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Influence of informal financial literacy training on financial knowledge and behavior of rural farmers: Evidence from Uganda

Ntakyo Renzaho Proscovia^{1*}, Johnny Mugisha², Robert Bangizi³, Diana Namwanje⁴ and Robert Kalyebara⁵

¹Faculty of Agriculture and Environmental Sciences, Kabale University, P. O. Box 317, Kabale Uganda.

²School of Agricultural Sciences, P. O. Box 7062, Makerere University, Kampala, Uganda.

³School of Education, Mountains of the Moon University, P. O. Box 837, Fort Portal, Uganda.

⁴The Johnny Mugisha Foundation, Uganda.

⁵Agricultural Business Initiative (aBi) Development Limited, Plot 20 Nakasero Rd, Kampala, Uganda.

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Financial literacy plays an important role in influencing financial behavior and knowledge of individuals. In this study, the impact of informal financial literacy training on rural smallholder farmers was assessed. Propensity score matching approach was used to assess training effects on distinct dimensions of financial knowledge. The study used a sample of farmers who are members of village savings and loans associations. Findings indicate higher scores (70.6% for training beneficiaries and 68.5% for the control group) in financial goals and the lowest scores (48.0% for training beneficiaries and 43.0% for control group) in planning and managing finances. Although the descriptive statistics show higher scores for the trained farmers, overall financial literacy scores in the different dimensions for trained farmers were not significantly different from those that were not trained. The result was attributed to spillover effects through networks given the period between training and evaluation. More financial education programs could be useful to empower communities with knowledge for informed financial decision making.

Key words: Financial literacy, financial decisions, smallholder rural farmers, informal training

INTRODUCTION

Whereas modern technology and liberalization have made new financial products and services more available, majority of the population especially those in rural areas remain excluded from the financial market and are not

well informed to make sound financial decisions (Lusardi and Mitchell, 2007). In low-income countries, especially sub-Saharan Africa, financial education programs are more limited to a small proportion of entrepreneurs and

*Corresponding author. E-mail: ntakyop@yahoo.co.uk.

the educated (Xu and Zia, 2012). In response, financial literacy has increasingly been recognized as a requirement/skill in the current financial environment to the extent that in recent years, it has attracted the interest of various institutions including governments and non-governmental organizations especially in developing countries to allocate resources in financial training programs (Carpena et al., 2011).

In this paper, the effects of informal financial literacy training on rural smallholders' financial behavior was assessed, focusing on the intermediary effects on farmers who are engaged in informal financial markets, particularly the village savings and loans associations (VSLAs). The study is based on the financial literacy training that was offered by different agricultural projects funded by aBi Development Limited in Uganda between 2014 and 2018. It is part of a comprehensive evaluation of the VSLA approach on smallholder farmers in Uganda, which was conducted in January, 2020. The VSLA model was first introduced by CARE in Niger in 1991 as a microfinance model under which saving groups are formed at community level to reduce poverty by socially and financially empowering the poor and vulnerable people (CARE Uganda). The original goal of VSLAs was to provide members especially rural women with access to credit, to meet subsistence needs or invest in income generating activities (Greyling and Rossouw, 2019).

The main objective of promoting VSLAs and training members was to enable farmers increase their savings and access to credit so as to engage in commercial agriculture and strengthen their competitiveness in the domestic and export market. Members of the VSLAs were trained over time in different dimensions of financial literacy including; financial planning and management, financial products and services, importance of saving, record keeping and balancing books. Other areas were budgeting, setting up rules and regulations, financial rules and discipline, how to access credit and investment opportunities. This training is unique in that it did not have a specific curriculum; it was rather informal where farmers were found in their own setup during their regular weekly meetings. As to whether this training model influences farmers' financial behaviour is the empirical question that was addressed in this study. Specifically, the effects were measured on four dimensions of financial literacy namely; planning and managing finances, financial goals, knowledge about financial products and saving and managing financial shocks. Measuring effects on financial knowledge is vital to understanding the potential impact of literacy programs on the rural population. This evaluation will guide policy and other actors engaged in rural development on financial inclusion of the rural farmers.

Financial literacy is here defined as the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial wellbeing (Nicolini and Haupt, 2019). As farmers increasingly participate in

market-oriented production, it is important that they know and understand the forms, functions and use of money and financial services (Aggarwal et al., 2014; Carpena et al., 2011). Financially illiterate households may face negative consequences of their financial decisions. They are likely to be more prone to over-indebtedness and to the use of exploitative sources of borrowing (Guiso and Jappelli, 2008; Abreu and Mendes, 2010). Financial literacy training aims at helping consumers develop the skills and confidence to become more aware of financial risks and opportunities, in order to make informed decisions and to take other effective actions to improve their financial well-being (Mian, 2014; Cole et al., 2009; OECD 2011). Financial education programs therefore, can increase financial knowledge and information seeking behavior such as improved saving and financial decision-making (Gibson et al., 2014; Lusardi 2008) of close to one hundred million adults in sub-Saharan Africa who use informal methods to save and borrow (Klapper and Singer, 2015).

The outcomes of financial literacy training depend on various factors. Cognitive constraints specifically have been reported as key barriers to improving financial knowledge (Jappelli and Padula, 2013; Carpena et al., 2011). The evidence on impact of financial literacy is, in some cases, mixed (Hastings et al., 2013) but largely, studies have shown that financial literacy programs have significant positive effects on financial behavior (Kaiser and Menkhoff, 2017). Sayinzoga et al. (2016) found that training increased financial literacy of participants, changed their savings, borrowing behavior and had positive effects on business start-ups in Rwanda. Similarly, in Tanzania, Krause (2016) found positive effects of financial literacy training on savings ability, employment confidence and personal finance of the youth. Financial literacy education has also positively impacted financial decisions in farming, for instance on rainfall insurance adoption in India (Gaurav et al., 2011) and performance of women farm enterprises in Kenya (Cherotich et al. (2019). However, Stoughton et al. (2011) argues that the impact of financial literacy training is influenced by the delivery mechanism of the training program. When financial advisors are also acting as sellers of financial products the training might be biased and farmers may not demand the financial advice.

Financial literacy is determined by various factors: Education qualifications (Mian, 2014; Lusardi, 2008), annual income and land size holding are reported to have a strong positive association with the level of financial literacy (Zhang and Xiong, 2019; Akoto et al., 2017; Aggarwal et al., 2014). Previous studies also indicate that males are more financially literate than females and that older people have a higher level of financial literacy compared with young people (Zhang and Xiong, 2019; Mian, 2014). In addition, geographic and racial/ethnicity disparities in financial literacy are commonly reported (Xu and Zia, 2012). In Ghana, for instance, Akoto et al.

(2017) report higher literacy levels among urban cocoa farmers with increased access to commercial banks. This paper contributes to the existing literature by providing insights on how financial literacy education has impacted the less educated rural farmers.

METHODS

Estimating the effects of financial literacy training on financial knowledge and behavior of rural farmers presents the common challenge of identifying causal effects. The challenges arise from selection bias and endogeneity associated with placement of the program, omitted variables and measurement errors. Very often, development programs are not randomly offered to the participants. There are driving factors such as convenience of location, infrastructure, previous activities, political influence that determine program placement. Such factors could have influenced the outcome of the program hence leading to overestimation of the outcomes.

Estimation strategy

Previous studies have addressed endogeneity in program evaluation such as training, by using various approaches including; experimental approaches, (randomized control trials and quasi-experiments), propensity score matching (PSM), panel data, instrumental variable and switching regression models. Others employ a combination of different approaches depending on the nature of the training, its design and the data available in order to reach a conclusion of causality. Since financial literacy is not observed, empirical studies face measurement error problems and OLS gives biased estimates due to unobserved factors.

A majority of studies have used experiments while others have used a mixed approach of both surveys and experiments. Cole et al. (2009) used a field experiment and small financial incentives with unbanked households in India and Indonesia to determine the effect of a financial literacy program on demand for financial services. Gaurav et al. (2011) conducted a randomized controlled trial to assess the effect of financial literacy training on personal financial management and on formal hedging of agricultural production risks, specifically rainfall insurance adoption randomly offered to selected farmers in the state of Gujarat. Sayinzoga et al. (2016) also measured the impact of financial literacy training on financial knowledge and behavior of small holder farmers in Rwanda using a field experiment. The experiments have the advantage of minimizing both allocation and selection bias, thus providing the strongest empirical causal evidence as it takes care of both observable and unobservable characteristics of the sample.

A few studies have addressed endogeneity in estimating impact of financial literacy by using the Instrumental variables (IV) approach. However, it is difficult to find a suitable instrument. Behrman et al. (2012) used survey data in Chile and IV approach to estimate the causal effect of financial literacy on wealth accumulation and wealth components. They used 11 instruments and find a strong effect on wealth accumulation. Jappelli and Padula (2013) used pre-labour market entry literacy endowment as an instrument to isolate the causal effect of financial literacy on wealth accumulation in 11 European countries. They assume that the life of a consumer covers two-period; where they earn income in one period 0 and live in retirement in period 1. In the first period, people choose saving and financial literacy investment.

The training evaluated in this study did not apply randomization in its implementation. Since the study is based on data collected from a cross sectional survey, we opt to use propensity score matching (PSM) approach to assess the effects of financial literacy

training on rural small holders' financial behavior. Propensity score matching has been used by other similar studies including Krause et al. (2016) who employed propensity score matching and fixed effects estimation methods to assess the changes in knowledge skills and attitude of marginalized youth as a result of financial literacy training program. Cherotich et al. (2019) in Kenya also used PSM to examine the effect of financial knowledge on performance of women farm enterprises using levels of savings and enterprise margins. The PSM approach has also been used to measure the impact of rural residents' financial education on financial literacy (Zhang and Xiong, 2019).

Analytical framework

In the case of this study, there is self-selection of individuals into membership of VSLAs. Such individuals may have unobservable characteristics or attributes such as entrepreneurship that non-members may not have. Yet, such characteristics may affect program outcomes thus, basic regression analysis for direct measurement of program effects on specific outcome variables produce biased estimates. Moreover, participation in training activities is also a choice that individuals make and this could be influenced by certain characteristics such as education, age etc.

In this study, we used matching techniques based on general household characteristics and other relevant exogenous variables to identify a control/comparison group from the non-beneficiaries of VSLA training; to compare with farmers who are in VSLAs that were trained so that we can assess the effects of the training of farmers' financial behaviour. Propensity score (p) is the conditional probability ($P(X)$) of a farmer participating in training given observable characteristics (X) that are not affected by the intervention (Rosenbaum and Rubin, 1983). The propensity of observations to be assigned into the treated group are estimated by a Logit model

$$P(X)=\text{prob}(d=1|X)=E(d|X);$$

Where d is the dependent variable; $d=1$ for farmers participating in training and $d=0$ for the comparison group. It is assumed that $0 < \text{prob}(d=1|X) < 1$.

This method gives us an indication of what the outcome variables (planning and managing finances, financial goals, level of confidence of a financial plan and knowledge about financial products and saving and financial shocks) would have been for the beneficiaries had they not benefited from VSLAs supported training.

Further, we do a multiple regression analysis to identify the demographic and social economic factors that are associated with financial literacy. The equation is expressed as follows;

$$Y_i = \beta_0 + \beta_1 \omega_1 + \beta_N X_{ni} + \varepsilon_i$$

Where; Y_i is the financial literacy score for farmer i ; ω_1 is a dummy variable for participation in financial literacy training. β_0 , β_1 , β_N are parameters to be estimated. X_{ni} is a vector for social economic and demographic variables believed to be associated with financial literacy. ε_i is the error term.

Study area and sampling

This study was carried out in six districts where aBi had provided funding to development partners whose projects involved financial literacy training. The districts are Mbarara, Bushenyi, Isingiro,

Table 1. Socio-economic characteristics of sampled smallholder farmers.

Characteristic	Pooled sample (n = 217)	Project beneficiaries (n = 109)	Control group (n = 108)	t- values
Age of the farmer (years)	44.8	46.1	43.5	1.36*
Sex of household head				
Male	80.6	84.4	76.8	1.40*
Female	18.9	15.6	22.2	
Sex of respondent farmer				
Male	55.1	58.3	51.8	1.01
Female	44.8	41.6	48.1	
Married=1; Otherwise = 0	90.3	93.5	87.0	-1.63**
Level of education of farmer (years)	7.4	7.5	7.3	0.29
Level of education of spouse (years)	7.2	6.7	7.6	-1.54*
Household size	7.3	7.7	6.9	1.80**
Main occupation; agriculture = 1; Otherwise = 0	88.3	89.7	86.9	0.83
Household has non-farm business	33.6	35.2	32.0	1.54*
Land size owned (acres)	4.0	4.5	3.5	1.41*
Member in farmer group =1; Otherwise =0	95.8	93.5	98.1	1.22

Kiboga, Iganga and Mayuge. Most farmers are engaged primarily in small scale agricultural production while a few households are engaged in small businesses. The most common small business activities include trade in produce and small retail shops. Economically, Mbarara and Bushenyi districts can be described as high economic status; Isingiro district is categorized as mid economic status while Iganga, Kiboga and Mayuge are low income economic status.

We used multisampling techniques combining purposive and random sampling procedures to get a representative sample. From a list of projects funded by aBi, 6 projects which implemented the VSLA approach in various districts were purposively selected. The project implementing partners (IP) in the respective districts provided a list of VSLAs under their management and 6 VSLAs (3 trained and 3 non beneficiaries) from each project were randomly selected. Using a list of members in each VSLA, a random sample of 6 farmers per VSLA was selected, thus, a total of 218 farmers; - 110 beneficiaries and 108 non beneficiaries (control group) were interviewed. To ensure that the treated members were as similar as possible to the control group, respondents were selected from similar villages in terms of social economic and geographic characteristics.

Table 1 presents the socio-economic characteristics of sampled farmers. The farmers are of middle age with average age of 43.5 – 46 years. A majority (90.3%) of respondents is married and is from male headed households (80%). The average household size is 8 persons. The respondents' average education is primary level and their main occupation is agriculture with less than 35% engaged in non-farming business. Over 98% belong to farmers groups and are members of a saving and credit group. Their average land size of 4 acres shows that they are smallholders.

Data collection and type

Primary data were collected using a semi-structured questionnaire which was administered to VSLA training beneficiaries and non-

beneficiaries. Interview guides were used for Focus Group Discussions (FGDs) with a few farmers and for interviews with key informants (loans officers, relevant local authorities, chairpersons of farmer groups, Savings and Credit Cooperatives (SACCO) managers and other key actors in financial institutions). To measure financial literacy, we used the OECD/INFE toolkit (2018). However, the original questionnaire was modified to adapt to the Ugandan conditions and to the education level of the rural farmers in the sample. Hence, only questions about basic financial literacy were asked. The questions asked were related to planning and managing finances, level of confidence of a financial plan, knowledge about financial products, saving and financial shocks and financial goals. Other financial literacy indicators such as financial attitude, access to financial services (savings and credit) and supporting institutions, investments and expenditures were assessed. In addition to financial literacy, the survey also captured quantitative data on demographics and other household characteristics that may be important determinants of financial literacy. These include age, income, family size, education, size of land holding etc for both training beneficiaries and the control group.

RESULTS AND DISCUSSION

Village Saving and Loan Associations (VSLAs) were formed to serve smallholders who have limited or no access to formal financial products and services. How does financial literacy training affect their financial decisions and behaviour? In what follows, we assess the impact of training VSLA members on key financial literacy indicators including planning and managing finances, financial goals, level of confidence of a financial plan, knowledge about financial products, saving and financial shocks. But first, we assess the factors that influence

Table 2. Logistic regression estimates of factors influencing participation in VSLA.

Participation in VSLA activities	Coefficient	Std. err.	P>z
Age of the farmer (years)	0.006	0.009	0.533
Sex of household head (Male =1, Otherwise =0)	0.167	0.291	0.567
Education of the farmer	0.260	0.233	0.264
Education of spouse	-0.329	0.235	0.161
Household size	0.069**	0.032	0.034
Land owned (Acres)	0.053	0.108	0.623
Experience in VSLA (months)	-0.004*	0.002	0.093
Number of obs	167		
Prob > chi ²	0.074		
Pseudo R ²	0.0559		

* and ** mean significance at 10 and 5%, respectively.

participation in VSLA training.

Determinants of participation in financial literacy training

Prior to estimation of training effects, we use a logit model to predict the probability of smallholder participation in VSLA training activities. The results of the logit formulation of the propensity score are presented in Table 2. Results show a positive relationship between household size and participation suggesting that farmers with a big number of household members are more likely to participate in VSLA training. We observe a significant negative relationship between experience in VSLA (number of months one has been a member) and participation, implying that farmers who have been members for a longer period are less likely to participate in VSLA trainings. This could mean that farmers who have been members for a longer period will have been trained in their first years of membership. In contrast to the findings of Zhang and Xiong (2019) that education level has a significant impact on rural residents participation in financial education, in this study, we find no significant relationship between education and participation in financial training.

Effects of financial literacy training on financial behaviour

Following Nicolini and Haupt (2019) and OECD (2018), we measured financial literacy using the indicators of knowledge, skills, attitude and behaviour of farmers. A descriptive analysis of financial literacy levels shows that farmers who participated in VSLA training appear to have higher scores across all indicators compared to those in the control group. The overall score for the beneficiaries is 3% slightly higher than that for the control group. Financial goals registered higher scores (70.6% for

beneficiaries against 68.5% for the control group) and the least scores were in planning and managing finances where all farmers registered below 50% across the categories. Table 3 presents a summary of farmers' scores in the various financial literacy indicators. The details of indicators used are presented in Appendix Table A1.

Planning and managing finances

Farmers were asked various questions that point to how they plan and manage their finances. Results show a higher mean score (48%) for the training beneficiaries compared to the control group with 43%. Majority (77% of beneficiaries and 74% of the control group) farmers do not just spend their money but have a plan to manage their income. We also observe that at least 50.9% of the beneficiaries against 43.9% separate money for day-to-day spending from that for big expenses. Farmers scored very low in record keeping of both current and upcoming expenditures, as only 39.5 and 32.2% of beneficiaries against 33 and 27% of the control group, respectively, keep such records. Similarly, a majority of farmers do not keep track of their expenses for example by using messages from mobile money. This may pose a big challenge for market oriented farmers.

Financial goals

Farmers registered the highest scores in financial goals with 70.6 and 68.5% for the beneficiaries and the control group, respectively. Over 95% of the farmers claim to have financial goals such as buying property. About 98% had saved or invested money in the past 12 months prior to the survey. This would be expected since they are members of VSLAs. Relatedly, a majority (84% beneficiaries and 83% control group) of the respondents had accessed credit in the same period implying that they

were fully utilizing the VSLAs to get the basic benefits (saving and credit). Apart from farming, we observed that a reasonably high proportion of farmers (82.8% beneficiaries and 74.2% of control group) also look for other sources of income. While about 66 and 65% indicate that they have planned for that period when they are not working, their level of confidence is relatively low at 72 and 65% for beneficiaries and control group, respectively.

Knowledge about financial products

Farmers were asked whether they knew the various financial products listed in Appendix Table A1. A loan secured on property, mobile money account, insurance and a savings account were the most known financial products in that order. Possibly, these are the common products accessed by majority of farmers in rural areas. About 95.3 and 92.5% of beneficiaries and control group respectively understand the loan secured on property. Mobile money account is also familiar to majority (92.5% beneficiaries and 87.9%) of the respondents. Surprisingly, about 90% of beneficiaries and 87.9% of the control group know about insurance as a product which is not commonly utilized by many people. Most (over 70%) of the farmers seem to know more about microfinance loan than any other type of loan. The least known product is a credit card loan with only 27% of beneficiaries and 18.5% of the control group acknowledging to know the product. This is followed by a bond with about 40% of the respondents who know about it. These findings are not unique to Uganda as similar findings have been reported in other African countries such as Mozambique, Malawi and Nigeria where a large population lack awareness of basic financial products and concepts such as savings accounts, interest on savings, insurance and loans (Xu and Zia, 2012).

Savings and financial shocks

The mean score for the farmers in savings and managing financial shocks is relatively low (59.1%) for both beneficiaries and the control group. However, a majority (97-98%) of farmers had at least saved part of their income in the 12 months prior to the survey. Farmers also save by buying property such as livestock (by 24.3 and 24.0%) and land (0.9% of beneficiaries) as reported by 77.5 and 80.3% of beneficiaries and control group, respectively (Figure 1). At least 54.6 and 52.7% of the beneficiaries and control group respectively save their money on a savings or deposit account. Farmers' hold savings accounts mainly in VSLAs and SACCOs and just a few in formal banks (Figure 2). Interestingly a relatively higher percentage (12.8%) of beneficiaries compared to 5.5% of the control group reported saving in commercial

banks; and more beneficiaries seem to prefer banks compared to SACCOs (8.2%). This might be explained by increased financial literacy which is evident from higher scores by the beneficiaries. Our interaction with respondents reveals that as a result of training a majority of the rural poor appreciate that it is possible to save even when their incomes are low. This corroborates the findings by Chowa et al. (2012) that, financial education and financial incentives improve saving performance. When institutional barriers to saving are removed, poor people can and do save. Figure 3 shows the trend of how members have been progressively saving in VSLAs the most common form/means of saving in the study area. The beneficiaries of training appear to save relatively higher weekly deposits compared to the control group. Again, this could be attributed to financial literacy as a result of trainings and perhaps increased income from other investments.

However, farmers do not save all their income; they also always have some cash at home or in a wallet as reported by 73.1 and 77.7% of beneficiaries and control group, respectively. Whereas, most farmers try to save some money their ability to manage financial shocks is still low. Only 50 and 42.1% of beneficiaries and control group, respectively, are able to manage a financial shock equivalent to their monthly income without borrowing.

Access to credit

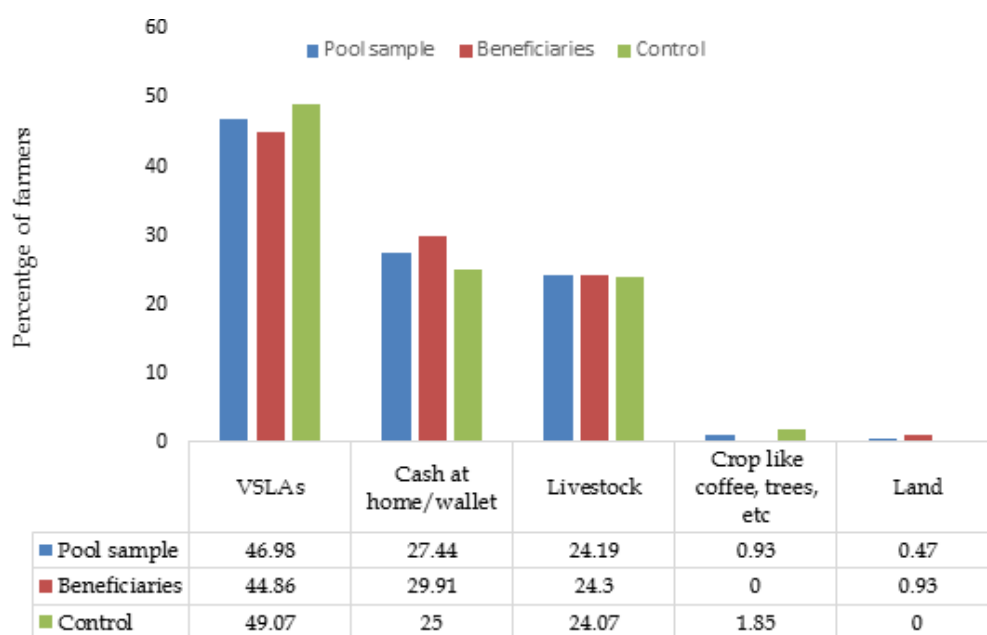
Farmers have not only increased savings but also their access to credit has increased. Before training, only 34.4% of sampled farmers had access to credit. At the time of this study, 87.6% had access to credit. Aside the VSLAs, a few farmers access credit from SACCOs (3.13% beneficiaries and 6.1% control group) and friends/relatives (1.0% and 1.2%) only. Across the categories, no farmer had accessed credit from a commercial bank in 12 months prior to the survey. This finding is not surprising given the various limitations for rural households to access commercial banks. Consistent to previous studies, access to formal credit tends to favour consumers with higher incomes and turnover which is not the case for most farming enterprises (Nkundabanyanga et al., 2014). The main reasons for borrowing include financing education for children (60.0% beneficiaries and 57.5% of control group), followed by purchase of agro-inputs (12% beneficiaries and 9.2% control group), working capital for starting or expanding business, and purchase of more land (7.2% beneficiaries and 6.1% control group).

This suggests that farmers mainly borrow for development purpose which is a good outcome of financial literacy training. These findings are supported by Jappelli and Padula (2013) who equally find that financial literacy has a strong effect on savings and wealth accumulation.

Table 3. Financial literacy levels of sampled farmers.

Financial literacy indicator	Pooled sample (n=217)		Beneficiaries (n=109)		Control group (n=108)		t-test
	Mean score (Standard Deviation)	Min - Max	Mean score (Stand. Dev.)	Min - Max	Mean score (Stand. Dev.)	Min - Max	
Financial literacy	59.7 (19.0)	15.4- 100	61.4 (18.8)	18.5-100	58.1 (19.1)	15.4-94.3	1.26*
Planning and managing finances	45.6 (33.6)	0 - 100	48.0 (33.5)	0 - 100	43.0 (33.8)	0 -100	1.078
Financial goals	69.5 (29.4)	0 - 100	70.6 (29.2)	0 - 100	68.5 (29.6)	0-100	0.531
Knowledge about Financial products	64.7 (23.0)	8.3 - 100	68.3 (23.7)	8.3 - 100	63.5 (23.7)	8.3 - 100	1.906**
Saving and financial shocks	59.1 (21.8)	14.2 - 100	59.2 (22.2)	14.2- 100	59.1 (21.6)	14.2- 100	0.037

* Significant at 10%, ** significant at 5% . For each of the indicators, we asked a set of questions (Annex 4) and every positive (yes) response scored 1 and every no response scored 0. Maximum scores; Planning and managing finances = 5, Financial goals =4, Knowledge about Financial products = 12, Saving and financial shocks =7. The scores are standardised to percentages.

**Figure 1.** Forms of savings used by farmers.

Changes in financial attitude and behaviour

We examined attitudes and behaviour towards use of financial services by asking farmers to assess themselves with regard to specific statements on financial behaviour. The results of those who agree and strongly agree are summarised in Table 4. Using a chi-square test, we do not find a significant difference between the proportion of beneficiaries and the control group who agree/strongly agree to specific statements. A majority (68-70%) of respondents appreciate the importance of saving for the long term. Over 80% of respondents strongly agree that when they borrow money, they have a responsibility to pay it back. This is a good indicator which might also be associated with the training in VSLAs as beneficiaries recorded a higher percentage (85.1%)

compared to the control group (79.6%). Another good indicator is that majority of farmers keep a close personal watch over their financial affairs. Interesting to note is that a reasonable proportion of farmers (24.3% beneficiaries and 28.2% control group) do not believe that their money is safe in a bank. This might explain partly why many farmers do not save in commercial banks. The result corroborates well with their claim that banks deduct high charges as one reason for not saving in banks.

Effects of training on financial literacy indicators

To assess the impact of training on financial literacy, we estimate the average treatment effect (ATT) using propensity score matching approach and the results are

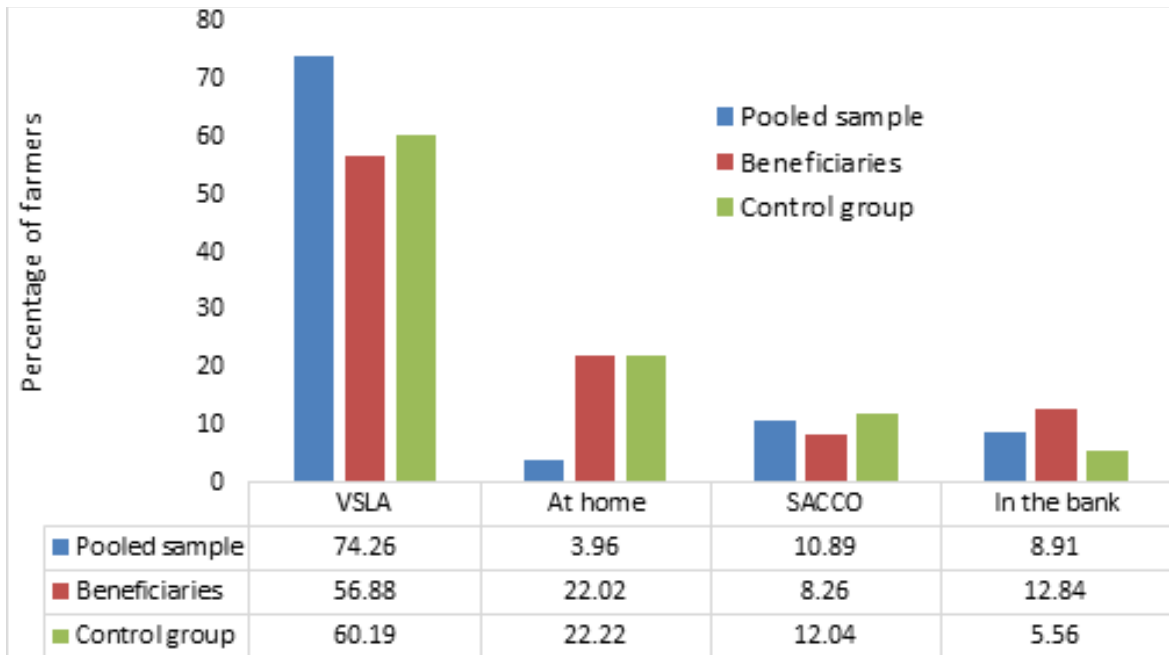


Figure 2. Where farmers keep their savings.

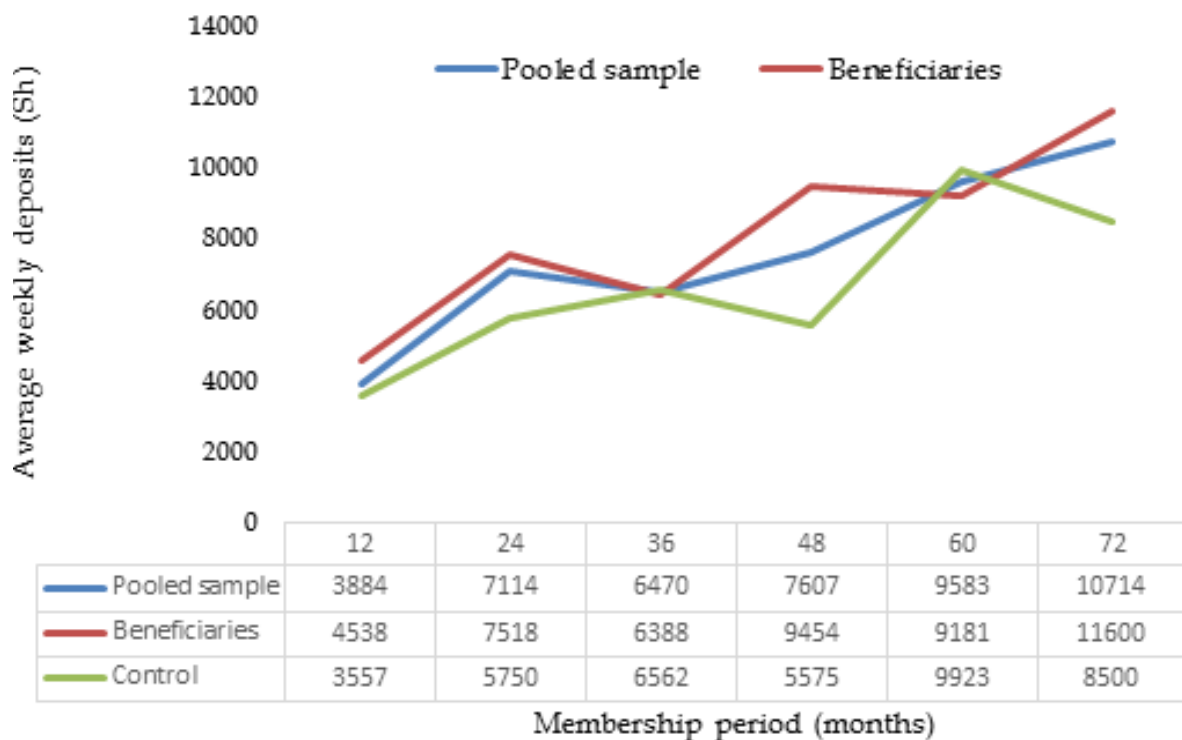


Figure 3. Trend of average weekly savings by farmers.

presented in Table 5. We impose the common support condition in the estimation of propensity scores by matching in the region of common support. This allows

farmers with the same values of confounding factors to have a positive probability of being among the trained group and the control group (Heckman et al., 1997).

Table 4. Attitude and behaviour of sampled farmers.

Attitude/behaviour	Pooled sample		Beneficiaries		Control group		Chi ² P-values
	4	5	4	5	4	5	
It is more satisfying to spend money than to save it for the long term	3.2	18.1	3.7	17.5	2.8	18.7	0.681
Money is there to be spent	21.7	23.6	22.2	25.0	21.3	22.2	0.853
I am satisfied with my present financial situation	25.9	12.4	27.7	15.7	24.1	8.1	0.314
I keep a close personal watch on my financial affairs	48.6	37.0	52.7	33.3	44.4	40.7	0.211
I use my mobile money to make or receive payments	46.3	22.2	50.0	18.5	42.5	25.9	0.160
My financial situation limits my ability to do the things that are important to me	23.1	54.1	24.1	54.6	22.2	53.7	0.852
I set long term financial goals and strive to achieve them	33.9	54.8	36.4	53.3	31.4	56.4	0.492
I believe that money in the bank will be safe even if the bank closes	10.3	50.2	12.2	49.5	8.5	50.9	0.414
I have too much debt right now	5.1	10.7	3.7	13.8	6.4	7.8	0.113
If I borrow money I have a responsibility to pay it back	15.7	82.4	14.8	85.1	16.6	79.6	0.621

We also used a 5-likert scale of 1=strongly disagree 2=I disagree 3= neither disagree nor agree 4.=Agree 5= Strongly agree.

Table 5. Average treatment effects of training on financial literacy.

Outcome	Matching algorithm	No. of beneficiaries	No. of control	Mean outcome beneficiaries	ATT (SE)	P-value
Financial literacy	Kernel matching (band width = 0.2)	86	81	63.3	-0.18 (3.31)	0.955
	Radius matching (caliper =0.1)	86	81	63.3	-0.51 (3.2)	0.874
Planning and managing finances	Kernel matching (band width = 0.2)	86	81	50.8%	2.1 (5.7)	0.733
	Radius matching (caliper =0.2)	86	81	50.8%	2.0 (5.3)	0.734
Knowledge about financial products	Kernel matching (band width =0.2)	86	81	8.4%	0.4 (0.5)	0.403
	Radius matching (caliper =0.2)	86	81	8.4%	0.4 (0.3)	0.306
Saving and financial shocks	Kernel matching (band width =0.2)	86	81	61.0%	-3.8 (3.4)	0.377
	Radius matching (caliper =0.2)	86	81	61.0%	-2.0 (4.1)	0.560
Financial goals	Kernel matching (band width = 0.2)	86	81	71.2%	-5.9 (4.5)	0.233
	Radius matching (caliper =0.2)	86	81	71.2%	-3.6	0.412

Predicted propensity scores for trained farmers and the control group range from 0.18 to 0.84 and 0.13 to 0.76 respectively. The distribution of propensity scores are shown in Appendix Figure A1. The pseudo R² after matching are very low and not statistically significant. The matching results are presented in Appendix Table A2. The absolute standardized difference of the means of the linear index of the propensity score in the treated and matched control group (B) and the ratio of treated to matched control group variances of the propensity score index (R) conform to Rubins' recommendation (Rubin, 2001); B is less than 25% and R within the range 0.5 - 2. These results show that all covariates are well balanced.

Contrary to descriptive statistics, our data does not show evidence of a significant difference in financial literacy among training beneficiaries and the control group. The results are consistent with both kernel and radius matching though with a slight difference in the level of effects. Nonetheless, the scores for beneficiaries are higher than for the control group by 0.4% for

knowledge about financial products and 2.1% for planning and managing finances. Similar results are reported by Jamison et al. (2014) who find no significant effects on financial planning by the youth in Uganda.

The non-significant effects in this study do not mean that financial literacy training had no impact but rather reflects the knowledge diffusion effect. Considering the fact that this study was conducted around 12 months post training, we believe that a lot of knowledge had been shared among the farmers' networks with those that were not trained. This is confirmed by reports from the survey that many other VSLAs have emerged in the study area as other farmers were learning from trained groups. Farmers intimated that they always share information among friends and relatives. These findings suggest that financial training programs have potential to impact a much wider community than the trained participants. This is highly expected in a progressing society with increasing networks of farmers associations and interactions both physical and through media such as telephones, radios

Table 6. Correlates of financial literacy among farmers.

Average Financial literacy score	Coef.	Std. error	t
Participation in financial literacy training	0.931	2.247	0.41
Age of the farmer	0.132	0.095	1.39
Gender of household head (male =1, 0 = otherwise)	4.377	3.175	1.38
Education Level of the farmer	2.214***	0.366	6.05
Education Level of the spouse	0.936***	0.339	2.76
Household size	0.205	0.339	0.61
Land size owned (acres)	0.613***	0.209	2.93
Membership in VSLAs (months)	0.041*	0.025	1.66
Constant	21.980***	6.601	3.33
Number of observations	193		
Prob >chi ²	0.000		
Pseudo R ²	0.344		

*, **, *** Significant at 10, 5 and 1%, respectively.

and televisions (Klarl, 2009; Ivković and Weisbenner, 2007; Singh, 2005).

Determinants of financial literacy

We find that financial literacy has a strong positive association with education level of the farmer and that of the spouse, the number of persons in the household, land size owned and the period the individual has been a member of credit and saving association. Table 6 displays the regression results. These results are consistent with most previous studies (Zhang and Xiong, 2019; Akoto et al., 2017; Aggarwal et al., 2014). Farmers with relatively higher education level are likely to appreciate financial knowledge and make use of it. Farmers with large size of land are likely to be engaged in market-oriented production and that might motivate them to seek for financial knowledge and services.

CONCLUSION AND RECOMMENDATIONS

This study assessed the effects of informal financial literacy training on smallholder farmers in rural Uganda using descriptive analysis and propensity score matching approach to identify causal effects of financial literacy training. It focuses on four dimensions of financial behavior and knowledge; planning and managing finances, knowledge about financial products, saving and managing financial shocks and financial goals. Our sample is drawn from members of VSLAs that received training and those that did not receive training as a comparison group. The findings indicate relatively higher scores in financial goals followed by knowledge about financial products and the lowest scores are observed in planning and managing finances.

Whereas descriptive statistics show higher scores for

the trained farmers, overall, data does not show significant effects of financial literacy training on the trained farmers. We conjecture that the findings might be attributed to spillover effects and knowledge diffusion effects through networks given the period between training and evaluation. According to farmers trained, they shared information with others and they believe the training was beneficial; they were motivated to increase savings and consequently increased access to credit; they gained knowledge and skills in budgeting, planning and managing finances. Moreover, financial literacy has slightly increased financial inclusion as more rural farmers participate in both formal and informal financial institutions. However, more training and sensitization is needed for both beneficiaries and the control group on financial products and services to motivate rural households to participate in formal financial institutions where they can benefit from the variety of products offered. It is recommended that more training be provided in planning and managing finances as well as managing financial shocks. The major limitation to this study is using a small sample which was due to constrained logistics. Further research on long term impact of the knowledge acquired involving a bigger sample might be useful in informing policy on financial education. Prior planning for more robust evaluation of such training programs, for example using randomized control trials might be more informative for policy strategies.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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APPENDICES

Table A1. Percentage of sampled farmers giving positive response to financial behaviour indicators.

Indicator	Pooled sample proportion of farmers (1= yes, 0=No)	Beneficiaries	Control
Planning and managing Finances			
A plan to manage income	75.5	77.0	74.0
Keep a record of your spending	36.4	39.5	33.3
Separate money for day today spending from that for big expenses	47.4	50.9	43.9
Keep a record of upcoming expenditures so that you do not forget them	29.6	32.1	27.1
Use bank or mobile money messages to keep track of your expenses	39.8	41.6	37.9
Saving and financial shocks			
Have you saved money in the past 12 months	97.7	97.2	98.1
Cash at home or in wallet	75.5	73.1	77.7
Paid in a saving /deposit account	53.7	54.6	52.7
Given money to a family member / relative or friend to keep it for you as savings	34.7	39.8	29.6
Saved money with any informal association /group	30.2	26.1	34.2
Saved money by buying property/assets e.g. livestock, land, etc.	78.9	77.5	80.3
If you faced a major expense today for example equivalent to your monthly income would you be able to pay without borrowing	46.1	50.0	42.1
Financial goals			
Do you have any financial goals? e.g. buying property	97.6	99.1	96.3
Prepared a plan of action	68.5	71.7	65.3
Saved or invested money	98.5	98.1	99.0
Looked for other sources of income	78.5	82.8	74.2
Looked for credit	84.3	84.9	83.8
Reduced my expense	51.02	51.5	50.5
Planned for that period when you are not able to work	65.7	66.1	65.4
Level of confidence (confident =1; Otherwise = 0)	68.6	72.5	65.0
Knowledge about financial products			
Pension or retirement benefits	67.5	71.3	63.8
Loan secured on property	93.9	95.3	92.5
Unsecured bank loan	53.2	55.5	50.9
A car loan	44.1	49.5	38.9
A savings account	85.6	89.8	81.4
Credit card loan	22.7	27.1	18.5
A microfinance loan	70.3	72.2	68.5
Insurance	86.1	90.7	81.4
Bonds	40.7	40.7	40.7
Mobile money account	90.2	92.5	87.9

Table A2. Propensity score matching and covariate balancing test.

Variable	Sample	Mean		%reduction (Bias)	t-test p>t
		Treated	Control		
Age of household head	Unmatched	44.30	41.00	77.2	1.16
	Matched	44.09	42.23		
Gender of household head (1= male, 0 = Otherwise)	Unmatched	0.88	0.83		
	Matched	0.87	0.84		

Table A2. Contd.

Education of household head	Unmatched	3.01	3.00		0.91			
	Matched	3.02	3.03	78.5	1.1			
Education of spouse	Unmatched	2.94	3.05					
	Matched	2.96	2.95	95.5	0.61			
Number of persons in the household	Unmatched	8.03	6.72					
	Matched	7.41	7.30	91.3	0.96			
Land owned (Acres)	Unmatched	2.03	1.83		1.28			
	Matched	1.94	1.91	85.4	1.08			
Member of saving and credit group =1; Otherwise =0	Unmatched	41.02	48.72		0.53*			
	Matched	40.44	41.58	85.3	0.81*			
Sample	Ps R²	LR chi²	p>chi²	Mean Bias	Med Bias	B	R	%Var
Unmatched	0.056	12.92	0.074	20.4	20.6	56.3*	1.12	33
Matched	0.003	0.58	0.999	3.6	3.0	11.9	1.15	17

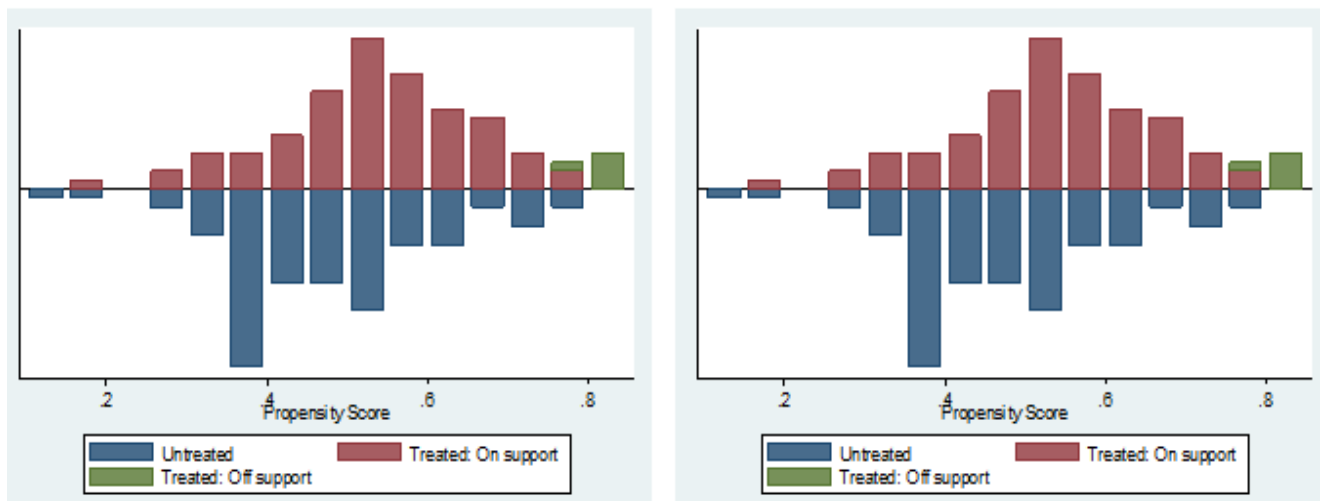


Figure 1. Distribution of propensity scores and the region of common support for kernel and radius matching.