AGRICULTURAL SECTOR OUTPUT AND ECONOMIC GROWTH SUSTAINABILITY IN NIGERIA

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ABSTRACT: *This study examined the impact of agricultural sector output on economic growth and sustainability in Nigeria. The data for the study were extracted from the Central Bank of Nigeria (CBN) Statistical Bulletin. The methodology adopted in the research is linear regression with the application of the Ordinary Least Squares (OLS) Technique. The E-views 10 was the econometric software used for the research. The major findings of the study reveal that agricultural output contributes negatively and insignificantly to economic growth, government agricultural expenditures contribute negatively and insignificantly to economic growth, rainfall contributes negatively and insignificantly to economic growth and foreign direct investment in the agricultural sector contributes negatively and insignificantly to economic growth. It is therefore the recommendation of this paper that the government of Nigeria should encourage farmers by giving soft loans for agricultural activities. This will help farmers meet with financial needs in terms of purchasing some seeds, hiring machines, etc. thereby boosting massive agricultural production in Nigeria.*

KEYWORDS: Agriculture, Economic Growth, Sustainability

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INTRODUCTION

The imperativeness of agriculture is underscored by the fact that below a certain level of nutrition, man lacks not only body energy and sound health but also lacks interest in many things. He cannot think, function, and rise significantly beyond animal existence and congenital infantilism. Food is fundamental because it is a necessity one cannot do without it (Anyaoha, 2019). Similarly, a greater proportion of the population, about two-thirds of the total labor force of the nation (Nigeria), depends on the sector for their livelihood. Also, the rural economy in particular is propelled by agriculture (Benson, 2019). It is the main source of food for most of the population and also the dominant economic activity in terms of employment and linkages with other sectors of the economy; serving as a major source of raw materials for the agro-allied industries (Moses, 2012).

In common parlance, agriculture has been defined as the production of food and livestock and the purposeful tendering of plants and animals. Thus, agriculture is the mainstay of many economies and it is fundamental to the socio-economic development of a nation. This is because it is a major element and factor in national development. The role of agriculture in transforming the economic framework of any economy cannot be overemphasized given that it is the source of food for man and animals and provides raw materials for the industrial sector. Thus, it plays a significant role in the reduction of poverty (Odoh, 2018).

Over the years in Nigeria, the agricultural sector has been contributing to the Gross Domestic Product (GDP). In 1981, the agricultural sector's contribution to GDP was ₦23.80 billion, which increased to ₦50.29 billion in 1987. This increase was maintained even from 1987 to 1990 which was ₦106.63 billion. This increase was also tremendous in the millennium years (2000s). Figure one below shows that the contribution of the agricultural sector to GDP has been on the nominal increase. This is demonstrated in the curve sloping upwards from left to right.

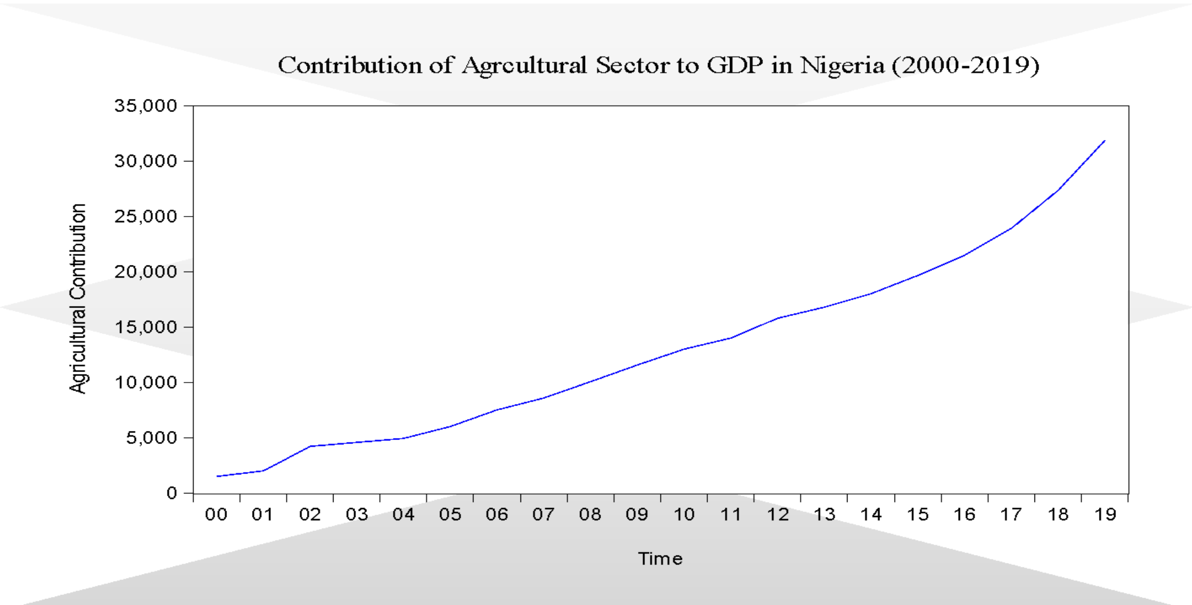

Figure 1:

Source: *Data extracted from CBN bulletin, 2020 and graphed with Eviews 10.*

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The figure shows that even during the millennium years, the contribution of the agricultural sector has been progressive. This demonstrates the significance of this sector to Nigeria. Hence, Abayomi (2017) noted that stagnation in agriculture is the principal explanation for poor economic performance, while rising agricultural productivity has been the most important concomitant of successful industrialization. Generally, the sector contributes to the development of an economy in four major ways-product contribution, factor contribution, market contribution and foreign exchange contribution (Simon, 2016). In realization of this, the government has embarked on various policies and programmes aimed at strengthening the sector to continue performing its roles, as well as measures for combating poverty.

The essence of this research is to ascertain the impact of agricultural sector output on economic growth in Nigeria. In Nigeria, agriculture is disaggregated into four distinct dimensions, namely: crop production, livestock, forestry and fishing. This research is motivated to ascertain how each of these dimensions impacts economic growth in Nigeria. One of the basic parameters to measure economic development in a developing economy like Nigeria is real gross domestic product. The behavior of the real GDP is a close reflection of the state of development experienced by a country (especially developing economies). Figure 2 shows that the rate of real gross domestic product has been expansive.

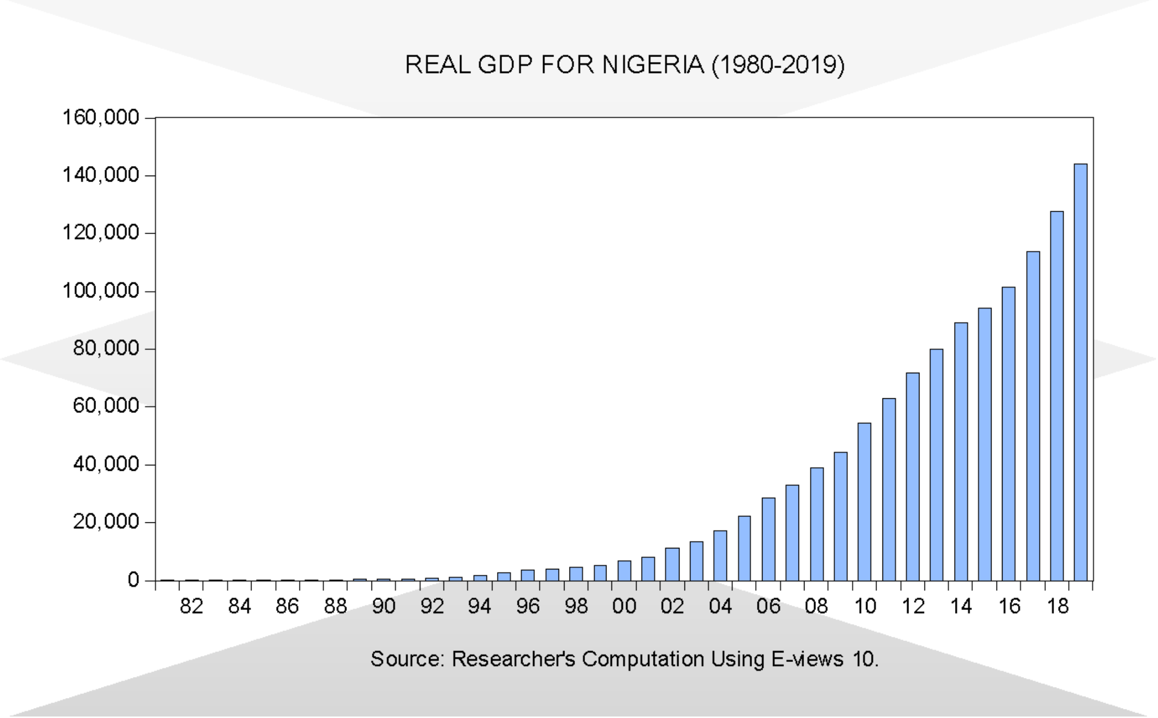

Figure 2

Source: *Data extracted from CBN bulletin, 2019 and graphed with Eviews 10.*

Figure 2 clearly shows that Nigeria's real gross domestic product has been on an increasing path. One begins to wonder whether agricultural output has a positive or negative effect on the economic growth and development of Nigeria for the years under analysis. It is based on the foregoing that this paper is aimed at carrying out an empirical investigation on the impact of agricultural sector output on the economic development of Nigeria covering the period 1981-

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2020. Nigeria, at independence, was an agrarian economy, feeding and generating income from the products of agriculture and exporting her surplus output to other countries of the world. The major reason was that Nigeria gave much attention to this important sector and also is highly bestowed with fertile soil that is conducive for varieties of crop production and other forms of agricultural practices. Agriculture has been the mainstay of the Nigerian economy as it has contributed greatly to the aggregate gross domestic product. Agriculture sustained the Nigerian economy at independence.

Despite Nigeria's rich arable land which favors increased agricultural production, the agricultural sector is still growing at a very slow rate. Only a little over half of the country's agricultural land is under cultivation (Manyong, 2015), hence contributing to the dwindling performance of agriculture in the country. The government has over many years formulated and implemented various policies and projects aimed at putting back the agricultural sector to its vital place in the economy. The researcher, however, suspects that rainfall or water provision has not been part of policy considerations when discussing or implementing agricultural policies. This study therefore suspects rainfall or alternative prioritization becomes the missing link to other studies estimated.

LITERATURE REVIEW

The Concept of Agriculture Output

Conceptually, agriculture is the production of food, feed, fiber and other goods by the systematic growing and harvesting of plants and animals. It is the science of making use of the land to raise plants and animals. It is the simplification of nature’s food webs and the rechannelling of energy for human planting and animal consumption (Akinboyo, 2018). Agriculture involves the cultivation of land, raising and rearing of animals, for the purpose of production of food for man, feed for animals and raw materials for industries. It involves forestry, fishing, processing and marketing of these agricultural products. Essentially, it is composed of crop production, livestock, forestry, and fishing. The role of agriculture in reforming both the social and economic framework of an economy cannot be over-emphasized. It is a source of food and raw materials for the industrial sector. It is also essential for the expansion of employment opportunity, for reduction of poverty and improvement of income contribution, for speeding up industrialization and easing the pressure on balance of payment (Moses, 2012).

According to Fulginiti and Perrin (2018), agricultural productivity refers to the output produced by a given level of inputs in the agricultural sector of a given economy. More formally, it can be defined as “the ratio of value of total farm outputs to the value of total inputs used in farm production”. Agricultural productivity is measured as the ratio of final output, in appropriate units to some measure of inputs. Kumar and Manimannan (2018) suggested that “yield per unit” should be considered to indicate agricultural productivity. Many scholars criticized this suggestion pointing out that it considered only land as the factor of production with no other factors of production. Therefore, other scholars suggested that agricultural productivity should contain all the factors of production, such as labor, farming experiences, fertilizers, availability and management of water and other biological factors.

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Anayo (2017) defines agriculture as the science of making use of the land to raise plants and animals. It is the simplification of nature's food webs and the rechanneling of energy for human planting and animal consumption. Until the exploitation of oil reserves began in the 1980s, Nigeria's economy was largely dependent on agriculture. Nigeria's wide range of climate variations allows it to produce a variety of food and cash crops.

Agricultural productivity therefore refers to the increase in per capita output of agricultural produce within an economy during a given period of time. It can be monthly, quarterly or annually. Most economists and statisticians tend to use the latter (annual trends) due to its precise and articulate information it tends to offer. The output of agricultural products tends to fluctuate over a period of time thereby necessitating the need for it to be studied or monitored closely. In the process of carrying out this research study, agricultural productivity would be looked at in two forms namely: an increase in the per-capita output of agricultural produce and a decrease in the per-capita output of agricultural produce. When the per-capita output of agricultural produce in a given year is greater than that of the previous year we say there is an increase and vice-versa.

Theoretical Literature

Solow Model of Growth

The Solow growth model propounded by Robert Solow (1956) who belongs to the neoclassical school of thought believes that a sustained increase in capital investments increases the growth rate only temporarily, because the ratio of capital to labor goes up. He further posits that the marginal product of additional units is assumed to decline and thus an economy eventually moves back to a long term growth-path with the real GDP growing at the same rate as the growth of the workforce plus factor to reflect improving productivity. The Solow model believes that to raise an economy's long term trend rate of growth requires an increase in labor supply and also a higher level of productivity of labor and capital. Differences in the rate of technological change between countries are said to explain much of the variation in growth rates.

Endogenous Growth Theory

The endogenous growth by Solow (1970) asserts that productivity improvements can be attributed directly to a faster pace of innovation and extra investment in human capital. They stress the need for government and private sector institutions to encourage innovation and provide incentives for individuals and businesses to be inventive. There is also a central role of the accumulation of knowledge as a determinant of growth i.e. knowledge industries such as telecommunication, electronics, software, or biotechnology are becoming increasingly important in developed countries.

Harrod Domar Growth Model

Harrod-Domar (1926) opined that economic growth is achieved when more investment leads to more growth. The theory is based on a linear production function with output given by capital stock (K) times a constant. Investment according to the theory generates income and also augments the productive capacity of the economy by increasing the capital stock. In as much as there is net investment, real income, and output continue to expand. And, for a full employment equilibrium level of income and output to be maintained, both real income and

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output should expand at the same rate as the productive capacity of the capital stock. The theory maintained that for the economy to maintain full employment, in the long run, net investment must increase continuously as well as growth in the real income at a rate sufficient enough to maintain full capacity use of a growing stock of capital. This implies that a net addition to the capital stock in the form of new investment will go a long way to increase the flow of national income. From the theory, the national savings ratio is assumed to be a fixed proportion of national output and that total investment is determined by the level of total national income.

Empirical Literature

Olabanji, Fakile and Emmanuel (2017) examined the long-run relationship between agricultural output and economic growth in Nigeria for the period 1981 to 2014 using time series data. Results from Johansen's maximum likelihood cointegration approach and Vector error correction model support evidence of a long-run relationship between agricultural output and economic growth in Nigeria. Granger causality test also confirms the cointegration results indicating the existence of causality between agricultural output and economic growth in Nigeria. The nature of the causality however depends on the variable used to measure Agricultural output. The paper therefore recommends that the government should further strengthen agricultural policies in the area of funding, storage facilities, and market access to enhance agricultural production. Policy Strategies that will make agriculture more profitable and attractive, and less laborious with improved technology should be adopted and promoted to attract investors and the youths back to agriculture.

Abula and Ben (2016) examined the impact of agricultural output on economic development in Nigeria using annual time series data spanning 1986 to 2014. Economic development proxied by per capita income (PCI) was explained by agricultural output (AOUT) and public agricultural expenditure (PXA). The study employed the Augmented Dickey-Fuller Unit Root test and the Vector Autoregressive model. The result of the multivariate VAR model indicated that most of the lags of the variables are not significant. However, the high level of the R^2 and F values in the VAR regression estimates for PCI gave convincing results that collectively all the lagged terms are statistically significant, implying that agriculture plays an important role in Nigeria’s economic development. The variance decomposition analysis revealed that the greater contribution to shocks in economic development apart from feedback shocks was received from shocks to agriculture. The results of the impulse response function in support of the variance decomposition analysis showed that per capita income responded positively to shocks in agricultural output throughout the ten years, while the response of PCI to shocks in PXA was negative in the first two year period but became positive throughout the last eight periods.

Ideba, Iniobong, Otu and Itoro (2014) investigated the relationship between agricultural public capital expenditure and economic growth in Nigeria over the period 1961 to 2010 using annual data obtained from the Central Bank of Nigeria. The data were analyzed using Augmented Dickey-Fuller test, Johansen maximum likelihood test, and Granger Causality test. The result of the Johansen cointegration test showed that there exists a long-run relationship between all the explanatory variables and the explained variable. The result of the parsimonious error correction model showed that agricultural public capital expenditure had a positive impact on economic growth. Also, the Granger Causality test showed a unidirectional relationship between agricultural public capital expenditure and agricultural economic growth. This means that agricultural economic growth does not cause expansion of agricultural public capital

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expenditure; rather it indicates that agricultural public capital expenditure raises the nation's agricultural economic growth. This investigation did not emphasize policy adjustment as a factor needed to promote economic growth.

Bakare (2013) examined the relationship between sustainable agriculture and rural development in Nigeria. Vector Auto Regression analytical technique (VAR) was employed for the empirical study. The a priori expectation is that sustainable agriculture will impact positively on rural development in Nigeria. The findings of the study show that the past values of agricultural output could be used to predict the future behavior of rural development in Nigeria. The main conclusion of this study was that while agriculture remains dominant in the Nigerian economy, it is unsustainable; the food supply does not provide adequate nutrients at affordable prices for the average citizen and rural development is deteriorating. The findings and the conclusion of the study suggested the need for policy makers to promote agriculture to a sustainable level by driving rural development.

Odetola and Etumnu (2013) investigated the contribution of the agriculture sector to the economic growth in Nigeria using the growth accounting framework and time series data from 1960 to 2011. The study found that the agricultural sector has contributed positively and consistently to the economic growth in Nigeria, reaffirming the sector's importance in the economy. The contribution of agriculture to economic growth is further affirmed from a causality test which showed that agricultural growth Granger-causes GDP growth, however no reverse relationship was found. The resilient nature of the sector is evident in its ability to recover more quickly than other sectors from shocks resulting from disruptive events e.g. civil war (1967-70) and economic recession (1981-85) periods. The study also found that the crop production sub sector contributes the most to agricultural sector growth and that growth in the agriculture sector is overly dependent on growth of the crop production subsector. This indicates the importance of this subsector and probably, lack of attention or investment to the other subsectors.

METHODOLOGY

Research Design

This study adopted the *ex-post facto* design as the researcher made use of past data in the form of secondary data to investigate the impact of agricultural sector output on economic growth in Nigeria. *Ex-post facto* research is chosen as a suitable research design for this work because the dataset obtained for analysis were wholly secondary data, which cannot be manipulated.

Model Specification

The model that will guide this study is specified thus:

$$RGDP = \beta_0 + \beta_1 AGO + \beta_2 GAGEXP + \beta_3 RF + \beta_4 FDIA + \mu \qquad (3.1)$$

Where;

GDP = Gross Domestic Product (Economic Growth)

AGO = Agricultural Sector Output

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GAGEXP = Government Agricultural Sector Expenditures

RF = Rainfall Frequency (Measured in Millimeters)

FDIA = Foreign Direct investment in Agricultural Sector

$\beta' s =$ The Parameters of the independent variables to be estimated.

μ = Stochastic Error Term

Unit Root/Stationarity Test

This will be used to test whether a variable's mean value and variance varies over time. It is necessary in time series variables in order to avoid the problem of spurious regression. The Augmented Dickey Fuller (ADF) test will be used for the analysis. Augmented Dickey-Fuller (ADF) test is used to test existence of unit root when there is autocorrelation in the series and lagged terms of the dependent variable are included in the equation. The following three models represent pure random walk, random walk with drift and random walk with drift and trend used in Augmented Dickey Fuller tests:

$$\Delta\psi_t = \Omega\psi_{t-1} + \sum_{i=1}^{p}\beta_i\Delta\psi_{t-1} + \varepsilon_t$$

$$\Delta\psi_t = \alpha_0 + \Omega\psi_{t-1} + \sum_{i=1}^{p}\beta_i\Delta\psi_{t-i} + \varepsilon_t$$

$$\Delta\psi_t = \alpha_0 + \Omega\Psi + \beta_2 t + \sum_{i=1}^{p}\beta_i\Delta\psi_{t-1} + \varepsilon_t$$

where: $\Omega = (\lambda - 1)$ The null hypothesis is $\mathrm{H}_0 : \Omega = 0$ and the alternative hypothesis is $\mathrm{H}_a : \Omega < 0$ If the ADF test statistic (t-statistic of lagged dependent variable) is less than the critical value, we reject the null hypothesis and conclude that the series is stationary (there is no unit root).

Co-integration Test

In an econometric analysis, there is the need to estimate the long-run relationship of the variables under consideration. This will be applied to the concept of Cointegration test. One of the most popular tests for cointegration has been suggested by Engel and Granger (1987). The process is demonstrated thus; given a multiple regression: $y_t = \beta' x_t + \mu_t, t = 1,...,T,$ where $x_t = (x_{1t}, x_{2t},..., x_{kt})'$ is the k-dimensional I(1) regressors. For y_t and x_t to be cointegrated, μ_t must be I(0). Otherwise it is spurious. Thus, a basic idea is to test whether μ_t is I(0) or I(1).

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Error Correction Model (ECM)

The error correction analysis is an econometric analysis carried out if the variables under investigation are seen to be cointegrated. The Error Correction Mechanism (ECM) will be used to estimate the speed of adjustment of the short-run dynamics of the variables and timing to long run convergence. The ECM is given by the equation: $\Delta RGDP = \beta_0 + \beta_1 \Delta AGO + \beta_2 \Delta GAGEXP + \beta_3 \Delta RF + \beta_4 \Delta FDIA + ECM_{t-1} + \mu$

Where Δ = First Difference Operator

Granger Causality Model

The Granger causality model is a statistical technique that was carried out in the direction of causality existing between the dependent variables and the specified independent variables. The Granger causality model was specified thus:

$$RGDP = \beta + \sum_{i}^{n} \eta_i RGDP + \sum_{i=1}^{n} \gamma_i AGO_{t-i} + \sum_{i=1}^{n} \gamma_i GAEXP_{t-i} + \sum_{i=1}^{n} \gamma_i RF_{t-i} + \sum_{i=1}^{n} \gamma_i FDIA_{t-i} + \Omega . AGO$$

$$= \phi + \sum_{i}^{n} \theta_i AGO_{t-i} + \sum_{i}^{n} \vartheta_i RGDP_{t-i} + \sum_{i=1}^{n} \gamma_i GAEXP_{t-i} + \sum_{i}^{n} \eta_i RF_{t-i} + \sum_{i}^{n} \eta_i FDIA_{t-i} + \psi GAEXP$$

$$= \beta + \sum_{i=1}^{n} \gamma_i GAEXP_{t-i} + \sum_{i}^{n} \theta_i RGDP_{t-i} + \sum_{i}^{n} \vartheta_i AGO_{t-i} + \sum_{i}^{n} \eta_i RF_{t-i} + \sum_{i}^{n} \eta_i FDIA_{t-i} + \mu RF$$

$$= \beta + \sum_{i=1}^{n} \gamma_i RF_{t-i} + \sum_{i}^{n} \theta_i RDGP_{t-i} + \sum_{i}^{n} \vartheta_i AGO_{t-i} + \sum_{i=1}^{n} \gamma_i GAEXP_{t-i} + \sum_{i=1}^{n} \gamma_i FDIA_{t-i} + \mu$$

$$FDIA = \beta + \sum_{i=1}^{n} \gamma_i FDIA_{t-i} + \sum_{i}^{n} \theta_i RDGP_{t-i} + \sum_{i}^{n} \vartheta_i AGO_{t-i} + \sum_{i=1}^{n} \gamma_i GAEXP_{t-i} + \sum_{i=1}^{n} \gamma_i RF_{t-i} + \mu$$

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Decision Rule

If the probability value of an estimated Granger causality is less than 0.05, we reject the null hypothesis and conclude that a Granger causality exists while if the probability value is greater than 0.05, we accept the null hypothesis and conclude that there exists no causality relationship among the variables.

Data Sources

The data required in this research are time series data on aggregate agricultural output, growth rate of gross domestic product, government expenditure on agricultural sector, rainfall statistics and foreign direct investment in the agricultural sector covering the period 1981-2020. They will be sourced from the central bank of Nigeria Statistical Bulletin, 2020 edition and World Development Index (WDI) 2020.

PRESENTATION AND ANALYSIS OF RESULTS

Empirical Results

Time series data are often assumed to be non-stationary and thus, it is necessary to perform unit root tests to ensure that the data are stationary. The test was employed to avoid the problem of spurious regression. Therefore, the Augmented Dickey-Fuller (ADF) unit root test was used to determine the stationarity of the data to complement each other. The decision rule based on the ADF test is that its statistic must be greater than Mackinnon Critical Value at 5% level of significance and in absolute terms. The results of the unit-root test are reported in table 4.1 below.

Unit-Root Test Result

Table 4.1: *Unit Root Test Result*

VARIABLE	ADF STAT.	CRITICAL VAL.	ORDER
RGDP	-3.124337	-1.949856	I(1)
AGO	-4.661449	-1.949856	I(1)
GAGEXP	-6.978566	-2.943427	I(1)
FR	-7.297295	-1.950117	I(1)
FDIA	-4.640726	-1.949856	I(1)

Source: *Author's Computation Using Eviews 10.*

Table 4.1 clearly shows that all the variables are stationary at first difference (I(1)). This means that the variables have unit-root until differences in the first order.

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Optimal Lag Selection

Table 4.2

VAR Lag Order Selection Criteria
Endogenous variables: RGDP AGO GAGEXP RF FDIA
Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1142.303	NA	5.90e+20	62.01635	62.23404	62.09310
1	-974.2102	281.6682*	2.62e+17*	54.28163*	55.58778*	54.74211*
2	-961.3318	18.09937	5.45e+17	54.93685	57.33146	55.78107
3	-933.8790	31.16259	5.90e+17	54.80427	58.28734	56.03222

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

The first step in estimating an econometric model is to select the optimum lag length for the analysis. Selecting a lag length arbitrarily may lead to estimates that are biased and inconsistent. As seen from table 4.2, it can be clearly seen the lag length with the highest priority is lag one. Hence, the analysis will be anchored on lag one.

4.3 Cointegration Analysis (Johansen Methodology)

Table 4.3: Cointegration Test Result

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.578564	85.08512	69.81889	0.0019
At most 1 *	0.414215	52.24981	47.85613	0.0183

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At most 2 *	0.341343	31.92729	29.79707	0.0280
At most 3 *	0.256347	16.06030	15.49471	0.0411
At most 4 *	0.118789	4.805427	3.841466	0.0284

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

Source: *Researcher's Computation Using Eviews*

The Johansen method of cointegration was used for the study because all the variables are stationary at first difference. The Johansen result as displayed in table 4.3 clearly shows evidence of cointegration as trace statistics test indicates 5 cointegrating equations. Here we reject the null hypothesis of no cointegration meaning that there exists a long-run relationship existing between the variables (RGDP, AGO, GAGEXP, RF, FDIA) under study. Given this, we can now run the unrestricted Vector Autoregression which is the Vector Error Correction Model (VECM).

Vector Error Correction Mechanism (VECM)

Table 4.4

Cointegrating Eq:	CointEq1
RGDP(-1)	1.000000
AGO(-1)	-0.002390 (0.00025) [-9.40331]
GAGEXP(-1)	-0.142399 (0.04068) [-3.50024]
RF(-1)	-0.000301 (0.00013) [-2.25736]
FDIA(-1)	0.033641 (0.00368) [9.15183]
C	-0.336385

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Error Correction:	D(RGDP)	D(AGO)	D(GAGEXP)	D(RF)	D(FDIA)
CointEq1	0.002374	-149.8193	-0.101171	54.68292	-13.24836
	(0.00764)	(19.7818)	(0.90555)	(298.417)	(7.04359)
	[0.31072]	[-7.57361]	[-0.11172]	[0.18324]	[-1.88091]
D(RGDP(-1))	0.674197	-1450.052	13.21300	-2416.246	125.9615
	(0.20826)	(539.151)	(24.6808)	(8133.33)	(191.973)
	[3.23730]	[-2.68951]	[0.53536]	[-0.29708]	[0.65614]
D(RGDP(-2))	0.551995	-1279.419	-55.01271	-3193.553	21.81578
	(0.58244)	(1507.84)	(69.0246)	(22746.4)	(536.889)
	[0.94774]	[-0.84851]	[-0.79700]	[-0.14040]	[0.04063]
D(AGO(-1))	-5.078705	-0.274729	0.000515	0.169817	-0.053981
	(7.1E-05)	(0.18292)	(0.00837)	(2.75943)	(0.06513)
	[-0.71792]	[-1.50191]	[0.06155]	[0.06154]	[-0.82880]
D(AGO(-2))	1.793205	-0.410570	0.004942	0.362109	-0.039602
	(6.3E-05)	(0.16304)	(0.00746)	(2.45954)	(0.05805)
	[0.28412]	[-2.51821]	[0.66216]	[0.14723]	[-0.68217]
D(GAGEXP(-1))	-0.000187	-19.62519	-0.612466	0.933711	-3.304024
	(0.00184)	(4.75315)	(0.21759)	(71.7034)	(1.69243)
	[-0.10164]	[-4.12888]	[-2.81483]	[0.01302]	[-1.95224]
D(GAGEXP(-2))	0.000328	-21.82882	-0.368937	10.11692	-1.604617
	(0.00176)	(4.55248)	(0.20840)	(68.6762)	(1.62098)
	[0.18655]	[-4.79493]	[-1.77033]	[0.14731]	[-0.98991]
D(RF(-1))	-3.186506	-0.038844	-0.000117	-0.676460	-0.002408
	(5.2E-06)	(0.01351)	(0.00062)	(0.20383)	(0.00481)
	[-0.60866]	[-2.87478]	[-0.18919]	[-3.31869]	[-0.50050]
D(RF(-2))	3.820006	-0.018401	-2.10E-05	-0.332687	-0.001001
	(5.0E-06)	(0.01285)	(0.00059)	(0.19385)	(0.00458)
	[0.76987]	[-1.43200]	[-0.03574]	[-1.71620]	[-0.21870]
D(FDIA(-1))	-0.000203	3.477623	-0.002087	-0.344964	0.411562
	(0.00025)	(0.64813)	(0.02967)	(9.77732)	(0.23078)
	[-0.81099]	[5.36563]	[-0.07033]	[-0.03528]	[1.78338]
D(FDIA(-2))	-0.000508	3.965001	-0.001362	-3.477779	-0.197283
	(0.00028)	(0.71732)	(0.03284)	(10.8211)	(0.25541)
	[-1.83429]	[5.52751]	[-0.04149]	[-0.32139]	[-0.77241]

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C	0.018748	1407.958	1.498426	-115.6788	107.1769
	(0.07442)	(192.658)	(8.81936)	(2906.34)	(68.5989)
	[0.25193]	[7.30805]	[0.16990]	[-0.03980]	[1.56237]
R-squared	0.716234	0.947881	0.349114	0.351575	0.418721
Adj. R-squared	0.591376	0.924948	0.062724	0.066268	0.162958
Sum sq. resids	0.458468	3072716.	6439.028	6.99E+08	389565.7
S.E. equation	0.135420	350.5833	16.04871	5288.704	124.8304
F-statistic	5.736423	41.33336	1.219015	1.232271	1.637144
Log likelihood	28.72876	-262.0531	-147.9462	-362.4611	-223.8453
Akaike AIC	-0.904257	14.81368	8.645741	20.24114	12.74840
Schwarz SC	-0.381798	15.33614	9.168201	20.76360	13.27086
Mean dependent	-0.005502	1005.887	1.873627	2.430297	33.12735
S.D. dependent	0.211847	1279.705	16.57702	5473.161	136.4416

Determinant resid covariance (dof adj.)	1.27E+17
Determinant resid covariance	1.79E+16
Log likelihood	-954.8135
Akaike information criterion	55.12505
Schwarz criterion	57.95504

Source: *Researcher's Computation Using Eviews 10*

From table 4.4, it can be clearly seen that the numerical coefficient of agriculture output (AGO) yielded a negative value at the magnitude of -5.078705. This entails that agricultural output contributes negatively to economic growth for the period under analysis. Hence, a 1% increase in agricultural output reduces economic growth by -5.078705. This practically entails that agricultural output is not contributing positively to economic growth in Nigeria. This is clearly because the agricultural sector is not performing optimally.

Government expenditure to the agricultural sector (GAEXP) yielded a negative numerical coefficient at the magnitude of -0.000187. This entails that government agricultural expenditure contributes negatively to economic growth in Nigeria. It entails that a 1% increase in government agricultural spending yields a 0.000187% decrease in economic growth.

Rainfall (RF) contributes negatively to economic growth in Nigeria as the numerical coefficient yielded -3.186506. This entails that rainfall does not contribute positively to economic growth in Nigeria. Hence, rainfall is not sufficient enough to improve economic growth and productivity.

Foreign direct investment on the agricultural sector (FDIA) yielded a negative numerical value (-0.000203). This entails that foreign investment in the agricultural sector does not lead to a positive increase in economic growth in Nigeria for the period under analysis. This does not also conform to economic a priori expectations.

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The R-squared value yielded 0.716234 which is more than 60%. This means that the explanatory power of the independent variables is high. It practically entails that variations in the dependent variable are explained by changes in the independent variable by approximately 72%. This shows the model has good fitness.

The F-statistics is a statistical tool employed in checking statistical significance of the entire regression plane. From the regression, it can be clearly seen that the probability value of the F-statistics yielded 5.736423. This means that the test is statistically significant at the entire regression plane.

Diagnostic Tests

Block-Wald Causality Test

Table 4.6

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 04/01/22 Time: 00:34
Sample: 1981 2020
Included observations: 37

Dependent variable: D(RGDP)

Excluded	Chi-sq	df	Prob.
D(AGO)	0.666826	2	0.7165
D(GAGEXP)	0.034819	2	0.9827
D(RF)	0.641086	2	0.7258
D(FDIA)	3.435581	2	0.1795
All	15.58704	8	0.0487

Source: *Researcher's Computation Using Eviews*

From table 4.6, it can be clearly seen that the Chi-Square probability of AGO yielded 0.7165 > 0.05. This entails that agricultural output (AGO) does not have any causal effect on RGDP. The table also reveals that GAGEXP does have any causal effect on economic growth because its Chi-Square probability yielded 0.9827 > 0.05. The Chi-Square probability of rainfall (RF) yielded 0.7258 > 0.05. This entails that RF does not have a causal effect on RGDP. From the table, we can conclude that FDIA does not have a causal effect on RGDP because its Chi-Square probability yielded 0.1795 > 0.05. Jointly, AGO, GAGEXP, RF and FDIA have short-run causal effects on RGDP.

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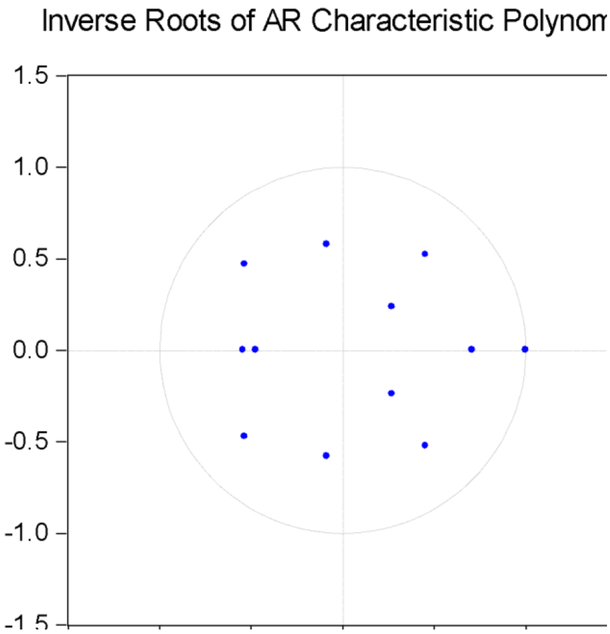
Model Stability (AR Unit-Circle)

Table 4.7



Source: *Researcher's Computation Using Eviews*

There is a need to carry out a stability diagnostic to make sure the model is dynamically stable. The condition for stability is that no inverse root dot should be outside the unit circle. Judging from the inverse roots of the AR characteristic polynomial, the model is stable as no dot lies outside the enclave of the unit circle.

Serial Correlation Test

Table 4.8

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.100195	Prob. F(2,22)	0.3201
Obs*R-squared	6.223502	Prob. Chi-Square(2)	0.2302

Source: *Researcher's Computation Using Eviews 10.*

The serial correlation test was carried out to ascertain the presence of serial correlation in our model. However, it is recalled that the null hypothesis states that there is no serial correlation. Based on the serial correlation test, it can be clearly seen that the probability of Chi-Square yielded 0.2302 > 0.05. This entails the acceptance of the null hypothesis and we therefore conclude that there is no evidence of serial correlation in our residuals.

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Heteroscedasticity Test (Breusch-Pagan-Godfrey)

Table 4.9

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.324963	Prob. F(15,20)	0.5803
Obs*R-squared	13.34488	Prob. Chi-Square(15)	0.8810
Scaled explained SS	16.36427	Prob. Chi-Square(15)	0.6968

Source: *Researcher's Computation Using Eviews 10*

The heteroscedasticity test was carried out to ascertain the presence of homoscedasticity in our model. The probability of the Chi-Square yielded 0.8810 > 0.05 and this means that there is no evidence of heteroscedasticity in our residuals. This is good and desirable.

Normality Test (Jaque-Berra)

Table 4.10

Component	Skewness	Chi-sq	df	Prob.
1	-3.669511	85.28029	1	0.0000
2	-0.389658	0.961610	1	0.3268
3	1.032298	6.749044	1	0.0094
4	1.061511	7.136440	1	0.0076
Joint		100.1274	4	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	20.15820	466.1392	1	0.0000
2	3.337493	0.180344	1	0.6711
3	4.714106	4.652086	1	0.0310
4	7.986682	39.37275	1	0.0000
Joint		510.3444	4	0.0000

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Component	Jarque-Bera	Df	Prob.
1	551.4195	2	0.0000
2	1.141953	2	0.5650
3	11.40113	2	0.0033
4	46.50919	2	0.0000
Joint	610.4718	8	0.0000

Source: *Researcher's Computation Using Eviews 10.*

The VEC normality test was carried out to ascertain if the residuals are normally distributed. The joint probability value of the Jarque-Bera yielded 0.0000 which is obviously less than 0.05. This compels us to accept the null hypothesis of normal distribution. Hence, we conclude that the residuals are normally distributed.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary of Findings

This study has been able to estimate the impact of agricultural output on economic sustainability in Nigeria covering the period 1981-2020. In the course of the study, data for the study was collected from the Central Bank of Nigeria (CBN) statistical bulletin, 2020. The linear regression with the application of Ordinary Least Squares (OLS) was used and the major findings of the study are as follows:

1. Agricultural output contributes negatively and insignificantly to economic growth.

2. Government agricultural expenditures contribute negatively and insignificantly to economic growth.

3. Rainfall contributes negatively and insignificantly to economic growth.

4. Foreign direct investment on the agricultural sector contributes negatively and insignificantly to economic growth.

Conclusion

The study has been able to carry out an empirical analysis of the impact of agricultural output on economic sustainability in Nigeria ranging from 1981-2020. In the course of the research, it was discovered that agricultural components have a negative and insignificant impact on economic growth in Nigeria for the period under analysis. The conclusion drawn from this

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study is that Nigeria is yet to build and develop its agricultural sector. This is a reflection of the low budgetary allocation to the agricultural sector over the years. The discovery of oil is indeed a disadvantage to the agricultural sector of Nigeria.

Recommendations

Based on the findings of the study, the following recommendations are recommended:

1. The study discovered that agricultural output contributes negatively but insignificantly to economic growth. Hence the government of Nigeria should encourage farmers by giving soft loans for agricultural activities. This will help farmers meet up with financial needs in terms of purchasing some seeds, hiring machines, etc thereby boosting massive agricultural production in Nigeria.

2. In the course of the study, it was also discovered that government agricultural expenditures contribute negatively but insignificantly to economic growth. Hence; for government agricultural expenditure to exhibit the desired results in the economy, government expenditure needs to be closely monitored. This will help ensure that agricultural budget allocations are channeled into the required targets that will help improve the economy.

3. Instead of relying entirely on rainfall, Non-Governmental Organizations (NGOs), and Private Public Partnership (PPP) mechanisms, should provide farmers with drip irrigation systems to deliver water directly to a plant’s roots, and hence reduce the evaporation that happens with spray watering systems.

4. It was discovered in the course of the study that foreign direct investment on the agricultural sector contributes negatively but insignificantly to economic growth. The need to attract FDI into Nigeria's economy cannot be over-emphasized. Massive investment for the provision of power is needed to achieve this growth.

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