper allows the inclusion of other variables other than capital and labour.

3. An Overview of Agricultural Reforms/Policies in Nigeria

Nigerian government has over the years introduced some reforms/policies targeted at transforming the agricultural sector from its peasant nature to a market-oriented production. Anyanwu (1997) noted that there had been a number of measures introduced by government in Nigeria to reform the agricultural sector which includes the creation of appropriate institutions and public services designed to improve the economic position of the farmer. The most popular reform instruments to improve agricultural productivity are price, tax and credit incentives, land reform etc. Ojo (1991) opined that these reforms can be grouped into three, viz; those meant to improve the productivity of peasant farmers. The second group contains policy reforms largely aimed at employing modern technologies and the third group consists of the institutional reforms specifically directed at revamping the research, land use, credit, marketing etc. For purpose of this study, these reforms/policies are discussed in line with the historical periods as indicated below.

A) 1970 to 1985 (Pre-SAP Period): This period witnessed massive government intervention in revamping agricultural activities in Nigeria. The reforms/policies are:

- 1) Preferred Sector Allocation of Credit: this was introduced in 1970. Banks were mandated to give 40 per cent of their loans and advances to the agricultural sector.
- 2) National Accelerated Food Production Programme (NAFPP): This was introduced in 1972 and it was included in the second National Development Plan (1970 -1974) of Nigeria. It was a joint programme between the Federal government and United States Agency for International Development (USAID). Its objectives include accelerating and increasing food production.
- 3) Nigerian Agricultural, Co-operative and Rural Development Bank (NACRDB): This was originally set up in 1972 as Nigerian Agricultural and Co-operative Bank (NACB). It was established by Federal government to dispense credit to co-operatives and individual small-holder farmers at a subsidized interest rate.
- 4) Agricultural Development Programme (ADP): This programme was established in 1975. It was a tripartite funding arrangement by World Bank, Federal Government and States government in Nigeria. It was aimed at providing rural roads, farm services, agricultural extension services and credit towards achieving food production. Also, Operation Feed the Nation (OFN) was officially launched in 1976 as part of the third National Development Plan of 1975-1980. The main objective of this policy was to educate the people to embrace agriculture and also eliminate the traditional bias against agriculture.
- 5) Rural Banking Scheme: The monetary authorities started the implementation of this policy in 1977. Banks were persuaded not only to open up branches in rural areas but also to extend 50 per cent of the deposits mobilized from the rural areas as loans and advances to rural dwellers who are mostly farmers.
- 6) Commodity Boards: This was simply the restructuring of the then existing marketing board system for export. This restructuring came into effect in 1977 from regional-oriented boards to those with a national outlook. There were seven of these Commodity Boards, viz: Cocoa, Rubber, Cotton, Groundnut, Grains (for Cereals) Root Crops (for Cassava, Yam and Cocoyam), and Palm Produce (for palm oil and Palm kernel) Commodity Boards. Their establishment was to encourage both the production and marketing of these respective commodities.
- 7) River Basin Development Authority (RBDA): Two River Basin Development Authorities were originally set up in 1973 (Sokoto-Rima and Chad Basin). Later, in 1977, nine RBDAs were established as part of the third National Development Plan to add to the existing ones. The focus of RBDAs is to provide rural water infrastructure for irrigation to encourage all season farming.
- 8) Land Use Decree: The Land Use Decree was promulgated in 1978. It is one of the most sensational institutional reforms in Nigerian agriculture for decades. The decree was intended to reform the land tenure system which was believed to constitute a formidable impediment to the development of large-scale agriculture. The reform is intended to give land owners a sense of security for their land as well as encourage large scale commercial agriculture.
- 9) Agricultural Credit Guarantee Scheme Fund (ACGSF): It was established in 1978. This scheme is concerned with small scale farmers who desire small loans to operate. The scheme is criticized for suffering from bureaucratic red-tapism.

- 10) National Grains Production Company: The company was established in 1979 for the purpose of expanding grain production through giving farmers improved seeds/seedlings as credit.
 - 11) Concessionary Interest Rates: These concessionary interest rates were meant for agricultural loans. The policy was implemented in 1980 as banks were directed to extend credit to the agricultural sector at a regulated rate of 9 per cent per annum.
 - 12) Green Revolution Programme: This programme was initiated in 1980. Its focus is to increase food production through giving credit to farmers and also mobilizing the local people to actively participate in agricultural activities.
- B) 1986 to 1999 (SAP and Post SAP periods):** Ugwu and Kanu (2012) asserted that this period witnessed the production of agricultural policy for Nigeria by the ministry of Agriculture, Water Resources and Rural Development in 1988. This policy is decreed to be operational for the next fifteen years. The reforms/policies are:
- 1) Directorates of Foods, Roads and Rural Infrastructure (DFRRI): It was established in 1986. It was an integrated approach to rural development through increased food production. This approach laid more emphasis on the provision of rural economic infrastructure to boost agricultural production.
 - 2) Nigerian Agricultural Insurance Corporation (NAIC): This Corporation was established in 1987 to provide insurance for all types of agricultural activities especially, farming related activities.
 - 3) National Agricultural Land Development Authority (NALDA): This institution was set up in 1991 to give credit alongside opening up more areas for agricultural production.
 - 4) Community Banking Programme: This programme was created in 1991 to give room for the establishment of community banks with focus on rural banking operations. It was intended to provide the needs of the rural communities in terms of credit to farmers.
 - 5) FADAMA: The programme was designed in 1993. Eze et al (2010) asserted that the programme is meant to promote simple and low-cost improved irrigation technology in agriculture under World Bank financing. The programme empowers the people with resources, training, and technical assistance to efficiently manage the resources for their own development. FADAMA adopts a socially inclusive and participatory process in which all users will collectively identify their development goals and pursue it when assisted.
 - 6) National Poverty Eradication Programme (NAPEP): The programme was established in 1999 by the Federal government. It is basically geared towards providing credit to farmers. The programme has four schemes which are; Youth employment Scheme, Rural Infrastructure Development Scheme, Social Welfare Services Scheme and Resource Development and Conservation Scheme. All these schemes were focused on providing a conducive atmosphere for agricultural production to thrive.
- C) 2000 to 2014 (The Millennium Development Agricultural Policies):** This period witnessed the relocation and merging of agricultural-oriented ministries and development agencies (MDAs) with its mother ministry -Ministry of agriculture. Departments such as department of co-operatives of the Ministry of Labour and its merger with the agricultural co-operatives division of the Ministry of Agriculture, the transfer of the Department of

Rural Development from the Ministry of Water Resources to the Ministry of Agriculture (all before 1999), the scrapping of the erstwhile National Agricultural Land Development Authority (NALDA) and the merging of its functions with the rural development department and the setting up of Projects Coordinating Unit (PCU) and later transformed into the National Food Reserve Agency (NFRA). There was the evolution of new institutions to enable the Nigerian agricultural sector to respond to the emerging dynamic needs of the global economic order (Uche, 2011). The reforms/policies during this period are:

- 1) Root and Tuber Expansion Programme (RETP): This programme was established in 2000. It aims at commercializing root and tuber crop production and by extension improves the income and standard of living of the agrarian poor.
- 2) Small and Medium Enterprise Equity Investment Scheme (SMEEIS). The scheme was initiated in 2001. Their aim is to extend credit facility to small and medium enterprises as well as agro-allied businesses at a single digit rate.
- 3) Refinancing and Rediscounting Facility (RRF): This reform came into force in 2002. Banks that give long term facility to the agricultural sector and are in need of liquidity are availed an amount which is a certain percentage of the outstanding asset portfolio to long term agriculture by CBN at reduced rates.
- 4) Agricultural Credit Support Scheme (ACSS): This scheme was initiated in 2006. The aim of this scheme is to advance credit facility to large agricultural projects to farmers at lower interest rates.
- 5) Large Scale Agricultural Credit Scheme (LASACS). This scheme came into being in 2009. This scheme, just like other schemes was to finance large integrated commercial farm projects. It favours long term borrowing and single digit lending rate.
- 6) Commercial Agricultural Development Programme (CADP): This was introduced in 2009. This programme has the objective of strengthening agricultural production systems and facilitating access to market for targeted value chains small and medium scale commercial farmers in the five participating states of Lagos, Kano, Kaduna, Enugu and Cross River.
- 7) Nigeria Incentive-Based Risk Sharing for Agricultural Lending (NIRSAL): This was launched in 2011. It is an innovative financing mechanism that is demand-driven credit scheme aimed at engendering agricultural industrialization process.
- 8) National Agricultural Transformation Agenda or Agricultural Transformation Action Plan (ATAP). This initiative was launched in 2014. It aimed at the overall development of the agricultural sector by making it an income generating commercial activity.

The Model and Data

As stated in the previous section, the theoretical underpinning of the study is anchored on the neoclassical growth model (Cobb-Douglas production model) which underlines that long run output growth can be achieved by the combinations of capital, labour and an exogenously determined variable termed 'A' or technological progress. In the context of this study, this theory is relevant given that in Nigeria, the most popular reform instruments to improve agricultural productivity are price and tax incentives, provision of credit and land reforms. Thus:

$$Y = f(AK,L) \quad (1)$$

Equation (1) simply states that output (Y, agricultural output GDP ratio) is a function of physical capital (K), labour (L) and technological progress (A). Since A is assumed constant in the model subject to augmentation, Y then becomes a function of K, L and market size (MKS). This relationship can be expressed as

$$Y = F(K, L, MKS) \quad (2)$$

Where MKS = Market size.

The argument in equation two is that output would increase if K, L and MKS are increased. When financial resources available to agro-entrepreneurs are increased through agricultural reforms, part of these increased financial resources would be used to finance variable inputs or operational capital and part used in financing investment expenditures on agriculture and thus increasing production capacity of the agricultural sector. Also, when there is an increase in market size in terms of increased demand as a result of increased per capita income, more of agricultural product will be produced /supplied to meet the increasing demand.

Agricultural reforms in the context of this study would affect public expenditure in agricultural sector, credit to the agricultural sector and labour available for agricultural activities. The market size as used in this study would be captured by domestic GDP (a proxy for income) and domestic population (a proxy for demand) to reflect economic size (income) and (demand) for agricultural goods respectively. In view of this, the model is modified and augmented as:

$$Y = AGDP = F(AGC, REXCH, ATR, GEA, DGDP, DPOP, APA) \quad (3)$$

Where:

Y is as previously defined but AGDP = Agricultural productivity measured by agricultural output GDP ratio

AGC = Credit to the Agricultural sector in millions of Naira (a proxy for capturing agricultural reforms)

REXCH = Real exchange rate

ATR = Annual total rainfall

K = GEA = is captured by public capital which in this study is government expenditure on Agriculture (GEA) in millions of Naira.

DGDP = Domestic GDP in billions of dollars representing world economic size or Income.

DPOP = Domestic population in billions capturing demand

APA = Average World price of Agricultural products (indices, 1985 = 100)

Putting the equation in an econometric form, we have:

$$AGDP = \beta_0 + \beta_1 \ln AGC + \beta_2 \ln REXCH + \beta_3 \ln ATR + \beta_4 \ln GEA + \beta_5 \ln DGDP + \beta_6 \ln DPOP + \beta_7 \ln APA + \Omega_1 \quad (4)$$

All the variables are as previously defined and Ω_1 is the error term of equation 4. It should be noted that the time period of analysis is 1970 to 2015. The sign of all the elasticity coefficients are expected to be positive. The study employs the Autoregressive Distributed Lag (ARDL) model estimation, given its simple computational procedure and its fairly satisfactory results. The time series properties of these variables as specified in the model were investigated using

Augmented-Dickey Fuller test (ADF). All the variables were stationary at first difference except agricultural output and average world price of agricultural products that were integrated of order zero.

A time series data set was obtained from two different sources. The data on population was obtained from world development indicators, 2016 while the data for all other variables were obtained from CBN Statistical Bulletin 2016. Data analysis is carried out using E-Views.

Presentation and Discussion of Results

Table III: Correlation Matrix

	AGDP	AGC	REXCH	ATR	GEA	DGDP	DPOP	APA
AGDP	1.000000	0.558386	0.422304	0.092336	0.482614	0.343886	0.538534	0.686879
AGC	0.558386	1.000000	0.491890	0.061250	0.463215	0.540633	0.532132	0.668470
REXCH	0.422304	0.491890	1.000000	0.355583	0.527527	0.413149	0.589855	0.387545
ATR	0.092336	0.061250	0.355583	1.000000	0.143820	0.144356	0.256977	0.051783
GEA	0.482614	0.463215	0.527527	0.143820	1.000000	0.541532	0.333507	0.481120
DGDP	0.343886	0.540633	0.413149	0.144356	0.541532	1.000000	0.554562	0.240494
DPOP	0.538534	0.532132	0.589855	0.256977	0.333507	0.541532	1.000000	0.309568
APA	0.686879	0.668470	0.387545	0.051783	0.481120	0.240494	0.309568	1.000000

Source: Authors' computation.

The study tested for multi-collinearity by employing the pair wise correlation method. A commonly used rule of thumb is that a correlation coefficient between two explanatory variables greater than 0.8 or 0.9 in absolute value indicates a strong linear association and harmful collinearity. Table III shows that there is a relatively high positive correlation between agricultural productivity and other variables captured in the model. Specifically, the outcome of the test suggests that only a few of the variables have a correlation coefficient slightly above 0.5. However, this can be ignored as the study relies more on the theoretical relationship that is estimated. Moreover, there seems to be no perfect multi-collinearity among the variables.

Table IV shows the results of the unit root test using Augmented Dickey-Fuller (ADF). It reveals that all the variables are integrated of order one (that is I(1) except Agricultural productivity (AGDP) and Average price of agricultural products (APA) that are integrated of order zero, that is I(0). Given this order of integration, ARDL bounds testing approach is appropriate. To establish the long run relationship, the Wald tests based on bounds testing approach is conducted. The results of the bounds test are reported in table V.

Table IV: Augmented Dickey-Fuller (ADF) Test

Variables	ADF Statistics		Remark
	Level	1 st Difference	
AGDP	-2.968050	-	I(0)
WPOP	-1.810506	-3.602491	I(1)
WGDP	-2.278741	-4.065622	I(1)

REXCH	-0.278570	-4.016021	I(1)
GEA	-1.971190	-5.048874	I(1)
AGC	-1.579322	-5.804608	I(1)
ATR	-1.904213	-4.327702	I(1)
APA	-3.114246	-	I(0)

ADF at 5% Level = -2.9303 and ADF at 5% 1st Difference = -2.9320

Source: Computed by the authors.

Table V: Results of the ARDL Bounds Test for Co-integration Unrestricted Intercept and Critical Value Unrestricted Trend

F-statistic	4.167802
P-Value	0.000012
Critical Bounds (5%)*	
Upper Bound	3.15
Lower Bound	2.11
Decision	Co-integration Exist

*Unrestricted Intercept and Unrestricted trend (k=8) from Pesaran et al (2001).

Note: Upper and Lower Bounds critical values are obtained from Table C1.v of Pesaran, Shin and Smith (2001).

From the results in table V, the F-Statistics value calculated (4.16) is greater than the upper-bound critical value of 3.15 at 5 per cent level. Since the F-Statistics value is greater than the upper-bound critical value, the null hypothesis of no co-integration is rejected while the alternative hypothesis of co-integration is accepted. Thus, there is long-run relationship among the variables in the model.

Lag Order Selection Criteria

Endogenous variables: AGDP AGC REXCH ATR GEA DGDP DPOP APA

Included observations: 42

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-5014.646	NA	3.50e+71	186.1045	186.3321	186.1253
1	-4617.076	628.7723	5.69e+64	170.4850	173.4339	171.5724
2	-3535.411	219.4680*	2.67e+62*	165.1158*	102.5871*	167.1509*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

The study used VAR lag length selection criteria to select the lag length. The outcome of the analyses suggests the maximum lag length of two at five percent level of significance.

Table VI: Simple Long-run static OLS Regression Results

Dependent Variable: LOG(AGDP)				
Sample(adjusted): 1972 2014				
Included observations: 42				
Variable	Coefficient	Std. Error	t-Statistic	Prob
LOG(AGC)	0.737476	0.271423	2.717072*	0.0010
REXCH	0.215508	0.107954	1.996294	0.0590
LOG(ATR)	0.500739	0.100354	4.989726*	0.0001
LOG(GEA)	0.141305	0.20605	0.685780	0.1562
LOG(DGDP)	9.562416	1.444106	6.621685*	0.0000
LOG(DPOP)	1.847043	0.932938	1.979813	0.0554
APA	7.044505	1.246105	5.653219*	0.0000
C	6.204196	3.438393	1.804388	0.0795

R-squared = 0.541025; Adjusted R-squared = 0.52114; F =19.0113; D.W. =2.24112. Note: *significant at 5 per cent.

Source: Authors' computation.

Based on table VI, the long-run elasticity of agricultural productivity (AGDP) with respect to market size is positive. Specifically, the long-run impact of income (DGDP) and population (DPOP) on agricultural productivity is positive and indicates that a one percent increase in the value of DGDP would increase agricultural productivity by 9.562416 per cent, all things being equal. Similarly, the long-run impact of population (DPOP) and real exchange rate (REXCH) on agricultural productivity is positive and reveals that a one per cent increase in the value of these variables would increase agricultural productivity by 1.847043 per cent and 0.215508 per cent respectively. Also, the impact of credit to the agricultural sector (AGC), annual total rainfall, government expenditure on agriculture (GEA) and average price of agricultural products (APA) on agricultural productivity is positive, thus conforming to economic theoretical expectations. Despite the positive impact of market size variables, only income has a statistically significant impact at 5 per cent significant level. The implication of this result is that income is the only significant market size variables that significantly impact on the performance of agriculture in Nigeria. This result gives credence to the fact that market size has the potential to contribute to output growth in Nigeria's agricultural sector.

The adjusted R² shows that about 52 per cent of the total variation in agricultural productivity is determined by changes in the explanatory variables. Thus, it is a good fit. The F-statistics (19.011) indicates that all the variables are jointly statistically significant at 5 per cent level. The Durbin Watson statistics of 2.24 reveals that it is within the acceptable bounds, thus it is good for policy analysis.

The next step is to analyse the short-run dynamic impact of the independent variables on agricultural productivity. Short-run dynamics of the equilibrium relationship are obtained through the error correction model and the results are presented in table VII.

Table VII reports the results of short-run dynamics of credit to the agricultural sector (AGC), real exchange rate (REXCH), average total rainfall (ATR), government expenditure on the agricultural sector (GEA), market size (income and population), average price of agricultural products (APA) and agricultural productivity in Nigeria. Given this result, the value of GEA, ATR, DGDP, DPOP and APA have significant positive impact on agricultural productivity in

Nigeria while AGC and past year REXCH have insignificant positive and significant negative impact on agricultural productivity respectively. The significant negative impact of real exchange rate on agricultural productivity in Nigeria is not out of place and is in line with economic theoretical expectations. This result may not be unconnected with the fact that a high real exchange rate may hinder the inflow of agricultural inputs into Nigeria over time, thus reducing agricultural productivity. Also, the positive impact of ATR, DGDG and APA corresponds to the long-run result. Thus, a one percent increase in the value of ATR, DGDG and APA would lead to 0.028320, 2.435118 and 0.009194 per cent increase in agricultural productivity respectively.

The negative and statistically significant estimate of ECM validates the established long-run relationship among the variables in the model. The results also indicate that the estimated ECM is 0.348610 and is statistically significant at 5 per cent level. This implies that about 34 per cent of deviations from long-run equilibrium are corrected for in one year. The adjusted R-squared indicates that 79 per cent of the total variation in the dependent variable (AGDP) is explained by the independent variables. This is a good fit. The F-statistic (41.99) reveals that all the variables are jointly statistically significant at 5 per cent level.

Table VII: Dynamic Short-run Results

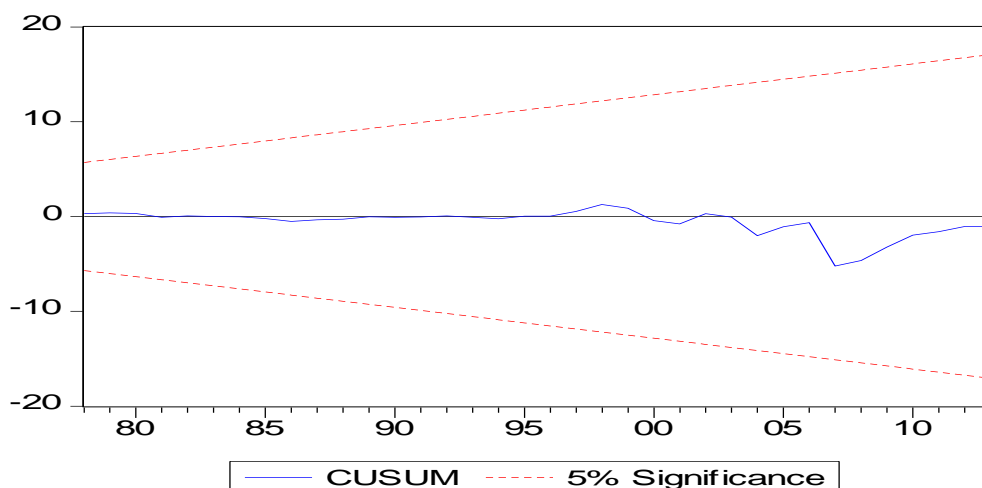
Dependent Variable: LOG(AGDP)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(AGDP(-1))	0.126417	0.043647	2.896369	0.0010
D(LOG(AGC))	0.007786	0.006016	1.294190	0.1987
D(REXCH(-2))	-0.217170	0.054261	-4.002343	0.0001
D(LOG(WGDP))	2.435118	0.258615	9.415996	0.0000
D(LOG(GEA(-1)))	0.034192	0.049541	0.690175	0.1435
LOG(WPOP)	0.279472	0.117580	2.376866	0.0015
LOG(APA)	0.009194	0.003243	2.835567	0.0012
LOG(APA(-1))	0.176123	0.036060	4.884124	0.0000
D(LOG(ATR))	0.028320	0.008724	3.246217	0.0020
D(LOG(ATR(-1)))	0.022109	0.032272	0.067654	0.9469
ECM(-1)	-0.348610	0.008546	-4.078836	0.0000
C	0.182329	0.192408	0.947620	0.3681
R-squared	0.815741	F-statistic		41.99677
Adjusted R-squared	0.797713	Prob(F-statistic)		0.000000
Durbin-Watson stat	2.074039			

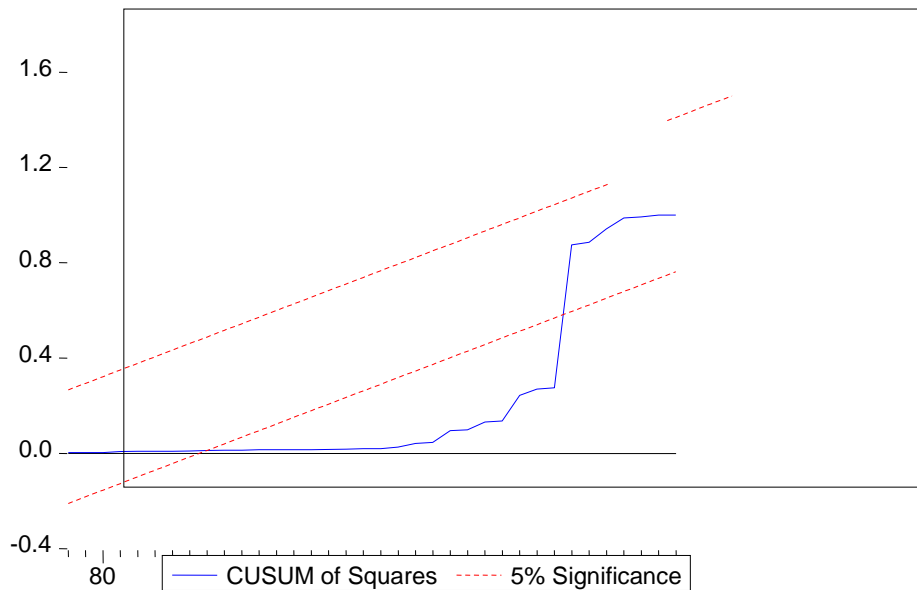
Source: Authors' computation.

Post Estimation Test

The test for stability of the short-run model using the CUSUM and CUSUM of squares as shown in figure 1 reveals that the error correction model is stable since the recursive residual falls within the 5 per cent critical bounds. The stability tests show that the bound testing cointegration approach offers strong results with regard to the yearly data.

Figure I: CUSUM and CUSUM square tests





The existence of the long-run relationships demands an investigation into the extent of causality between the independent and dependent variables. Thus, Granger causality test as shown in table VIII was estimated. Table VIII shows rejection of the null hypotheses that AGC, EXCHR, ATR, ATM, GEA, DGDP, DPOP and APA do not Granger cause AGDP. This implies that there is a unidirectional relationship running from these independent variables to agricultural productivity. Interestingly, all the variables of agricultural productivity cause AGDP. From this analysis, there is a clear indication of the relative positive impact of market size on agricultural output in Nigeria.

Table VIII: Granger Causality results

Null Hypothesis	Lags	Obs	F-Statistics	Probability
AGC does not Granger Cause AGDP	2	43	13.9865	0.00000
AGDP does not Granger Cause AGC			1.24122	0.55794
EXCHR does not Granger Cause AGDP	2	43	3.28454	0.00716
AGDP does not Granger Cause EXCHR			1.31445	0.28087
ATR does not Granger Cause AGDP	2	43	3.22412	0.00089
AGDP does not Granger Cause ATR			1.91160	0.84551
GEA does not Granger Cause AGDP	2	43	11.0698	0.00000
AGDP does not Granger Cause GEA			1.61724	0.98274
WGDP does not Granger Cause AGDP	2	43	4.80585	0.00185
AGDP does not Granger Cause WGDP			0.73750	0.48503
WPOP does not Granger Cause AGDP	2	43	2.53356	0.09271
AGDP does not Granger Cause WPOP			0.76414	0.47276
APA does not Granger Cause AGDP	2	43	3.31943	0.00076
AGDP does not Granger Cause APA			0.92962	0.40349

Source: Computed by the authors.

Discussion of Results

The simple ARDL result shows that the coefficient of credit to the agricultural sector is statistically significant and positively signed specifically in the long run result. This strongly underscores the relative importance of credit to the agricultural sector in the determination of agricultural performance in Nigeria. This result further supports the reasoning of Ogwumike and Ozughalu (2014) who stated that reforms in the agricultural sector are expected to provide an enabling environment for agricultural activities to thrive thereby spurring productivity growth. These reforms may be in the form of credit incentives to the agricultural sector.

Also, the coefficient of average world price of agricultural products (APA) is positive and significant. It confirms the fact that the average world price of agricultural product can trigger improved agricultural productivity if it is favourable to agricultural producers. Thus, a higher price may strengthen the need for increased agricultural output in Nigeria. The coefficient of government expenditure on agriculture (GEA) impacts insignificantly on agricultural productivity in Nigeria. This is not surprising given the low level of government expenditure on agriculture as earlier observed by Ochigbo (2012). Perhaps, this may be the reason why Olarinde and Abdullahi (2014) advocated for expansionary fiscal policy as one of the strategies to enhance agricultural productivity in Nigeria...

Domestic income (DGDP) is significantly positive in the long run and short run results. This outcome further supports Ojede, Amin, and Daigyo (2013) and Eyo (2008) who posited that macro-economic variables (income) can improve agricultural productivity. This is more so given the fact that increase in income can provide ready market for agricultural products and by so doing, it may engender higher productivity in that sector.

From the results, it is very obvious that the coefficient of population (DPOP, which measures demand) in the estimate is positively significant in the short-run. This suggests that population is a critical determinant of agricultural productivity in Nigeria. This implies that as the population's demand for agricultural product increases, agricultural productivity would increase. This result is at variance with the thinking of Oyewole and Philip (2006) who stressed that in a developing country which is characterized by unemployment and poverty, increase in population may reduce aggregate supply and by extension per capita GNP growth, all of which can lead to a fall in demand. In a nutshell, the result is an indication that macro-economic reforms and market size are capable of improving agricultural productivity in the long run.

Conclusion

The uniqueness of this study lies in the fact that it is based on an extended data point estimated with simple ARDL. It should be noted that most of the variables included in the model to capture reforms and market size were not only correctly signed but were also statistically significant. This clearly re-emphasizes the fact that reforms and market size are potent macroeconomic variables that could be taken into account when formulating policies to boost agricultural productivity in Nigeria. A major policy implication of this result is that increasing expenditure on the sector is a necessity so as to increase productivity. Government should continue to evolve reforms toward mobilizing the private sector to invest in agricultural activities. This can be achieved through appropriate provision of incentives for investments in the agricultural sector.

References

- Akpaeti, A. J., Umoh, G. S. (2013). Farm resource productivity in conflict communities: Evidence from the Niger Delta region, Nigeria, *Sky Journal of Agricultural Research*. 2(3):28 – 39.
- Akpan, O. E. (1995). The state of the Nigerian agricultural economy (1960-1994) and agenda for policy action. *Ecojournal: Journal of Economics*, 1(1) 94-98. A publication of Economics Department, University of Calabar.
- Anyanwu, J. C., Oyefusi, A., Oaikhena, H. & Dimowo, F. A. (1997). *The structure of the Nigerian economy (1960-1997)*. Onitsha: Joanee Educational Publisher Ltd.
- CBN (2006). *The agricultural credit guarantee scheme fund (ACGSF): Guidelines and operations*. Abuja: CBN.
- Dim, C. & Ezenekwe, U. (2013). Does agriculture matter for economic development? Empirical evidence from Nigeria. *Journal of Economics and Finance*, Vol. 1, 61-77.
- Eyo, E.O. (2008). Macroeconomic environment and agricultural sector growth in Nigeria. *World Journal of Agricultural Science*. 4(6): 781-786
- Eze, C. C., Lemchi, J. I., Ugochukwu, A. I., Eze, V. C., Awulonu, C. A. O., Okon, A. X. (2010). Agricultural financing policies and rural development in Nigeria. A paper presented at the 84th Annual Conference of the Agricultural Economics Society, Edinburgh. 29th to 31st March 2010
- Falusi, A. O. & Olajide, B. W.s (1980). Nigeria fertilizer Sector: Present situation and future prospects. International fertilizer development centre, *Technical Bulletin (T18)*, Muscle Shoals.
- Iganiga, B. O. & Unemhilin, D. O. (2011). Impact of federal government agricultural expenditure on agriculture output in Nigeria. *Journal of Economics*, Vol.2(2), 81-88
- Memon, M. H., Baig, W. S., & Ali, M. (2008). Causal relationship between exports and agricultural GDP in Pakistan *MPRA Papers No.11845*. Available at <http://mpa.ub.uni-muenchen.de/11845/>.
- Ochigbo, F. (2012). Nigeria's agricultural budget under 10 per cent. *The Nation Newspaper*, Nigeria. www.thenationonline.net/2011/business. Retrieved on 20/3/16.
- Ogwumike, F. O. & Ozughalu, U. M. (2014). Institutional reforms, credit incentives and agricultural sector Performance in Nigeria. *The Nigerian Journal of Economic and Social Studies*, 56(1), 37-59.
- Ojede, A., Amin, M., Daigyo, S. (2013). Macroeconomic policy reforms and productivity growth in African agriculture. *Journal of Contemporary Policy* Vol. 31 No. 4, 814-830.
- Ojo, M. O. (1991). The effectiveness of agricultural policies on Nigeria's economic development. In John, E., Udo, N. & Akpan, H. E. (eds.) *The Nigerian Economy at the Crossroads: Policies and their effectiveness*. University of Calabar Press. Calabar, Nigeria. Chapter 3, 33 - 60
- Olarinde, M. O. & Abdulahi, H. (2014). Macroeconomic policy and agricultural output in Nigeria: Implications for food security. *American Journal of Economics*, 4(2): 99-113

- Omojimate, E. (2012). Institution, macroeconomic policy and agricultural output in Nigeria. *Global Journal of Human Social Science* Volume 12 Issue, 1-8.
- Oyewole, O B & Phillip, B (2006). Agro-food chains and sustainable livelihood – A case study of cassava marketing in Nigeria. In Ruben, R., Slingerland, M. & Nijhoff, N. (eds.) *Agro-food chains and networks for development*. Chapter 9, 107 -115. The Netherlands: Springer Publications
- Sunday, B., Ini-mfon, V., Glory, E. & Daniel, E. (2012). Agricultural productivity and macro-economic variables fluctuation in Nigeria. *International Journal of Economics and Finance*; Vol. 4, No. 8, 114-135.
- Uche, I. P. (2011). *Impact of agricultural policies on Nigerian economy*. A published Thesis Submitted to the Department of Public Administration and Local Government, Faculty of Social Sciences, University of Nigeria, Nsukka. University of Nigeria Nsukka Virtual Library
- Udah, E. B. & Obafemi, N. F. (2011). Impact of financial sector reforms on agricultural and manufacturing sectors in Nigeria: An empirical investigation. *European Scientific Journal* Vol.8, No 17, 1857-7881
- Ugwu, D. S. & Kanu, I. O. (2012). Effects of agricultural reforms on the agricultural sector in Nigeria. *Journal of African Studies and Development* Vol. 4(2), 51-59.
- Walkenhorst, P. (2007). Distortions to agricultural incentives in Nigeria. *MPRA Paper No. 10055*.
- Zepeda, L. (2001). Agricultural investment, production capacity and Productivity. *FAO economic and social development paper no 148*
<http://www.fao.org/docrep/003/x9447e/x9447e00.htm>.