

Agricultural Financing Mix and Poverty Reduction in Nigeria

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ABSTRACT

This study investigates the impact of agricultural financing on poverty reduction in Nigeria, applying the Development Finance Theory to examine the relationship between financial systems and economic development. Agricultural financing, which includes loans, credit, insurance, and investment tailored to the needs of farmers and agribusinesses, is critical for enhancing productivity, improving livelihoods, and promoting sustainable development. Using secondary data from 2000 to 2023 sourced from the Central Bank of Nigeria (CBN), UNDP, and World Bank, this study employs a quasi-experimental research design and econometric models to analyze the influence of deposit money bank loans (DMBL), government expenditure (GEX), foreign direct investment (FDI), and other key financial variables on poverty levels. The findings reveal that increases in agricultural financing, particularly through DMBL and GEX, have a significant but complex relationship with poverty, suggesting that ineffective financial allocations may exacerbate poverty. In the long run, stable exchange rates and improved access to agricultural finance are essential for poverty alleviation. This study concludes that targeted reforms in agricultural financing policies and the optimization of financial resources are crucial for achieving sustainable economic growth and poverty reduction in Nigeria.

Keywords: Agricultural financing, Economic development, Poverty Reduction, Development finance theory, Deposit Money Banks (DMBs), Foreign Direct Investment (FDI), Government expenditure, Nigeria, Sustainable development, Poverty reduction.

INTRODUCTION

Agricultural financing encompasses the financial services and products provided to farmers, agribusinesses, and other entities involved in agricultural production. This type of financing is essential for the development and sustainability of the agricultural sector. It includes loans, credit, insurance, and investment options tailored specifically to the needs of the agricultural industry. These financial services help farmers purchase inputs such as seeds, fertilizers, and machinery, manage risks, and invest in technologies that can increase productivity and sustainability (Miller & Jones, 2010). Scholars acknowledge the impact of agricultural financing because access to financing allows farmers to invest in high-quality inputs, modern machinery, and advanced technologies. This increases yields and higher-quality produce, contributing to food security and economic growth (World Bank, 2014). Also, agricultural financing often includes insurance products that protect farmers against risks such as crop failure, extreme weather events, and price volatility. This financial safety net encourages farmers to invest more confidently in their operations (FAO, 2017). By supporting the agricultural sector, financing contributes to the overall economic development of a region.

Conceptual/Theoretical Framework

This study applied development finance theory to decipher the nexus between agricultural financing and economic development nexus. Development Finance Theory, also known as Development Finance Framework, provides a systematic approach to understanding the role of financial systems in fostering economic development, particularly in developing countries. Here's an overview based on the typical elements of such a theory: Development Finance Theory has been developed by various economists and scholars in the field of development economics. Specific theorists include: Robert E. Evenson (studied agricultural development and economic growth, including the role of finance in agricultural transformation), Erik

Thorbecke (studied poverty and development economics, including the importance of financial systems in poverty reduction), and John W. Mellor (studied agricultural development theory, focusing on the role of finance in agricultural transformation and rural development). The theory has evolved over time, with key contributions made from the mid-20th century to the present day. Significant advancements occurred particularly during the 1960s and 1970s, coinciding with increased focus on development economics and agricultural finance.

The theory assumes that financial markets in developing countries are imperfect, characterized by limited access to credit, high transaction costs, and inadequate financial services for rural populations. It recognizes the critical role of institutions, including government policies, regulatory frameworks, and financial intermediaries, in shaping financial systems and supporting economic development. Development Finance Theory often focuses on specific sectors such as agriculture, recognizing the sector's importance in poverty reduction, food security, and economic growth. Development Finance Theory employs empirical methods to analyze the impact of financial systems on economic development outcomes, including poverty reduction, income inequality, and sectoral growth. The theory relies on case studies and country-specific analyses to illustrate the application of financial interventions in promoting development, particularly in agriculture. Development finance theory posits that effective financial systems, including access to credit, savings, insurance, and payment services, are essential for fostering economic growth and reducing poverty in developing countries. It placed emphasizes on the sectoral importance of finance, particularly in sectors such as agriculture, where access to credit and financial services can enhance productivity, improve livelihoods, and promote sustainable development.

Ironically, poor farmers are especially vulnerable due to climate change and they are more dependent on climate-sensitive resources, though they contribute the least to climate change. Therefore, the problem of food insecurity is either directly or indirectly tied to emission of GHGs hence poses a challenge for Nigerian agricultural future. As 85% of Nigerian farmers are marginal, cultivating agricultural land less than 1 ha and small, cultivating between 1 and 2 ha; the task is more challenging (WTO, 2020). Scholars have advocated that providing smallholder farmers with access to credit, smallholder farmers can afford the relatively high upfront costs of quality seed and fertilizer; in turn this fertilizer is an enabler of GHG emissions. Such long term climate change and extreme weather events will bring greater fluctuations in crop yields and local food supplies and higher risks of food insecurity (FAO, 2023; IPCC, 2021).

Empirical Review

Ajayi et al (2023) in a paper titled agro-financing, institutions and poverty in low-middle income African countries employed Pooled OLS analysis and Random effects method were applied to the data sourced from World Development Indicators (WDI), Food and Agriculture Organization (FAO), Africa Country Policy and Institutional Assessment (CPIA) from 2005 to 2020. Consequently, the study found that institutions, agricultural land, agriculture credit are negatively significant to poverty in low and middleincome African countries. In addition, it showed that technology is negatively significant to poverty reduction in low and middle-income African countries. Other variables included in the model – agricultural employment and crop production. The study concludes that the policymakers in low-middle income African countries should embark on development of quality institutions and proper financing of the agricultural sector in order to bring about reduction of poverty in those countries.

Obadire (2022) study was carried out in Ogbomoso Metropolis, Oyo State, Nigeria, to evaluate the efficiency of microfinance institutions as a strategy for eradicating poverty there. The standard of living of the respondents was looked into, and the accessibility of microloans for expanding small and mediumsized businesses was also evaluated. The strategies were evaluated by distributing surveys directly to the microfinance institutions' customers. In order to examine the primary data, the chi-square test, Pearson correlation, and Analysis of Variance (ANOVA) tests were performed. The findings revealed an association between the respondents' level of living and the effect of microfinance banks on their household that was both favourable and significant ($p < 0.05$ and $r = 0.212$). The t-statistic test's value of 16.383 with a p value of 0.05 indicated that the poor had strong access to loan facilities from microfinance banks for the growth of microenterprises, according to the data. The impact assessment's conclusions led to the conclusion that

microfinance institutions have the power to eradicate poverty, notably by improving the standard of living for the poor and granting microloans to small businesses. Hence, a consistent increase in micro lending led to a significant drop in poverty in Nigeria.

Oluwasegu, Toluyemi and Opeyemi (2016) conducted a study on various agricultural investment options and their benefits for alleviating poverty in Nigeria. The Cobb-Douglas Production Function served as the study's theoretical underpinning and was one of two models employed for the time series econometrics research. The annual poverty rate and the percentage of the agricultural sector in the GDP, respectively, are the dependent variables in the two models. Time series secondary data from 1985 to 2012 were used for this inquiry. The unit root test for stationarity indicated that each variable was stationary at the first difference, which increases the likelihood that there may be short-run disequilibrium among the variables. The Johansen cointegration test was run to see if there was a long-term connection between them. As a result, the Error Correction Model (ECM) was created. The level of poverty in the current year was found to be statistically significantly reduced by the lag effects of capital, labour, and ACGS. In light of the higher labour sensitivity to productivity, which is also found to reduce poverty, the study recommends that public investment in the agricultural sector be redirected towards the provision of infrastructural facilities, the purchase of fertilisers and agrochemicals, and the pursuit of labour-intensive methods of production. Private investment in the agricultural sector should also be given a significant boost through the expansion of credit facilities under ACGS.

Benfica, Cunguara and Thurlow (2018) in a study titled linking agricultural investments to growth and poverty: an economy-wide approach applied to Mozambique. The study proposed an economy-wide systems-approach that combines ex post household econometric analysis (using propensity score matching) of investment impacts with ex ante modeling of growth and poverty linkages (using a spatially-disaggregated dynamic computable general equilibrium model). The paper applied this approach retrospectively to Mozambique. Simulation results indicate that the country's investment plan from 2012-2017 would not achieve national growth targets, despite doubling public spending on agriculture. Rather than increasing spending, the government should have reallocated resources towards agricultural research and extension, instead of irrigation and fertilizer subsidies. Providing extension services to smallholders is most effective at raising growth and reducing poverty in all regions of the country. Investing in irrigation was more likely benefit growth in the country's southern region due to less favorable agro-ecological conditions. The study therefore concluded that robust assumptions about investment efficiency should be taken across sectors. As demonstrated in Mozambique, the study's approach provides a consistent framework for evaluating ex ante sectorwide agricultural investment plans based on growth, poverty and regional equity considerations. Our approach complements household-level evaluations by enhancing their relevance for national planning.

RESEARCH METHODS

Quasi-experimental research was utilized in this study. The quasi-experimental research design designs involve comparing groups that are not randomly assigned, thus lacking the complete control of true experiments.

Specific Models Aligning the Objectives in this Study

Based on Islam (2020) model the following is used to capture the study objectives and its corresponding research questions.

After modification, this study uses $\text{Economic Development} = f(\text{GFAA}, \text{CFA}, \text{DMBFA}, \text{FDIA}, \text{INT}, \text{INF}, \text{LE})$

Where;

GEXX= Government financing allocation on agricultural sector (proxy by budget allocation)

FDIPA = Foreign Direct Investment inflow on agricultural sector

DMBL = Deposit Money Banks financing on Agriculture (proxy by credit and loans from DMBs to farmers)

INT = Interest Rate

INF = Inflation Rate

EXCR = Exchange Rate

The Modified model becomes the following

Poverty (proxied by Poverty Head Count) and Agricultural Financing Mix model

$$\Delta POV_t = \beta_0 + \beta_1 \Delta POV_{t-1} + \beta_2 \Delta GEX_{t-1} + \beta_3 \Delta DMBL_{t-1} + \beta_4 \Delta FDIPA_{t-1} + \beta_5 \Delta INF_{t-1} + \beta_6 \Delta INTA_{t-1} + \beta_7 \Delta EXCR_{t-1} + \theta_1 \ln POV_{t-1} + \theta_2 \ln GEX_{t-1} + \theta_3 \ln DMBL_{t-1} + \theta_4 \ln FDIPA_{t-1} + \theta_5 \ln INF_{t-1} + \theta_6 \ln INTA_{t-1} + \theta_7 \ln EXCR_{t-1} + \delta ECM_{t-1} + \epsilon_t$$

This study used secondary data between 2000 and 2023. The data is sourced from Central Bank of Nigeria (CBN) statistical bulletin, UNDP, Food and agricultural Organization (FAO), Our Data, World Bank Development Indicators.

Table 1: Descriptive Statistic

	DMBAL	EXCR	FDIPA	FSI	GEX	GHG	HDI	INE	INF	INTA	MIS	POV	GDPPC
Mean	282.95	124.13	0.4538	68.357	186.212	46176.4	1.527	34.748	18.819	17.593	30.51	68.881	1.477
Median	49.390	118.56	0.0147	69.910	1017996	34231.	0.530	34.600	13.006	17.590	25.10	72.100	2.100
Maximum	1934.2	589.45	5.4633	106.46	519856	98502.	44.00	45.000	72.835	29.800	81.87	94.100	8.832
Minimum	28.010	0.6177	0.0027	23.840	9636.5	22255.	0.320	27.320	5.3880	7.7500	11.68	27.200	0.070
Std. Dev.	467.21	133.11	1.0346	27.340	196461	24373.	6.631	4.1903	16.268	4.3468	16.12	19.700	2.4111
Skewness	2.3551	1.3618	3.2904	-0.1791	0.5248	1.1378	6.325	0.2751	1.9188	0.2046	1.594	-0.2175	-0.3156
Kurtosis	7.8403	4.8684	14.758	1.7643	1.5516	2.8657	41.01	2.7623	5.6117	4.1368	4.813	1.8051	1.6161
Jarque-Bera	81.726	19.545	325.30	2.9653	5.7328	9.3108	2876.	0.6436	38.609	2.6155	24.10	2.8971	4.1451
Probability	0.4563	0.6745	0.9845	0.2270	0.1569	0.1195	0.000	0.7248	0.0000	0.2704	0.000	0.2349	0.1258
Sum	12167.	5337.5	19.514	2939.3	800715	19855.	65.69	1494.2	809.25	756.53	1311.	2961.9	155.5
Sum Sq. Dev.	91682	744274.	44.962	31394.	1.62E+	2.49E+	1847.	737.47	11116.	793.58	1091	16300.	126.3
Observations	43	43	43	43	43	43	43	43	43	43	43	43	43

Source: Author's Computation using EViews 12 Software

The descriptive statistics in table 1 positioned the descriptive analysis of the series. The averaged mean value of deposit money bank loan to agricultural sector (DMBAL) was #282.95billion, exchange rate averaged #124.13 per Dollar, gross domestic product per capita (GDPPC) averaged value was \$1.477, foreign direct investment percentage to agriculture (FDIPA) averagely stood 0.45percent. Food security index (FSI) averaged 68.34 percent while government capital expenditure on agricultural sector (GEX) valued averaged at #186.2129billion, the average value of greenhouse gas emission (GHG) stood at 46176.4kt (Kiloton). The human development index (HDI) averaged 1.527 percent while the average of misery index (MIS) was 30.51 percent, inequality (INE) averaged 34.748 percent and poverty rate (POV) averaged 68.88 percent. Interest rate (INTA) and inflation rate (INF) stood at 17.59 percent and 18.81 percent respectively within the data set period. The closeness of the mean and median revealed that the series are good for economic forecast and prediction as there are not wide outlier between the mean and median except on the series of deposit money bank loan to agricultural sector (DMBAL), foreign direct investment percentage to agriculture (FDIPA), government capital expenditure to agricultural sector and human development index (HDI).

The skewness analysis resolved the indication of the observations and their closeness or wideness around the mean. Positive skewness implies that the series are not symmetric around the mean while negative skewness indicates that the series are symmetric around the mean. The implication is that decisions on positive skewness are less accurate as the mean value is greater than the median. On the other hand economic decisions on negative skewness are more accurate as there median is greater than mean value. From our observations, food security index (FSI), poverty rate (POV), and gross domestic product per capita (GDPPC) are negatively skewed and prediction on them intend to be more accurate. The observation on deposit money bank loan to agriculture (DMBAL), income inequality (INE), misery index (MIS), human capital index (HDI), exchange

rate (EXCR), inflation rate (INF), government capital expenditure to agricultural sector (GEX), greenhouse gas emission (GHG), interest rate (INTA) and foreign direct investment percentage to agriculture (FDIPA) are positively skewed and its economic implication is that caution needs to be made while making decision on them.

The peakness or flatness of the distribution of each variable is capture on the analysis of the Kurtosis. Kurtosis is grouped into platykurtic and leptokurtic. Platykurtic entails that the series in question is less than three and its implication is that the distribution is flat with a low probability in relation to normal distribution assumption while leptokurtic details that the variable in question is greater than three and is peak in relation to normal distribution with a high probability value. From the descriptive stable of 4.1, food security index (FSI), government capital expenditure on agriculture sector (GEX), gross domestic product per capita (GDPPC), greenhouse gas emission (GHG), income inequality (INE), and poverty rate (POV) have flat distribution while deposit money bank loan to agriculture (DMBAL), exchange rate (EXCR), foreign direct investment percentage to agriculture (FDIPA), human development index (HDI), inflation rate (INF), interest rate to agriculture (INTA), and misery index (MIS) have peak distribution.

The ordinary least square assumption on normal distribution is evaluated through the Jaque Bera statistics. The probability value of the Jaque Bera statistics validates the normality assumption. The null hypothesis buttressed that the variable is normal distributed with the Prob. Value greater than 5 percent level of significant while the alternative hypothesis suggested that the series is not normal distributed with the prob. Value being less than 5 percent level of significant. From the descriptive statistics table in 4.1, all the variables have their probability value greater than 5 percent except human development index. This implies that all the variables except human development index (HDI), inflation rate (INF) and misery index (MIS) are normally distributed at 5 percent level of significant.

Table 2 Poverty Model Selection Criteria

VAR Lag Order Selection Criteria						
Endogenous variables: POV						
Exogenous variables: C FDIPA GEX DMBAL INF EXCR INTA						
Date: 07/20/24 Time: 07:53						
Sample: 1981 2023						
Included observations: 39						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-158.1154	NA*	279.6421*	-8.467457*	-8.766045*	-8.574587*
1	-158.1104	0.007944	294.8626	8.518482	8.859726	8.640918
2	-158.0161	0.145084	309.6729	8.564928	8.948827	8.702668
3	-156.5580	2.168475	303.4638	8.541435	8.967990	8.694479
4	-156.4739	0.120792	319.3355	8.588403	9.057613	8.756752
* indicates lag order selected by the criterion						

Source: Author's Computation using E-Views 12 Software

The model selection criteria of our models are built in table 2. The criteria for lag selection is that the model is best suited with the criteria with the least absolute value. From the analysis, the Alkaike Information Criteria (AIC) is best suited for the entire model with different lad periods

Table 3: Poverty (SDG 1) and Agricultural Financing Mix Result

Panel A	Short run	Model		
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INDMBAL	35.74386	10.41050	3.433443	0.0018
INGEX	35.45519	10.80478	3.281437	0.0027
FDIPA	6.199383	3.123636	2.284669	0.0467
EXCR	0.150652	0.057337	2.627465	0.0136

INF	0.059802	0.150275	0.397947	0.6936
INTA	0.223590	0.657288	0.340171	0.7362
C	-322.6243	119.1380	-2.707988	0.0112

Source: Author's Computation using E-Views 12 Software

Panel B	Long run	Model		
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INDMBAL	30.82551	9.716700	3.172425	0.0080
INDMBAL(-1)	-15.74138	11.02796	-1.427406	0.1790
INDMBAL(-2)	9.213085	10.45380	0.881314	0.3955
INGEX	23.32745	15.59509	3.495820	0.0105
FDIPA	12.31935	3.445449	3.575543	0.0038
FDIPA(-1)	11.60931	4.826536	2.405308	0.0332
FDIPA(-2)	9.727290	9.071750	1.072262	0.3047
EXCR	0.356960	0.115380	3.093782	0.0093
EXCR(-1)	-0.448207	0.197244	-2.272347	0.0423
EXCR(-2)	0.494963	0.217974	2.270749	0.0424
INF	0.224284	0.169325	1.324573	0.2100
INF(-1)	-0.681323	0.252225	-2.701252	0.0193
INF(-2)	0.883065	0.267413	3.302250	0.0063
INTA	1.635189	0.777807	2.102306	0.0473
INTA(-1)	-0.808724	0.660860	-1.223745	0.2445
INTA(-2)	-0.635420	0.651827	-0.974829	0.3489
CointEq(-1)*	-0.816152	0.176572	-10.28562	0.0000
R-Square = 0.901015	Adj. R-Squ. = 0.89	F-Stat. = 5.381854	F-Stat. Prob.= 0.001958	DW. Stat.= 2.172748

Source: Author's Computation using E-Views 12 Software

In the short run model of the poverty head count as a function of agricultural financing in table 3 panel A, the constant term of -322.62 implies that absolutely poverty is natural phenomenon. The constant value buttressed that if all things being equal that poverty have a natural tendency to exist either absolutely or relatively. The relationship between deposit money bank credit to agricultural sector and poverty head count ratio is positive. This implies that increase in bank credit to agriculture increases the poverty rate as the probability value is significant. This implies that a one percent increase in deposit money bank credit to agricultural sector will result poverty rate to shift upward by 35.7 percent with immediate effect. The relationships that exist between government capital expenditure on agricultural sector and poverty rate are positive in the short run. This means that increase in government capital expenditure to agriculture will increase poverty rate. The prob. Value of government capital expenditure on agricultural sector indicted a significant impact to poverty rate. Thus a one percent increase in government capital project on agricultural sector will cause 35.45 percent increase to poverty rate. Foreign direct investment percentage to agricultural sector exhibits a positive impact on poverty rate. The significant of the prob. Value illustrated that a one percent increase in the inflow of foreign direct investment will shift the poverty rate upward by 6.19 percent. In the short run model, exchange rate has a direct relationship with poverty rate and the significant of the probability value implies that a unit change in exchange rate will result to 0.15 percent increase to poverty rate. The relationship of inflation rate and interest rate to agricultural sector to poverty rate also indicated to be positive but in the short run period both inflation and interest rate are insignificant to alter the level of poverty in Nigeria.

In the long run model of poverty rate influenced by agricultural financing mix, the lag selection criteria implies that the model is best analysis at level (o). The deposit money bank loan to agricultural sector is positive related to poverty rate and its probability value indicated that DMBAL is statistically significant at the long run to influence poverty rate. This implies that a one percent increase in deposit money bank to agricultural sector will cause a 30.82 percent increase in poverty rate. Government capital expenditure to agricultural sector has a positive relationship with poverty rate in long run and it has a statistical impact to cause a significant change to

poverty. A one percent change will cause a 23.32 percent change in the same direct with poverty rate. At level, foreign direct investment as percentage of agricultural sector share is statistically significant to poverty rate and the positive relationship implies that increase in FDIPA will cause Poverty rate to rise. Exchange rate and interest rate to agricultural sector in the long run model also maintain a positive relationship with poverty rate. The significant of exchange rate and interest rate implies that a unit change (increase) to exchange rate and interest rate will change 0.356 percent and 1.63 percent respectively to poverty rate while inflation rate is insignificant to cause change to poverty rate in the long run.

The negative value of the co-integration validates the establishment of long run association of the series. The co-integration equation posits that in the case of disequilibrium in the poverty rate model that it will take an average speed of 81 percent to adjust to equilibrium position. The D-W statistics value of 2.17, posits that the series are out of bondage of first order of Markov scheme. The overall model is statistically significant as it is shown in the F-stat. value of 5.38 and the F-stat prob. Value of 0.001958. The R-squared and adjusted R-squared values suggest that a significant portion of the variation in the dependent variable is explained by the independent variables. The R-squared value indicates that approximately 89 percent of the total variation in agricultural sector output is explained by the independent variables, with the remaining 11 percent attributed to random factors.

Table 4: Diagnostic Analysis Result

Poverty Model as a Function Agricultural Financing Mix and FDI				
Hypothesis	Test statistic	Cal-Stats	Prob.	Remark
Residual normally distributed	Jacque Bera (JB)	2.2259	0.3285	Accepted
No Serial correlation	Breusch Godfrey (BG)	3.761612	0.0605	Accepted
Homoscedasticity	Breusch-Pagan-Godfrey	0.442613	0.9601	Accepted
No specification error	Ramsey RESET	0.093081	0.9269	Accepted

From the table 4.13 above, the OLS assumptions were validated as the prob. Values are greater than 5% level of significant. This means that our models were correctly casted with zero means and normally distributed with a constant variance of error term.

CONCLUSION

In order to reduce poverty rate in the country, Deposit money bank agricultural lending (DMBL), government capital expenditure on agriculture (GEX), foreign direct investment on agriculture (FDIPA) should be improved and while a stable exchange rate (EXCR) should be pursued or implemented to guarantee stability in the international market. Government expenditure (GEX) and deposit money banks agricultural lending (DMBAL) should be utilized to guarantee food security in the country.

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