

**CONTRIBUTION OF VILLAGE SAVINGS AND LENDING ASSOCIATIONS TO
IMPROVING RICE PRODUCTIVITY AND INCOME IN MVOMERO DISTRICT,
MOROGORO, TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENT FOR THE DEGREE OF MASTER OF ARTS IN PROJECT
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EXTENDED ABSTRACT

Village savings and lending associations (VSLAs) have proven to overcome the obstacles that exist to informal financial services and are recognized to facilitate access to credit for smallholder rice farmers in rural areas. However, there is not enough information on its impact on rice productivity and income, which is still low despite the effort of the government to make sure smallholder farmers improve their production through the use of recommended inputs. Previous impact studies on VSLAs show the big role played by VSLAs in facilitating access to credit for the rural population, but which kinds of VSLAs are more appropriate for smallholder farmers is not yet documented. This study assesses the contribution of VSLAs' with bundled services to improving rice productivity and income in Mvomero District, Morogoro using propensity score matching. Adopting a cross-sectional research design, the study involved the sample size of 350 smallholder rice farmers for quantitative data, whereby 145 were VSLA participants and 205 were non-VSLA participants and 56 for qualitative data. The quantitative data was obtained through a household survey where the questionnaires were administered and were analyzed using propensity score matching and logistic regression analysis with the help of Stata 14. Qualitative data was obtained through focus group discussions and key informant interviews and the information obtained was analyzed using thematic analysis.

The study findings from PSM show that participation in VSLAs had a positive and significant impact on rice productivity and income ($P=0.05$) ranging from 1.997bag/acre/season and TZS 108,019 (nearest neighbour matching) to 2.776/acre/season and TZS 142,255 (Kernel matching) and 2.431 bag/acre/season and TZS 118,000 for radius matching.

Moreover, through binary logistic regression and descriptive statistics, the study found that VSLAs with bundled and collective services, were the key determinants of credit access to smallholder rice farmers in the study area, and they saved more than 59% of the credits obtained by the smallholder farmers. Moreover, 83% of the credits obtained were invested in rice farming. Credit promotes access and use of farm inputs (fertilizers, agrochemicals, labour, and other technologies) that improved not only the yield per area but also the rice income. The credit obtained also enables the smallholder rice farmers to manage other income-generating activities which contribute to the household income. Thus, the study concluded that facilitating easy access to financial services to smallholder farmers will enhance rice sector development, which will contribute to food security and income in Tanzania.

To overcome the constraints smallholder rice farmers encounter in accessing and using agricultural credit from formal financial institutions, the study recommended that the Government, policymaker implementers, and development partners should potentially be geared toward improving, strengthening, and supporting the VSLAs with bundled services which allow smallholder farmers to mobilize their capital and access credit both in cash and inputs.

DECLARATION

I, Rozalia Patrice Mtenga do hereby declare to the senate of the Sokoine University of Agriculture that this dissertation is my original work done within a period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

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DEDICATION

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ABBREVIATIONS AND ACRONYMS

ADB	Agriculture Development Bank
ASDPH	Agriculture Sector Development Program Phase II
ATT	Average Treatment Effect on Treated
CARE	Cooperative for Assistance and Relief Everywhere
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GDP	Gross Domestic Product
IMA	Inputs and Market Association
IP	Impact Pathway
IRR	Internal Rate of Return
IV	Instrumental Variable
NRDS II	National Rice Development Strategy Phase Two
PSM	Propensity Score matching
RIPOMA	Rice postharvest Management and Marketing
SACCOs	Savings and Credit Cooperatives
SRI	System of Rice Intensification
ToC	Theory of change
VSLA	Village Savings and Lending association

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

The agriculture sector has been and remains the backbone of many developing countries' economies, including Tanzania's, and an engine for livelihood as it ensures income, food security, and raw materials for industries (Kanza and Vitale, 2015). The sector contributes 29.1% of the national GDP and accounts for 25.88% of the country's economy. Furthermore, the agriculture sector employs about 80% of the working-age population and it contributes 40% of the export earnings (Sanka, 2021; Rugumamu, 2014). The sector is dominated by small-scale farmers who account for 70-95% of the farming population. They are also responsible for the production of 95% of the food demanded (Meemken and Bellemare, 2020; Mkonda and He, 2018).

To transform the sector, this large percentage of farmers needs to be facilitated to easily access financial services to enable them to adopt improved farming technologies, including the use of recommended inputs. Thus, agricultural credit is an important component in the development of the agricultural sector in developing countries, as well as in Tanzania. However, its access is still a big challenge to smallholder farmers (Sanka and Nkilijiwa, 2020). Among the initiatives taken by developing countries, including Tanzania, was the establishment of Agriculture Development Banks (ADB), which to a greater extent has not yet solved the problems in credit access by smallholder farmers due to lack of awareness, bureaucratic procedures, collateral requirements, and centralization (Shafiwu *et al.*, 2013). Microfinance is one of the financial access gateways to the poor and disadvantaged groups around the world (Monduch, 2012). The microfinance sector, despite having a long way to go in gaining self-sufficiency and impact, has made a difference in the lives of many individuals in developing countries (Hossen *et al.*, 2019).

In Tanzania, the number of formal microfinance is more than 5000, and all are aimed at helping the poor to get out of poverty through fair and affordable credit (Garib and Mwakeje, 2013). Regardless of the government's effort to make sure credit services are available and affordable in rural areas, credit access from formal financial institutions is still a challenge to smallholder farmers as they lack qualified physical assets that they can pledge as collateral and long procedures (Mbuga, 2019). Also, small-scale farmers fail to access credit from formal financial sources due to long application procedures, distance, bureaucracy, and high-interest rates, which are higher than the farmer's internal rate of return (IRR) (Dube *et al.*, 2015; Girabi and Mwakaje, 2013).

Rice is among the major food crops grown in Tanzania. Others include maize, cassava, bananas, legumes, sorghum, and vegetables. Rice is selected to be among the country's strategic commodities due to its contribution to food security and the economy for the households and the country as a whole (Liu and Ingabire, 2017). Despite the potential of the crop, difficulties in accessing credits from the formal financial institutions have led to low productivity (less than 3 tons per Ha) as farmers cannot timely access improved and recommended inputs such as fertilizers, quality seeds as well as difficulties in accessing harvest and post-harvest technologies (Msangya and Yihuan, 2016). The constraints on accessing credit from financial services by smallholder rice farmers have stimulated non-governmental organizations and the government to come up with different alternatives/models to facilitate access to credit and other financial services for rice farmers in the rural areas, which will help them acquire capital for investing in rice production. In 2017, HELVETAS Tanzania, during the implementation of Rice Postharvest Management and Marketing (RIPOMA), introduced the Village Savings and Lending Association (VSLA), which took a different model and includes other services apart from savings and lending. Other services provided by RIPOMA VSLAs were collective services, including

the collective purchase of inputs, collective warehouse, and marketing. This facilitates easy access to agricultural inputs among smallholder rice farmers of the Mvomero District and promotes the use of the credit as intended.

The VSLA is one of the microfinance models introduced in Tanzania by CARE International in 2008, and it has since been adopted by other non-governmental organizations such as Aghakan Foundation, World Vision, Catholic Relief Services Plan International, and HELVETAS Tanzania as a means of facilitating credit access in rural areas. The VSLAs involve groups of 20-30 members who mobilize savings and take small loans from them at an affordable interest rate (CARE, 2017). The RIPOMA VSLAs take a different methodology by providing a bundle of services that is cash and input (fertilizer and agrochemicals) credit. Moreover the inputs are purchased collectively through the Input and Market Association (IMA) and distributed to members depending on their needs.

1.2 Problem Statement

For many years, rice production in Tanzania has been one of the important sources of food and income for smallholder farmers and the country as a whole, as it accounts for 2.7% of the national GDP (Liu and Ingabire, 2017). Ndekenye (2013) revealed that 90% of the total rice produced in Tanzania is produced by smallholder farmers, among whom 80% are women. The major challenge faced by smallholder farmers is low productivity, which is attributed to limited access to credit, which is necessary for timely acquisition of farming inputs and improved technologies such as the System of Rice Intensification (SRI), harvest and post-harvest technologies. A study conducted by Parmena (2013) reported that the use of recommended fertilizer at the required rate depends on the farmer's financial capability. Also, a study carried out by Kangile *et al.* (2018) revealed that for farmers to use improved farming technologies, they require relevant training and an appropriate means of accessing

credit. Similarly, the study established that about 90% of the rice seeds used by farmers come from their harvests saved from the previous season and this is escalated by an inability to access credit for purchasing quality seeds during the season. Moreover, studies by Mlambiti (2013) and Mbuga (2019) revealed that 95% of rice farming field operations in Tanzania are performed manually as most farmers lack adequate capital to purchase farm machinery and equipment, and this leads to poor performance. Numerous studies have shown that there is a positive linkage between access to credit and agricultural productivity. For example, a study conducted by Sulemana and Adjei (2015) reported that access to credit has a vital role in improving agricultural production. Likewise, studies by Liu and Ingabire (2017) in the Mvomero District reported that access to credit enhances agricultural productivity. Meanwhile, Mahoukede *et al.* (2015) reveal more or less the same findings.

Generally, access to credit by smallholder rice farmers in rural areas is still a major challenge (Mbuga, 2019; Isaga, 2018 and Monduch, 2012). Even in areas with favorable growing conditions, rice yield remains low (1.6 to 2.4 tons/ha compared to a potential yield of 4-6 tons per ha). One of the reasons for this may include access to affordable credit, which can help farmers afford production costs, including the purchase of improved and recommended inputs (Msangya and Yihuan, 2016; Ngailo *et al.*, 2016; Parmena, 2013). One of the measures taken to help smallholder farmers in rural areas was the introduction of service bundled VSLAs. However, no evidence has been documented to show its impact to smallholder rice farmers.

To increase smallholder rice farmers' access and use of credit, rationality is needed, and smallholder farmers may need to choose a credit service model that helps them to have easy access to credit and make use of credit in farming. From this perspective, the proposed study focused on how VSLAs with bundle services effect smallholder rice

farmers and fill the gap left by research on the impact of VSLAs. The study used propensity score matching by generating a comparison group of non-VSLA participants with the use of propensity scores to assess the contribution of VSLA with bundled services to the improvement of smallholder rice productivity and income in Mvomero District, which is hardly documented, and whether the approach has contributed to smooth credit access and bridging the gap created by formal financial institutions.

1.3 Justification for the Study

Lack of evidence on the effect of the informal microfinance models on rice productivity and income, and how it influences access to credit among smallholder farmers, hinders the government and development partners' effort to facilitate easy access to credit among smallholder farmers in rural areas. Thus, the study places interest in the contribution of VSLAs with bundled services to improving smallholder rice productivity and income. Therefore, they foster improvement and the formulation of evidence-based policies.

The findings of the study contribute to the body of knowledge as it has given a broader understanding of the rural microfinance sector, particularly to smallholder rice farmers. Moreover, it envisioned that the empirical findings generated help to furnish information and knowledge to researchers, NGOs, policymakers, project/program planners, financial institutions and the government, who are interested in improving financial policies and the models used to scale up financial inclusion in agriculture and rural areas. Additionally, the triangulation from the mixed-method provides room to fully understand the constraints faced by rice smallholder farmers in credit access from convention financial institutions and how VSLAs can be used to penetrate financial services to the smallholder rice farmers and enhance productivity.

Also, the study employed propensity score matching approach/methodology which helps to eliminate the selection biases in social studies and come up with true estimates, since the decision to participate in VSLAs or not to participate was not randomized and there was no baseline data.

1.4 Research Objectives

1.4.1 Overall Objective

To assess the contribution of VSLAs to improving rice productivity and income among the smallholder farmers in the Mvomero District.

1.4.2 Specific Objectives

1. To determine the effect of VSLAs with bundled services on improving rice productivity and income
2. To assess the VSLAs bundled services on credit accessibility to smallholder rice farmers
3. To assess the use of credit obtained by smallholder rice farmers in the Mvomero District

1.4.3 Research Questions

This research will be guided by the following questions

1. Does access to RIPOMA VSLA services help to improve rice productivity and income?
2. Are VSLAs a determinant factor for credit access to smallholder farmers in the Mvomero District?
3. Do the smallholder farmers use the credit offered in rice farming?

1.5 Hypothesis

This study hypothesizes that access to VSLA services improves agricultural productivity in the rice value chain by farmers in Mvomero District.

1.6 Scope of the Study

This study focuses on assessing the contribution of VSLA services to the rice productivity and income of smallholder rice farmers in the eight RIPOMA project wards in Mvomero District. In terms of time, the study covered the period from 2017 to June 2020.

1.7 Relevance of the Study

The study is in line with the Agricultural Sector Development Program Phase II (ASDP II) component two and three, which aims at transforming agriculture towards achieving high productivity through enhancing farmer's access to rural finance and agricultural inputs. Correspondingly, the study lines up with Sustainable Development Goals (SDG) which intend among others to end poverty and hunger. Similarly, the study is linked with the Tanzania Development Vision 2025 target number one which aims at attaining high-quality livelihood by ensuring food self-sufficiency, food security and the absence of objective poverty.

1.8 Theoretical and Conceptual Framework

1.8.1 Impact Pathways

The study takes a theory-based approach to comprehend the understanding of the project's Theory of Change (ToC) (figure 1.8.1). A ToC takes a wide view of desired change, carefully probing the assumptions behind each step in what may be a long and complex process (Vogel, 2012). The impact pathway (IP) involves VSLA services as a new product introduced by the RIPOMA project to facilitate farmers' access to credit for investing in agriculture. The assumed impact pathway involves low rice productivity as a problem that

was caused by the limited access to credit, that was intervened upon by the introduction of VSLAs. The VSLAs provide credit to small rice farmers, which are used in rice farming operations including purchasing inputs, short-term agricultural technologies, farm management, and the establishment of other income-generating activities. This output result was an intermediary outcome that improved rice productivity and income. Later this outcome led to an improved standard of living (food security, health, and education). This IP is in line with the theory behind microfinance as stated by Hearth, (2018) and Al Shami (2013).

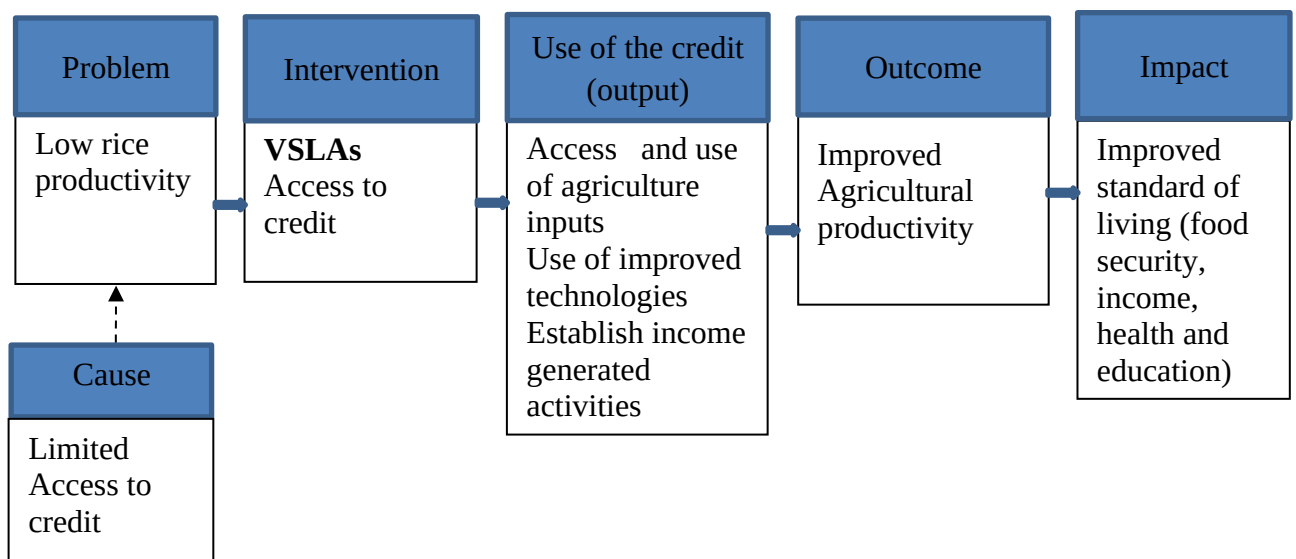


Figure 1.1: Theory of change adapted from classic microfinance theory of change

1.8.2 Conceptual framework

The study conceptual framework figure 1.2 shows the hypothesized inter-link and relationships between background, independent and dependent variables. Rice productivity (dependent variables) is influenced by different factors (explanatory variables). The background variables are those variables that may not have a direct influence on dependent variables but influence the independent variables either positively or negatively. i.e., age, sex, education level, marital status, and household size, as well as respondent's main occupation. Independent variables are those assumed to have a direct influence on the

dependent variable (rice productivity) among smallholder rice farmers. The independent variables include access to credit, planting method, harvesting method, use of fertilizers, access to extension services, land size, land ownership, VSLA participation, experience in rice farming and family labour. However, this study presumes that the chances of change in the dependent variable will be highly dependent on changes in the independent variables.

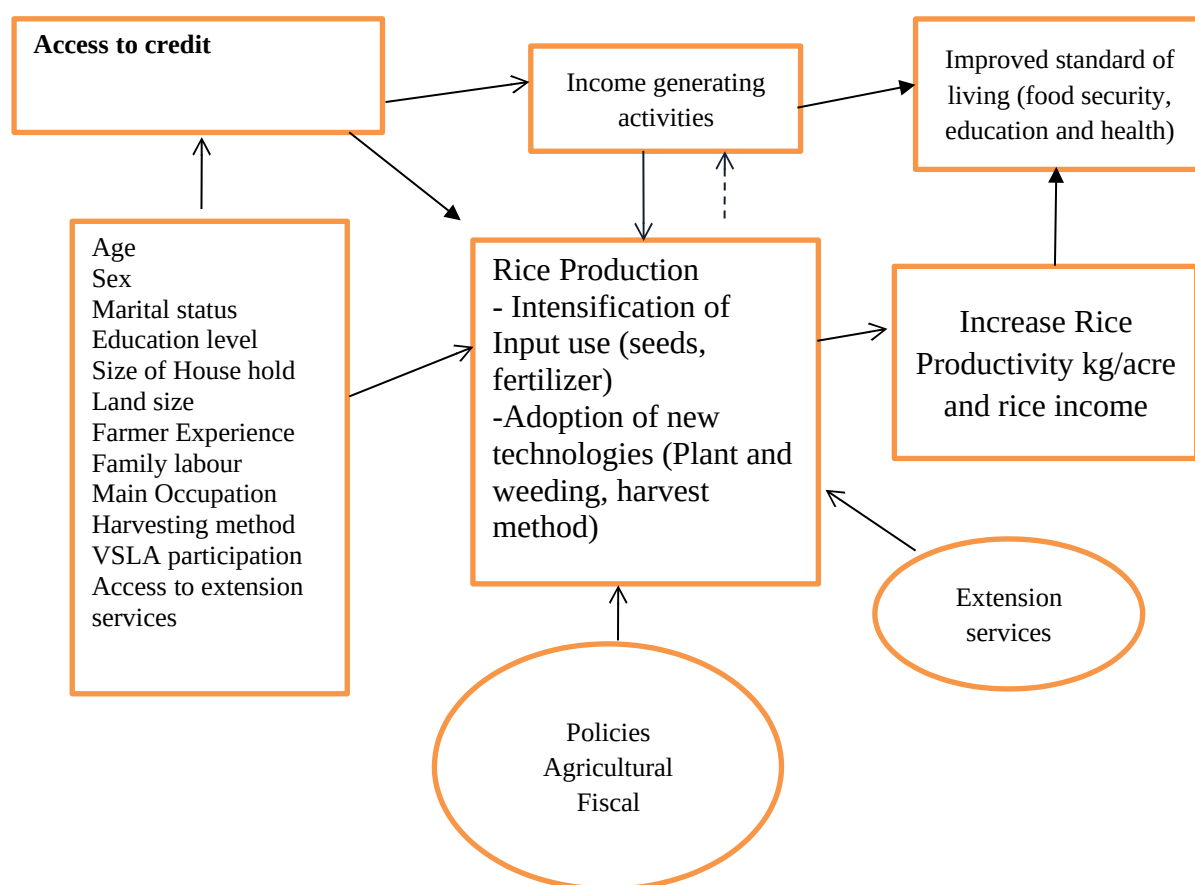


Figure 1.2: Conceptual Framework

1.9 Indicators of Change and Measurement

The indicators of change are based on two levels of change that are output, and outcome level. Output 1: Access to VSLA credit services: This is measured by the number of rice farmers who access VSLA credit services. Output 2: Use of agriculture inputs in rice farming: This is presented as the number of smallholder rice farmers who access and use

agricultural inputs. For this study land was considered as the main resource for agriculture production. Therefore, the productivity is presented as yield/area/season. The income was measured as a gross margin per one acre of rice.

1.10 Organization of the Dissertation research

The dissertation is prepared in four chapters. The first chapter presents the extended abstract and introduction of the overall study. In addition, it describes the concepts presented in the manuscripts. The second chapter comprises the publishable manuscript, which covers objective one and provides answers to the first research question. The third chapter contains a publishable manuscript that covers objectives two and three which provides answers to the second and third research questions. Furthermore, the fourth chapter presents the study's conclusions and recommendations.

1.11 Limitations of the Study

The major limitation of the study was that it took place during the harvesting season, so it was a bit difficult to meet with the respondents on time. But with the help of the ward extension officers and village executives, we changed the modality of the meeting, including meeting them at their farms and after farm hours. The study was conducted when there was a fear of COVID-19, which created a difficult environment for some respondents to accept meeting visitors. The village executives helped us to make them understand the importance of the meeting and the measures to be taken during the interview, including keeping distance.

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CHAPTER TWO

2.0 IMPACT OF PARTICIPATION IN VILLAGE SAVINGS AND LENDING ASSOCIATIONS ON RICE PRODUCTIVITY AND INCOME IN MVOMERO DISTRICT, MOROGORO, TANZANIA

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2.1 Abstract

The rice sector in Tanzania is dominated by small-scale farmers who produce about 90% of the rice produced in the country. The majority of these smallholder rice farmers are facing constraints, including access to financial services from formal financial institutions. The Village Savings and Lending Associations (VSLAs) microfinance model has proved to overcome the obstacles that exist in formal microfinance institutions and meet the financial needs of the poor population in the rural areas. This paper aimed at assessing the impact of participation in service bundled VSLAs on rice productivity and income among smallholder rice farmers in Mvomero District, Morogoro, Tanzania. The study used a cross-sectional research design whereby quantitative data for participants and non-participants were obtained through household survey where semi-structured questionnaires were administered. Propensity score matching (PSM) was employed to assess the effect of participation in VSLA on rice productivity and income. The study finding from PSM shows that participation in VSLA has a positive and significant impact on rice productivity and income for smallholder rice farmers at a 5% significance level. The results range from 1.997 bags/acre and TZS 108,019 (nearest neighbor matching) to 2.776/acre and TZS 142,255 (Kernel matching) and 2.431 and TZS 118,000 (for radius matching) more than non-participants. Thus, it can be concluded that participation in VSLA increases farmers' ability to get additional income, which can be invested in rice production, improving productivity and income, and enhancing rice sector development. The study recommends that VSLAs need to be supported and promoted as a tool that can mobilize farmers to build their own financial capital through savings and facilitate easy access to credit in rural areas.

Keywords: Rice productivity, rice income, village savings and lending association, credit, VSLA participation and propensity score matching

2.2 Introduction

In many countries in Africa, the larger portion of the diet constitutes rice, and currently the demand for rice is growing and is expected to increase to 2.27 million tons in the next 5 years from 2.05 million tons in 2018 (Zakaria, 2018). In Tanzania, rice has been selected to be among the country's strategic commodities due to its contribution to food security and the economy for households and the country as a whole (Liu and Ingabire, 2017). Rice contributes about 2.7% of the national GDP and it is consumed by 60% of the Tanzanian population. Also, 90% of the rice is produced by smallholder farmers who face numerous challenges, including easy access to credit, which can be invested to improve productivity.

Rice farming is the major source of livelihood for smallholder rice farmers in the Mvomero District. However, farmers face difficulty in accessing agricultural credit from formal financial institutions, due to lack of collateral and other requirements of formal sources (Mbuga, 2019). In most cases, smallholder farmers own less than 2 hectares of land and the majority of the land owned cannot be pledged as collateral required by the formal financial institutions (Mbuga, 2019 and Isaga, 2018). Despite the potential of the crop, difficulties in accessing credits from formal financial institutions leads to low productivity (Kulyakwave *et al.*, 2019). Agricultural credit is recognized to play a vital role in agriculture, in particular, and overall economic development as it facilitates timely access to agricultural inputs (Mahoukede *et al.*, 2015 and Msangya and Yihuan, 2016). The study by Martey *et al.*, 2019) reported that credit is important to smallholder farmers as it enhances timely access and use of appropriate agricultural inputs.

Agricultural credit is one of the important components to be strengthened to enhance improvement in agriculture productivity in Tanzania (URT, 2013). It can be used as capital for purchasing recommended farm inputs and improved technologies, which are the main

factors for improving agricultural productivity (Dawuni and Mabe, 2020). Among the initiatives taken by the government to facilitate access to credit was the establishment of Agriculture Development Banks (ADB) and the emergence of numerous microfinance institutions (more than 500 in 2013) to help low-income people with fair credit. But to a greater extent, it has not yet solved the challenges of access credit for smallholder farmers, due to lack of awareness, bureaucratic application and processing procedures, collateral requirements, and centralization (Shafiwu *et al.*, 2013).

In response to the challenge, HELVETAS Tanzania, during the implementation of Rice Postharvest Management and Marketing (RIPOMA), introduced the Village Savings and Lending Association (VSLA) with bundled services to facilitate easy access to credit among smallholder rice farmers of the Mvomero District. The VSLAs involve groups of 20-30 members, who mobilize savings and take small credits from them at affordable and agreed-upon interest rates (CARE, 2017). However, the RIPOMA VSLAs also provide collective services that are collective input purchase, collective marketing and warehouse. The studies by Grossman (2020), Boukhali (2019) and Ngegba *et al.* (2016) revealed that VSLAs improved the lives of farmers in rural areas. According to Theophilus and Paul (2019), women who participate in credit and savings associations are more active socially and economically than those who do not participate.

The basic question leading this study is whether participation in VSLAs with bundled services had an impact on rice productivity and income among smallholder rice farmers in Mvomero District. Assuming that farmers who participate in VSLAs can have access to credit which can be invested in rice farming to purchase necessary inputs and increase productivity and income. Therefore, this study has attempted to assess the impact of participation in VSLAs bundled with other services than credit and savings on rice

productivity and income among smallholder rice farmers, using propensity score matching as a robust method for reducing or eliminating biases in observational studies.

2.3 Research Methodology

2.4 Description of the Study Area

The study was conducted in the Mvomero District, Morogoro (Figure 2.1). The Mvomero District is located at latitude 06° 26' south and longitude 37° 32' East. The district occupies a total area of 7,325 square kilometres whereby 549,375 hectares are suitable for crop cultivation. According to the Tanzania National Census (2012), the district's population was 312,109, of which 154,843 were males and 157,266 were females, with an average household size of 4.3 people. The average rainfall per year ranges from 600mm to 2000mm.

The Mvomero District was chosen as a study area based on the fact that the district was one of the areas where the RIPOMA project was implemented and the VSLA groups established were 67 compared to 31 groups in the Kilosa District. Therefore, it was easy to get enough respondents for the study.

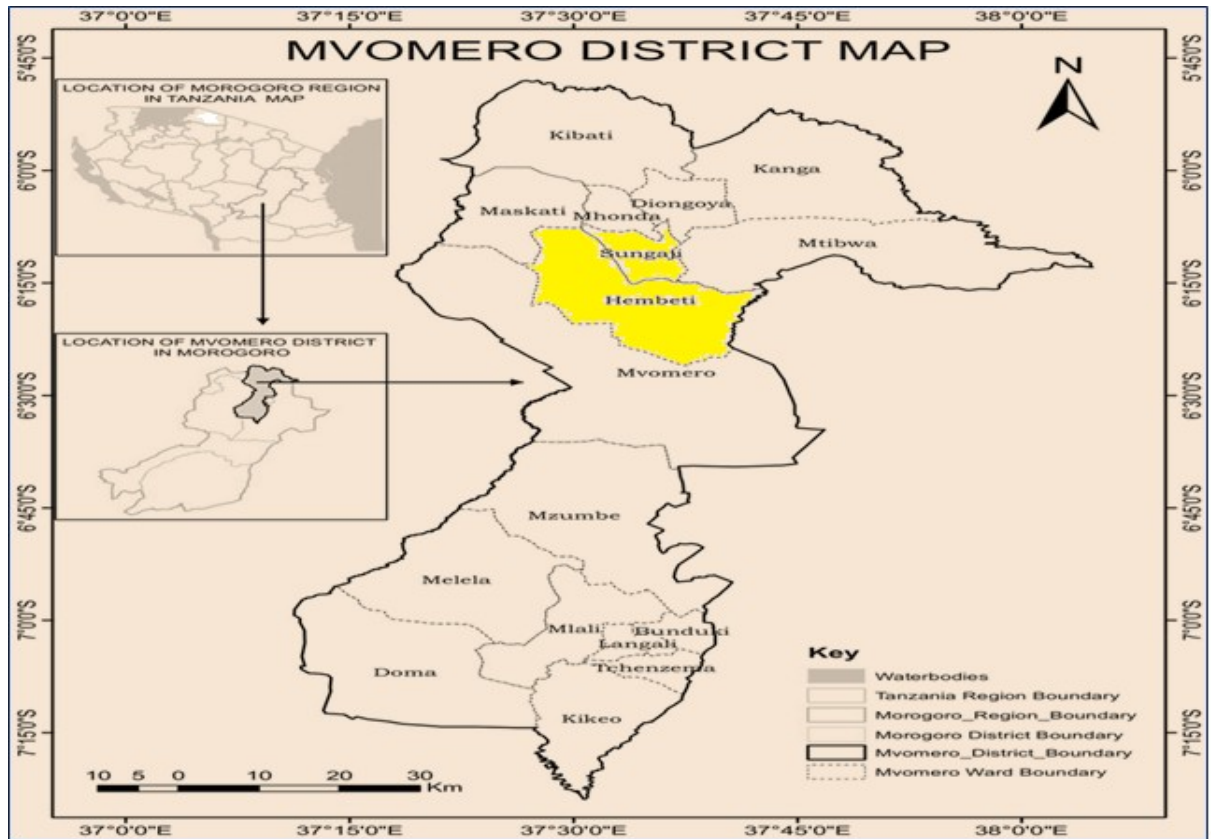


Figure 2.1: Map of the study area (Mvomero District) of Morogoro Region, Tanzania

Source: Researchgate.net

2.5 Research Design

The study adopted a cross-sectional research design which allows the collection of similar data from different groups of respondents at a single point in time (Setia, 2016). Cross-sectional research is considered to be favourable in this particular study since it is economic and allows comparison of the variables of interest from the stallholder rice farmers at the same time without additional cost.

2.6 Sample size and Sampling Procedure

The sample size for this study was 350 rice smallholder farmers as shown in Table 2.1, where multi-stage sampling was used to draw the appropriate sample from the study population. In the first stage, the Mvomero District was selected purposively due to its participation in the implementation of the RIPOMA project. In the second stage, the three

wards were selected randomly from the eight RIPOMA project wards. In the third stage, 18 groups, which were beneficiaries of VSLAs, including Utulivu, Uwezo, Twitange, Jembe Mkombozi, Chawahe, Uyanjo, Kilimo Kwanza, Busara, Endelevu, Uhuru, Mtego wa Simba, Maendeleo, Tushikamane, Ushauri, Mandela, Divue, Wapendanao and Hiari were selected purposively. Thereafter, 145 respondents were selected randomly from 18 groups. On the other hand, 205 non-VSLA participants were selected randomly from the same wards.

The sample size of 350 respondents for this study was justified by the sample sizes used by other studies conducted using propensity score matching and arrived with the intended results. The samples used by the other studies ranged from 342 to 473 households (Dowuni and Mabe, 2019; Nguyen *et al.*, 2018; Mahaukede *et al.*, 2015; Su and Hoken, 2015; Wu *et al.*, 2010).

Table 2.1: Participant per study ward

Study wards	VSLA Participants	VSLA non-Participants	Pooled
Hembeti	40	70	110
Mkindo	40	70	110
Sungaji	65	65	130
Total	145	205	350

2.7 Data Collection

The quantitative data for this study was collected through a household survey, which was based on questionnaires administered to the sampled rice smallholder farmer's households. Before data collection, the authority at the district level was informed and the exercise was approved. Quality assurance was engrained in all key study milestones, including recruitment of research assistants, data collection, and analysis.

2.8 Data Processing and Analysis

Qualitative data was sorted, coded, summarized, and analyzed using STATA 14, whereby descriptive and inferential statistics were used to analyze quantitative data. The impact of participation in the VSLAs on rice productivity and income was analyzed using propensity score matching (PSM). The PSM approach has been used to attain balance or comparability of treatment and control groups in terms of their socio-economic characteristics thereby controlling for confounding bias in estimating treatment effects (Nguyen *et al.*, 2018). The instrumental variable (IV) was intended to be used to check the robustness of the PSM if the Wu-Hausman F test confirms the presence of endogeneity.

2.9 Analytical Framework

2.9.1 Testing of endogeneity

The participation in VSLAs was non-randomly selected, instead determined by socioeconomic characteristics, which may influence participation and may also affect rice productivity directly. Therefore, the decision on whether to participate or not to participate was unobservable, which may have resulted in a correlation between the error term/residual and the independent variable. To assure robustness of methods used in the assessment of the impact of VSLA participation on rice productivity and income, the endogeneity was tested using Wu-Hausman test Table 2.2, and the variables used were age, sex, marital status, education level, farmer experience, household size, head of household main occupation, family labour, land ownership, land size, harvesting method, and VSLA participation.

Table 2.2: Tests of endogeneity of VSLA Participation

H0: Regressor is exogenous		
Wu-Hausman F test	0.50865 F (1,338)	P-value = 0.47621
Durbin-Wu-Hausman chi-sq test:	0.52592 Chi-sq (1)	P-value = 0.46833

The results in Table 2.2 show that P-Value is greater than 0.05 means the null hypothesis cannot be rejected, therefore the models are not systematically different. Thus, a single method, which is PSM, was used to assess the impact of VSLA participation on rice productivity and income. The IV wasn't used to check the robustness of the PSM because the VSLA participation was confirmed to be exogenous, which means no necessary covariates were omitted from the model.

1.9.2 Propensity score Matching

Given lack of baseline data and the voluntary nature of the participation, propensity score matching was used to assess the impact of VSLA participation on rice productivity and income as a robust method for correcting potential selection biases in observational studies that may result in biased estimates (Harris, 2018; Heinrich *et al.*, 2010). The households which did not participate in VSLA are termed as the “control group” and those who participate in VSLA as the “treatment group”. The comparison of these groups was done by using similar socio-economic characteristics to estimate the proper counterfactuals which fit for PSM (Dawun and Mabe, 2020).

In the first step of implementing PSM, the propensity scores were estimated by running a logistic model using the observed socio-economic characteristics of the two groups, namely VSLA participants and non-VSLA participants. The aim was to estimate the propensity scores which affect the VSLA participation and are the conditional probabilities for an individual to participate in the program or not.

$$p(X) = p(Z=1 \vee X) \quad (1)$$

Where $p(X)$ is the propensity score, Z is the farmers' decision to participate in the VSLA ($Z = 1$ if the farmer participates and $Z = 0$ if otherwise), and $X = \text{Covariates}$ (farmers' socio-

economic characteristics). Propensity scores estimated by a binary logit model as presented in equation 2 below:

$$P(x) = Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \dots + \beta_n X_n + \varepsilon_i \quad (2)$$

Whereby $P(x)$ = Propensity score, X_1 - X_n = Observed covariates, β_0 = Constant coefficient β_1 - β_n = Coefficients (each independent variable's weight) and ε_i is the error term. The covariates used in the model were age, sex, education level, marital status, land size, land ownership, household size, family labour, head of the household occupation, experience in rice farming, and harvesting method as shown in Table 2.3. The aforementioned covariates were selected because they are related to smallholder rice farmers' self-selection into the VSLA intervention. Therefore, they were used as predictors for participation in VSLA in the creation of propensity scores using the logistic regression model. Some other covariates, i.e. access to credit, access to extension services, use of fertilizers, and use of improved seeds, were not included in the model because they are affected by the participation in the VSLA, and they didn't match between the two groups on the ground.

Table 2.3: Description of variables in the treatment effect model of rice productivity and income

Variables	Level of measurement	Type of variable	Description	Expected sign	Measurement
Treatment variable: VSLA participation (Z=1 for VSLA participation and Z=0 for non-participation)					
Outcome variable					
Rice productivity(yield/area)	Ratio	Continuous	The average quantity of rice produced per area		Kg/acre
Covariates					
Age	Interval	Continuous variable	Number of years of individual farmer since born	+/-	Number of years
Sex	Nominal	Dummy	Sex of individual farmer	+/-	D=1 Male, D=0 Female
Marital status	Ordinal	Categorical	Marital status of the rice farmer	+/-	D=1 Married, 0= otherwise
Household size	Interval	Continuous	Number of members in the household	+	Number of members
Education level	Ordinal	Categorical	The time the individual farmer spent in formal education	+	Number of years
Respondent main occupation	Ordinal	Categorical	The main occupation of respondents	+/-	1 agriculture, 2 business, 3 employed
Farmer experience	Ordinal	Continuous	Number of years a farmer spent in rice farming	+	Number of years
Family labour	Interval	continuous	Number of household members who can participate in farming al labour	+	Number of members in the household.
Farm size	Ratio	Continuous	Size of land allocated for rice production	+	Number of Acres
Land ownership	Ordinal	Categorical	Land ownership status of a smallholder rice farmer	+/-	D=1 owned, D=0 otherwise
VSLAs Participation	Nominal	Categorical	Whether the farmer is a member of VSLA or not	+/-	1=participant 0= non-participant

The second step was to check the socio-economic characteristic balance between the two groups, VSLA participants and non-participants. This involves checking if the two groups have similar observable socio-economic characteristics based on propensity scores. This

was done to ensure the two groups are comparable, to avoid comparing the incomparable groups (Henrich *et al.*, 2010; Hoken and Su 2015), and the check was done using a histogram and t-test. Moreover, the balanced treatment groups attained the same traits as the randomized control trial (RCT) given the quality of the observable data (Staffa and Zurakowski, 2018). The next step was matching the two groups by similar propensity scores. To ensure the quality of matches between the treatment and control groups, Nearest Neighbor Matching (NNM), caliper or radius matching, and kernel matching (KM) were used in this study (Harris and Horst, 2016). The NNM relies on the nearest propensity scores between participants and non-participants, while KM focuses on comparing the outcome of each treated individual to the average weighted propensity scores of untreated individuals who have nearer propensity scores (Chegere, 2020). The fourth step was the estimation of the average treatment effect on treated (ATT) to assess the impact of participation in VSLA on rice productivity and income. The final step was sensitivity analysis to examine the presence of hidden biases from the unobserved covariates. The unobserved confounder may influence the results and lead to incorrect estimates (Linden *et al.*, 2020).

2.9.3 Yield Effect

To estimate the effect of VSLA participation on rice productivity, let $P_{1i}=1$ represent VSLA participants and $P_{0i}=0$ represent non-participants. Assume the outcomes for VSLA participants are Y_{1i} and Y_{0i} for non-participants. Then the treatment effect (Z) is presented as follows:

$$Z = Y_{1i}(P_{1i}=1) - Y_{0i}(P_{0i}=0) \quad (3)$$

Normally, in observational studies, there is a problem where participant Y_1 ($P_{1i} = 1$) and non-participant Y_1 ($P_{1i} = 0$) cannot be observed at the same time due to the situation of

counterfactuals. Because either a participant or a non participant was observed in this situation, estimating the individual treatment effect becomes difficult (Mabe and Tahidu, 2020). Therefore, ATT was used to estimate the average difference in outcomes that would be obtained by comparing the outcomes of individuals with and without treatment. ATT is presented in equation 4 below:

$$ATT = E(Y_{1i} | Z=1) - E(Y_{0i} | Z=1) \quad (4)$$

Where ATT denotes the average treatment effect on the treated, it measures the impact of the VSLA participation ($Z=1$) on rice productivity; Y_{1i} denotes the yield of a rice farmer who participates in VSLA; Y_{0i} is the yield of a rice farmer if he/she did not participate in VSLA. $E(Y_{1i} | Z=1)$ is the average yield obtained by the individuals in the presence of VSLA, whereas $E(Y_{0i} | Z=1)$ is the average yield obtained by the VSLA participants if they were not exposed to the intervention.

2.9.4 Income Effect

To compute gross profit from rice farming for both VSLA participants and non-participants, the gross margin (GM) analysis was applied. The equation for GM is presented as follows:

$$GM_i = \sum_{i=1}^n (TR - TVC) = \sum P_y Y - \sum P_x X_i \quad (5)$$

Where TR was the total revenue from selling a bag of paddy, TVC was the total variable cost of producing a bag of paddy, and P_y and P_x are the prices of one bag of paddy and inputs, respectively, whereas Y and X_i are the quantities of paddy solid and inputs used, respectively.

The average treatment effect on income was given by the equation below:

$$ATT = E(GM_i) - E(GM_0) \quad (6)$$

Therefore, $ATT = E(GM_i) - E(GM_0)$

Where ATT denotes the average treatment effect on the treated, it measures the impact of the VSLA participation on rice income. $E((P_1 Y_1 | Z=1) - P_x X)$ is the average rice income obtained by the individuals in the presence of VSLA, whereas $-E((P_0 Y_0 / Z=1) - P_x X)$ is the average rice income obtained by VSLA if they were not exposed to the intervention. GM1 and GM0 are gross margins for VSLA participants and non-participants, respectively.

2.10 Result and Discussion

2.10.1 Socio-economic characteristics of smallholder rice farmers in the Mvomero District

The descriptive values of socio-economical characteristics of the smallholder rice farmers in the Mvomero District are presented in Table 2.4. The results reveal that the majority of smallholder rice farmers who participated in VSLA have an average age of 42 years compared to non-VSLA participants who were 39 years. This implies that it is likely easier to save the elderly in groups than the younger ones. This result is consistent with the one reported by Alesane *et al.* (2019). The respondent's education level implies that the majority of the respondents attended primary education for both participants and non-participants (82%) with farming as their main occupation (91%). The average household size for VSLA participants was 4.8 and 4.9 for VSLA non-participants. Moreover, the average household family labour for participants was 2.4 and 2.6 for VSLA non-participants. This implies that families with less family labour were more likely to join VSLAs than those with more family labour.

The non-VSLA participants had more experience in rice farming for an average of 12 years compared to the VSLA participants, who had an average of 10 years in rice farming. The majority of VSLA participants have access to extension services (87%) compared to non-participants (55%). In addition, 70% of the smallholder rice farmers in Mvomero have

access to credit from different sources. By comparing the two groups, 95% of the VSLA participants had access to credit, while only 48% of the non-participants had access to credit. The source of credit for participants was the association's mobilized savings. In contrast, non-participants received credit from different sources, including banks, SACCOS, and individual lenders.

Table 2.4: Descriptive values of socio-economic characteristics of smallholder farmers in Mvomero district.

Variable	VSLA participants 145	VSLA non-participants 205	Total Sample
	Mean/proportional	Mean/proportional	
Age	42.283(10.52)	39.049(11.098)	40(10.964)
Sex	0.289	0.322	0.309
Marital status	0.731	0.708	0.717
Education Level	2.062	2.103	2.086
Household size	4.835(1.467)	4.878(1.7005)	4.86(1.606)
Family Labour	2.455(1.0406)	2.649(1.07260)	2.569(1.062)
Land size	1.061(0.5418)	1.026(0.6165)	1.04(0.586)
Landownership	0.586(0.494)	0.531(0.500)	0.554(0.498)
Household occupation	1.173	1.093	1.125
Experience in rice farming	10.883(6.954)	12.069(8.916)	11.577(8.171)
Harvesting method	1.173	1.23	1.206
Access to extension services	0.87(0.330)	0.55(0.498)	1.251(0.677)
Access to credit	1(0)	0.48(0.501)	0.7(0.458)

Note: The standard deviations are shown in parentheses.

2.10.2 Impact of VSLA participation on rice productivity and income

2.10.2.1 Estimation of the propensity scores

The propensity scores of smallholder rice farmers' participation in VSLA were estimated by the application of a logistic model as a function of observable farmers' characteristics as shown in Table 2.5 below. The generated propensity scores of the two groups, VSLA participants and non-participants were used to create the comparison group in which the impact of VSLA participation was estimated.

Table 2.5: Logistic model for propensity score estimation

VSLA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age	0.061	0.014	4.49	0	0.034	0.087	***
Sex	-0.396	0.271	-1.47	0.143	-0.927	0.134	
Marital status	0.152	0.267	0.57	0.569	-0.371	0.675	
Education level	-0.252	0.267	-0.94	0.345	-0.775	0.271	
Household size	0.031	0.084	0.37	0.71	-0.134	0.197	
Family labor	-0.227	0.132	-1.72	0.085	-0.487	0.032	*
Respondent main occupation	0.572	0.263	2.18	0.029	0.057	1.087	**
Experience in rice farming	-0.065	0.018	-3.54	0	-0.101	-0.029	***
Land size	0.268	0.209	1.28	0.2	-0.142	0.677	
Landownership	0.142	0.234	0.61	0.544	-0.317	0.601	
Harvest method	-0.489	0.295	-1.65	0.098	-1.067	0.09	*
Constant	-1.514	0.911	-1.66	0.096	-3.299	0.27	*
Mean dependent var		0.414	SD dependent var			0.493	
Pseudo r-squared		0.074	Number of obs			350	
Chi-square		34.945	Prob > chi2			0.000	
Log-likelihood		-2199605					

*** $p < .01$, ** $p < .05$, * $p < .1$

As specified in the model, the value of Pseudo R-square=0.074, the pseudo-R-square close to zero, which is 0.074, indicates a successful balance between the two groups has been achieved. The log-likelihood of -2199605 and significance level of 1% indicates the fitness of the model to the data. The age of the respondents, their main occupation, and experience in rice farming were statistically significant at 0.01, 0.01, and 0.05 levels of significance, respectively. Also, the results are consistent with the previous findings by Alesane *et al.* (2019) that elderly people are easier to save through groups than young people. On the other hand, if the respondent's main occupation is agriculture, the probability of participating in VSLA increases by 57% while other factors remain unchanged.

2.10.2.2 Balancing socio-economic characteristics between participants and non-participants groups

The socio-economic characteristic between VSLA participants and non-participants were balanced using a two sample t-test and the distribution of estimated propensity scores (histogram). The two sample t-test results in Table 2.6 indicate that 91% of socio-economic characteristics between VSLAs participants and non-participants are insignificance at the p-value of 0.05. The results imply that there is no statistical difference in sex, education level, household size, marital status, land size, land ownership, family labour, head of the household occupation, experience in rice farming, and harvesting method. Therefore, the two groups were homogeneous and comparable

Table 2.6: Balanced socio-economical characteristics of VSLA participants and non-participants

	VSLA participants 145	VSLA non- participants 205	t value	p value
	Mean/proportional	Mean/proportional		
Age	42.283	39.049	-2.75	0.007
Sex	0.289	0.322	0.65	0.52
Marital status	0.731	0.708	-0.5	0.629
Education Level	2.062	2.103	0.8	0.418
Household size	4.835	4.878	0.25	0.803
Family Labour	2.455	2.649	1.7	0.093
Land size	1.061	1.026	-0.55	0.586
Landownership	0.586	0.531	-1	0.314
Household occupation	1.173	1.093	-1.7	0.092
Experience in rice farming	10.883	12.069	1.35	0.181
Harvesting method	1.173	1.23	1.3	0.196

P-value ≤ 0.05

Table 2.7: Distribution of the estimated propensity scores

Variable	Obs	Mean	Std. Dev.	Min	Max
VSLA participants	145	0.471	0.157	0.151	0.856
Non-VSLA participants	205	0.374	0.141	0.102	0.839
Overall	350	.414	0.153	0.102	0.856

From Table 2.7 above, the overall propensity scores ranges between 0.102 and 0.856. For VSLA participants, the propensity score ranges between 0.151 and 0.856, while for non-VSLA participants they ranges between 0.102 and 0.839. Therefore, the common support would be between 0.102 and 0.856. Out of 350 respondents, 1 observation from VSLA participants was out of the range. Therefore, 349 respondents were used to predict the impact of participation in VSLAs on rice productivity and income. The common support shows the validity of the matching of the socio-economical characteristics of the two groups of participants and non-participants.

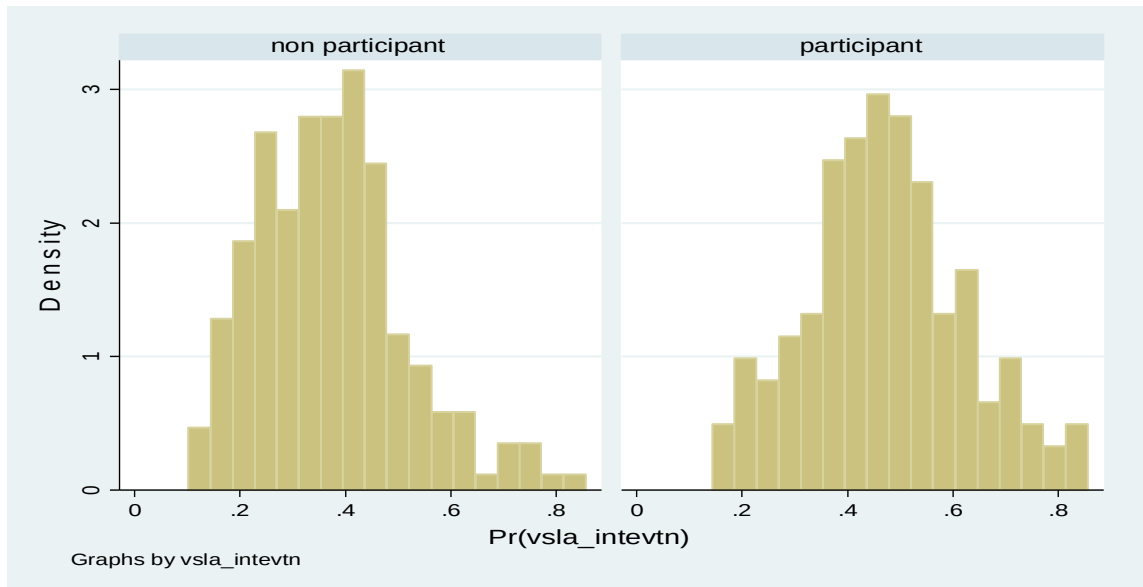


Figure 2.2: The distribution of propensity scores across participant and non-participant groups

On the other hand, figure 2.2 above shows that the propensity scores were rigorously distributed between 0 and 0.8, and therefore, there was sufficient overlap between the propensity scores of participants and non-participants with a larger area of common support. On the other hand, not too many probabilities are concentrated near zero or eight. Thus, there was no evidence of the overlapping assumption of propensity score Matching being violated as the two estimates have their respective masses in the region where they overlap and create common support (figure 2.3). Therefore, the overlap was acceptable and the balance was obtained among participant and non-participant groups.

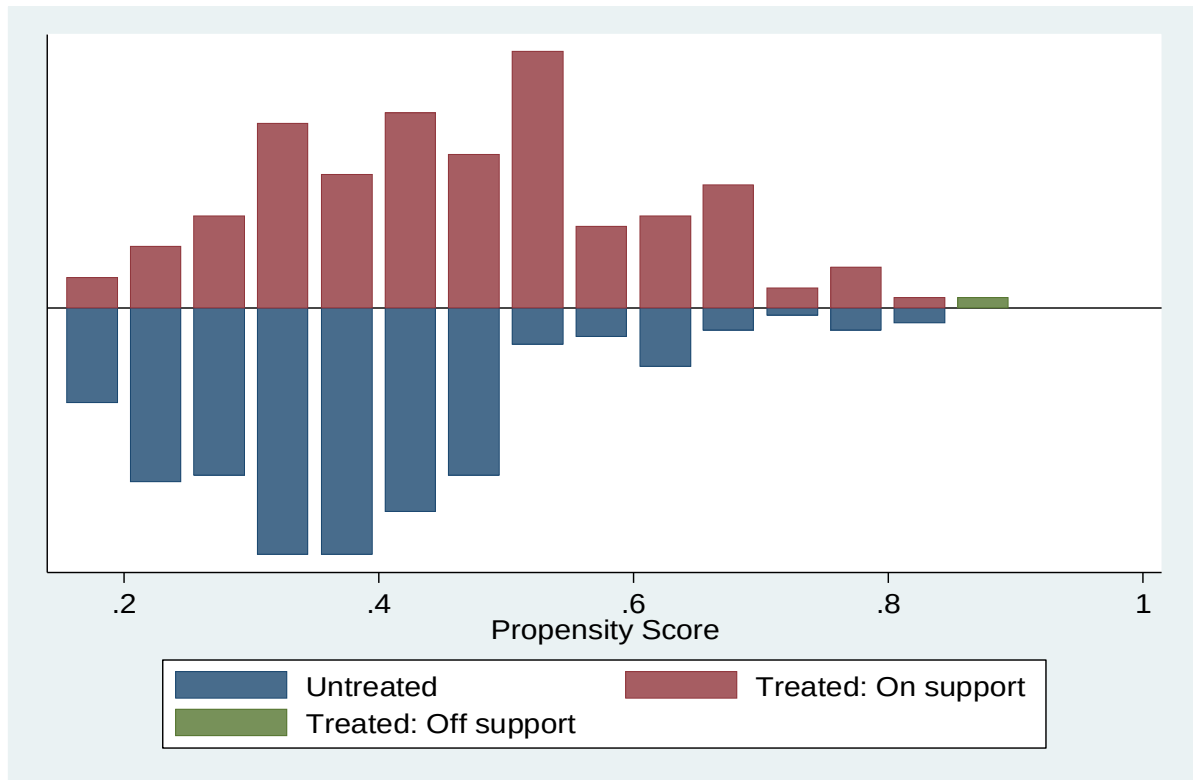


Figure 2.3: Graphical representation of the common support

2.10.2.3 Average impact of participation in the VSLAs on rice productivity and income

After balancing the socio-economic characteristic of the two groups and achieving the common support, the impact of VSLA participation on rice productivity and income was estimated. The impact of VSLA participation was estimated using matching methods that compare the individual household outcomes of participants and non-participants using propensity scores. Given the observable characteristics matching estimates are balanced between the two groups, the estimators could vary depending on how the match's controls are defined and assigned weight.

Table 2.8: Estimation of the impact of VSLA participation in rice productivity and income

Matching Method	Outcome Variables							
	Rice productivity				Rice income			
	Nearest neighbor	Kernel	Radius	Average	Nearest neighbor	Kernel	Radius	Average
VSLA participation								
Participants	205	145	121		205	145	121	
Non Participants	144	199	170		144	199	170	
ATT	1.997	2.776	2.431	2.401	108,019	142,225	118,000	122,748
STD error	0.874	0.701	0.702		30892.74	25298.8	26739.53	
		0.001**	0.001**					
P-value	0.025**	*	*		0.005***	0.003***	0.004***	

Note: Bootstrap with 50 replications was used to estimate standard error for the propensity score matching

*** $p < .01$, ** $p < .05$, * $p < .1$

From the estimations in Table 2.8 above, the ATT value of 1.997 for treated implies that rice productivity for VSLA participant households is higher by 1.997 bags of rice =199.7kg/season than that of the non-VSLA participants. On the other hand, the ATT value of TZS 108,019 for rice income implies that the rice income of VSLA participants households is higher by TZS 108,019 than that of the non-VSLA participant households. However, impact estimations with radius and kernel matching suggest that participation in VSLA with bundled services has a significant positive effect on rice productivity and income. The rice productivity and income for VSLA participants are higher by 2.431 bags and TZS 118,000 respectively for radius matching and 2.776 bags and TZS 142,255 for kernel matching.

Generally, after matching the two groups, the results indicate that participation in VSLA had a positive and significant impact on the rice productivity and income of smallholder rice farmers, as indicated in Table 2.8. The VSLA participants obtained an average of

2.401 bags/acre/season of rice, higher than their counterparts, and this implies that VSLA participants were better off in rice farming than non-participants. The p-value for both methods is below 0.05 and this indicates that the null hypothesis was rejected in all impact estimation methods at 0.1%, 1%, and 5% significance levels respectively. On the other hand, the results indicate that VSLA participants can access credit or shares from the groups and purchase inputs and manage farm operations on time, which led to an increase in production per area which had an effect on rice income and wellbeing more than non-participants. Moreover, the study findings show that VSLA non-participants had no reliable source of credit and that few of them (48%) had access to credits from individual lenders at high cost and not at the proper time. Also, VSLA participants had an opportunity to collectively purchase inputs where they formed an umbrella known as the input market association (IMA), which operates at the ward level. The umbrella purchases inputs collectively and distribute them to VSLA groups. Furthermore, the inputs are distributed to VSLA members at a lower cost and time before the season. The credit accessed from VSLA enables VSLA participants to afford short-term rice farming technologies which have a positive effect on rice productivity and income.

These findings are also supported by results from previous studies such as Dawuni and Mabe (2020) which reported that VSLA participation has a positive and significant impact on farm value chain productivity where VSLA participants had more units due to timely purchase and use of inputs and technologies. The studies by Karlan *et al.* (2017) and Kizza (2019) found that VSLA participation has positive results for businesses, especially for women, who are the primary target of the associations. Also, the study by Ngegba *et al.* (2016) reported that VSLA has improved farm profit and enables the farmers to manage medical services and school fees for their household members. Moreover, the study by Nyamaka (2019) concluded that VSLA financial services methodology contributed to the

improvement of livelihood for the VSLA members. The study by Dagunga *et al.* (2020) on the impact study of VSLA on agricultural technology adoption concluded that promoting VSLA groups improves smallholder farmers' saving capacity for agriculture investment.

2.10.2.4 Sensitivity analysis

The Rosenbaum bounds sensitivity analysis was performed to check the presence of hidden bias caused by the unobserved covariates between participants and non-participants.

Table 2.9: Rosenbaum sensitivity analysis for the average treatment effect on treated

Rosenbaum bounds for Rice productivity (N = 350 matched pairs)			Rosenbaum bounds for Rice income (N = 350 matched pairs)		
Gamma	Sig+	Sig-	Gamma	Sig+	Sig-
1	0	0	1	0	0
2	0	0	2	0	0
3	0	0	3	0	0
4	2.2e-16	0	4	2.2e-16	0
5	2.0e-13	0	5	2.1e-13	0
6	1.8e-11	0	6	1.8e-11	0
7	4.4e-10	0	7	4.4e-10	0
8	4.9e-09	0	8	5.0e-09	0
9	3.2e-08	0	9	3.2e-08	0
10	1.5e-07	0	10	1.5e-07	0

* Gamma-log odds of differential assignment due to unobserved factors; Sig+ - upper bound significance level;

Sig- - lower bound significance level

Table 2.9 shows that the p-critical values of all outcome variables estimated at various levels of critical values of gamma are significant at a p-value less than the usual value of 0.05, which infers that the main covariates which affect the participation in VSLA and the outcome variables have been considered, and changes in gamma values didn't change the

study inferences. Therefore, the positive effect of VSLA on rice productivity and income is insensitive to potential hidden bias due to an unobserved confounder.

2.11 Conclusion and Recommendations

This paper assessed the impact of VSLA participation on rice productivity and income for smallholder rice farmers in the Mvomero district, using propensity score matching. The result from propensity score matching shows that VSLA participation has a positive and significant effect on rice productivity and income. This is evidenced by the results from the three matching methods, which are nearest neighbor matching, radius/caliper matching, and kernel matching, which show that, on average, VSLA participants have more yield and income than non-participants. This implies that VSLA participation improved rice productivity and income of smallholder rice farmers through easy access credit which was used to purchase recommended inputs, technologies and support timely farm management. Additionally, the larger proportion of the population who are employed in agriculture are women and the participants of VSLAs majority are women. Therefore promoting participation in VSLAs helped large a portion of smallholder farmers mostly women to access credit and improve their farming practices, which had multiple effects on the households, agriculture sector and economy.

Therefore, this study recommended that the VSLA model need to be supported and promoted by the private sector in collaboration with the government so that it can be more efficient in serving smallholder farmers in rural areas. To ensure sustainability, the model should be established and promoted beyond the project and programme level, where after the implementation period, the associations remain without proper guidelines. Also, there is a need to enhance and replicate the VSLA methodology for smallholder farmers and women in other districts and crops within the country, particularly in the rural and

marginalized communities, to help them mobilize savings and obtain credit in a proper and affordable way

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CHAPTER THREE

3.0 ASSESSMENT OF BUNDLED SERVICES BASED VILLAGE SAVINGS AND LENDING ASSOCIATIONS ON ACCESSIBILITY AND USE OF CREDIT AMONG SMALLHOLDER RICE FARMERS.

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3.1 Abstract

In developing countries, agricultural credit plays a crucial role in the development of the agricultural sector. It increases farmers' purchasing power of recommended inputs and farming technologies. While the Government is putting more effort into making sure credit services are accessible and affordable in rural areas, access to credit for smallholder farmers is still a challenge. The purpose of this study was to assess the influence of VSLA with bundled services on the accessibility and use of credit among rice smallholder farmers in the Mvomero District. The study used a cross-sectional research design whereby quantitative data for participants and non-participants were obtained through a household survey, which was based on questionnaires administered to 350 respondents. Qualitative data were obtained from focus group discussions (FGDs) and key informant interviews (KIIs) with a sample size of 56 respondents. The qualitative data obtained were analyzed through thematic analysis. Descriptive statistics and regression analysis were done with the help of STATA 14. The study found that VSLA with bundled and collective services had a positive and significant association with credit access at $P < 0.01$. Other factors that influence credit access were land size, family labour, total yield and rice income at $P < 0.01$ and $P < 0.05$. Moreover, the study found that 83% of the respondents had used a larger proportion of their credit for rice farming. The study concluded that VSLA with bundled and collective services, land size, family labour, total yield, and rice income are the key determinants of credit access among smallholder rice farmers. The study recommends that the Government and other agriculture stakeholders should promote the VSLAs with bundled services as an important tool that influences access to credit for smallholder farmers, and use the credit as intended. Also they help them to improve their farming activities and productivity through the use of recommended inputs.

Keywords: Use of credit, access to credit, smallholder rice farmers, bundled services, VSLA, collective access of inputs.

3.2 Introduction

The agricultural sector's influence on food security, employment, the economy, and livelihood remains crucial in developing countries. It employs 75% of the country's working age population. It contributes about 29.1% of the country's GDP and 40% of the export earnings (Sanka 2021; NBS, 2017; Akinkunmi, 2017). The sector is critical to achieving the Millennium Development Goals (MDGs) for sustainable development. To achieve these goals, agriculture should move from traditional methods to modern to have more production (Saqib *et al.*, 2018; Chandio *et al.*, 2017 and Jan *et al.*, 2017). Development in the agriculture sector cannot be achieved without improvement in production technologies, including the use of recommended inputs (Fan and Rue, 2020; Kangile *et al.*, 2018; Msangya and Yihuan, 2016 and Ngailo *et al.*, 2016).

Agricultural credit is recognized to play a vital role in achieving modern agricultural technologies for the development of the agriculture sector (Mahoukede *et al.*, 2015). As a result, credit access is critical for smallholder farmers to afford farming management and the use of improved technologies, as well as a risk management strategy (Frimpong and Mensah, 2020; Hong and Hanson, 2016 and Saqib *et al.*, 2016). Tanzania's government encouraged the growth of microfinance, and there are now over 5000 formal microfinance institutions aimed at assisting poor people in reducing poverty through fair credit access (Garib and Mwakeje, 2013).

Despite the effort of the government to make sure credit services are available and affordable in rural areas, credit access from formal financial institutions is a big challenge to smallholder farmers as they lack qualified assets that they can pledge as collateral for the credit (Mbuga, 2019). Also, small-scale farmers fail to access credit from formal financial sources due to bureaucracy, long application procedures, and higher interest rates

than the farmer's internal rate of return (IRR) (Dube *et al.*, 2015; Girabi and Mwakaje, 2013).

In 2017, HELVETAS Tanzania, during the implementation of Rice Postharvest Management and Marketing (RIPOMA), introduced Village Savings and Lending Associations (VSLAs) with bundled and collective access of services (collective purchase of inputs, collective warehouse and marketing) to facilitate easy access and use of credit in rice farming among smallholder rice farmers in Mvomero District.

The basic question leading to this study is whether the VSLA, with bundled services, influences access and use of agricultural credit for smallholder farmers. The study by Chandio *et al.* (2020) highlighted that factors like education, farming experience, landownership, membership in farmer's cooperatives, road access and access to extension services influence credit by smallholder farmers. The study by Anang *et al.* (2019) reported that sex, awareness of financial institutions, latest technology adoption, household income, farm capital, access to extension, and farm location influence access to credit for smallholder farmers. Moreover, the study done by Sanka and Nkilijiwa (2021) reveals that gender, household income, household size, cooperatives membership, asset value and land size have a positive influence on agriculture credit. Previous studies document the influence of farmers' cooperatives and associations on access to credit. However, little is documented about the influence of VSLAs, with bundled services, on credit access to smallholder rice farmers. Therefore, to build on the previous studies, the objective of this study was twofold: first to assess the influence of bundled services VSLAs on credit access among rice smallholder farmers in the Mvomero District, second to assess the use of credit obtained

3.3 Research Methodology

3.4 Description of the Study Area

The study was conducted in the Mvomero District, Morogoro, Tanzania (Figure 3.1). The Mvomero District is located at latitude 06° 26' South and longitude 37° 32' East. The district occupies a total area of 7,325 square kilometres whereby 549,375 hectares are suitable for crop cultivation. According to the Tanzania National census, (2012), the district's population in 2012 was 312,109 of which 154,843 are males and 157,266 are females with an average household size of 4.3 people. The average rainfall per year ranges from 600mm to 2000mm.

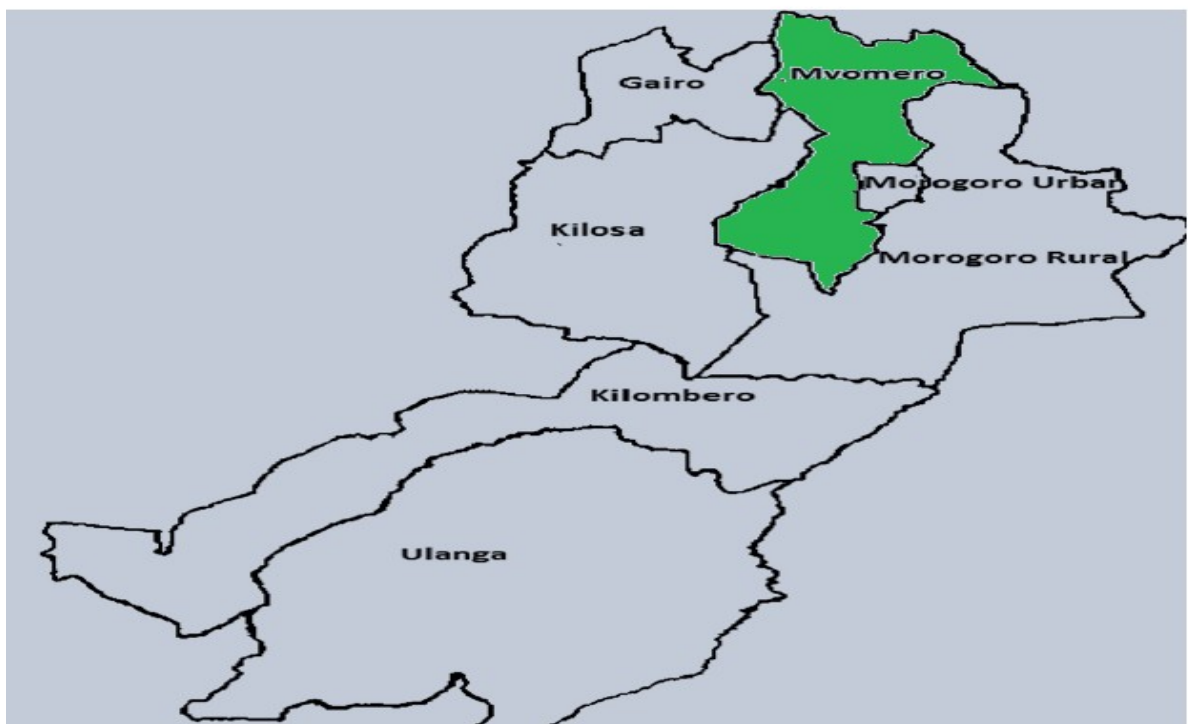


Figure 3.1: Map of the sumpling area (Mvomero District) of Morogoro Region

Source: Semanticsholar.org

The Mvomero District was chosen as a study area based on the fact that the district was one of the areas where the RIPOMA project was implemented and the VSLA groups established were 67 compared to 31 groups in the Kilosa District. Therefore, it was easy to get enough respondents for the study.

3.5 Research Design

The study adopted a cross-sectional research design, which allows the collection of data from the respondent at a single point in time (Setia, 2016).

3.6 Sample size and Sampling Procedure

The study used a sample of 350 respondents as described in Table 3.1 where the multi-stage sampling was used to draw the appropriate sample from the study population (VSLA participants and nonparticipants). In the first stage, the Mvomero District was purposively selected due to its participation in the implementation of the RIPOMA project. In the second stage, three wards were selected randomly from the eight RIPOMA project wards. In the third stage, eighteen groups were selected purposively because they were the beneficiaries of VSLAs. Thereafter, 145 respondents were selected randomly from eighteen groups. On the other hand, 205 non-VSLA participants were selected randomly from the same wards.

Table 3.1: Participant per study wards

Study wards	VSLA Participants	VSLA non-Participants	Pooled
Hembeti	40	70	110
Mkindo	40	70	110
Sungaji	65	65	130
Total	145	205	350

3.6.1 Data collection

The quantitative data for this study was collected through a household survey, whereby questionnaires were administered to the sampled rice smallholder farmer households. Qualitative data were gathered using key informant interviews and focus group discussions. The key informant interviews involved three ward extension officers and one RIPOMA project personnel. Two focus group discussions were conducted in each ward with VSLA participants and non-participants and each had 6 to 10 participants.

Before data collection, the authority at the district level was informed and the exercise was approved. Quality assurance was engrained in all key study milestones, including recruitment of research assistants, data collection, and analysis.

3.7 Data Processing and Analysis

Quantitative data was sorted, coded, summarized, and analyzed using STATA 14, whereby descriptive and inferential statistics were used to analyze the data. The bivariate logit model was employed to estimate the determinants of credit access by rice smallholder farmers in Mvomero District. Moreover, thematic analysis was used to analyze the qualitative data.

The bivariate logit model is specified as follows:

$$Y = \ln \left(\frac{P}{1 - P} \right) \dots \dots \dots (1)$$

$$Y = \ln \left(\frac{P}{1 - P} \right) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \dots B_k X_{ik} + \epsilon_i \dots \dots \dots (2)$$

Y = Dependent binary variable (access credit = 1, no access to credit= 0),

P = Probability of having access to credit, 1 – P = Probability of not having access to credit.

$\ln$ = Natural logarithm function

β_0 = Constant

$\beta_1 - \beta_k$ = Regression coefficients

$X_{i1} - X_{ik}$ = Independent Variables

ϵ_i = Random error term.

3.8 Access to Credit Logit Model

The factors influencing access to credit were analyzed using the bivariate logit model. The dependent variable was measured as the ability of a farmer to obtain credit that could be invested in rice farming. Among the independent variables, VSLA participation was included as a dummy variable, which we expect to result in access to credit for rice farmers. According to the model specification, the independent variables that may affect access to the credit include age, sex, marital status, household size, main occupation, land size, land ownership, family labour, total yield, rice income and access to extension services as described in Table 3.2.

Table 3.2: Description of Variables used bivariate logit modal

Variable Name	Variable description	Nature of Variable
Dependent variable		
Credit access	Whether have access to credit or not	Binary
Explanatory variables		
Age	Age of respondent(year)	Continuous
Sex	Sex of respondent(male=1, female=0)	Binary
Marital status	Marital status of respondent(married=1, otherwise=0)	Dummy
Main occupation(HH)	Whether farming, business or formal employment	Dummy
Education level	Whether non, primary, secondary or tertiary	Dummy
Household size	(total number of people in a household)	Continuous
Land size (in acres)	Number of acres used for rice farming	Continuous
Land ownership	(owning land or renting	Dummy
VSLA participation	Whether VSLA participant or not	Dummy
Access to extension services	Whether have access to extension services or not	Dummy
Family labour	Number of family members who are working	Continuous
Total harvest	Number of bags harvested per season	Continuous
Rice income	The gross profit obtained from the rice production per acre	Continuous

3.9 Results and Discussion

3.9.1 Socio-economic and demographic characteristics of Mvomero smallholder rice farmers

The socio-economic and demographic characteristics of smallholder rice farmers as presented in Table 3.3. The majority of VSLA participants were female (71%) versus male (29%). The reason for this distribution was project conditions to focus on women and motivation that had limited sources of income to support their farming activities and other income-generating activities (Grossman, 2020). The larger proportion of VSLA participants aged 36–45, or 42%, above 45 was 34%, and 20–35 was 26%. This revealed that old people are more attracted to the association than younger people, and this is due to the responsibilities they have which need financial resources to be accomplished (Alesane *et al.*, 2019). Moreover, the majority of VSLA participants are married (73%). The implication is that the VSLA model uses social capital security and married people are more trusted in society than unmarried. This is because the rate of married people to move

from one place to another is low than unmarried (Bannor *et al.*, 2020). The family size of the majority of VSLA participants ranged from 1-5 (63%) and above 5 was 33%. On the other hand, the family labour of the majority of the households was 1-4 members (97%) with 3% above 4 people. This implies that the associations are more attractive for households with few members and manpower. The majority of the respondents attended primary school education 83% for VSLA participants and 80% for non-VSLA participants. Secondary school education was 10% for VSLA participants and 12% for their counterparts. 0.7% and 1% of VSLA participants and non-participants respectively, attended tertiary education, while 6% of participants and 5% of non-participants had not attended formal education.

Variable	VSLA Participant N= 145		VSLA Non-Participants N=205		Overall N=350	
	Frequency	%	Frequency	%	Frequency	%
<i>Age</i>						
20-35	37	26	85	41	122	35
36-45	62	42	72	35	134	38
above 45	50	34	48	24	98	28
<i>Sex</i>						
Male	42	29	66	32	108	31
Female	103	71	139	68	242	69
<i>Marital status</i>						
Married	106	73	145	71	251	72
Otherwise	39	27	60	29	99	28
<i>Education Level</i>						
no formal education	8	6	11	5.37	19	5
primary education	121	83	165	80.5	286	82
Secondary education	15	10.3	26	12	41	12
Tertiary education	1	0.7	3	1.5	4	1
<i>Household size</i>						
1 to 5	92	63	136	66	228	65
above 5	53	37	69	34	122	35
<i>Family Labour</i>						
1 to 4	140	97	193	94	333	95
5 and above	5	3	12	6	(17	5
<i>Land size</i>						
<1acre	43	30	73	36	116	33
1 and above	102	70	132	64	234	67
<i>Landownership</i>						
Yes	85	58	109	53	194	55
No	60	42	96	47	156	45
<i>Main occupation</i>						
Agriculture	126	87	196	95	322	92
formal employment	13	9	3	1	16	5
Business	6	4	8	4	14	4
<i>Experience in rice farming</i>						
3 to 10years	95	66	119	58	214	61
above 10 years	50	34	86	42	136	39
<i>Harvesting method</i>						
Manual	120	83	158	77	278	79
Machine	25	17	47	23	64	18

Table 3.3: Summary of the socioeconomic Characteristic of the respondents

3.9.2 Determinants of credit accessibility to smallholder rice farmers

The results of the bivariate logit model on the factors that determine access to credit among smallholder rice farmers are presented in Table 3.4. The log-likelihood of -148.57547 and significance level of 1.0 % indicates the fitness of the model to the data. The results in Table 3.4 reveal that increasing one acre of land size increases the odds of a smallholder rice farmer accessing agricultural credit. This is because land size is one of the factors of production. As the size of the land increases, more resources are required, which increases the demand for agricultural credit. This result was the same as the findings by Sanka and Njilijiwa (2021) that land size is positively associated with credit access.

Table 3.4: Logistic regressions of the factors that determine access to credit

Access to credit	Odd ratios	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age	1.007	.017	0.44	.664	.974	1.042	
Sex	1.028	.336	0.08	.933	.542	1.95	
Marital status	1.243	.41	0.66	.51	.651	2.371	
Household main occupation	1.141	.399	0.38	.707	.575	2.264	
Education level	.718	.232	-1.02	.307	.381	1.354	
Household size	.892	.079	-1.29	.107	.75	1.061	
Land size	.267	.167	2.12	.034	.078	.908	**
Land ownership	.622	.186	1.59	.102	.347	1.116	
VSLA membership	18.855	10.989	5.04	0	6.016	59.092	***
Access to extension services	.923	.285	-0.26	.796	.505	1.69	
Experience in rice farming	.994	.022	-0.27	.786	.951	1.038	
Family labour	.961	.014	-2.72	.007	.933	.989	***
Total Harvest	1.081	.031	2.70	.007	1.022	1.144	***
Rice income	1	0	-2.98	.003	1	1	***
Constant	76.099	124.117	2.66	.008	3.112	1860.722	***
Mean dependent var		0.686	SD dependent var			0.465	
Pseudo r-squared		0.318	Number of obs			350	
Chi-square		138.590	Prob > chi2			0.000	
Log-likelihood		-148.575447					

*** $p < .01$, ** $p < .05$, * $p < .1$

Being a member of VSLAs, which are bundled with the collective services, increases the likelihood of smallholder rice farmers getting access to credit, and these results were statistically significant at $p < 0.01$. This might be because VSLA groups operate differently from formal financial institutions. They are available within the village and use of collective liability for the loan (Bannor, 2020). Also, bundled services (cash and inputs) and collective actions in obtaining agricultural services motivate farmers to join the groups and increase the access to credit to smallholder farmers. This result is the same as the one reported by Fischer and Qaim (2014) that collective ways of obtaining inputs and marketing motivate farmers to join farmer's associations. According to Benson *et al.* (2020), collective action in obtaining agricultural services increases the odds of smallholder farmers having credit access. It was revealed during a focus group discussion and key informant interview that collective services help the groups to access credit from formal financial institutions.

One of the RIPOMA project beneficiaries said that: *“Collective warehouse and marketing help the groups to access credit from the formal financial institutions, which used to credit the group members in terms of cash and inputs(bundle), decreases the habit of the farmers to sell their produce at low prices soon after harvesting due to capital constraints.”* (Key informant interview, Jan 2021).

Moreover, VSLAs help smallholder rice farmer's access credit more easily than other financial services because the interest rate is lower compared to other services, and the lack of lengthy procedures and bureaucracy makes the model more attractive to smallholder farmers. The same findings were reported by Dawuni *et al.* 2021; Sanka and Nkilijiwa

2021; Romana 2019; Ksoll *et al.* (2016) that membership in VSLA groups positively influences access to credit to smallholder farmers in rural areas.

A unit increase in family labour decreases the probability of a farmer accessing agricultural credit because one of the reasons for demanding credit was to cover labour costs. Therefore, as family labour increased, some of the costs were covered within the family. This was also revealed in the focus group discussion when one farmer from Hiari VSLA group said that:

“We are only two in the family, so it is hard to manage the farms, so I used the credit obtained to pay for labour costs, especially during farm preparation, planting, and harvesting” (FGD, Jan. 2021).

A unit increase in rice yield increased the probability of a rice smallholder farmer accessing credit. This might be because some lenders use a farmer's farm performance as a criterion for lending, especially individual lenders who need a borrower to repay crops instead of cash. Furthermore, it was revealed during a focus group discussion with non-VSLA members that if a farmer fails to repay a loan from an individual lender due to poor farm performance, the same farmer will find it difficult to access credit for the following season, and will instead be required to repay the outstanding loan.

A unit increase in rice income decreases the likelihood of a smallholder rice farmer accessing credit. This might be because smallholder farmers need credit to invest in rice production, so if their farm income increases, it can be reinvested and reduce the demand for credit.

3.9.3 Source of Agricultural Credits

Figure 3.2 show the different sources of credit in the study area. It revealed that the source of credit in the study area was Village Savings and Lending Associations, which saved 59% of the respondents; individual lenders, which saved 33% of the respondents; banks, which saved 6% of the respondents; SACCOs, saved 2% of the respondents; and relatives and friends, saved 1% of the respondents.

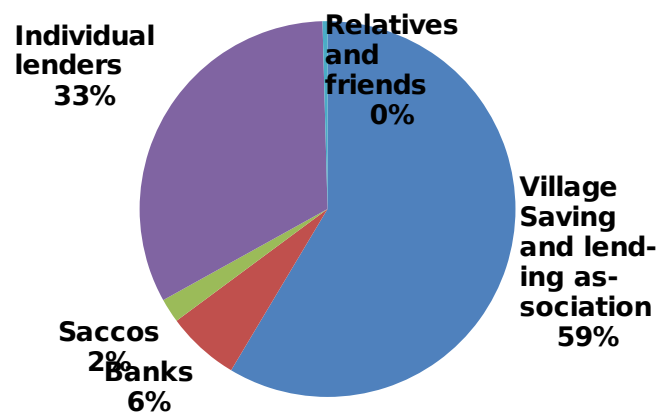


Figure 3.2: Credit sources in the study area

The results above infers that Village Saving and Lending Associations were the main sources of agricultural credit in the study area, as they accounted for 59% of all the credits obtained in the study area. The association looks more attractive to farmers because of its ease of lending, no requirement for physical collateral, low-interest rate, simple procedures, and ability to operate within the village. Moreover, individual lenders, which account for 33% of all credits, are the next source of agricultural credit in the study area. This source is taken as a fast way of obtaining credit, especially when a farmer has a farming emergency, but was reported to be more expensive due to the high-interest rate.

Individual lenders' credits were paid after harvesting with an interest rate ranging from 25%-50%. This looks to be a very high interest rate which undermines the farmer's effort.

On the other hand, this result revealed that smallholder farmers in the study area had fewer options for obtaining credit from formal financial institutions like commercial banks, due to collateral requirements, long procedures, and distance from the formal institutions. Furthermore, farming risk due to external factors such as weather, pest and disease, long season nature, price fluctuation, and natural calamities causes many banks to view agriculture lending as too risky (Sanka and Nkilijiwa, 2021).

3.9.4 Amount of credit obtained

Results in Table 3.5 revealed that 52 per cent of the VSLA participants had credit ranging from TZS 50 000-200,000, 42 per cent ranged from TZS 200 000-350 000, 33 per cent ranged from TZS 350 000-500 000, 10 per cent ranged from TZS 500,000-750,000, and a few 3 per cent ranged from TZS 750,000-1 000 000. In contrast, 31.22% of none VSLA participants had credit ranging from TZS 50 000 to 200 000, 13.7% had credit ranging from TZS 200 000 to 350 000, and the remaining 3.99% had credit ranging from TZS 350 000 to 1 000 000. This revealed that the majority of the credits accessed by the smallholder rice farmers ranged from TZS 50 000-500 000. This amount is small compared to the real cost of rice production and this is caused by low savings for VSLA participants and high demand for loans during the season.

Table 3.5: Amount of Credit Accessed by Smallholder farmers of the Study Area

Credit amount	VSLA participants		VSLA non-Participants	
	Freq.	Per cent	Freq.	Per cent
50 000-200 000	52	35.87	64	31.22
200 000-350 000	42	28.97	28	13.66

350 000-500 000	33	22.76	3	1.46
500 000-750 000	10	6.90	4	1.6
750 000-1 000 000	3	2.07	1	0.46
Total	140	100.00	100	100

For non-VSLA participants, as revealed during a focus group discussion, they failed to take larger loans due to high-interest rates from individual lenders who are their main source of credit.

However, it was further reported during the FGD with VSLA members that the credits obtained from the groups were not enough to fulfil farmers' credit needs. One VSLA group member said that:

“Currently, the credits obtained help to address only short-term technologies, but there are some other challenges that remain unsolved, like poor individual farm infrastructure, which affects production.” (FGD, Jan. 2021)

3.9.5 Utilization of the Credit Obtained by Smallholder Rice Farmers

Figure 3.3 revealed that 79% and 89% of VSLA participants and non-participant smallholder farmers in the study area use larger proportional credits in rice farming. 13% of the VSLA participants use the credit in other income-generating activities (IGA), while non-participants use the credit for IGA. Moreover, 8% of VSLA participants and 5% of non-participants used the credit obtained to pay school fees for their children. Furthermore, 3% of VSLA participants and 2% of non-participants used a larger proportion of the credit to pay for health services. Also, 4.6% and 4% of VSLA participants and non-participants, respectively, used a larger proportion of the credit obtained in land acquisition. The results imply that smallholder farmers in the study area used a large proportion of the credit

obtained from different sources for rice farming. This is because rice farming is their main economic activity, and also rice farming is resource-demanding.

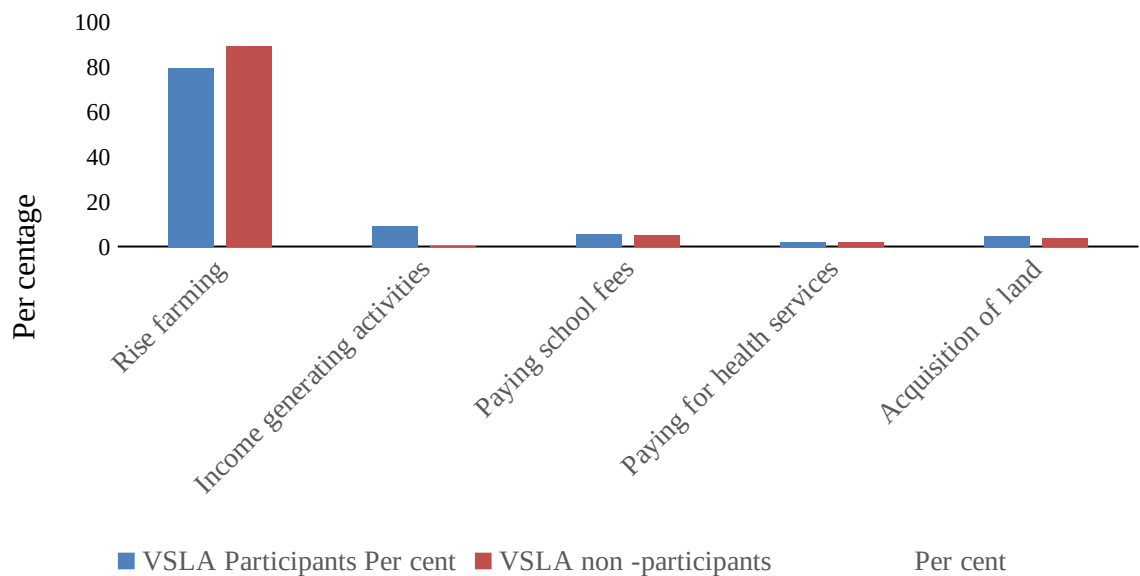


Figure 3.3: Major utilization of credit obtained by smallholder rice farmers

Additionally, the findings from the focus group discussion with VSLA members and key informant interviews with extension officers revealed that credit is an important component in rice farming as it facilitates timely and easy access to agricultural inputs. Also, this was made easier by farmer's associations through collective purchase and input credit, which helped farmers to have credit in place during the season. One extension officer said that:

“One of the main reasons for credit demand was the need for inputs during the season and to overcome farming risks. The input credits obtained from their association (VSLA) help farmers to use the credit for the intended purpose.” (Key informant, Jan. 2021)

These findings are the same as those reported by Martey *et al.* (2019) and Mahoukede *et al.* (2015), who reported that credit is vital to smallholder farmers as it facilitates easy and timely access to agricultural inputs. Also, another extension officer said that:

“Collective services attract farmers to join VSLAs, which increases access to credit and adoption of technologies, as they find it easy to introduce new farming technologies to the farmers who are in VSLA, which are bundled with collective services, than other farmers’ cooperatives and associations.” (Key informant Jan. 2021)

The same findings were also reported by Dagunga *et al.* (2020) and Musinguzi (2016) that participation in associations enhances farmers’ ability to access input credit and adopt farming technologies.

3.10 Conclusion and Recommendations

The focus of this paper was to assess whether the VSLAs with bundled services, contribute to the access and use of the credits obtained in agriculture. From the findings, this paper concluded that VSLA with bundled services had a positive and significant influence on smallholder farmers’ access to credit and it helps farmers to be more focused on the use of credit. Other factors that influence access to credit in the study area were land size, family labour, rice yield and rice income. The study suggests that one of the agricultural constraints that hinder smallholder farmers from adopting new technologies and improving their production and productivity in Tanzania is access to agricultural credit. The study also revealed that the majority of the smallholder farmers in the study area prefer village saving and lending associations as a source of agricultural credit as it saves a larger number of farmers than the other sources. Also, the VSLAs participants in the study area used a larger proportional amount of the credit obtained for rice farming, and this was

accelerated by the characteristics of bundled and collective access of services of the RIPOMA VSLAs. Thus, the findings imply that for smallholder farmers to have easy access to credit and use them as intended, they have to organize themselves into VSLAs, which are bundled with collective services.

Based on the findings the study recommends that; governments, financial service providers, and development partners should focus on promoting the VSLAs bundled with collective services as they were found to be more successful in facilitating farmers' access to credit and use of credit in farming in the rural areas. Furthermore, these associations are formed and managed locally by members within their villages and this cuts transaction costs, simplifies application procedures, and ensures timely access to credit. The associations allow members to make savings which are used as collateral for the loan and as capital at the end of the cycle, since the groups operate on a one-year cycle, then the savings and profit are distributed to members depending on individual shares before starting a new cycle. . Moreover, it recommended that the government need to establish a special linkage between the VSLAs and commercial banks so that they can increase capital through affordable group loans and save the members' with enough credits.

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CHAPTER FOUR

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary of the Major Findings

This section provides a summary of the major study findings in sequential order as presented in the manuscript.

4.1.1 Impact of participation in VSLAs on rice productivity and income

Objective one of this study aimed at assessing the effect of VSLA on rice productivity and income among smallholder rice farmers of Mvomero District.

Generally, the study findings show that the majority of respondents were female for both VSLAs participants and non-participants. Seventy one per cent (71%) of VSLA participants were female and for non-participants, 69% were female. The mean age of VSLAs participants' respondents were 42 years old, and 39 years for their counterparts, and this implies that VSLAs are more attractive to aged people than young people. The majority of the respondents attended primary school education, 83% for VSLA participants and 80% for non-VSLA participants. Secondary school education was 10% for VSLA participants and 12% for their counterparts. 0.7% and 1% for VSLA participants and non-participants respectively, attended tertiary education, while 6% for participants and 5% for

non-participants had not attended formal education. Moreover, the majority of the respondents were married (73% of VSLAs participants and 70% of non-participants).

The result from the propensity score matching shows that the VSLAs' participation had a positive and significant effect on rice productivity and income, using the three matching algorithms, which are Nearest Neighbor Matching (NNM), Radius Matching (RM), and Kernel Matching (KM). This implies that when a farmer gets access to VSLAs services, he or she manages to purchase recommended inputs and manage the farming activities on time, which increases productivity and consequently income, which results in the improvement of the farmer's wellbeing as they can afford to pay school fees for their children, access health services, and food security.

4.1.2 Assessment of bundled services based VSLAs on accessibility and use of credit among smallholder rice farmers

Objective two of this study was aimed at assessing the VSLA, which is bundled with services on credit accessibility to smallholder farmers in the Mvomero District, while the third objective was aimed at assessing the use of credit obtained among smallholder rice farmers.

Generally, the result shows that 71% of the VSLAs respondents were female. Apart from being the project condition, the majority of females have limited sources of income, so they use groups and associations as their main source of income. VSLAs are more appealing to older people than to young people, with 42% of participants aged 36-45 years and 34% over 45 years, owing to the responsibilities they bear in comparison to young people. Also, 73% of VSLA participants were married. The village saving and lending associations use social security, and married people are more trusted in the communities than unmarried ones.

The main source of credit in the study area is VSLA as it saved 59% of the respondents. This model looks friendlier to smallholder farmers as it has no physical collateral requirements, it operates within the village with a low interest rate and procedures for obtaining credit are simple compared to formal sources. Also, individual lenders were the second source of credit to smallholder farmers in the study area. It saved about 33% of the respondents, and the majority were non-VSLA participants. This source helps farmers obtain credit fast, especially in the incidence of farming emergencies, but it is reported to be more expensive.

The result from binary logit regression shows that VSLAs had a positive and significant association with credit access, and this implies that VSLAs are the determinant factor for credit access in the study area, as revealed in the findings that 59% of those who access credit in the study area was from VSLAs. Other factors which were associated with access to credit were land size, family labour, total yield and rice income.

Moreover, the findings of the descriptive statistics show that a larger proportion of the respondents, about 79% of VSLA participants and 89% of non-participants, use the credit obtained from the different sources in rice farming. This is because rice farming is their main source of livelihood, and input credits for VSLA participants facilitated them to focus on the use of the credit as intended. For non-VSLA participants, the majority demanded credit when they had a farming emergency, so this pushed them to use the credit for rice farming.

4.2 Recommendations

Based on the findings of the study and the conclusions reached, the government and agricultural stakeholders need to:

- i. Promote and support the VSLA model so that it could be more efficient in serving smallholder farmers in rural areas.
- ii. Promote VSLAs which are bundled with services, as they were found to be more successful in facilitating farmers' access to credit and the use of credit in farming in the rural areas. Furthermore, these associations are formed and managed locally by members. They allow members to make savings which are used as collateral for the loans and as capital at the end of the cycle, since the groups operate on a one-year cycle, then the savings and profit are distributed to members depending on individual shares before starting a new cycle.
- iii. Enhance and replicate the VSLA methodology for smallholder farmers and women in other districts and crops within the country, particularly in the rural and marginalized communities, to help them mobilize savings and obtain credit properly and affordably.
- iv. Establish a special linkage between the VSLAs and commercial banks so that they could increase capital through affordable group loans and save the members with enough credit.

APPENDICES

Appendix 1: VSLA Members Survey Questionnaire

Questionnaire no

Ward.....Village.....Group
name.....

Date of interview

A. SOCIO-ECONOMIC CHARACTERISTICS

Write appropriate codes where applicable,

1. Name of respondent
2. Phone number
3. Age/year of birth
4. Sex (Tick where appropriate)

Male	
Female	

5. Marital status (Tick appropriate)

Married	
Not married	

6. Education Level (Tick where appropriate)

No formal education	
Standard Seven	
Secondary school (Form I-VI)	

Tertiary education	
--------------------	--

7. How many are you in your Household (actual household size)
 Working group.....
 Dependence.....

8. Who is the head of the household (tick the appropriate)

Men	
Women	

9. Main occupation of the head of household (Tick where appropriate)

Formal employment	
Agriculture	
Business	
Other (specify)	

10. How many years do you have in rice farming?

B. ACCESS TO AND USE OF CREDIT

11. Are you a member of the VSLA group for how long? (Tick where appropriate)

Less than 1 year	
One year	
Two years	
More than 2 years	

12. How many VSLAs you're a member too? (Tick where appropriate)

One	
Two	
More than two	

13. What services do you receive from VSLAs.....

Credit	
Value addition services	
Marketing services	
Storage services	
Savings	
Financial management training	

Good agricultural practices training	
--------------------------------------	--

14. What kind of credit did you receive from the VSLAs? (Tick, where appropriate)

Input	
Credit	
Both	

15. What amount of your last loan received from VSLA

16. How did you use the loan received from VSLA (Tick where appropriate)

Credit utilization	Yes / No
Agriculture	
Starting up a business	
Investing in existing business	
Paying school fees	
Paying health services	
Paying other debt	
Social functions(ceremonies)	
Household expenses (food, clothes, utilities)	
House repair and maintenance	
Others specify	

17. If credit was used in Agriculture which crop (tick the appropriate)

Rice	
Maize	
Sugar cane	
Others specify	

18. If the credit was used in rice farming what agricultural activity?

Activity	Yes / No
Land preparation	
Cultivation	
Rent farm	
Purchase inputs	
Weeding	
Harvesting	
Buying a farm	
Hiring labour	
Buying agriculture equipment	
Others (specify).....	

19. What Proportion of the credit received was allocated for rice farming?

.....

20. What Proportional of the credit received was used for other economic/social activities?

21. If the loan was used to access agricultural inputs, which kind of inputs

Input	Yes/No
Improved seed	
Fertilizers	
Pesticides	
Others (specify)	

22. How are you performing farming activities? (write the appropriate number)

	1=Manual 2=Machinery 3= Chemical
Cultivating	
Planting	
Weeding	
Harvesting	

B: RICE PRODUCTIVITY AND INCOME GENERATED

23. How much land do you own? (Acreage)

24. How much of the above is located for rice production

25. How many bags of rice did you harvest in the last harvesting season?

.....

26. How do you utilize the harvested crops (indicate no of rice bags)

	2017	2018	2019	2020
Sales				
Food				
Relatives				
Loan repayment				
Others(specify)				

27. At what price do you sell the harvested crops?

28. What was the cost of production per farm activity/acre and inputs used per season

Activity/input	Cost/acre
Cultivation	
Labour cost	
Planting	

weeding	
Fertilizer application	
Agrochemicals application	
Fertilizers	
Improved seeds	
Harvesting	
Storage	
Transportation	
Land hiring	
Agrochemicals	
Others(specify)	

Thank you for your cooperation

Appendix 2: Non -VSLA Members Survey Questionnaire

Questionnaire no

WardVillage.....

Date of interview

Write appropriate codes where applicable

1. Name of respondent
2. Phone number
3. Age/year of birth
4. Sex (Tick where appropriate)

Yes	
No	

5. Marital status (Tick where appropriate)

Single	
Married	

6. Education Level (Tick where appropriate)

No formal education	
Standard Seven	
Secondary school (Form I-VI)	
Tertiary education	
Other	

7. What is your household size?

8. Who is the head of the household (tick the appropriate)

Men	
Women	

9. How many years do you have in rice farming?

A: CREDIT ACCESS AND USE OF INPUTS

10. Ever you received a loan from any microfinance institution? (Tick where appropriate)

Yes	
No	

11. If yes which institution/lender?

Source Of Loan	Yes / No
a)SACCOS	
b)Individual lenders	
c)NGO	
d) Bank	
e) Relative, friend or family member	
f) other specify	

12. What was the amount of the last received loan?

13. How did you use the credit?

Credit utilization	Yes / No
Agriculture	
Starting up a business	
Investing in existing business	
Paying school fees	
Paying health services	
Paying other debt	
Social functions(ceremonies)	
Household expenses (food, clothes, utilities)	
Buying assets	
House repair and maintenance	
Others specify	

14. If credit was used in Agriculture which crop (tick the appropriate)

Rice	
Maize	

Sugar cane	
Others specify	

15. If the credit was used in rice farming what agricultural activity?

Activity	Yes / No
Land preparation	
Cultivation	
Rent farm	
Purchase inputs	
Weeding	
Harvesting	
Buying a farm	
Hiring labour	
Buying agriculture equipment	
Others (specify).....	

16. What Proportion of the credit received was allocated for rice farming?

.....

17. What Proportional of the credit received was used for other economic activities

18. If the loan was used to access agricultural inputs, which kind of inputs

Input	Yes/No
Improved seed	
Fertilizers	
Pesticides	
Others (specify)	

19. How are you performing farming activities? (write the appropriate number)

	1=Manual 2=Machinery 3= Chemical
Cultivating	
Planting	
Weeding	
Harvesting	

B: RICE PRODUCTIVITY AND INCOME GENERATION

20. How much land do you own? (Acreage).....

21. How much of the above is located for rice production? (Acreage).....

22. How many bags of rice did you harvest in the last harvesting season?

23. How do you utilize the harvested crops (indicate no of bags)

	2017	2018	2019	2020
Sales				
Food				
Relatives				
Loan repayment				
Others(specify)				

24. At what price you sold the harvested crops?

25. What was the cost of production per farm activity/acre and inputs used per season

Activity/input	Cost/acre
Cultivation	
Planting	
Labour cost	
weeding	
Fertilizer application	
Agrochemicals application	
Fertilizers	
Improved seeds	
Harvesting	
Land hiring	
Storage	
Transportation	
Agrochemicals	
Others(specify)	

Thank you for your cooperation

Appendix 3: Focus group discussions checklist – VSLA participants

Guiding questions

1. Does the introduction of VSLAs address the challenges in credit access?
2. How does VSLA help you to address the farming challenges?
3. Do the services obtained from VSLAs help you to improve your rice productivity?
(Yield/ha/season, income increase, and decrease of postharvest losses)
4. Have received credit from other sources before VSLA?
5. If yes how can you compare the credit with VSLA credit in terms of accessibility, interest rate and repayment schedules?
6. How can you compare the use of recommended inputs before and after joining VSLA?
7. Have you experienced changes in yield since you join VSLAs?
8. Does being a member of VSLA help you to improve your household wellbeing? (Education, health services, food security etc.
9. What challenges do u face in operating VSLAs?

Thank you for your cooperation

Appendix 4: Focus group discussions checklist – Non-VSLA participants

Guiding Questions

1. How are you access capital for financing rice farming activities?
2. What challenges are you facing in credit access and repayment?
3. How can you compare the use of fertilizer/acre for the period of 2017-2020?
4. Is there any changes in household income for the period of 2017 to 2020?

Thank you for your cooperation

Appendix 5: Key informant interview checklist- Project Officer (RIPOMA PROJECT)

An interview guide with RIPOMA Project officer

A: Introduction

Name of respondent

Phone number

Age/year of birth

Sex (Tick where appropriate)

Male () Female ()

B: Guiding questions

1. Does the VSLAs help rice farmers to access credit as intended?
2. What was the use of credits received by smallholder farmers from VSLA?
3. Does the VSLA facilitate access and use of improved agricultural inputs and technologies?
4. Was their improvement of rice productivity by comparing the time before and after VSLAs
5. What are other services the group member receive from the VSLAs rather than credit?
6. How does VSLA service benefit the different groups in Mvomero? (youth, women, and men)
7. Does participation in VSLA help to improve household income?

Thank you for your cooperation

Appendix 6: Key informant interview checklist- Ward extension officers

A: Introduction

Name of respondent

Phone number

Age/year of birth

Sex (Tick where appropriate)

Male () Female ()

B: Guiding questions

1. Does VSLAs contribute to the availability of capital for rice farming? how
2. Does VSLA help to improve farming practices? (Use of inputs and improved technologies)
3. Are there any changes in rice production since the introduction of VSLA?
4. Does the VSLAs help farmers to access market and storage facilities for their produces?
5. What changes have you observed in VSLA participants compared to non-participant?
6. What are the other services offered by VSLAs to make the associations more attractive to smallholder farmers?

Thank you for your cooperation

