

EFFECT OF VILLAGE LOAN AND SAVINGS ASSOCIATIONS (VSLAs) ON FARMER'S FOOD SECURITY AND INCOME IN KEBBI STATE, NIGERIA

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ABSTRACT

This study assessed the effect of Village Savings and Loan Associations (VSLAs) of the PROACT program on farmers' food security and income in Kebbi State. Primary data were collected from a total of 576 respondents comprised of 288 participating farmers and 288 non – participating farmers sampled through the multistage sampling procedure. The data were analyzed using descriptive statistics, logit regression model, and propensity score matching techniques. The PSM result on the income of participants compared with non-participants revealed an average difference in income of ₦339,816.67 which was statistically significant at $p \leq 0.01$ probability level. The result of the propensity score matching (PSM) on food security shows an average treatment effect (ATE) score of 5.90 which was significant at $p \leq 0.01$ probability level. The difference in the average food security score shows the level of contribution of VSLA to household food security of the participants. The study concluded that VSLA has improved income and food security of the participating farmers in Kebbi State and recommended its inclusions into the agricultural program for food security and poverty reduction in the study area.

Key Words: *Income, food security, household, farmers, savings*

INTRODUCTION

According to the World Bank (2019) majority of the low-income earners live in rural areas of developing countries and are mostly employed by the agricultural sector with limited infrastructure. More than half of the extreme low-income earners are in Sub – Sahara Africa with Nigeria leading as the country with the highest number of people living below the poverty line. These low-income earners need financial intermediation to access credit and to employ risk coping strategies.

However, the history of rural financial intermediation is not encouraging and the recent explosive growth in microfinance institutions established to increase access to finance and reduce rural poverty in the rural areas of developing countries has concentrated only in the urban and semi-urban areas (Lonborg and Rasussen, 2014). Thus, there is still a large gap between the needs of the poor for financial services and the ability of banks and MFIs to provide these services due to the low borrowing ability of rural people and the high cost of reaching the rural areas (Allen, 2006).

In the absence of formal financial institutions are not available, households use informal mechanisms such as “Sussu” in Ghana, “Tontines” in Niger, “Isusu and Adashe” in Nigeria called Rotating Savings and Credit Association (ROSCAs) and Accumulating Savings and Crediting Associations (ASCAs) (Bergere, 2017). A ROSCA is a small group with members whom all contribute a fixed amount at agreed-upon intervals. The amount collected from each interval is paid to one member in turn, until every member received it. ROSCA is popular because it is simple, transparent, easy to manage, accessible, and tailored to the financial realities of the members. Yet, it has limitations as money is often not available when needed or in the amount needed and tends to attract only people with a steady source of income.

The Accumulating Savings and Credit Association (ASCA) model improves on a ROSCA's essential strengths, introducing greater flexibility and access for the more vulnerable and it has gained increased popularity in rural Africa as it provides an alternative to existing informal networks and provide more flexibility, transparency, and security (Hendrick and Chidiae, 2011).

The Village Savings and Loan Association (VSLA) is a form of ASCA developed by Cooperative Association and Relief Everywhere (CARE) and was first initiated in the Niger Republic in 1991 as a saving and credit intervention program that has gained increased popularity in developing countries around the world due to its impact on the rural poor especially on the household income and family well-being. The VSL model has spread to at least 73 countries in Africa, Asia, and Latin America, with over 12 million active participants worldwide

(CARE, 2013). Thus, VSLA models intend to provide the very poor with savings services as well as insurance and credit that can be delivered with minimum cost, provide a secure place to save, the opportunity to borrow modest amount, easy to understand and transparent in its operations.

Many International Donor Agencies (IDAs) such as Bill and Melinda Gates Foundation, Cooperative Association and Relief Everywhere (CARE), Ford Foundation, European Union (EU), and Non – Governmental Organizations (NGOs) have pushed to create and expand VSLA groups in developing countries because of its grass root and low–cost mechanism of providing financial service (Karlanet *al.*, 2007).

OXFAM is an International Non – Governmental Organization (NGO) that is working with its partners to implement the VSLA initiative under the PROACT project in Bauchi, Benue, Plateau, Nasarawa, Kebbi, Adamawa, Oyo, and the Taraba States to increase household income and to decrease household vulnerability to financial and other shocks and stresses of farmers.

It is against this background that this research will assess the impact of Village Savings and Loan Associations (VSLA) on farmers household income and food security in Kebbi State (a case study of PROACT PROJECT: Oxfam/European Union support to food security and resilience in northern Nigeria(Mohammed, 2019).

Unlike other saving and credit groups, the VSLA is a highly standardized emerging group that is flexible, provides training on business skills, promotes entrepreneurship, and more sustainable for rural communities. In spite of the success recorded in the implementation of the VSLA model in Africa and its rapid spread in Nigeria, little or no empirical studies were conducted to assess its impact on poverty reduction among its beneficiaries. The majority of studies in Nigeria focused primarily on other informal saving groups or formal microfinance institutions (MFIs) that provide micro-credit facilities neglecting its impacts on beneficiaries. Therefore, this study will attempt to fill the gap of providing empirical evidence on the effect of VSLA on farmer's household income and food security. This study is to determine the level of contribution of VSLA to the household income and food security of farmers in the study area. The study could provide useful information on the impact of VSLA on household income augmenting the existing literature on rural finance as the basis for further research that may lead to expanding access of rural farmers to financial services. It may also serve to the government, donor agencies, and NGOs with useful information on rural finance especially on VSLA that would help in increasing financial inclusion, household income, and poverty reduction in the rural areas.

METHODOLOGY

Study area: Kebbi State was carved out of old Sokoto State in 1991; it consists of 21 Local Government Areas and four Emirate councils. The State is located within latitude 11°30'0N and longitude 4° 0' 0E . It is located in North-Western Nigeria. The State occupies a total land area of 36,800 square kilometers and shares boundaries with Sokoto State on the North-Eastern axis, Zamfara State on the Eastern part, Niger State on the Southern part, and the Republic of Niger on the Western part (KBSG, 2008). According to NPC (2006), Kebbi State has an estimated population of 3,662,103. Kebbi State has an agriculturally viable environment since it is endowed with high soil fertility, vast farmland, and economically viable rivers such as river Niger and it is also sheltered by the fine tropical climate. Owing to these factors, Agriculture has remained the major source of revenue and indeed the backbone of the economy of the state. Agricultural activities in the state include crop cultivation, animal rearing, and fish farming. Major food crops produced in the area are millet, guinea corn, maize, cassava, potatoes, rice, beans, onions, and vegetables. While cash crops include wheat, soybeans, ginger, groundnuts, and tobacco while animals reared include cattle, sheep, and goat (KBSG, 2008).

Sampling procedure and sample size

A multistage sampling technique was employed to select respondents from the study area. The first stage involves the purposive sampling of the 3 LGAs captured in the VSLA PROACT PROJECT program viz; Birnin Kebbi, Jega and Danko – Wasagu. The second stage was a simple random selection of 3 communities each from the 11 participating communities in each LGA. While the third stage was a simple random selection of 32 participating respondents and purposive selection of 32 non participating respondents from each of the 9 selected communities constituted the sample size for the study, which was determined by Yamane (1970) method of sample size determination as presented below:

$$n = N / (1 + N(e)^2)$$

Where:

n= sample size

N=sampling frame (1,017)

$e = \text{error or significance level } (0.05)$
 $n = 1,017 / (1 + 1,017(0.05)^2)$
 $n = 1,017 / (1 + 1,017(0.0025))$
 $n = 1,017 / (1 + 2.5425)$
 $n = 1,017 / 3.5425$
 $n = 287.085 \approx 287$

Therefore, 287 participating respondents approximated to 288 to be able to sample 32 respondents from each community and 288 non-participating respondents constituted the sample size of 576 respondents. A large number of non-participating respondents were used to increase the likelihood of finding good matches for the participating respondents (Baser, 2006).

Data collection

Primary data was used for the study. The primary data were collected using a structured questionnaire. The data collected includes the socio-economic characteristics of the respondents such as their ages, marital status, gender, educational level, household size, and years of experience. Other information that was sourced includes income levels, food security perception. Key informal interviews were also conducted with OXFAM staff to supplement the information supplied from the questionnaires.

Analytical techniques

Propensity score matching (PSM) method was used to determine the levels of contribution of VSLA to household income and food security using the average treatment effect on treated (ATT) approach. The PSM technique has been applied in a very wide variety of fields in the program evaluation literature {Heckman, Ichimura and Todd (1998), Lechner (1999), Dehejia and Wahba (2002), and Smith and Todd (2005)}. PSM consists of four phases: estimating the probability of participation, i.e. the propensity score, for each unit in the sample; selecting a matching algorithm that is used to match beneficiaries with non-beneficiaries to construct a comparison group; checking for balance in the characteristics of the treatment and comparison groups; and estimating the program effect and interpreting the results.

Propensity Score Matching (PSM)

The basic PSM model that was applied in this study is described as follows:

$$\delta_i = Y_{1i} - Y_{0i} \dots\dots\dots(9)$$

Where, δ_i is the impact of a treatment for an individual i , Y_{1i} the potential outcome in case of treatment and Y_{0i} is the potential outcome in absence of treatment:

Therefore, the impact of VSLA for participating individual i is defined as the mean difference between the potential outcome in case of participation in VSLA and the potential outcome in absence of VSLA program;

$$Y_t = \alpha + \beta I_t + \delta X_t + \epsilon_t \dots\dots\dots (10)$$

Where Y is the outcome of interest for given household and I is the treatment indicator (access to VSLA), where $I = 1$ when a household participated in VSLA program and $I = 0$ when household does not participate in VSLA program. Because an individual cannot be in both states, we cannot observe both Y_0 and Y_1 . X_t captures the households' observable characteristics such as household characteristic, socio-economic and farm household characteristic, β , δ are estimated parameters. ϵ variable is the usual error term that captures unobservable factors and potential measurement errors that affect Y .

For household that participated in VSLA ($I = 1$) the outcome of interest is equal to:

$$Y_{1t} | I_t = 1 = \alpha + \beta I_t + \delta X_t + \epsilon_t \dots\dots\dots (11)$$

And for households that are not participated in VSLA ($I = 0$) and the outcome of interest is equal to:

$$Y_{0t} | I_t = 0 = \alpha + \delta X_t + \epsilon_t \dots\dots\dots (12)$$

The difference between (10) and (11), β , is the impact of participation in VSLA on household livelihood.

This parameter is known as Average Treatment Effect or ATE:

$$ATE = E(\delta) = E(Y_1 - Y_0) \dots \dots \dots (13)$$

$E(.)$ represents the average (or expected value).

Another quality of interest is the Average Treatment Effect on the Treated, or ATT, which measures the effect of the program on those individuals who participated:

$$ATT = E(Y1 - Y0 | D = 1) \dots \dots \dots (14)$$

Finally, the **Average Treatment Effect on the Untreated (ATU)** measures the impact that the VSLA program would have had on those who did not participate:

$$ATU = E(Y1 - Y0 | D = 0) \dots \dots \dots (15)$$

The problem is that all of these parameters are not observable, since they depend on counterfactual outcomes. For instance, using the fact that the average of a difference is the difference of the average, the ATT can be rewritten as:

$$ATT = [E(Y1 | D = 1)] - [E(Y0 | D = 1)] \dots \dots \dots (16)$$

The second term, $E(Y0 | D = 1)$ is the average outcome that the VSLA participating individuals would have obtained in absence of participation, which is not observed. However, we do observe the term, $E(Y0 | D = 0)$ is, the value of Y_0 for the non-participated individuals. Thus, we can calculate:

$$\Delta = E(Y1 | D = 1) - E(Y0 | D = 0) \dots \dots \dots (17)$$

What is the difference between Δ and the ATT? Adding and subtracting the term

$$E(Y0 | \Delta = E Y_1)$$

$$\Delta (Y1 | D = 1) - E(Y0 | D = 1) + E(Y0 | D = 1) - E(Y0 | D = 0)$$

$$\Delta = (ATT + E(Y0 | D = 1) - E(Y0 | D = 0))$$

$$\Delta = ATT + SBD \dots \dots \dots (18)$$

The second term, SB, is the selection bias: the difference between the counterfactual for individuals and the observed outcome for the untreated individuals. If this term is equal to 0, then the ATT can be estimated by the difference between the mean observed outcome for treated and untreated.

$$ATE = E(Y | D = 1) - E(Y | D = 0) \dots \dots \dots (19)$$

However, in many cases the selection bias term is not equal to 0 due to some potential sampling and errors. In these cases, the difference in means will be a biased estimator of the ATT. Assuming that the treatment and the control group are identical in terms of all observed and unobserved characteristics, simple comparisons of the means across the treatment and the control group can allow for initial estimations of program impact.

Propensity score estimation (PSE) model specification

Logit model can be used to estimate the propensity score (Caliendo and Kopeining, 2005). In estimating the logit mode, the dependent variable is participation which takes a value of 1 if the household participated in a program and 0 otherwise. The logit model is mathematically formulated as follows:

$$P_i = \frac{e^{z_i}}{1 + e^{z_i}} \dots \dots \dots (20)$$

Where, P_i is the probability of participation in the VSLA program;

$$Z_i = \beta_0 + \sum \beta x_i + u_i \dots \dots \dots (21)$$

Where $i = 1, 2, 3, \dots, n$, β_0 is the intercept, β_i represents regression coefficient to be estimated, u_i a disturbance term, and x_i pre-intervention characteristics.

The probability that a household belongs to the non-participant group is:

$$1 - P_i = \frac{1}{1 + e^{z_i}} \dots \dots \dots (22)$$

Then the odds ratio can be written as:

$$\frac{P_i}{1+P_i} = \frac{1+e^{z_i}}{1+e^{-z_i}} = e^{z_i} \dots\dots\dots(23)$$

The left-hand side of equation (22) $\frac{P_i}{1+P_i}$ is simply the odds ratio in favor of participation in programme. It is the ratio of the probability that the household would participate in the VSLA programme to the probability that he/she would not participate in the programme. Finally, by taking the natural log of equations (10) and (11) the log of odds ratio can be written as:

$$L_i = L_n \left(\frac{P_i}{1+P_i} \right) = L_n \left(e^{\beta_0 + \sum_{j=1}^n \beta_j X_{ji}} \right) = z_i = \beta_0 + \sum_{j=1}^n \beta_j X_{ji} \dots\dots\dots(24)$$

Where L_i is log of the odds ratio in favor of participation in the VSLA programme, which is not only linear in X_{ji} but also linear in the parameter.

The study was considered households that are benefited and that are not benefited whose. Livelihood status is represented as Y_{1i} and Y_{0i} , respectively. For many households, we must estimate the average outcome across all sample households that are benefited and that are not benefited to obtain the expected value of the average treatment effect, specified as:

$$ATE = e(Y_{1i} - Y_{0i}) \dots\dots\dots(25)$$

Where $e(\cdot)$ denotes the expected value and the sample equivalent given by:

$$ATE = \frac{1}{n} \sum_{i=1}^n n(Y_{1i} - Y_{0i}) \dots\dots\dots(26)$$

The average treatment effect (ATE) measures the effect of benefit from assuming a randomized sample drawn from the population. Our interest in this case is to measure the average gain of benefit from VSLA programme compared to what would have been if these households had not benefited, specified as:

$$ATT = e(Y_{1i} - Y_{0i} / I_t = 1) = e(Y_{1i} / I_t = 1) - e(Y_{0i} / I_t = 1) \dots\dots\dots(27)$$

Equation (17) is the average treatment effect on the treated (ATT), where the sample equivalent is written as:

$$ATT = \frac{1}{n} \sum_{i=1}^n n(Y_{1i} - Y_{0i}) / I_i = I = \frac{1}{n} \sum_{i=1}^n n(Y_{1i} / I_i =$$

RESULTS AND DISCUSSION

Effect of VSLA on the Food Security of Participants in the Study Area

The propensity score matching method uses continuous data for the research, the food insecurity perception responses were used to generate the food security perception score with a range between 0-15, as used by Correa, (2007) if a respondent has a score of 15, then they are food secure, if they have a score of 10 to 14, they are at light food insecurity level, if the score is between 5 and 9, they are at moderate food insecurity level and if the score is between 0 and 4, then they are at serious food insecurity level.

Table 4.1: Food Security Levels using Food Insecurity Perception Score

Level of Food Security	Scores range	Participants		Non-participants	
		Frequency	Percentage	Frequency	Percentage
Food Security	15	163	56.60	71	24.65
Light Food Security	10 – 14	57	19.79	67	23.26
Moderate Food Insecurity	5 – 9	53	18.40	97	33.68
Serious Food Insecurity	0 – 4	15	5.21	53	18.40
Total		288	100	288	100

Source: Field Survey, 2020

The result Table 4.1 shows that 56.6% of the participants were food secured, 19.79% were in the range of light food security, 18.40% were in the range of moderate food insecurity while 5.21% were seriously food insured. While only 24.65 of the non – participants were food secured, 23.26% were in the range of light food security, 33.68% were moderately food in secured and 18.23% were seriously food insecure. This depicts that majority of the participants (56.6%) were able to attained food security level as against 24.64% of non-participating respondents. This is in line with the findings of Nixon, (2014) who reported improved food security level of participants in VSLA/ Kilomo Plus Subsidy program in Kenya and Allen *et al.*, (2004) who reported positive impact of VSLA on the livelihood of women in Malawi. Also, an impact study on VSLA conducted in Nigeria by Chinwe *et al.*, (2019) reported an improved food security of participants while Holden and Lunduka, (2010) reported a wide disparity in food security between participating and non-participating in VSLA program in Tanzania.

Propensity score matching approach (PSM) was used to match the participants and non – participants using the food security perception scores The PSM result showing the effect of VSLA on the food security situation of participating households in the study area compared with that of the non-participating households is presented in Table 4.4. It shows that the average food security score of the respondents is 12.25 given that they all participated in VSLA while it is 6.35 if none of them had participated. More so, the difference in the average food security score which is the average treatment effect (ATE) value on the respondents was 5.90 which was statistically significant at $p \leq 0.01$ probability level. The difference in the average food security score shows the level of contribution of VSLA to household food security of the participants This implies that participation in VSLA had a positive and significant effect on the food security of the respondents in the study area. This finding is similar to that of the Women’s Empowerment Strategic Impact Inquiry, (2006) which shows that VSLA households experienced greater food security compared to non-VSLA households in Tanzania and also in agreement with the result of the impact study of VSLA in Nigeria by Chinwe *et al.*, (2019).

Table 4.2: Average Treatment Effect of VSLA Participation on Food Security of Respondents in the Study Area

Outcome indicator	Treated group	Control group	Difference	T-stat
Food security score	12.25	6.35	5.90	3.03***

Note: *** = $p \leq 0.01$ probability level

Effect of VSLA on the Income of Participants in the Study Area

The result in Table 4.3 shows the result of the effect of VSLA on the income of participating households (treatment group) in the study area compared with the income of the non-participating households (control group). It revealed that the average income of all respondents (pooled data) if none of them had participated in VSLA, is ₦417,268.06. However, if all respondents had participated in VSLA, the average income they should have generated is ₦757,084.72 which is ₦339,816.67 more than the baseline average of ₦417,268.06. In other words, the average difference in income between the participants and non-participants was ₦339,816.67. This shows the level of contribution of VSLA to the household income of the participants. This difference was statistically significant at $p \leq 0.01$ probability level which implies that VSLA has significantly improved the income of the participants. This result is in agreement with those of Allen and Hobane, (2004), Anyango, (2005) and Chinwe *et al* (2019) who in their various studies in Zimbabwe, Malawi and Nigeria respectively concluded that VSLA improved the livelihood and average income of participants compared to their non-participant counterparts.

Table 4.3: Average Treatment Effect of VSLA Participation on the Income of Respondents in the Study Area

Outcome indicator	Treated group	Control group	Difference	T-stat
Average income (₦)	757,084.72	417,268.06	339,816.67	3.29***

Note: *** = $p \leq 0.01$ probability level

Conclusion

The study concluded that VSLA has improved both income and food security of farmers in Kebbi State based on the result of the propensity score matching (PSM). The average difference in income between the participants and non-participants was ₦339,816.67. This difference was statistically significant at $p \leq 0.01$ probability level which

implies that VSLA has significantly improved the income of the participants. Likewise, food security shows an average treatment effect (ATE) score of 5.90 which was significant at $p \leq 0.01$ probability level. This implies that participation in VSLA had a positive and significant effect on the food security of the respondents in the study area.

Recommendations

Based on the findings of the study and the conclusion drawn, the following recommendations are proffered for implementation. VSLA can be used as a tool for poverty reduction by government and Non – governmental organizations (NGOs) given its role in the improvement of the income of its beneficiaries. It is also recommended that government should include VSLA in its program to accelerate the attainment of zero hunger by 2030 of the sustainable development goals (SDGs) given its effect in improving the food security of rural farmers

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