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DEPOSIT MONEY BANKS' CREDIT AND AGRICULTURAL OUTPUT IN NIGERIA

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ABSTRACT

Agriculture is the major source of economic growth, it provides huge number of employments for the society and of most importance, the main source of raw material for food production to the nation. It is imperative to examine the impact of deposit money banks' credit to Agricultural sector, from 1990 to 2022 due to its importance to economic development. The study applied Johansen cointegration and multiple regression technique. The results from the analysis shows a long run relationship between deposit bank credit on agricultural sector in Nigeria. Similarly, from the estimation result, commercial bank credit to agriculture (CBCA) and *agricultural credit guarantee scheme fund (ACGS)* were positive and statistically significant. These implies that credits were effectively utilized to improve agricultural sector over the period of study. *Lending rate (LR) had a direct relationship with agricultural sector, exhibiting the importance of credit to agricultural sector, but not significant due to high lending rate charges from deposit money banks, thus discouraging borrowings from farmers. Inflation (INF) and farm size (FARZ) had negative impact on agricultural sector, inflation eroding the benefit of large farm land size, the high cost of input for agriculture discourage agricultural performance. The study recommended that attractive lending should be applied to agricultural sector in other to enhance agricultural production and at the long run encourage economic development.*

***Keywords: Deposit money banks, agricultural* output, ARDL, Nigeria.**
JEL Classification Codes: E43, G21, O13.

1.0 INTRODUCTION

Agriculture has historically been the backbone of Nigeria's economy, playing a critical role in providing employment, ensuring food security, and contributing significantly to the growth of Nigeria. Despite the sector's potential and its substantial contributions, the agricultural sector in Nigeria faces numerous challenges, such as inadequate infrastructure, low levels of technology adoption, and insufficient access to finance (Enilolobo & Ode-Omenka, 2018; Afolabi et al., 2021).

One of the pivotal factors influencing agricultural productivity and growth is access to bank credit. Credit is essential for farmers to

purchase inputs like seeds, fertilizers, and machinery, invest in irrigation systems, and adopt modern farming techniques. However, the agricultural sector in Nigeria has traditionally been underfunded, with farmers experiencing difficulties in securing loans from formal financial institutions. The idea that agriculture is a high-risk sector, the dearth of suitable collateral, and the limited bank presence in rural areas all contribute to this problem (Adedokun & Olowookere 2023). Credit in Agriculture overtime had made input acquisition and modernization easier, which can lead to increased productivity and efficiency. With adequate financing, farmers can implement better risk management strategies, such as crop diversification and the adoption of insurance schemes (Rayhan et al., 2023). Credit facilitates the expansion of farming operations, allowing farmers to scale up their activities and improve their income levels. Financing is crucial for the adoption of innovative farming techniques and technology, which are essential for sustainable agricultural practices and increased yields. This importance to bank credit in agriculture is associated with challenges in accessing bank credit (Ouattara et al., 2023).

The sector faces significant barriers in accessing bank credit. Banks view agriculture as a high-risk sector due to factors such as unpredictable weather conditions, price volatility, and the long gestation period of agricultural investments. Many smallholder farmers lack the necessary collateral to secure loans, making it difficult to access formal credit (Emenuga, 2019). The underdevelopment of financial infrastructure in rural areas limits the reach of banks and other financial institutions, hindering farmers' access to credit, high-interest rates and unfavorable loan terms oftentimes deter farmers from seeking bank credit, as the cost of borrowing may outweigh the potential benefits (Emenuga, 2019). In recognizing the critical role of agriculture in national development, the Nigerian government and various financial institutions have undertaken several initiatives to improve access to credit for farmers (Afolabi et al., 2021). Nigeria agricultural programs such as the Agricultural Credit Guarantee Scheme Fund (ACGSF), the Anchor Borrowers' Program (ABP), and the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) aim to provide financial support and risk-sharing mechanisms to encourage banks to lend to the agricultural sector (Nwosu & Okafor 2022). These efforts aim to enhance agricultural productivity and support sustainable growth within the sector. However, the policies were not able to achieve the intended purposes as farmers still find it difficult to access credit. This has equally affected the productivity of the sector (Adedokun & Olowookere 2023). This study therefore examines the impact of deposit money banks credit on agricultural sector output in Nigeria.

2. LITERATURE REVIEW

2.1. Review of Empirical Literature

Afolabi et al. (2021) studied, agricultural credit on economic growth in Nigeria from 1981 to 2017.The study revealed a long run relationship between agricultural credit and economic growth in Nigeria. Adedokun and Olowookere (2023) assessed commercial bank credit on Nigerian agricultural growth from 2010 to 2021. The study used a combination of qualitative and quantitative methods, including interviews with bank officials and regression analysis, to determine the impact. Commercial bank credit has a significant positive impact on agricultural GDP. Interest rates and loan tenure are critical factors affecting the effectiveness of credit. There is a need for banks to understand the unique nature of agricultural lending. Develop specialized agricultural loan products with favorable terms and provide training for bank officials on agricultural lending. Ogunleye and Oladapo (2022) investigated the role of microfinance institutions in supporting agricultural development in Nigeria. Using data from 2010 to 2020, the study finds that microfinance significantly enhances access to credit for smallholder farmers, leading to increased productivity and income.

Atseye et al. (2022) examine the effect of financial sector growth on agricultural output in Nigeria. The study used money market variable and capital markets in the analysis. The study reveals that money supply, has a significant and positive impact on agricultural sector output. Market capitalization and trade openness are positive but non-significant. While deposit money credit which measure financial efficiency shows a negative impact on agricultural output in Nigeria. Azike et al. (2020) studied deposit money bank credit to agricultural sector and agricultural output in Nigeria, using annual date from 1986 to 2016. The study uses ordinary least square techniques and granger causality test as methods of analysis. The results indicate that deposit money bank credit to the agricultural sector has positive and insignificant impact on agricultural output, while lending rate has negative and insignificant impact on agricultural output during the period. Moreover, a long-run relationship exists among the variables as confirmed by the co-integration test. Causality results indicate a unidirectional relationship running from agricultural output to deposit money banks' credit (DBC) and agricultural output (AGR1C). However, there is bidirectional relationship between lending rate (LR) and deposit Money bank credit (DBC).

Nwosu and Okafor (2022) explored the impact of agricultural financing on rural development, focusing on the period from 2005 to 2020. The study used econometric models to analyze the data and found that agricultural financing has significantly contributed to rural development by improving agricultural productivity and livelihoods. Access to bank credit has led to modernization of agricultural practices. Rural areas with better access to credit facilities show higher levels of development. Credit availability

has reduced rural-urban migration by providing better livelihood opportunities in rural areas. Enhance rural banking infrastructure and offer training programs for farmers on credit management.

Oloyede et al. (2021) studied agricultural credit on agricultural productivity in Nigeria from 2000 to 2018. The results revealed agricultural credit has a significant impact on agricultural productivity with increased credit leading to higher investment in agricultural inputs and positive correlation between credit access and crop yields. Smallholder farmers benefited significantly from micro credit schemes. The study recommended policies that enhances credit accessibility, particularly for smallholder farmers. It also recommended that microfinance institutions should be strengthened and interest rates reduced to make credit more affordable for farmers.

Adepoju and Oni (2020) investigated the factors influencing the utilization of agricultural credit among Nigerian farmers. Using a sample of 500 farmers across different regions, the study found that education level, farm size, and collateral availability are significant determinants of credit utilization. Farmers with higher education levels are more likely to utilize credit effectively larger farms have better access to credit due to their ability to provide collateral Credit utilization positively impacts farm income and productivity. The study recommended improved financial literacy among farmers and development of collateral-free credit products.

Emenuga (2019) studied the effect of commercial banks' credit (CBC) on agricultural productivity in Nigeria from 1981 to 2017. The study employed error correction model and the result found that CBC and ACGS have positive effect on the development of Nigerian agricultural sector. Lawal et al. (2019) in their study investigated the effect of bank credit on Nigerian agricultural productivity from 1981 to 2015. A Toda and Yamamoto non-granger causality method was employed and the result suggested that there is unidirectional causality running from ACGS to agricultural productivity. Enilolobo and Ode-Omenka (2018) in the study, deposit money bank credit to agriculture sector in Nigeria from 1978 to 2016, revealed no long-run relationship between deposit money bank credit to the agriculture sector in Nigeria.

The impact of deposit money banks' agricultural credit on productivity of agricultural sector in Nigeria was empirically investigated by Ogbuabor and Nwosu (2017). The study covered a period of 1981 to 2014 and the time series data collected were analysed with ECM method. The findings of the study revealed that deposit money banks' agricultural credit positively impacted the productivity of Nigerian agriculture. Udoka et al. (2016) applied OLS method to examine how commercial banks' credit affected agricultural production in Nigeria between 1970 and 2014. The study's findings showed that agricultural output is significantly and favourably impacted by commercial banks' loans and ACGSF.

2.2. Gap in the Literature

The inclusion of farm size which is proxied by agricultural land per square kilometers is a variable which is important in examining the relationship but has not received much attention in the previous studies done by scholars. The size of land used for farming will determine the output of the farmer and the amount of loans from banks can determine the amount of land farmers can as well acquire. So, including this variable is a value addition.

2.3. Theoretical Framework for Model Specification

To develop a robust model for analyzing the impact of bank credit on the agricultural sector in Nigeria, various theories that support this study are financial intermediation theory, credit rationing theory, development finance theory, and rural finance theory. In synthesizing these theories, constructive theoretical framework that underpin the model specification, is the credit rationing theory, that explains banks may limit the amount of credit due to information asymmetry and the risk of default, leading to credit rationing. This theory highlights the potential constraints farmers face in accessing credit, which can be incorporated into the model by including variables that capture credit constraints and accessibility.

3. METHODOLOGY

3.1. Model Specification

Economic theory typically serves as the foundation for economic model specification. The lending interest rate, farm size, CBC to agriculture, ACGSF, inflation rate, and output of the agricultural sector are the fundamental macroeconomic variables of concern that are being taken into consideration. In order to ascertain the relationship between CBC and the constraints facing Nigeria's agricultural output, the study adapted Azike et al. (2020) that Deposit Money Bank Credit to Agricultural Sector and Agricultural Output in Nigeria. The functional form is stated as

$$AGRIC = f(DBC, LR) \quad (1)$$

Where, AGRIC = aggregate Agricultural output. f = functional relationship, DBC = Deposit money bank credit to the agricultural sector, LR= lending Rate.

The functional model was slightly modified, by adding Agricultural credit guarantee scheme fund (ACGS), farm size proxied by agricultural land per square kilometers (FARZ), Inflation rate (INFR) as moderating variables. The reasons for adding those variables are to ensure that agricultural sector gets maximum support through credit programmes that support agricultural output. In line with the modification, the main functional model for this study is specified as;

$$AGO = f(CBCA, ACGS, LINR, FARZ, INF) \quad (2)$$

Where,

AGO = Agricultural output
CBCA = Commercial banks credit to agriculture
ACGS = Agricultural credit guarantee scheme fund
LINR = Lending interest rate
FARZ = Farm size proxied by agricultural land per square kilometers
INFR = Inflation rate

The econometric form of the model is:

$$AGO_t + \beta_0 + \beta_1 CBCA_t + \beta_2 BACGS_t + \beta_3 LINR_t + \beta_4 FARZ_t + \beta_5 INFR_t + \mu_i \quad (3)$$

By assuming linearity among the variables and taking the natural logarithm of both sides of equation (3), one can obtain:

$$lnAGO_t + \beta_0 + \beta_1 lnCBCA_t + \beta_2 lnBACGS_t + \beta_3 LINR_t + \beta_4 lnFARZ_t + \beta_5 lnINFR_t + \mu_i \quad (4)$$

Where, β_0 is the intercept and β_1 to β_5 are coefficients, while μ_i is stochastic disturbance (or Error) term.

3.2. Estimation Technique and Procedure

The study employs the tools of time series econometrics to explore the impact of bank credit on agricultural sector growth in Nigeria. Specifically, the multiple least square method is used in this research work. The multiple regression model not only shows the direction and magnitude of the independent variables' effects on the dependent variable, but it is also easy to compute. Augmented Dickey-Fuller (ADF) unit root test is used for the model's pre-test procedures. This is implemented to prevent spurious regression. The Johansen cointegration test was used to perform the cointegration test. This is used to determine the variables' long-term relationship.

3.3. Sources of Data

For the evaluation period (1990–2022), the World Bank database and the Central Bank of Nigeria Statistical Bulletin provided the time series data for every variable.

4. DATA PRESENTATION AND INTERPRETATION

Presentation and Interpretation of Result

Descriptive Statistics

This describes the data set of the series and the result is presented in Table 1.

Table 1: Descriptive Statistics

	AGO	CBCA	ACGS	FARZ	LINR	INFR
Mean	3.941077	1.988309	6.189896	5.817414	1.263909	1.165161
Median	4.009556	1.830845	6.611452	5.822148	1.250298	1.109801
Maximum	4.280830	3.205399	7.095387	5.836603	1.500374	1.862343
Minimum	3.539668	0.625312	4.898217	5.768742	1.060060	0.731428
Std. Dev.	0.270575	0.715029	0.785303	0.018096	0.088907	0.282457
Skewness	-0.256235	-0.068107	-0.476179	-1.323743	0.221946	0.947597
Kurtosis	1.444064	2.096131	1.590854	3.892038	3.720512	3.249171
Jarque-Bera	3.689896	1.148859	3.977431	10.73176	0.984745	5.024043
Probability	0.158034	0.563026	0.136871	0.004673	0.611175	0.081104
Sum	130.0555	65.61419	204.2666	191.9747	41.70899	38.45031
Sum Sq. Dev.	2.342744	16.36053	19.73442	0.010479	0.252942	2.553014
Observations	33	33	33	33	33	33

Source: Researcher's computation using Eviews 10 Output

Table 1 presents the descriptive statistics of the study. From the table, the standard deviation for all the variables shows low values, meaning that the estimates are close to their true values and can be used to predict the future. The skewness values show that AGO, CBCA, ACGS and farm size (FARZ) are negatively skewed, that is, skewed to the left owing to their negative values. However, the skewness values for lending interest rate (LINR) and INFR shows that the variables are skewed to the right, that is, positively skewed. Comparably, the kurtosis shows that the distributions of FARZ, LINR, and INFR are flat, whereas the distributions of AGO, CBCA, and ACGS are mesokurtic, or long-tailed. The probability values reveal that AGO, CBCA, ACGS, LINR, and INFR are normally distributed since their p values are greater than 5%, while FARZ is not normally distributed.

Augmented-Dickey Fuller Unit Root Test

This subsection addresses the unit root test. The ADF unit root test was used to check for stationarity since time series data typically exhibit unit root. In order to avoid misleading results, this test is required. Thus, Table 2 presents the result.

Table 2: Unit Root Test

Variables	ADF Statistics	Critical Value @5%	Order of Integration	Remarks
AGO	*-5.0665*	*-2.9604*	*I(1)*	*Stationary*
CBCA	*-6.4296*	*-2.9604*	*I(1)*	*Stationary*
ACGS	*-5.1599*	*-2.9604*	*I(1)*	*Stationary*
FARZ	*-3.7840*	*-2.9604*	*I(1)*	*Stationary*
LINR	*-6.7053*	*-2.9604*	*I(1)*	*Stationary*
INFR	*-4.6328*	*-2.9640*	*I(1)*	*Stationary*

Source: Author's compilation using Eviews Output 10

Table 2 shows the results of the stationarity tests conducted on the variables. The decision rule is that, if the ADF statistic is less than the critical level, the null hypothesis would be rejected meaning that, unit root does not exist. If otherwise, it means unit root exists. The summary of the ADF result revealed that all the variables are stationary at first difference. It is therefore concluded that there is stationarity in the model and our estimates can produce reliable results.

Co-integration Test

Applying a bound F-test to ascertain a long-term association among the variables comes next, following the determination of the variable's order of integration. In Table 3, the critical values and the outcomes of the Johansen co-integration test are presented.

Table 3: Summary of Johansen Co-integration Test

Hypothesized No of CE(s)	Eigenvalue	Trace statistic	Critical value @ 5%	Max-Eigen statistic	Critical value @ 5%
None*	0.7911	143.917	95.7536	48.5409	40.0776
At most 1*	0.7283	95.3756	69.8189	40.3924	33.8769
At most 2*	0.6105	54.9832	47.8561	29.2303	27.5843
At most 3	0.4124	25.7529	29.7971	16.4805	21.1316
At most 4	0.2254	9.27238	15.4947	7.91819	14.2646
At most 5	0.0427	1.35419	3.84147	1.35419	3.84147

Source: Eviews 10 Output.

For both trace and max-eigen statistics, results in Table 3 indicate that there are three co-integrating equations. Consequently, a long-term link between the variables can be suggested to exist. Thus, it is determined that there is no co-integration, which is the null hypothesis.

Multiple Regression Model

After establishing that the variables are co-integrated, the multiple regression result was conducted to estimate the parameters of the model and the result is presented in Table 4.

Table 4: Summary of Multiple Regression Result

Dependent Variable: AGO

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	26.22427	7.536683	3.479551	0.0017
CBCA	0.264863	0.035898	7.378290	0.0000
ACGS	0.201097	0.023612	8.516568	0.0000
LINR	0.007129	0.161242	0.044211	0.9651
FARZ	-4.132412	1.310129	-3.154202	0.0039
INFR	-0.020297	0.034258	-0.592467	0.5585

R-squared	0.973388	Mean dependent var	3.941077
Adjusted R-squared	0.968459	S.D. dependent var	0.270575
F-statistic	197.5136	Durbin-Watson stat	1.537547
Prob(F-statistic)	0.000000		

Source: Author's compilation using Eviews Output 10

As demonstrated by the constant (c), which has a value of 26.224, it means that the value of agricultural output will be 26.224 if all the variables are kept fixed or constant (zero). It follows that the intercept is consistent with the theoretical expectation since the a-priori assumption is that it could be positive or negative. The CBCA, ACGS and LINR have positive values of 0.264, 0.201 and 0.007 respectively, which means that, on average, 1 percent increase in CBCA, ACGS and LINR will increase agriculture output (AGO) by 0.026 percent, 0.201 percent and 0.007% respectively supported by the works of Emenuga 2019, Adepoju and Oni (2020); Oloyede et al. (2021); Afolabi et al. (2021); Ogunleye and Oladapo (2022). The p values of 0.000 for CBCA and 0.000 for ACGS suggest that CBCA and ACGS are statistically significant with AGO, while the p value of 0.965 for LINR reveals statistically insignificant relationship between LINR and AGO in Nigeria. On the other hand, farm size (FARZ) and inflation rate (INFR) have negative coefficient values of -4.132 and -0.020 respectively. This implies that on average, one percent increase in FARZ and INFR will reduce agricultural output by 4.13% and 0.02% respectively.

The coefficient of determination (R^2) from the study regression result is 0.973, indicating a very good explanatory power of the variables. This indicates that changes in CBCA, ACGS, FARZ, LINR, and INFR account for or explain 97% of the variability in the AGO, with the remaining 3% being explained by other possible AGO determinants not included in the model. The F-statistic shows a value of 197.514 with probability value of 0.0000. This implies that the variables are highly statistically significant at 5 percent. The study's Durbin-Watson (D-W) statistics, which it derives from the regression result, show that the DW statistic is 1.537, or approximately 2. Since D-W statistic is approximately equals to two, and this suggests no autocorrelation, according to the decision rule. As a result, it may be said that the models are reliable and that the variables do not auto-correlate.

Post-Estimation Tests

Table 5: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.911133	Prob. F(5,27)	0.4885
Obs*R-squared	4.764183	Prob. Chi-Square(5)	0.4453
Scaled explained SS	2.543671	Prob. Chi-Square(5)	0.7699

Source: Author's compilation using Eviews Output 10

This test determines if each observation's error variance is constant or not. To accept the null hypothesis of no heteroscedasticity in the residuals, the estimated F-test statistic (F) must be greater than the 0.05 level of significance. Consequently, P(F) = 0.489. This signifies that the probability F statistic is more than the 0.05 percent level of significance. As a result, the study accepted the null hypothesis that the model has no heteroscedasticity in the residuals, implying that the data is reliable for predictions.

Test for Normality

This test is conducted to test whether the model is normally distributed or not. The histogram normality test is applied here and the result is presented in Figure 1.

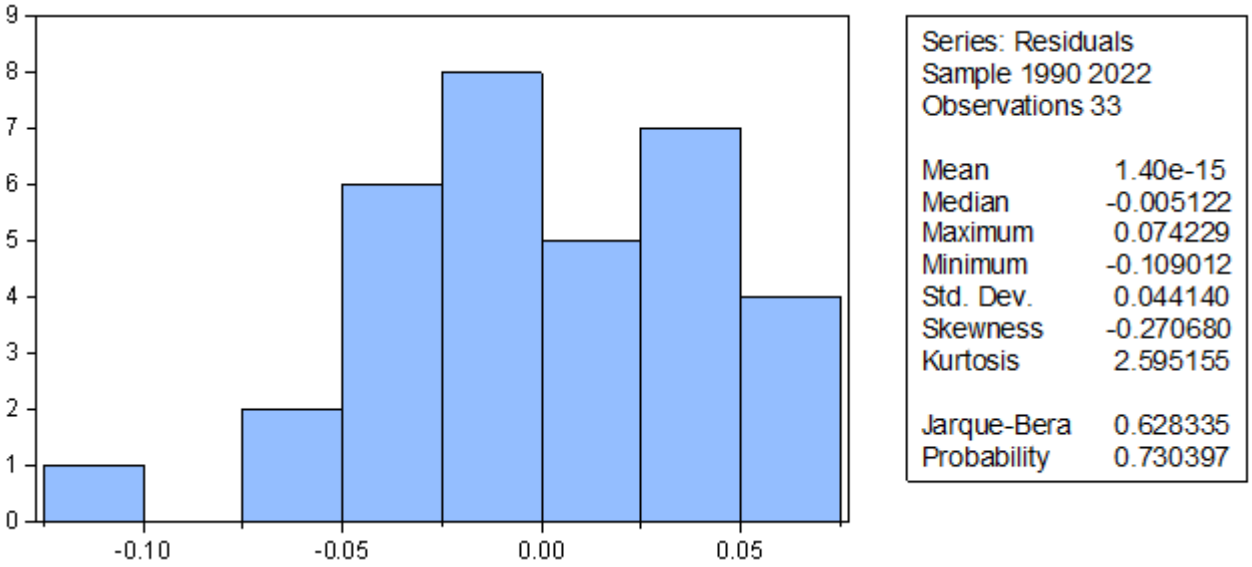


Figure 1: Histogram Normality Test
Source: Eviews 10 Output

The result in Figure 1 reveals the Jarque-Bera probability value of 0.730, which is greater than 0.05. This suggests that the model is normally distributed. Therefore, the null hypothesis which states that the residual is normally distributed is accepted.

Discussion of Findings

The result in Table 4. is discussed here. From the result, commercial bank credit to agriculture is positive and statistically significant. This implies that the credit to agricultural sector was judiciously used to increase agricultural output over the period of the study. The finding conforms to a priori expectation and also in tandem with the findings of Adedokun and Olowookere (2023) and Ogunleye and Oladapo (2022). The ACGS also has a positive and significant impact on agricultural output in Nigeria, which suggest that the total amount of credit facilities extended to farmers increase agricultural output as farmers are able to access these funds. This is expected because any funds committed to agriculture should be able to increase the output of the sector. The finding of Emenuga (2019) is also in line with the finding of this study. The lending interest rate failed to

conform to the a priori expectation because it has positive impact on agricultural output. In reality and owing to the rate at which banks gives loans to farmers, lending rate is not expected to contribute to increase in agricultural output. This is because an increase in the rate of interest charged on farmers for funds borrowed discourages many farmers from borrowing, which in turn results in less agricultural investment.

On the other hand, inflation and farm size have negative impact on agricultural output. this is because inflation will erode the purchasing power of farmers, thereby reducing the quantity of agricultural inputs that can be purchased. This will also reduce agricultural output. This finding on inflation is consistent with the a priori expectation. Farm size which is revealed to have negative impact is however not expected because the availability of land should encourage agricultural investments which will boost productivity. However, the reason for this negative impact can be connected to the issues of insecurity which makes farmlands inaccessible for farmers. This finding failed to support the findings of Adepoju and Oni (2020) which established that access to land can increase agricultural productivity in Nigeria.

The study's R^2 indicates that the independent variables have a strong explanatory power. According to the F-statistic, which assesses the model's overall significance, every estimated regression model is statistically significant. Based on the DW statistic, the model is also free from autocorrelation. The post-estimation diagnostic tests carried out show the model is homoscedastic and normally distributed.

5. CONCLUSION AND POLICY RECOMMENDATIONS

Using a multiple regression model, the study examined how commercial bank credit affected agricultural output in Nigeria from 1990 to 2022. The regression's conclusion shows that, while farm size and inflation rate have a negative influence on the agricultural sector, commercial banks' credit to agriculture, the fund for the ACGS, and lending interest rates have a favourable effect. The results also imply that the model's explanatory variables adequately account for fluctuations in the agriculture sector. Additionally, the variance and mean remain stable throughout time, the variables are jointly statistically significant, and the model is not autocorrelation-affected. The study leads to the conclusion that deposit money banks credit significantly enhances agriculture sector in Nigeria. In view of this, the following recommendations were made;

i) 75% of the amount in default net of any security realized, committed to agriculture should be increased to about 90% since agricultural credit guarantee scheme fund is found to be positive and statistically significant. This will help farmers to access these funds.

ii) Government should ensure that our forests and farmlands are secured from the hands of bandits, kidnappers,

herdsmen. This would help more farmers to access farmlands for farming, and agricultural output will increase.

iii) Interest on lending especially to farmers should be reduced to 5%. This will enable more farmers to access bank loans and investments in agriculture will increase.

iv) Inflation is found to be negatively impacted on agricultural output. Government needs to make policies that will stabilize and reduce inflation to single digit for agricultural sector to develop.

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