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Smallholder Farmers' Access to Agricultural Credit and Agricultural Output in Plateau State, Nigeria

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Abstract

This study examined the impact of smallholder farmers' access to agricultural credit on agricultural output and its broader socio-economic implications. Through an extensive review of literature, the study highlights the positive relationship between agricultural credit and agricultural productivity. When smallholder farmers have improved access to credit, they can invest in modern farming technologies, high-quality inputs, and sustainable practices, leading to increased crop yields and overall agricultural output. This, in turn, contributes to higher income levels for farmers, poverty alleviation, and enhanced food security within rural communities. Moreover, the study explores the various socio-economic impacts of agricultural credit on smallholder farmers and their surrounding regions. It uncovers the potential for job creation, rural development, and economic growth as agricultural output rises and agro-based industries thrive due to increased production. The study also identifies several recommendations to strengthen smallholder farmers' access to agricultural credit. These recommendations include the establishment of agricultural credit institutions, financial literacy and capacity-building programs, targeting women farmers, promoting climate-smart agriculture, and implementing monitoring and evaluation mechanisms to ensure the effectiveness of credit programs. In conclusion, the findings of this study underscore the critical importance of providing smallholder farmers with improved access to agricultural credit. By doing so, governments and stakeholders can significantly boost agricultural output, alleviate poverty, and enhance the overall socio-economic well-being of rural communities. Empowering smallholder farmers through agricultural credit is a promising strategy for building more resilient and sustainable agricultural systems and fostering inclusive economic growth.

Key Words: Smallholder Farmers, Agricultural Credit, Agricultural Output, Plateau State, Nigeria

1. Introduction

Agriculture in Nigeria is not carried out with intention and enterprise. Many farmers work in agriculture for sustenance rather than for profit. Low investment, low savings, poor income, low output, and a lack of collateral for lending access could all contribute to this. These prevent farmers from amassing the assets required for successful and long-lasting agricultural operations, which results in very poor capital utilisation on their part. To completely shift smallholder agriculture from a market-oriented to a subsistence-oriented approach, there must be adequate credit or loan availability (Mgbebu, & Achike, 2017).

One of the most crucial strategies for increasing agricultural output is to have access to agricultural loans. Small loans offered to smallholder farmers, known as "microloans," improve the agricultural standing of small-scale farmers by investing the money considered to be loans into tangible assets and people (Okurut, et. al. 2004). The amount of agricultural production will undoubtedly increase with the availability of sufficient and timely finance, and adoption of new knowledge will undoubtedly improve the acquisition and use of some superior agricultural inputs that are currently out of the farmer's reach (Oladeebo & Oladeebo, 2008). Together with family size, marital status, and educational attainment, a study by Nweze (1991) found that loan size, the process by which agricultural financial institutions distribute loans, and promptness in payment and repayment are essential for enabling smallholder farmers to benefit from the loans the agricultural financial institution lent to them and, as a result, improving the agricultural output of smallholder farmers in Nigeria.

2. Literature Review

The literature review centers on the expected utility theory.

2.1 Expected Utility Theory

The general normative and taking into account descriptive literature uncertainty under risk has been really occupied by expected utility theory. It is a reality to consider while analyzing input and production choices in agricultural production. (Babcock, et. al. 1998; Chavas & Holt, 1990 & Feder, 1980; Ramaswami, 1992; Collender & Zilberman, 1985; Hennessy, 1998). The utility function, which regarded wealth as concave, was a key component of the framework of the anticipated utility theory to explain risk aversion.

Consumers possessed lesser infinitesimal utility for more wealth. Rabin (2000) propounded a theorem that showed and explained expected utility theory having a completely improbable clarification for substantial risk aversion over small and modest likelihoods. The concave utility function can have relatively minimal risk aversion over tiny and modest likelihoods, indicating that there was a ridiculously high degree of risk aversion over large likelihoods, within the context of anticipated value theory. Winter and Neilson (2001) did a study and found that a utility function of risk trade-off data and wage fatality portfolio choice can both be explained by a single constant relative risk aversion (CRRA) model that takes into account both small- and large-scale hazards. The constant relative risk aversion coefficients that are consistent with the data on the wage fatality risk premium.

According to Neilson and Winter (2001) were lesser than the coefficients compared the utility function used to evaluate large risks is viewed as less risk averse than those used to evaluate small and moderate risks, according to portfolio choice data. Undeniably, the most firmly and empirically well-known characteristic of risk preference, loss aversion, denoted a total deviation to straight and detailed explanation which paved way aversion to risk on a small and moderate scale. According to some, it is said that, smallholder farmers' loss aversion is importantly having more averse to losses compared to the class of smallholder farmers that are attracted by gains

(Rabin, 2000). This theory gave good starting point in trying to study how smallholder farmers take decision on how to look for credit for agricultural purposes and whether or not, for the reasons solely for the production of agriculture. Smallholder farmers would like to invest their personal monies into the agricultural activities that have lower and certain agricultural output other than seeking large amount of credit from lending institutions that they are uncertain about whether the agricultural output will be sufficient to repay the credit.

3. Empirical Literature Review

Credit availability was the focus of research by Quach, et. al. (2005), who discovered a decline in family poverty in rural Vietnam. In the years 1992 and 1993, a cross-sectional study of the surveys from the two families was started. In the years 1997 and 1998, a study was also started. The findings demonstrated that family credit significantly increases the economic well-being of families in line with income per head expenditure, income per head on food, and income per head on non-food. Whether a family is wealthy or poor, credit has a clear impact on their financial well-being in both cases. Credit was shown to have some influence on economically disadvantaged families' well-being, and it was also discovered that criteria including family size and head of household age were practical and thought to have an effect on family borrowing. To determine if credit has a higher favorable impact on agricultural productivity, the current study attempted to borrow from (Quach *et al.*, 2005).

In a study on sectoral allotment, Avinash and Mitchell-Ryan (2009) examined how it affected commercial banks' credit, agricultural development, and growth in Trinidad and Tobago. The study found that commercial bank lending played a crucial role in how people and businesses in Trinidad and Tobago finance enterprises with economic value. According to the study's findings, credit had an effect on agricultural growth by influencing capital investment because of the manner it was distributed through monetary transmission mechanisms. In order to establish that there is a relationship between credit and investment and to determine its directionality, the vector error correction model was taken into consideration in the research. The model demonstrated clear correlations between requests and the rise of all credit. Nonetheless, a leading study of the relationship between economic growth and lending in a significant non-oil sector revealed the need for further research. The current study attempted to draw from Avinash and Mitchell-Ryan (2009) in order to determine the effects of sectoral credit allocation from commercial banks on agricultural development and improvement.

Using data from Lahore, Punjab, et.al. (2010); Bashir et al. (2010) conducted research on the effects of credit on agricultural output of wheat crops. Also designated to represent institutional credit sources as an agent is United Bank Limited (UBL). By stratifying the data into the districts, well-designed questionnaires were employed as the research's principal source of data. Ten people from each village were then randomly selected from a list of loanees given by the UBL after two villages from each stratum were randomly chosen. Similarly, the number of non-loanees was picked for the purpose of contrast. The analysis of multiple regressions was performed. Findings indicated that agricultural loans were particularly effective in accelerating agricultural development and enabling farmers to participate in the production process. The existing study employed the treatment effect model to determine the relationship between loan access and agricultural output, whereas the study by (Bashir et al., 2010) employed the OLS model (ordinary least squares).

3.1 Model Specification

The study tried to determine Smallholder Farmers' Access to Agricultural Credit and Agricultural Output in Plateau State, Nigeria.

Regression discontinuity requires a large number of farmers close to the discontinuity to draw meaningful conclusions, but this is challenging because the characteristics of the variables continue to change as one moves away from the discontinuity line. Therefore, Propensity- Score Matching (PSM) was chosen instead of regression discontinuity method. Similar to the instrumental variable approach, regression discontinuity also produces a local treatment effect. A PSM makes the assumption that farmers who received treatment and those who did not differed not just in terms of the type of therapy but also in terms of factors that affected access and the result. Because the control group (untreated farmers) is statistically equivalent to the treated farmers, it looks out untreated farmers who share the same characteristics as the treated farmers and matches them using propensity scores, establishing a quasi-experiment (Winter, et. al. 2010). Using the observed variables, the propensity score was used to assess the likelihood of receiving treatment (Pi=1).

(X): Pr Pi = Pr (Pi=1|X) (1)

Since 0 < Pi < 1, a estimating the conditional likelihood of participation was done using a probit model (propensity score), with the dependent variable being a dummy variable with a value of one if the farmer used credit and zero otherwise (Wooldridge, 2002). The qualities that affected agricultural output served as the independent variables, recreating the selection process. As recommended by Rosenbaum and Rubin (1983), PSM was used to compare the scores of individuals who received treatment vs those who did not. The result for the treatment and control groups, as well as the gap between the two was used as a yardstick to measure how credit availability affected agricultural output. Hence, the estimated ATE is obtained by taking the mean of these individual impacts (Gertler, et. al. 2011).

$ATE=E[Y_1(t=1, D=1) - Y_0 (t=1, D=0)]$ (2)

Where Y_1 is the outcome for the treated, Y_0 is the outcome for the non-treated, $t=1$ represents the period of post-treatment, $D=1$ represents credit accessed and $D=0$ did not access credit

3.2 Target Population

There are 3,206,531 people living in Plateau State, with 458,075 households, of which 10,218 are small-scale farmers, according to the National Population Commission of Nigeria (2006). Due to the fact that agriculture has been the area's primary economic activity, the study focused on these households that were involved in agricultural activities (National Bureau of Statistics of Nigeria, 2016).

TABLE 1: Target Population

Zone	Small Holding Households	Percentage
Northern zone	4, 394	43
Central zone	2, 657	26
Southern zone	3, 168	31
Total	**10, 218**	**100**

Source of data: National Bureau of Statistics (2016)

The three geopolitical zones that were selected for this study are made up of Plateau State. The three zones are comparable in that smallholder farmers can be found in each of them. These smallholder farmers start their smallholder farming. Their economic

foundation is also the same, and their standard of living is comparable throughout the State. These smallholder farmers from each zone do not cultivate the same crops or raise the same animals, which is the distinction between these three regions.

3.3 Sampling Frame

According to data from the National Bureau of Statistics of Nigeria, the sample frame for the current study included a list of all 10, 218 small holding households in Plateau State, Nigeria (2016). In Plateau State, the smallholder farmers were divided into three strata: the Northern Zone, the Central Zone, and the Southern Zone. This was done as part of the study's stratified multistage random sampling technique. With the assistance of local government and agricultural officers in each region, the respondents were chosen by a straightforward random sampling technique following stratification by region. Each of the smallholders in the sample group had their information recorded, they had been told of the study's goal, and permission to use their information to conduct the questionnaires had been requested. The HH was directed to specific areas in each home.

The Yamane (1967) formula, however, was employed to calculate the sample size. According to Mugenda & Mugenda, the population was assumed to have a normal distribution with a confidence interval of 95% in order to calculate the sample size (2009). Below is the Yamane formula:

$$n = \frac{N}{1+N(\varepsilon)^2} \quad (3)$$

Where n = Sample Size, N = Total population of small holder households, ε = Error tolerance (level) considered to be 0.05 in this study (Mugenda & Mugenda, 2009). Replacing the values in the formula gives:

$$n = \frac{10{,}218}{1+10{,}218(0.05)^2}$$

n = 384 Households

According to Suresh & Chandrashekara (2012); Wayne (1975), a sample size can be adjusted for non-response in order to obtain the desired sample size overall using the following formula:

$$Desired\ Sample\ Size, adjusted\ for\ non\ response = \frac{Obtained\ Sample\ Size}{1 - Non\ Response\ Rate}$$

If there are more than 10,000 people in the population, Mugenda & Mugenda (2009) predicted a non-response of 1 to 10 percent. The overall desired sample size changed when Mugenda & Mugenda (2009)'s estimate of a 5 per cent non-response rate was taken into account.

$$n = \frac{384}{1-0.05} = 404$$

404 smallholder farmers in Plateau State were thus specifically selected by the study to take part in the survey. The small holding households' HH heads were thus the target.

4. Results

The PSM procedure was justified after it was shown that the propensity scores balanced the distribution of variables between the two matched groups and that the assumption of shared support was true. The difference in average agricultural output between the two matched groups was then used to calculate the impact of smallholder farmers' access to finance on agricultural output. In Table 1.2, the findings are presented as the average treatment effects for the treated (ATET).

TABLE 2: Effect of Access to Agricultural Credit on Agricultural Output from PSM

Estimator	Outcome	Effect	Coef.	AI Robust Std. Err.	P-Value
NNM	Agricultural Output	ATET	58409.26***	18,216.36	0.002

Source: Source: Author's computation based on Survey data (2021)

*AI robust standard errors are used to generate heteroskedastic –robust variance estimators to correct for potential heteroskedasticity (Abadie & Imbens, 2002; Ateka (2018).

According to Table 2, there was a positive and significant ATET for the impact of access to agricultural financing on agricultural output. It appears from this that having access to agricultural loans can greatly raise agricultural output by 58,409.26 Naira (USD. 142.9). This suggests that small-holder farmers may benefit from accessing loans for agricultural activities if the borrowed money is used for its intended purpose.

When borrowed agricultural credit has a higher marginal utility in agriculturally related activities and a lower marginal utility in non-agriculturally related activities like consumption, short-term investments in rival businesses, and long-term investments like education, it can have a significant impact on agricultural activity (Mghenyi, 2015).

If, as suggested by Siddiqi et al. (2009), the flow of credit to farmers increases the demand for inputs to increase crop production in terms of the number of tractors, use of chemical fertilizer, size of cultivated land, and pesticides, the amount of credit accessed may occasionally fail to have a significant impact on output. When credit is not obtained in a sufficient amount, the influence of such a high input demand on production costs may be felt.

However, having access to loans may encourage farmers to use mechanized farming techniques like using tractors or fertilizers, which may increase output (Siddiqi et al. 2009). On the other hand, Anyiro and Oriaku (2011) found that small-holder farmers in Abia State, Nigeria, did not significantly benefit from access to microcredit in terms of their agricultural output. This was primarily caused by the fact that most farmers used their agricultural credit for unrelated, non-agricultural purposes.

4.1 Socio-Economic Impact of the Smallholder Farmers' Access to Agricultural Credit and Agricultural Output

Access to agricultural credit plays a crucial role in the socio-economic development of smallholder farmers and can significantly impact agricultural output. Let's explore the socio-economic impacts of smallholder farmers' access to agricultural credit on agricultural output:

1. Increased Investment in Farming: Access to agricultural credit allows smallholder farmers to invest in modern farming practices, better seeds, fertilizers, and machinery. This leads to increased agricultural productivity and output, as farmers can afford to adopt more efficient and sustainable farming methods.

2. Higher Crop Yields: With access to credit, farmers can afford improved irrigation systems and other technologies that enhance crop yields. They can also diversify their crops, reducing dependence on a single crop and minimizing risks associated with crop failure. Higher yields contribute to food security and improve the farmers' economic well-being.

3. Income and Poverty Alleviation: When farmers have access to credit, they can invest in their farms, which lead to higher income potential. Increased income helps lift smallholder farmers and their families out of poverty, improving their overall quality of life.

4. Employment Generation: Improved agricultural output due to access to credit can lead to increased employment opportunities in rural areas. As farms become more productive, they may require additional labor for various farming activities, thus reducing unemployment rates.

5. Rural Development: Smallholder farmers are often the backbone of rural communities. When they have access to credit, they can contribute more effectively to local economic development. Increased agricultural output can stimulate agro-based industries, such as food processing and storage, leading to more comprehensive rural development.

6. Empowerment of Women Farmers: Access to agricultural credit can benefit women farmers, who often face barriers in accessing financial services. When women are empowered with credit, they can invest in their farms, leading to improved agricultural productivity and increased gender equality in rural areas.

7. Enhanced Food Security: Improved agricultural output ensures an adequate supply of food for the population. When smallholder farmers can access credit to enhance their farming practices, it helps mitigate food shortages and reduces dependence on food imports.

8. Climate Resilience: Agricultural credit can enable farmers to invest in climate-resilient farming practices and technologies. This helps them adapt to the impacts of climate change and reduce the vulnerability of their crops to extreme weather events.

9. Reduced Rural-Urban Migration: When smallholder farmers have access to credit and experience improved economic conditions, it reduces the incentive for rural-to-urban migration. This can help in maintaining the balance between rural and urban populations and reduce the strain on urban infrastructure.

10. Overall Economic Growth: Agriculture is a significant contributor to the economy of many countries, especially those with a large rural population. When smallholder farmers' productivity increases due to access to credit, it positively impacts the overall economic growth of the nation.

5. Conclusion

Access to agricultural credit for smallholder farmers has a significant impact on agricultural output and the socio-economic development of rural communities. The evidence presented in this study demonstrates that when smallholder farmers have improved access to credit, they can invest in modern farming practices, better inputs, and technologies, leading to increased agricultural productivity and higher crop yields. This, in turn, contributes to income generation, poverty alleviation, and enhanced food security in the region.

The positive socio-economic impacts of agricultural credit on smallholder farmers are not limited to individual households but also extend to the broader rural economy. With increased agricultural output, there is a potential for job creation, rural development, and economic growth, as agro-based industries thrive due to the surplus production.

5.1 Recommendations

Strengthening Agricultural Credit Institutions: Governments should collaborate with financial institutions and development agencies to create and strengthen agricultural credit institutions that specifically cater to the needs of smallholder farmers. These institutions should offer affordable and accessible credit products tailored to the agricultural sector's requirements.

Financial Literacy and Capacity Building: Providing financial literacy and capacity-building programs to smallholder farmers is essential to ensure they understand the benefits and responsible use of credit. These programs should also focus on improving farmers' knowledge of modern farming techniques and sustainable practices to maximize the impact of credit on agricultural output.

Flexible Loan Terms: Governments and financial institutions should design credit programs with flexible loan terms, including reasonable interest rates, grace periods, and repayment schedules that align with the agricultural production cycle. This will alleviate the burden on farmers and increase their capacity to repay loans.

Targeting Women Farmers: Special efforts should be made to ensure that women farmers have equal access to agricultural credit. Gender-specific credit programs and initiatives can empower women farmers, leading to improved agricultural productivity and gender equality in rural areas.

Climate-Smart Agriculture: Promoting climate-smart agricultural practices through credit support can help smallholder farmers adapt to the challenges posed by climate change. Investments in climate-resilient technologies and practices will enhance the sustainability of agricultural output.

Monitoring and Evaluation: Governments should establish robust monitoring and evaluation mechanisms to assess the impact of agricultural credit programs continually. Regular assessment will help identify areas for improvement and ensure that credit reaches the intended beneficiaries effectively.

Public-Private Partnerships: Encouraging public-private partnerships can bring together the expertise and resources of both sectors to design and implement more comprehensive agricultural credit schemes. Such collaborations can lead to innovative solutions and better outreach to smallholder farmers.

Risk Management Mechanisms: Governments and financial institutions should develop risk management mechanisms to protect farmers from unforeseen events such as natural disasters or market fluctuations. Insurance products tailored to the agricultural sector can act as safety nets for farmers, encouraging them to invest in their farms with confidence.

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