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Microfinance services and membership of farmer-based organization as drivers of household food security among rice farmers in Niger and Nasarawa States, Nigeria

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ABSTRACT

Food security in Nigeria is a critical issue, with millions of farming households struggling daily. One potential solution is the provision of microfinance services and the promotion of membership in farmer-based organizations. This study examines the effect of these factors on the food security of 300 rice-farming households in Niger and Nasarawa States. Using descriptive and inferential statistics, ordered probit regression, and the household food insecurity access scale, the study reveals key findings: larger household sizes, older household heads, higher education levels, and larger farm sizes negatively affect food security. Conversely, membership of farmer-based organizations, access to microcredit and microsavings, extension services, farm income, and farming experience positively influence food security. The household food insecurity access scale (HFIAS) analysis shows that only 49% of rice-farming households in the study area are food secure. The study recommends expanding microfinance services, especially microcredit and microsavings, to improve food security among rice-farming households. Additionally, farmers should be encouraged to join farmer-based organizations to enhance their food security.

Keywords: farmer-based organizations, food security, microcredit, microfinance, Nigeria



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1. Introduction

The struggle for food security in Nigeria has become a battle for daily survival, affecting millions of people, demanding serious attention and action, and achieving the UN Sustainable Development Goal (SDG) 2 of Zero Hunger by 2030 has emerged as one of Nigeria's most pressing concerns. According to [1], [2], making sure that millions of households who are in poverty can obtain enough food to live healthy lives has become a major concern. In the country, the rural areas suffer more acute hunger, compared to urban areas where 19% of the population lives below the poverty line [3], [4]. Peng and Berry [5] defined food security as a state in which everyone at all times has physical access to enough, safe, and nutritious food that satisfies their dietary needs and food choices for an active and healthy existence.

In numerous developing nations, such as Nigeria, various strategies and initiatives have emerged as a crucial tool for improving the well-being of farming households. Some of these initiatives include programmes like the Agricultural Credit Guarantee Scheme Fund (ACGSF), Commercial Agriculture Credit Scheme (CACS), Agricultural Credit Support Scheme (ACSS), and many more, which were developed to help assist farmers [6]. Ladigbolu et al. [7] assert that the Nigerian government came up with the concept of microfinance

institutions to close the gaps left by commercial banks that accept collateral but are hesitant to provide the particular credit needs of the rural population, which is primarily made up of farmers and smallbusiness owners. Microfinance provides access to loans for smallholder farmers and entrepreneurs, which may increase productivity, income, food security, and in the long run welfare at the household level [8].

Swamika and Pushpanathan [9] posited that microfinance services encompass microcredit, microsavings, and micro-training, which can be gotten from both formal and informal sources. Some of these informal sources may include cooperatives, NGOs, rotating savings and credit associations, and many others. These services are mostly gotten from Microfinance institutions. These institutions can be categorized into formal and informal institutions. The formal institutions are mainly the microfinance banks and the informal institutions are farmer-based organizations, NGOs, rotating savings, credit associations and many others. Farmer-based organizations (FBOs) are groups that represent farmers in a certain region and are primarily concerned with agribusiness [10]. They include farmers' associations, farmer cooperatives, farmer clubs, farmer groups, producer organizations, and women's groups.

According to [11] about 987 microfinance banks have been developed to make financial services more accessible to farmers. The establishment of several microfinance banks in various states in Nigeria including Niger and Nasarawa States was made to assist farming households in enhancing their access to financial services leading to a tremendous growth of the microfinance sector over the years. Additionally, the state government of Nasarawa had also supplemented the federal government's efforts by obtaining and providing fertilizer at a discounted price, as well as providing other supplies to farmer-based organizations while also serving as informal institutions for farmers to have access to credit [12]. However, despite all these efforts and interventions, according to [11], about 41.6% of the rural population are still financially excluded and most of these smallholder farmers are still facing problems in accessing these financial services leading to shortage of funds affecting their farming operations. Furthermore, despite the fact that very few of these farmers and their households are receiving financial assistance, they still seem to experience food insecurity especially in Niger and Nasarawa States [12].

This study, therefore, seeks to unveil the effects of microfinance services and membership of farmer-based organisations on the food security of rice-farming households in Niger and Nasarawa States, Nigeria. The study's precise objectives are to; identify the various microfinance services used in the study area, assess the level of food security in the study area, and examine the effects of microfinance services and membership of farmer-based organizations on the food security of rice-farming households in the study area.

1.1. Classic microfinance theory of change

This study explains how microfinance services affect farmers' welfare using the microfinance theory of change. Srikant et al. [13] promoted the classic microfinance theory of change which was also employed by [14], [4] [15], [16]. Microcredit is a type of banking service accessible to unemployed or low-income individuals or groups who would otherwise be denied access to financial services. This is one of the microfinance theories that explain how low-income people can acquire microcredits and use them to launch or grow a microenterprise [10]. According to Chris Dunford's theory of microfinance, borrowing money from or saving money at a microfinance institution gives access to a financial inclusion database, which makes it easier to estimate a group's accessibility to financial products and services using evidence. One of the well-known microfinance philosophies that many prosperous business people adhere to is this one [15]. According to the World Bank's 2008 Poverty Assessment, microfinance services remain beneficial to the poor if they are able to endure income and non-income shocks like a financial crisis brought on by the sudden passing of a productive family member, the loss of an economic asset, or natural disasters. Based on this theory, microfinance institutions' operations can help farmers become more productive by enhancing their ability to do so. This study's premise implies that small-scale farmers use microfinance institutions' services (microcredit, micro-savings, micro-insurance, and entrepreneurship training), which improves their efficiency. Therefore, the most important theory supporting this study is the microfinance theory of change. This is due to the theory's premise that low-income households (farming households) will employ microfinance services provided by microfinance institutions, invest the money in farming activities that generate income, and manage the farm to provide a significant return on investment. Therefore, as farming households will now have enough money to buy enough food, this leads to enhanced well-being as well as food security.

1.2. Social capital theory

Theorists, decision-makers, and community groups have all paid close attention to social capital theory as a means of evaluating and comprehending the connection between social networks and collective action [17]. According to Putnam as cited in [17] social capital can be defined as social organization features, like networks, norms, and social trust, that facilitate coordination and cooperation for mutual benefit. Social capital theory was founded on the premise that individuals are “embedded” in a network of social relations that influence decisions and actions [17]. The social capital theory postulates that people derive value from their interpersonal relationships because they offer resources that may be employed to accomplish goals [18]. According to [19] social capital theory (SCT) was first defined by Bourdieu in 1985 as the aggregate of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition.

According to [18] several arguments on social capital theory have been made by scholars and there seem to be converging opinions on the issue. He opined that several conceptualizations have been used to characterize social capital. Bizzi [18] asserts that in 1992, Burt identified social capital as friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital. Also, Bizzi [18] acknowledged that one of the most popular conceptualizations of social capital focuses only on the structure of network relationships developed in organizations. Similarly, according to [20] social capital is uneven among groups, making it difficult for some firms to access resources to sustain their businesses. According to [19] social capital can be broken down into two elements: the social relationship itself, which allows individuals to claim access to resources possessed by their associates, and the amount and quality of those resources.

According to [20] social capital theory has been used in the business world to illustrate how underprivileged individuals build their social capital and gain access to resources to enhance the operation of their businesses. People who are accepted into a social or economic group are likely to exploit that acceptance to affect their access to financial resources, according to [20]. Therefore, this theory shows how farmer based organizations play a crucial role in enhancing social cohesion, knowledge sharing, and collective action within rural communities by fostering networks of trust, reciprocity, and cooperation among farmers. This theory emphasizes the importance of collective networking and the joining of resources to help achieve both individual and collective goals.

2. Method

2.1. Study area

The study was conducted in Niger and Nasarawa States, Nigeria. Niger and Nasarawa state is in the country's north-central area. The population of Niger State in the year 2019 was 6,220,617 [21]. Agriculture is the mainstay of Niger and Nasarawa State's economy with major economic activities that comprise farming, fishing, and cattle rearing. The population of Nasarawa State in the year 2019 was 2,632,239 [21].

2.2. Sampling technique

Multi-stage sampling technique was utilized in the selection of respondents for this study. In the first stage, one (1) Local Government Area (LGA) was selected purposively from each of the three (3) zones in both Nassarawa and Niger States due to the predominance of rice production in these areas. The LGAs are Lafia, Wamba, and Doma for Nassarawa and Wushishi, Katcha, and Bosso for Niger States, giving six (6) LGAs in total. The second stage involved the random selection of five (5) villages from each LGA, bringing the total to thirty (30) villages. In the final stage, ten (10) rice-farming households were chosen at random from each of the 30 villages, resulting in a total of three hundred (300) rice farming households. This research utilized primary sources to collect cross-section data. Leveraging Computer-Assisted Personal Interviewing (CAPI) technology via Kobotoolbox, the questionnaire facilitated the systematic collection of socioeconomic characteristics, farmers' access to microfinance services, and the level of food security among rice-farming households.

2.3. Model specification

Percentages and frequencies were used and the Household Food Insecurity Access Scale (HFIAS) and Ordered probit regression model. The HFIAS tool used a 9-item questionnaire to draw attention to the growing issue of severe food insecurity [22]. Suppose a household responds "often" to all nine frequency-of-occurrence questions, it receives a maximum score of 27; otherwise, it receives a minimum score of 0 (if it answers "no" to all occurrence questions, in which case the frequency-of-occurrence questions are coded as 0). The greater

the score, the more severe the household's food insecurity. A household experiences reduced food insecurity as its score decreases.

$$\text{HFIAS Score (0-27)} = Q1a + Q2a + Q3a + Q4a + Q5a + Q6a + Q7a + Q8a + Q9a \quad (1)$$

According to [23] each household's access category for food insecurity: 1 = Food Secure; 2 = Mildly Food Insecure Access; 3 = Moderately Food Insecure Access; 4 = Severely Food Insecure Access.

2.4. Ordered probit model

This model was adopted to examine the influence of microfinance services on rice-farming households' food security. The following specification for the ordered probit regression model is shown below:

$$Y_i^* = \beta^1 X_n + \varepsilon_n \quad (2)$$

The observed and coded discrete food insecurity variable, Y_i^* is determined from the model as follows:

$$Y_i^* = 0 \text{ if } -\infty \leq Y_i^* \leq \mu_1 \text{ (Food secured)} \quad (3)$$

$$1 \text{ if } \mu_1 < Y_i^* \leq \mu_2 \text{ (Midly food insecure)}$$

$$2 \text{ if } \mu_2 < Y_i^* \leq \mu_3 \text{ (Moderate food insecure)}$$

$$3 \text{ if } \mu_3 < Y_i^* \leq \infty \text{ (Severely food insecure)}$$

where the μ_1 represent thresholds to be estimated (along with the parameter vector β); X_i are the independent variables; β_0 = constant; β_1 - β_{13} = vector of the explanatory variables.

X_1 = Membership of farmer-based organizations (1 if a household rice farmer is a member, 0 otherwise); X_2 = Microcredit (Amount of microloan received by the household head in the last 12 months); X_3 = Microinsurance (access to microinsurance 1, 0 otherwise); X_4 = Microsavings (Amount of money saved with microfinance institutions in the last 12 months); X_5 = Microtraining (number of microtraining received in the last 12 months); X_6 = Access to extension contact (1=yes, 0=otherwise); X_7 = Household size (number of people living under the same roof with the household head and eating from the same pot); X_8 = Rice farm size (Hectares); X_9 = Farm income(Naira); X_{10} = Non-farm income (Naira); X_{11} = Farming experience of household head (Years); X_{12} = Age of household head (Years); and X_{13} = Education level of household head (Number of years spent in school).

3. Results and Discussion

3.1. Identification of the various microfinance services used by rice farming households in the study area

Microfinance institutions offer microcredit, microsavings, microinsurance, training programs, remittance services, fixed deposits, bank deposits, and leasing [14]. However, the research concentrated on microcredit, microsavings, microinsurance, and microtraining. Table 1 shows that approximately 36.40% of respondents used microsavings, 26.40% used microcredit, 19.20 % used microtrainings, and 18% used microinsurance. This demonstrates the inequalities in microfinance service accessibility. The relatively high rates of microsavings and microcredit use suggest a recognition of the importance of financial services in household resource management and capital acquisition for agricultural activities. Lower rates of microinsurance use, on the other hand, suggest that respondents may lack understanding, accessibility, or sense of the necessity of this service. This conclusion is consistent with the results of [24] who observed that 43% of respondents were aware of insurance, compared to 57% who were not, and that 69% lacked any type of insurance.

Table 1. Distribution of microfinance services used by rice farming households in the study area

Microfinance services	Frequency	Percentage (%)
Microcredit	79	26.40
Microsavings	109	36.40
Microinsurance	54	18.00
Microtrainings	58	19.20
Total	300	100

3.2. Membership of farmer-based organizations of the respondents

According to Figure 1 findings, about 43% of the respondents did not belong to a farmer-based group, while 57% of the respondents did. This demonstrates that a sizable fraction of the rice-farming households were members of a farmer-based organization. This shows that, to an extent, the agricultural community has a high degree of organizational engagement and participation, underscoring the value of teamwork, shared resources, and collective action in tackling shared problems and achieving common goals. The significant percentage of the respondents (43%) who were not members of a Farmer-based Organization (FBO) indicates possible avenues for broadening the organization's reach and improving membership inclusion among farmers. These results are in line with the findings of Adiel et al. [25] who found that a large percentage of rice farming households in Plateau and Nasarawa states belonged to a farmer-based organization, suggesting that the area's rice farmers maintained a high social profile, engaged in a lot of social interaction, and had access to information.

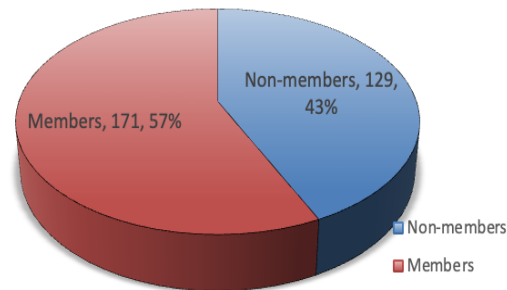


Figure 1. Membership in farmer-based organizations of respondents
(source: computed from field data, 2024)

3.3. Food security status of rice farming households in the study area

Table 2 shows the level of household food insecurity among rice-growing households in Nasarawa and Niger states. In totality, 49% of these households had been identified to be food-secure, while 51% were food-insecure, with 27% having mild food insecurity, 18% moderate food insecurity, and 6% severely food insecure. This underlines the continued difficulty that rural agricultural communities encounter in obtaining adequate food. Specific to each state, statistics indicate considerable differences: in Nasarawa, 30.67% of rice farming households were identified as food-secure, compared to just 18.33% in Niger. These findings indicate a variation in food insecurity prevalence among the two states, consistent with [22], who found that a large number of rice-farming households in their study area were food-insecure.

Table 2. Frequency distribution of the prevalence of household food insecurity in the study area

Food Insecurity Status	Total Sample	Nasarawa	Niger
Food Secure	147 (49)	92 (61.3)	55 (36.7)
Mildly Food Insecure	81 (27)	19 (12.7)	62 (41.3)
Moderate Food Insecure	54 (18)	22 (14.7)	32 (21.3)
Severely Food Insecure	18 (6)	17 (11.3)	1 (0.67)
Total	300	150	150

Note: figures reported in parentheses are percentages; source: computed from field data, 2024

3.4. Effect of microfinance services and membership of farmer-based organizations on food security of rice farming households in the study area

Table 3 analyzed the effects of microfinance services and membership in farmer-based organizations on household food security. Ordered probit regression findings showing marginal effects of explanatory factors on food insecurity levels (food secure, mildly food insecure, moderately food insecure, and severely food insecure) were assessed. The diagnostic statistics of log pseudolikelihood of -328, Wald chi2(12) of 63.03, with Prob > chi2 (p-value) of 0.0000, suggest that the model was fit.

The result of the marginal effect showed that membership of a farmer-based organization was significant at ($p < 0.01$). The findings showed that a unit increase in the membership of farmer-based organizations increases the likelihood of the household being food secure by 0.19. However, a household's probability of being mildly,

moderately, or severely food insecure is reduced by 0.04, 0.09, and 0.058, respectively as a result of the head of the household's membership of a farmer-based organization. This is consistent with findings by [26], [27] who reported that households would be more food secure if they were involved in farmer-based organizations.

Microcredit and micro-savings were both significant at ($p < 0.1$). The findings showed that a unit rise in the amount of microcredit and micro-savings increases the likelihood of the household being food secure and will decrease the likelihood of the household being mildly, moderately, or severely food insecure. This result is in line with [26], [28], [29]. However, Sallahu and Hassan [26] suggested that a household's food security status appears to rise in tandem with higher levels of savings and credit amount. The notion that financial services assist farmers in making prudent decisions that may boost output and stabilize the pattern of consumption could be one explanation for this. Farm households may be better equipped to increase their quality of life through more profitable farming and non-farm economic activities if they have more effective access to credit and enhanced financial services.

Access to extension services was significant at ($p < 0.05$). Indicating a unit increase in access to extension services raises the likelihood of a household being food secure by 0.097 and lowers the probabilities of mild, moderate, and severe food insecurity by 0.021, 0.046, and 0.03 respectively. Extension services provide education on modern farming practices, pest control, and crop management, leading to higher productivity.

Additionally, household size was found to be negative and significant at ($p < 0.1$) indicating that with an increasing number of members in a household the probability of becoming food secure reduces by 0.081. This implies that larger households could have more difficulty providing for the dietary and nutrient demands of every member, which would leave them more vulnerable to food insecurity. This is because households with large numbers of persons have more mouths to feed. These findings correspond to Osfor et al. [29] who reported that smaller household sizes increase the food security of a farming household. Farm size was also significant at ($p < 0.05$). The findings of the marginal effects showed that increased farm size reduces the likelihood of being food secure by 0.363 and increases the likelihood of mild, moderate, or severe food insecurity by 0.078, 0.172, and 0.113, respectively. A possible explanation could be that farms that are found to be larger may face greater management complexities, and more labor and resources.

Farm income plays a very important role in determining food security, with increased income correlating with higher food security and lower food insecurity, supporting [30]. Higher income provides financial stability, allowing households to invest in better farming inputs and diversify their diets. Farming experience was also significant at ($p < 0.01$). The result of the marginal effects showed that farming experience reduces food insecurity, with each additional year of farming experience decreasing the likelihood of a household being food insecure and increasing food security by 0.015. Experienced farmers have accumulated skills and knowledge over time, leading to better farming practices and higher yields. This could increase food security over time.

The age of the household head was significant at ($p < 0.01$), with ageing household heads prone to face food insecurity. This is similar to the findings of [31]. A possible explanation could be that older farmers may face physical limitations that reduce their ability to perform labor-intensive farming tasks. This could reduce their productivity and in the long run, affect food security.

Similarly, a one-year increase in the years of schooling of the farming household head increases the likelihood of the households being mildly, moderately, and severely food insecure by 0.0016, 0.0034, and 0.0023, respectively. In the same way, a one-year increase in the years of schooling of the household heads reduces the probability of the households being food secure by 0.007. This indicates that with an increase in the years of education of the household head, it is more likely that the household is food insecure and less likely that it is food secure. This contrasts with several other research, such as [32], [33] which found that a household's likelihood of being food secure increases with the number of years the head of the household has completed education, and a household's likelihood of being severely food insecure decreases. The findings of this present study make understanding when one considers the possibility that as household heads become more educated, their income may be diverted from enhancing food purchases to furthering their education or advancing their careers. As a result, households' levels of food security decline because there is insufficient money to meet their needs for nutrition.

Table 3. The marginal effect of the influence microfinance services and membership of farmer-based organizations on food security of rice farming households in the study area

Explanatory Variables	Coefficients	Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely food insecure
		dy/dx	dy/dx	dy/dx	dy/dx
+Membership of FBO	-0.53*** (0.14)	0.19*** (0.47)	-0.04*** (0.013)	-0.09*** (0.025)	-0.058*** (0.016)
Microcredit (Naira)	-2.62e-06 * (1.42e-06)	9.25e-07 * (4.97e-07)	-2.0e-07 * (1.14e-07)	-4.37e-07 * (2.36e-07)	-2.87e-07 * (1.66e-07)
+Microinsurance	-0.12 (0.15)	0.042 (0.053)	-0.009 (0.011)	-0.019 (0.025)	-0.013 (0.016)
Microsavings (Naira)	-1.63e-06 * (1.03e-06)	5.77e-07* (3.61e-07)	-1.25e-07* (8.2e-07)	-2.8e-07* (1.71e-07)	-1.8e-07* (1.18e-07)
Microtraining	0.06 (0.044)	-0.02 (0.015)	0.0045 (0.003)	0.009 (0.007)	0.0064 (0.005)
+Access to Extension Services	-0.276** (0.142)	0.097** (0.049)	-0.02* (0.011)	-0.046** (0.023)	-0.03* (0.016)
Household size	0.023 (0.016)	-0.008* (0.005)	0.0017 (0.0012)	0.004 (0.0026)	0.0025 (0.0018)
Farm size (Hectares)	1.02** (0.53)	-0.363** (0.183)	0.078* (0.041)	0.172* (0.89)	0.113* (0.061)
Farm Income (Naira)	-5.26e-06** (2.56e-06)	1.86e-06** (8.89e-07)	-4.03e-06** (2.03e-07)	-8.78e-07** (4.39e-07)	-5.78e-07** (2.9e-07)
Non-Farm Income (Naira)	-3.28e-07 (2.06e-07)	1.16e-07 (7.28e-07)	-2.51e-07 (1.57e-07)	-5.47e-07 (3.43e-07)	-3.60e-08 (2.28e-07)
Farming experience (Years)	-0.039*** (0.0077)	0.014*** (0.0025)	-0.003*** (0.00069)	-0.006*** (0.0014)	-0.004*** (0.0012)
Age (Years)	0.012** (0.004)	-0.0042** (0.0017)	0.0009** (0.0041)	0.002** (0.0083)	0.0013** (0.0059)
Education level (Years)	0.021* (0.014)	-0.007* (0.0049)	0.0016* (0.001)	0.0034* (0.0024)	0.0023* (0.0017)
Diagnostic Statistics					
Cut 1	-0.342				
Cut 2	0.479				
Cut 3	1.397				
Number of observations	300				
Wald chi2(12)	63.03				
Prob<chi2	0.000				
Log pseudolikelihood	-328				

(+) is dummy variable from 0 to 1, *** p<0.01; ** p<0.05; *p<0.1. Figures in parentheses are robust standard errors.

4. Conclusion

Following the results of this study, the study showed that indeed microfinance services and membership of farmer-based organizations had an influence on rice farming household food security. Therefore, the following recommendations are: (1) Access to extension services emerged as a significant factor contributing to food security of rice-farming households in the study area. Therefore, extension services should be made available to farmers with timely information, technical assistance, and training on modern agricultural practices. Strengthening extension services can empower farmers with the knowledge and skills needed to improve productivity, mitigate risks, and enhance food security; (2) Microfinance institutions should prioritize increasing the amount of microcredit available to rice farming households. They should make sure that loans are offered at low interest rates to make them accessible and affordable for smallholder farmers; (3) Microfinance institutions should also help in promoting a savings culture by offering innovative programmes and schemes that will motivate smallholder farmers to save, and offering financial education training to enhance ways of handling money among farming households; (4) The findings of this study showed that membership of a farmer-based organization had a positive effect on the food security of rice farming

households in the study area. Hence, farmers should be encouraged to join and participate in farmer-based organizations.

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