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Effect of Public and Private Financing on Agricultural Output in Nigeria

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Abstract
This paper evaluated the effect of public and private financing on agricultural output in Nigeria. Data were collected from the CBN Statistical Bulletin and the World Development Indicator. The period of study spanned from 1981 to 2020. In the study, Agricultural output was proxied by agriculture's ratio to GDP, public financing was proxied by Agricultural Credit Guarantee Scheme Fund and Federal Government's budgetary share to the agricultural sector (Recurrent Expenditure) while private financing was proxied by loans disbursed to agriculture by commercial banks. To analyse the objectives, Auto Regressive Distributed Lags Bounds Test was used to test for the long run relationship while Error Correction Method was used to analyse the short-term association. Granger Causality was used to check the causal correlation between agricultural financing and agricultural output. The results showed that loans granted to agriculture by commercial banks and Agricultural Credit Guarantee Scheme Fund had a positive and significant influence on agricultural output while agricultural output can be said to granger cause government expenditure on agriculture. Therefore, the study concluded that public and private financing had a significant effect on agricultural output. From the findings recorded, recommendations were made for the government to boost its budgetary allocation to agriculture and make policies to bolster the agricultural credit guarantee scheme while encouraging private sector/ commercial bank lending to the agricultural sector.

Keywords: Agricultural Finance, Agricultural Output, Agricultural Gross Domestic Product, ARDL bounds test, Granger causality.

1.0 Introduction

Agriculture serves as the backbone and a primary means of income for majority of households in the country and plays an important role in Nigeria's economy (Ayeomoni & Aladejana, 2016). Being a developing economy, Nigeria possesses vast arable land and favorable agricultural climate which allows for diverse agricultural production including crop, fishery, livestock, forestry products (Ewetan *et al*., 2017). Nigeria has about 71 million hectares of agriculture land area, with the main crops being cassava, beans, guinea corn, maize, millet, rice and yam (Food and Agricultural Organization, 2021). Agricultural products possess industrial value and significant export potential, which in turn enhance farmers' income and benefit various economic actors engaged in processing and marketing. In addition, these resources act as primary raw materials for various industries and make a substantial contribution to the nation's foreign exchange earnings (Orji *et al*., 2019).

Nigeria's agricultural industry is classified into four primary sectors namely; livestock, forestry, crop production and fishing. Crop production represents the sector's largest segment and contributes around 88% of total output; with other sectors contribute for the remaining 12%. Agriculture also remains one of the largest and most crucial sector in the country contributing an average of 24% to Nigeria's GDP from 2013 to 2019. Furthermore, it is the most significant employer of labour in the country, engaging over 36% of the nation's labor force (Oyaniran & Omomia, 2018).

Agriculture in Nigeria faces many challenges including limited financing which has affected its productivity despite its contribution to the

economy. This challenge in line with other problems such as insufficient adoption of irrigation farming, increased impact of climate change on food production, limited technological advancements, high production costs, inadequate distribution of inputs, substantial post-harvest losses, and inadequate access to markets have hampered agricultural productivity, ultimately impacting agriculture's contribution to the GDP (FAO, 2021). Insufficient financing has had a significant constraint on agricultural output and production in many developing economies and this has resulted in the use of outdated and inefficient agricultural equipment in developing nations.

In the case of Nigeria, inadequate funding and ineffective management have contributed to the underperformance of the agriculture in Nigeria (Orji *et al*., 2014). Given the capital-intensive nature of large-scale agriculture, proper financing is crucial for achieving the desired growth by enabling upgrades, repairs, replacements, and acquisitions of modern equipment (Obudah & Tombofa, 2016). According to Nigeria's budgetary allocation, agricultural financing has fallen short of public expectation in Nigeria (Nevin *et al*., 2019). Out of a N16.9 trillion budget, N291.4 billion was allotted to agriculture in 2022. This represents under 2% of aggregate government yearly spending consumption and is considerably lower in relation to other countries such as Kenya and Brazil at 6% and 18% respectively. It is also a substantial disparity from the recommended benchmark established in July 2003 at the Maputo declaration by the Comprehensive African Agriculture Development Program (CAADP) which calls for agriculture to receive 10% of the annual budget (Ali *et al*., 2016).

In 2019, just 4.2% of commercial bank loans was granted to the agricultural industry. In contrast, services received about 37 percent, oil and gas received 22 percent, and manufacturing received approximately 15 percent (NBS, 2019). These figures indicate that agriculture is largely neglected in terms of formal financial support and recent statistics indicate that farmers in Nigeria represent the largest segment of financially excluded individuals with a recorded exclusion rate of 37.6% (EFINA, 2017; Fowowe, 2020). All these observed development raises questions as to whether all these initiatives targeted at financing agriculture has really had any impact on agricultural productivity. It is against this background that this study is designed to determine the effect of public and private funding on agricultural output in Nigeria and investigate the causal correlation between agricultural funding and agricultural output in Nigeria.

2.0 Conceptual Framework

2.1 Concept of agricultural output

Agricultural output is the value derived from diverse agricultural activities, such as livestock rearing, crop production, forestry, fishing (Muftaudeen & Hussainatu, 2014). It is also the value of agricultural products, which are available for export and consumption (Ewetan *et al*., 2017). According to Francis (2013) as cited in Ibitomi & Ijaiya (2020) and (Eno & Eze, 2023), cash crops refer to crops cultivated for profitable sales, such as cocoa, coffee, cotton, oil palm, fruit trees, rubber, and sugarcane. On the other hand, food crops are agricultural products cultivated for the purpose of consumption, intended for either commercial trade or personal use by the farmer. These include cereals, legumes, vegetables, tubers, fruits, and other varieties, and are cultivated across all regions of the country. Livestock refers to animals that are domesticated and reared for a variety of purposes, including meat, eggs, milk, fur and leather (Obasi, 2015). This category includes animals such as cattle, goats, sheep, poultry, and many others. Fisheries involve the management of aquatic resources including fish for the purpose of food production, while forestry entails the sustainable management and utilization of natural resources associated with forestlands (Obilor, 2013).

2.2 Concept of agricultural financing

Finance in agriculture pertains to the aspect of agriculture that centers on obtaining and utilizing financial resources by individual farm units. It involves obtaining and utilizing capital, which is a crucial factor in agricultural production (Tandan, 2012). According to Mbutor *et al*. (2013), agricultural finance deals with the demand and supply of money in agriculture. In the perspective of (Kersten *et al*., 2017), agricultural financing involves providing various financial products, such

as subsidized loans, guarantees, grants, priority-lending regulation, and overdraft facilities, specifically for agricultural purposes. The purpose of short-term credit is to fund operating expenses whereas intermediate-term loan is employed for the acquisition of farm equipment and machinery. Long-term loan is mostly utilized for the construction of farm building and houses (Adebayo & Adeola, 2008).

2.3 Contribution of agriculture to GDP

Agriculture holds a crucial position in the economies of African nations, making substantial contributions to the continent's GDP and employment rates. It accounts for approximately 32% of Africa's GDP and the livelihoods of over two-thirds of the population depend on agricultural activities. During independence, Nigeria's economy was mainly agrarian, with agriculture accounting for 63.8% of GDP. However, agriculture's contribution to GDP has declined over time. For instance, the share of agricultural output in total output, which stood at 63.8% in 1960, fell to 24.14% in 2020 (Central Bank of Nigeria, 2019). Post-independence, agriculture contributed around 40% to Ghana's GDP and employs around 55% of the working population. Ghana has achieved an average annual growth rate exceeding 5% in the past decade, positioning it among the top five performers globally. Agriculture represents approximately 50% of the nation's revenue from exports and is the major source of income and livelihood particularly for rural communities (Atakli & Agbenyo, 2020).

Mwesigye *et al*., (2017) noted that agriculture makes up about 25% of Uganda's GDP, while Ethiopia witnessed exceptional growth between 2005 and 2014, characterized by an average agricultural sector growth rate of 9.5%. This remarkable achievement was primarily attributed to the increased public spending and investment in agriculture. Agriculture is significant in India's economy and contributes around 17% to the total GDP thereby providing employment for more than 60% of the population. Despite undergoing a significant decline from 30% in 1990- 1991 to approximately 15% in 2011-2012, the agricultural sector remains a key pillar of the economy in Indian (Mishra & Bhandari, 2013; Tyagi, 2012). Likewise, agriculture's contribution to the total GDP in Bangladesh was 70.0% in 1950, but it declined to 20.6% in 2009 (Anam & Hossain, 2012). In Uzbekistan, the agricultural sector accounts for approximately 29% of the GDP (Tadjibaeva, 2013).

2.2 Sources of Agricultural Financing in Nigeria

2.2.1 Self-financing

According to (Aryeetey & Udry, 1995; Adetiloye, 2012), this is where a farmer invests in acquiring farm equipment, improved seedlings, and other inputs like fertilizers or decides to reinvest his savings in either a new agricultural project or the expansion of an existing one. However, this process of saving and reinvestment is gradual and influenced by various economic and fiscal factors. It is commonly associated with small-scale farmers and suitable for subsistence farming. In addition to self-financing and formal sources, farmers also rely on other sources such as friends and family for funding. Therefore, the growth of the informal financial sector can be attributed to the financial assistance provided by various farmer groups such as cooperatives.

2.2.2 Government expenditure

Government expenditure refers to the funds disbursed from the annual budgetary allocation of a country across various sectors of the economy to attain economic growth. Specifically, government expenditure on agriculture denotes the total resources allocated to agriculture from the yearly budgetary allocation. These funds aim to enhance output by supporting activities such as crop and livestock production, seedling procurement, purchase of inputs, as well as agricultural research and development (Anderu & Omotayo, 2020).

2.2.3 Other government sources

2.2.3.1Agricultural credit guarantee scheme fund (ACGSF)

The ACGSF was established in 1977 and commenced operations in April 1978. The ACGSF provides financing to farmers residing in rural areas with the aim of fostering sustainable growth and empowering them financially within the agricultural sector (Olaitan, 2006). The loans borrowed to farmers by banks are guaranteed by

the Fund up to 75% of the amount in default, net of any security realized. The CBN oversees the operations and fund management of the scheme. It also establishes the eligibility criteria for farmers seeking access to the funds (CBN, 2010). By June 2012, the scheme effectively offered guarantees for agricultural loans valued at approximately 55 billion naira, benefiting a total of 770,438 farmers and projects (Mbutor *et al*., 2013).

2.2.3.3Commercial agricultural credit scheme (CACS)

The Federal Ministry of Agriculture and Rural Development and the CBN collaborated to establish the CACS in 2009. The Debt Management Office, under the Federal Government, raised 200 billion naira through bonds to finance the program. The objective of the scheme is to support the entire agricultural value chain and it achieves this by giving finance to commercial farmers at a maximum of 9% interest rate, thereby facilitating the expansion of commercial agricultural enterprises in Nigeria (Mbutor *et al*., 2013). The bank's goal was to increase food production by stabilizing price in the country and reducing inflationary pressures as inflation could be lowered by increasing the amount of food supply thereby reducing the prices of agricultural goods and services (CBN 2009).

2.2.3.4Nigeria incentive-based risk sharing system for agricultural lending (NIRSAL)

NIRSAL was introduced in 2011 by the CBN. To kick-start its operations, the CBN allocated N75 billion and authorized a 75% guarantee on loans disbursed by Deposit Money Banks (DMBs) to farmers nationwide, including all 36 states and the FCT as part of its collective efforts to bring about a transformation in the agricultural sector. The scheme was mobilized to offer financial support for Nigerian agribusiness in the value chain such as farmers, input producers, processors, dealers and manufacturing companies by using credit guarantees to mitigate the risks linked with default in repayment (CBN, 2011; Mbutor *et al*., 2013)

2.2.3.5Anchor borrowers' programme (ABP)

The aim of the program was to provide a link between processing companies in agriculture and smallholder farmers of major agricultural commodities. Since its establishment in 2015, the programme has helped about 3.8 million farmers, with a total of $1.422 billion distributed to beneficiaries since its commencement.

2.2.4 Private funding

2.2.4.1Commercial banks

According to (Solanke, 2007) as cited by (Emenuga, 2019), A commercial bank is a privately owned financial institution that accepts deposits from customers and utilizes them to provide loans to borrowers With their credit policies, commercial banks act as growth catalysts for many sectors of the economy (Akpansung & Gidigbi, 2014). Traditionally, commercial banks have played a crucial role in offering financial support to the agricultural sector. They extend loans and credit advances to farmers, guided by the principles of profitability, liquidity, and solvency. Various factors influence their lending decisions, including prevailing interest rates, deposit volumes, domestic and foreign investments, liquidity ratios, as well as factors like prestige and public recognition (Olokoyo & Ogunnaike, 2011). These factors influence the decision-making process of banks and perform a crucial role in determining the availability and conditions of loans extended to borrowers

2.2.4.2Foreign direct investment

FDI is considered a long-term investment made by a foreigner or an entity with the intention of gaining ownership and control over a company located in a different economy (Rotjanapan, 2005). FDI involves investing in and acquiring a lasting stake in an enterprise that operates outside the investor's own country, as defined by the United Nations Conference on Trade and Development (UNCTAD, 2002).

2.2.4.3D*evelopment *partners funding

Development Partners like the Alliance for a Green Revolution in Africa (AGRA), African Development Bank (AfDB), Food and Agriculture Organization (FAO), and the Department of International Development (DFID) have significantly contributed to promoting agricultural sector growth. Over the years, they have provided financial investments for capacity development, policy formulation and implementation, advancements in farming techniques and best practices, as well as increased

agricultural output. Their contributions have significantly contributed to the advancement of the agricultural sector (Oyaniran and Onomia, 2018).

2.2.5 Other sources

2.2.5.1Crowd-funding

Crowd funding in Nigeria is in its developing stage and has huge potentials. Start-up farms like Farmcrowdy and Thrive Agric began by enabling individuals invest in farming through technology-enabled platforms. However, this form of financing has come with challenges such as the inability of such farms and start-ups to pay back the guaranteed return on investment to investors due to the high risk of agribusiness (Balana et al., 2023)

2.2.5.2 Technology-enabledcommodity exchange

The introduction of technology-enabled commodity exchanges seeks to address farmers' challenges related to aggregation, storage, financial inclusion, and access to a reliable market for both farmers and buyers. This innovative concept, if effectively utilized, has the potential to bring about a significant revolution in the Agribusiness value chain, especially in the post-harvest stage. AFEX Commodities Exchange Limited is leading the way in driving this transformative movement.

2.3 Theoretical Review

2.3.1 Keynesian theory of public expenditure

According to the Keynesian economic theory, expenditure by the government can have a positive influence on industrial growth within the economy including the agricultural sector. Increasing government expenditure is believed to generate multiplier effects on aggregate demand, leading to higher employment, profitability, and investment. Keynes believes that public expenditures can foster and stimulate economic growth. This school of thought also believed that government intervention would help correct market failures. In contrast to the idea that increasing savings alone would be beneficial, Keynes emphasizes the significance of spending. By increasing public spending, individuals gain purchasing power, leading to increased production by producers. This, in turn, generates more employment opportunities for people. This concept is known as the multiplier effect, which establishes a causal relationship from public expenditure to national income (Keynes, 1936). This theory is relevant to agricultural output since it illustrates how the government improves agricultural growth sector by its spending on the sector.

2.3.2 Commercial loan theory

This concept highlights the importance of commercial banks providing short-term loans specifically to financially sound enterprises, with a focus on ensuring that the loans can be repaid through self-liquidation. A loan is categorized as self-liquidating when the proceeds generated from the business transaction can be used to repay the loan (Jhingan, 2004). As business expands or contracts and trade volume increases or decreases, the Central Bank adjusts bank reserves by rediscounting approved loans. In line with this theory, commercial banks is essential in financing the agricultural industry by providing loans to farmers for their capital requirements. The proceeds generated through the sale of agricultural produce are usually used to repay these loans.

2.4 Empirical Review

Uremadu et al. (2019) conducted a study in Nigeria to examine the impact of commercial bank loans and government spending on agricultural output. Using the OLS estimating technique, the study discovered that government allocation to agriculture had a negative effect on agricultural output. Commercial bank lending, on the other hand, had a significant influence on agricultural output. As a result, the researcher concluded that it was important to increase the budgetary allocation to agriculture and called for continued credit provision by banks to agricultural stakeholders to boost productivity. Udoka et al. (2016) evaluated the association between bank loans and agricultural output in Nigeria. The data show that loans granted had a considerable impact on agricultural output. Furthermore, the study found that the influence of interest rates on agricultural output was negative for the Nigerian economy.

Using annual data from 1970 to 2011, Chisasa and Makina (2015) evaluated the link between bank lending and agricultural productivity in South Africa. The Error Correction Model (ECM) and Granger Causality methods were used to analyse

the data. The study showed a long-term positive relationship between agricultural loans and agricultural output, but a short-term negative relationship, which reflects the uncertainty surrounding institutional lending in South Africa. Udoh (2011) evaluated the relationship between public expenditure, private investment, and growth in the agricultural sector and found it to be asymmetric, revealing that while government public expenditure has a positive impact on agricultural output, private investment had an insignificant influence.

Marafa (2022) analysed the association between agricultural funding and productivity in Nigeria. The granger causality test found that the agricultural credit guarantee scheme fund granger caused agricultural production, whereas loans by banks to agriculture and government expenditure on agriculture did not. Orji et al. (2020) examined the causal association between agricultural funding and agricultural output growth in Nigeria. The results revealed that no causal association existed between agricultural financing and agricultural output.

3.0 Methodology

3.1 Study Area

The research was carried out in Nigeria. Nigeria has a land area of 923,768 sq. km (356,669 sq. mi) and is located in West Africa.

3.2 Data Collection and Sources of Data Collection

The research used time series secondary data from 1981 to 2020. Data was obtained from the World Development Indicator (WDI) and the CBN Statistical Bulletin.

3.3 Model Specification

This study used the ARDL bounds test method developed by Pesaran, et al. (2001) to test for co-integration. Where the variables are a combination of 1(0) and 1(1), the ARDL co-integration approach is used for long run regression estimation. The short-term relationship was analysed using the Error Correction Method. The analysis employed E-views 12.0 econometric software to analyse this objective.

The model was specified as:

AGDP= *f* (ACGSF, GREA, CBCA, INF, INT) (1)

The above equation in (1) was converted into ARDL model for the long run (Pesaran *et al*., 2001) as shown below:

$AGDP_t = \beta_0 + \beta_1 ACGSF_{t-1} + \beta_2 GREA_{t-1} + \beta_3 CBCA_{t-1} + \beta_4 INF_{t-1} + \beta_5 INT_{t-1} + et$ (2)

Where β_0 is the constant term, β_1 is the agricultural credit guarantee scheme fund coefficient (public financing), β_2 indicates the coefficient of government expenditure on the agricultural sector (public financing), β_3 is the coefficient of bank credit to agriculture (private financing), β_4 represent the inflation coefficient, β_5 represents the interest rate coefficient, t is time and *e* is the error term.

The error correction method (ECM) for the short run relationship was defined in the equation below:

$$\Delta AGDP_t = \beta_0 + \sum \gamma_{1i} \Delta AGCSF_{t-i} + \sum \gamma_{2i} \Delta GREA_{t-i} \sum \gamma_{3i} \Delta CBCA_{t-i} + \sum \gamma_{4i} \Delta INF_{t-i} + \sum \gamma_{5i} \Delta INT_{t-i} + \delta ECM_{t-1} + e_t \quad (3)$$

3.4 Causal Relationship between Agricultural Funding and Agricultural Output in Nigeria

Granger causality test was used to assess whether the variations in agricultural financing was caused by a variation in agricultural output or vice versa. The model was specified as:

$$AGDPt = \boldsymbol{\alpha_0} + \sum_{i=1}^{k} \boldsymbol{\alpha_1} AGDP_{t-1} + \sum_{i=1}^{k} \boldsymbol{\alpha_2} ACGSF_{t-1} + \sum_{i=1}^{k} \boldsymbol{\alpha_3} GREA_{t-1} + \sum_{i=1}^{k} \boldsymbol{\alpha_4} CBCA_{t-1} + \sum_{i=1}^{k} \boldsymbol{\alpha_5} INF_{t-1} + \sum_{i=1}^{k} \boldsymbol{\alpha_6} INT_{t-1} + et \quad (4)$$

where the values of the independent variable are significant in explaining the dependent variable and vice versa.

4 Results And Discussion

4.1 Unit root test

The ADF unit root test result presented in Table 1 below show that that GREA and INT were stationary at levels and at 1% level of significance, INF was stationary at level and at 5% level of significance, while other variables showed stationarity at first difference. This suggests that the variables possess different orders of integration.

Table 1: Augmented Dicky Fuller Unit Root Test

The table below reports the Augmented Dicky Fuller Unit Root test results.

Variables	Level	1st Difference	1% CV	5% CV	10% CV	Decision
AGDP	-1.8045	-5.6324***	-4.2191	-3.5330	-3.1983	1(1)
ACGSF	-2.1255	-7.0495***	-4.2191	-3.5330	-3.1983	1(1)
GREA	-4.6377***		-4.2191	-3.5330	-3.1983	1(0)
CBCA	3.2246	-3.8809**	-4.2191	-3.5330	-3.1983	1(1)
INF	-4.0684**		-4.2191	-3.5330	-3.1983	1(0)
INT	-7.5794***		-4.2191	-3.5330	-3.1983	1(0)

Source: Author's computation from Eviews 12

****,** indicate significance at 1% and 5% respectively*

Table 2: Phillips-Perron Unit Root Test

The table below reports the Phillips-Perron Unit Root test results.

Variables	Level	1st Difference	1% CV	5% CV	10% CV	Decision
AGDP	-1.8004	-5.6341***	-4.2191	-3.5330	-3.1983	1(1)
ACGSF	-2.1310	-7.0495***	-4.2191	-3.5330	-3.1983	1(1)
GREA	-4.6125***		-4.2191	-3.5330	-3.1983	1(0)
CBCA	8.0560	-3.8809**	-4.2191	-3.5330	-3.1983	1(1)
INF	-2.9102	-10.7202***	-4.2191	-3.5330	-3.1983	1(1)
INT	-7.2614***		-4.2191	-3.5330	-3.1983	1(0)

Source: Author's computation from Eviews 12

****,** indicate significance at 1% and 5% respectively.*

From the findings in the table above, it was revealed that at first differencing, all the variables except GREA and INT were stationary. AGDP, ACGSF, and INF were stationary at the 1% significance level, while CBCA was stationary at 5%. These results confirm that the variables exhibit different orders of integration and warrant further analysis using the ARDL Bounds test.

ARDL Long run and Short run Test

The ARDL bounds test is used to determine if a long-run or short-run correlation exists between two or more variables in a time series data.

Table 3: ARDL F-Bounds Test

Test Statistics	Value	Signif.	1(0)	1(1)
F-statistics	4.118858	10%	2.26	3.35
	4	5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

Source: Author's computation from Eviews 12

Table 3 above shows the results of the co-integration between the variables using the bounds test method. The results show that the estimated value of the F-statistics (4.11) exceeded the upper and lower bound value of 2.62 and 3.79 at 5% level of significance. This suggests that co-integration is present and demonstrates that there is a long-term equilibrium relationship between agricultural funding and agricultural output.

Table 4: Result of the ARDL Long Run Test

Variable	Coefficient	Std. Error	t-Statistics	Prob.
ACGSF	0.001146	0.000281	4.076437	0.0028**
GREA	-102.8205	87.31748	-1.177548	0.2692

CBCA	15.92445	3.328088	4.784864	0.0010**
INF	88.51005	42.34288	2.090317	0.0661
INT	63.49422	67.62487	0.938918	0.3723

Source: Author's computation from Eviews 12

The estimated long-run model reveals that CBCA and ACGSF were positive and achieved statistical significance at 5% level. This suggests that ACGSF and CBCA exhibited a positive influence on AGDP during the study period. Specifically, a one unit increase in the ACGSF will increase agricultural GDP growth by 0.001 percent while a one unit increase in CBCA corresponds to a 15.9 percent increase in agricultural GDP growth. These findings corroborate with similar studies such as Ngozi *et al*., (2022), Ijaiya and Abdullahi (2017), and Egwu (2016) who concluded that loans provided by the ACGSF had a significant influence on agricultural output. Additionally, studies by Nnamocha and Eke (2015), Udoka *et al*. (2016) and Florence *et al*. (2020) highlighted the positive and significant influence of commercial bank loans on agricultural output (AGDP).

Table 5: Result of the Short Run Error Correction Model

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	-4.892493	76.78520	-0.063717	0.9506
D(AGDP) (-1)**	-1.002726	0.251418	-3.988274	0.0032
D(ACGSF)	-0.000133	0.000032	-4.195795	0.0023**
D(GREA)	5.911822	4.234252	1.396190	0.1961
D(CCBCA)	-7.794934	1.469839	-5.303064	0.0005**
D(INF)	-3.770056	4.654026	-0.810063	0.4388
D(INT)	4.800699	6.468694	0.742143	0.4769
CointEq(-1)*	-0.386697	0.062368	6.200216	0.002

R= 0.897105, R^2=0.759911

Source: Author's computation from Eviews 12

From the short-run result, ACGSF and CBCA achieved statistical significance at 5% level, but their influence on agricultural output was negative. This suggest that there is an averse relationship between these variables and AGDP in the short run. Findings from the results also showed that the explanatory variables explained 89% of the total variation in the dependent variable, as evident from the R^2 value of 0.897105. The adjusted R^2 value of 0.75% suggests that the explanatory variables effectively explain the variation in agricultural output. The table further revealed that the short-run estimation of the error correction term is -0.386, which is statistically significant at the 5% level. This implies that 38% of the disequilibrium in agricultural GDP growth is adjusted within the period by variations in the explanatory variable to the long run relationship.

4.2 Residual Diagnostics and Stability Tests

Table 6: Summary of Residual Diagnostic Tests

Residual diagnostics test	Statistics	Probability value
Serial Correlation LM Test	0.224178	0.8047
Breusch-Pagan-Godfrey	2.154186	0.5466
Heteroskedasticity Test	0.632887	0.4320
Heteroskedasticity Test(ARCH)	1.160833	0.5596
Jarque-Bera Normality Test		

Source: Author's computation from Eviews 12

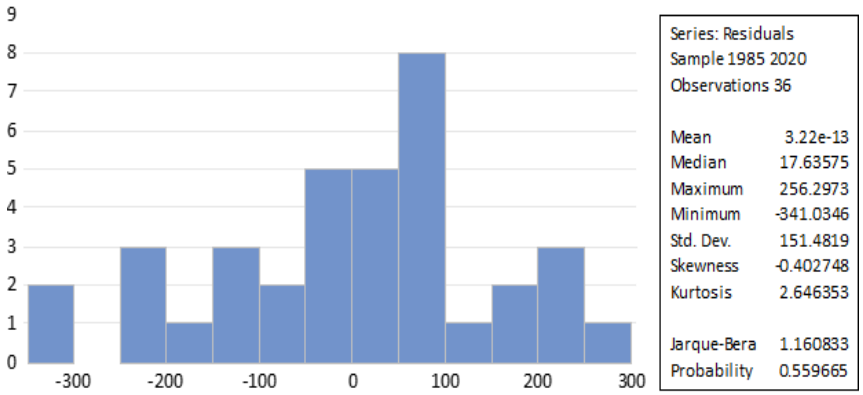

Figure 1: Normality Test

Source: Author's computation from Eviews 12

The normal distribution of the variables was examined using the Jarque-Bera normality test. The result indicated in the figure above shows a probability value of 0.559, which is more than the 5% significance level at 0.05%. Furthermore, The test shows that the data's kurtosis and skewness align with those expected in a normal distribution. Hence, there is no evidence of non-normality in the series, and both the residuals and the model can be considered normally distributed.

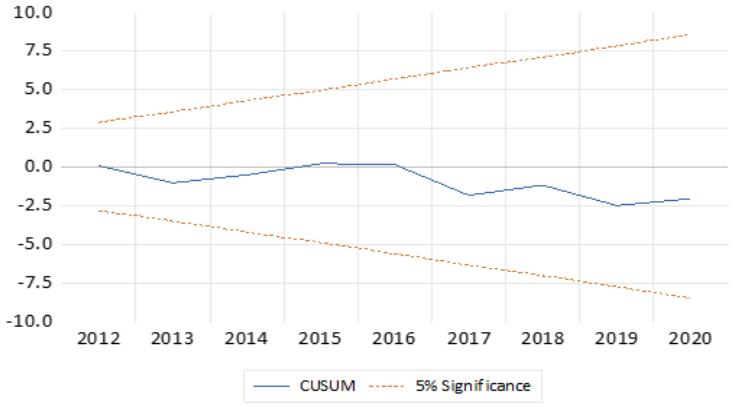

Figure 2: CUSUM Test

Source: Author's computation from Eviews 12

From the figure above, an analysis of the plots of the CUSUM test shows that the series lies within the bound line. Thus, it is significant and confirms that the model is stable.

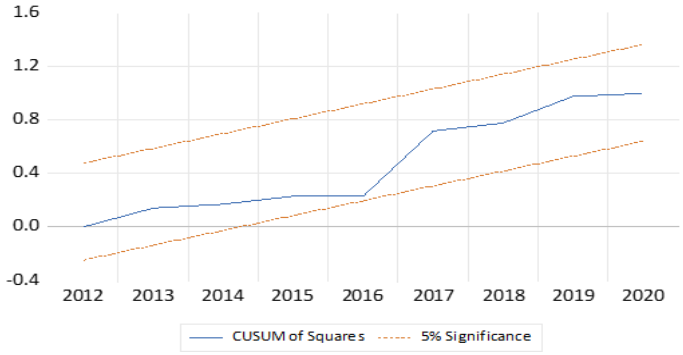

Figure 3: CUSUM of Squares Test

Source: Author's computation from Eviews 12

In addition, the CUSUMSQ statistics in the figure above shows that the series lies within the bound line. Thus, it is significant and confirms that the model is stable. These diagnostic and stability test results agree with findings from Danladi *et al*. (2021) and Afolabi *et al*. (2022).

4.3 Causal Relationship between Agricultural Funding and Agricultural Output in Nigeria

4.3.1 Granger causality test

The Pair-Wise Granger causality test indicated the absence of a bidirectional causality. However, a unidirectional causality was observed at a significant level of 5%, moving from AGDP to GREA. This implies that AGDP granger-causes GREA, as evidenced by the probability level of 0.0011. Therefore, this suggests that changes in agricultural output can be explained by fluctuations in government expenditure on agriculture. This finding corroborates with the study conducted by Athanasius (2017), which also reported a unidirectional causality at a significant level of 5%, moving from AGDP to GREA.

Table 7: Result of Granger Causality Test

Null Hypothesis	Obs	F-statistics	Prob.
ACGSF does not Granger Cause AGDP	38	0.38985	0.6802
		0.72431	0.4922
AGDP does not Granger Cause ACGSF	38	0.05383	0.9477
		8.46345	0.0011**
GREA does not Granger Cause AGDP	35	0.98076	0.3867
AGDP does not Granger Cause GREA		0.22021	0.8036
BCA does not Granger Cause AGDP	38	0.60211	0.5536
AGDP does not Granger Cause BCA		1.70171	0.1980
INF does not Granger Cause AGDP		1.32902	0.2785
AGDP does not Granger Cause INF	38	1.67463	0.2029
INT does not Granger Cause AGDP			
AGDP does not Granger Cause INT			

Source: Author's computation from Eviews 12

5.0 Conclusion And Recommendations

5.1 Conclusion

From the findings of this study, Agricultural credit guarantee scheme fund and loans granted by commercial banks to agriculture had a positive and significant impact on agricultural output whereas government funding the agricultural sector recorded a negative and insignificant impact on agricultural output (AGDP). Agricultural output was seen to granger cause government spending which means that changes in agricultural output can be explained by changes in government expenditure on agriculture. In line with these research outcomes, it can be proposed that public and private financing play a crucial role in agricultural output.

5.2 Recommendations

1. The government and the Central Bank should strengthen the agricultural credit guarantee scheme and encourage private sector/commercial bank lending to the agricultural sector with less stringent conditions for farmers
2. The government should bolster its budgetary allocation to agriculture while ensuring that the funds are directed towards agricultural production.
3. The government should enable policies that will attract and encourage foreign direct investment and other sources of private financing into the agricultural sector as it has been shown that private financing tends to drive agricultural growth.

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