Journal of Agriculture and Rural Development in the Tropics and Subtropics
Vol. 122 No. 1 (2021) 103–114

https://doi:10.17170/kobra-202104133656 ISSN: 2363-6033 (online); 1612-9830 (print) – website: www.jarts.info

Choice of savings instruments among rural women maize farmers: evidence from Uganda

Harriet Mawia, Franklin Simtowe, Dil Bahadur Rahut

International Maize and Wheat Improvement Center (CIMMYT), Kenya

Abstract

Households in developing countries employ a wide range of mechanisms for making cash and in-kind (goods and services) savings which are either formal or informal. Yet, literature on how choices about appropriate savings instruments are made remains scanty. We examine the patterns and choice of these saving instruments using household data from women farmers in eastern Uganda. In particular, the paper focuses on the choice between formal cash saving instruments like commercial banks, village savings and loans associations (VSLAs) and savings at home. A multinomial logit model was applied to identify and quantify the effects of socio-economic factors on farmers' choice of different savings instruments. The results reveal that financial capital and socio-economic factors such as age, education, farm size, and level of maize commercialisation were the critical drivers of women maize farmers' choices of saving in informal and formal instruments.

Keywords: Banks, home, likelihood, mobilisation, multinomial logit

1 Introduction

Saving is a key macroeconomic variable as it is a potential source of investment and thus economic growth and development of countries (Beckman *et al*., 2013); hence, featuring in both academic and policy discussions. From an aggregate perspective, savings help determine the supply of funds for investment. Growth theories have shown that saving is a necessary ingredient to investment which enhances a country's productivity (Addai *et al*., 2017). Savings are also an important determinant of wellbeing at both individual and national levels. For individuals, savings help smooth consumption of food and non-food items in the face of volatile incomes over time (Carpenter & Jensen, 2002). According to Antwi & Chagwiza (2019), savings enable farmers to invest in their farms and expand production. This ensures continuity of production due to provision of fresh funds to grow and act as a buffer in case of emergencies and risks in production (Antwi & Chagwiza, 2019). Savings also improve individuals' eligibility for credit from credit providers such as banks and microfinance institutions. For these institutions, savings mobilisation is a crucial strategy for liquidity management to achieve sustainability as, subject to legal and regulatory restrictions, they can be mobilised to generate liquidity (Beck & Torre, 2007).

Despite the importance of savings, most households in developing countries continue to lack access to safe and sound institutions where they can deposit their savings (Branch & Klaehn, 2002; Kasirye, 2007; Onyilo & Adongo, 2019). In Uganda, there are a variety of instruments available for saving. These instruments range from formal institutions such as banks and credit unions to less formal instruments such as savings groups and village savings and loans associations (VSLAs). These instruments differ in important ways that have significant micro-and macro-economic implications. Yet very little is known about the micro-level determinants of savings mobilisation through the various instruments among rural women in Uganda. In this paper, we discuss a simple framework of choice of savings instruments and provide empirical evidence from Uganda. We focus on choice between formal market savings, specifically banks, and informal savings (i.e., VSLAs and home savings). Though restrictive, we focus on these instruments because they represent intermediated funds and are the most prevalent forms of savings in Uganda.

* Corresponding author – harrimawia@gmail.com

Published online: 25 May 2021 – Received: 27 February 2020 – Accepted: 10 May 2021

Focusing on the distinction between banks, VSLAs and saving at home is important for several reasons. VSLAs are quite prevalent among rural women in Uganda and are successful in meeting some specific financial needs such as improving women access to farm inputs such as inorganic fertilisers through vouchers, loans, or cash transfers (Allen, 2016). Further, VSLAs and informal saving group members share a common social bond; hence, the desire to maintain the capital embodied in those bonds, which provides incentives against voluntary default (Carpenter & Jensen, 2002). However, because informal savings groups tend to be localised, they have less ability to exploit economies of scale, and are more vulnerable to local economic shocks that affect all group members. Additionally, theft and robbery of the savings is a significant problem. Therefore, banks are superior on these grounds and provide some additional advantage over the informal sector for individuals. For instance, banks accept savings from depositors while government insurance reduces risks when saving are made with banks (Tsuru, 2003). In addition, effective monetary policies typically rely on the central bank or government control over the banking system, which guarantees the security of savings (Friedman, 2000). The largely undeveloped informal financial sector lacks this ability. Therefore, the connection between informal instruments and monetary policies in the formal sector is important since financial development requires a sustainable transition from informal to formal sector in developing economies.

Uganda is an important case to study because formal financial institutions are less prominent in rural than urban areas and only serve 14 % of the rural population (Uganda Communications Commission [UCC], 2017). Furthermore, informal financial institutions play an important role in the rural financial service provision and serve approximately 12 % of the rural population. These numbers indicate that Uganda's financial system is still quite shallow. Regarding access to finance, 62 % of Uganda's population has no access whatsoever to financial services (USAID, 2018). According to a recent report on the state of Uganda population (2018), the number of the population holding accounts in banks is 4 million or 3 % of the 12 million who were bankable in 2017 (United States Agency for International Development (USAID), 2018) Additionally, the savings to GDP ratio is still low at 16 % (USAID, 2018). Dupas *et al.* (2018) stated that just increasing access to formal savings via basic bank accounts using policies such as subsidizing those who open accounts is ineffective and unlikely to improve welfare of the rural poor in developing countries. Therefore, expanding access to savings services that are tailored to the financial needs and preferences of individuals has proven to be a more effective way of achieving financial inclusion (Dupas & Robinson, 2013; Dupas *et al*., 2018). Understanding the choice of savings instruments as well as the financial service quality preferred by rural communities is important to enable financial deepening. Therefore, more studies need to focus on the saving behaviours of the rural communities in the context of sustainable coexistence between formal and informal financial institutions. This paper brings clarity on the key drivers of saving in different instruments.

The analysis of rural women's choice of savings instruments is particularly important because it provides an in-depth understanding of their saving behaviour, which is of great relevance to policy makers and other stakeholders involved in the development of the financial system in Uganda. We do not attempt a full structural analysis of the savings decisions of rural households because it would require modelling and estimating the income processes in the borrowing and lending environment. Our objectives are more diffident and descriptive. First, we compare rural women that made savings at the time of the survey and those that did not make savings, highlighting their socio-economic differences. We then assess the factors influencing rural women decision to save in different savings instruments.

2 Materials and methods

2.1 Random Utility Theory (RUM)

The RUM states that individuals will choose the alternative good or service that maximizes utility. Given that utility is unobservable, people choose what they prefer and what they do not is influenced by random factors (McFadden, 2000). The utility of a choice is comprised of deterministic and an error component. The error component is independent of the deterministic one and is influenced by a predetermined distribution. This shows that it is not possible to predict with certainty the alternative that the decision maker will select. However, it is possible to express the probability that the perceived utility associated with a particular option is greater than other available alternatives (McFadden, 2000). Choice-based studies are premised on random utility model (Gujarati & Porter, 2009). Following these latter authors, the utility (U) of a farmer associated with the choice of savings platform j is expressed as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \tag{1}$$

where, U_{ij} is the utility derived by the ith farmer from choosing savings platform choice j, V_{ij} is the systematic (or deterministic) component of utility and ε_{ij} is the random/stochastic part of utility. The deterministic compon-

ent of utility is a function of the observable attributes of the choice alternatives and individual-specific characteristics of the respondent i.e., a conditional indirect additive utility function that can be expressed as a linear-in-parametric Equation 2 (Gujarati & Porter 2009).

$$V_{ij} = X_{ij}\,\beta \tag{2}$$

where X is a vector of observable attributes, while β are the unknown parameters of the observable attributes and a series of alternative specific constant terms to be estimated. Thus, given a choice set (H) of alternative savings platform, the random utility theory assumes that a rational farmer i will choose alternative j that yields higher utility than other alternatives. The probability that the farmer i prefers one savings platform j compared to the other is restricted to lie between zero and one. The probability that saving platform j is selected by farmer i within choice set H is expressed in Equation 3:

$$Prob\,(Y_i = j) = \frac{\varepsilon^{\beta'}\, j^{x_i}}{\sum_{j=1}^{m} \varepsilon^{\beta'}\, j^{x_i}} \tag{3}$$

$$where\ 0 < P_{ij} < 1\ and\ j = 1, 2\ and\ 3$$

Therefore,

$$Prob\,(Y_i = j) = P\,(\beta_0 + \beta_i x_i + ... + ...\beta_k x_k) + \varepsilon_i$$

where Y_{ij} is probability of farmer i choosing savings platform j; x_i is the vector of household and socio-economic factors variables and β_i is the vector of coefficients to be estimated.

2.2 Study area and data

The data was collected by the International Maize and Wheat Improvement Centre (CIMMYT) based on a 2018 survey of households that had been selected for participation in a financial literacy training coordinated by CIMMYT under the Stress Tolerant Maize for Africa (STMA) project. The STMA project aimed to develop improved multiple stress tolerant maize varieties that effectively address emerging and future production challenges, while increasing genetic gains and scaling-up and scaling-out of products developed, and knowledge gained. One of the project activities focused on economic empowerment of women by encouraging savings mobilization to increase the purchase of drought tolerant maize varieties. The data used in this paper formed part of the baseline data from the women farmers that had been randomly selected for participation in the project.

The selection process of the households for the survey included the identification of districts where drought tolerant maize varieties were actively promoted, and where some key financial service providers such as the Development Finance Company of Uganda Bank Limited (DFCU), Centenary and Stanbic banks operated. The DFCU bank has an investment club product called investment club accounts (ideal for group savings) while Stanbic bank has a 'pure save' account plus other savings products that allow them to collect deposit savings from households. Post Bank Uganda has a Village Saving Loan Association (VSLA) account which is ideal for savings by farmer groups in rural areas. Based on consultations with these banking service providers three districts were selected, namely Sironko, Bulambuli and Tororo. From Sironko district, Sironko TC and Bhukolo sub districts were selected, from Tororo district, Iyolwa and Magola sub districts were selected and from Bulambuli districts, Bwikonge and Nabongo sub districts were selected. From each of these sub-districts 46 villages were randomly selected as shown in Appendix I.

From each sub-district, farmer groups were selected if they met the following criteria: (i) they had been already formed for other previous projects and had some degree of formalisation (concrete constitution, registration at the level of sub-district, partial registration, order of organisation with elected leaders); (ii) they were interested in maize production; (iii) the majority of the members in the group were women; (iv) they were not currently benefiting from other development projects; (v) they had challenges in accessing credit. A list of farmer groups meeting the eligibility criteria were identified in collaboration with community development officers and assistant agricultural officers. Twenty (20) farmer groups were selected from each of the sub-districts. From each women's group farmers were randomly selected for the interview which led to the selection from each of the selected households from different villages. Detailed information was collected that included household demographic and socioeconomic characteristics, crop production, awareness, savings and credit acquisition, production conditions and utilisation of maize, social capital, risk attitudes, food security, and housing conditions.

2.3 Econometric model

VSLAs, commercial banks and saving at home were the main offered savings instruments in the study area. Therefore, the women farmers had four alternative choices to make with regards to where to save to maximize their utility, i.e., 0= not saving at all, 1= saving with VSLA, 2= saving at home, and 3= saving with commercial banks. Hence the dependent variable, savings instruments, had four choices the traditional logit regression was considered inappropriate as it can only address the binary dependent variables. The saving

types can be ordered in terms of efficiency, and convenience however, because the preference varies for different farmers as they make choice decisions based on their own characteristics and preferences to maximize their utility. Therefore, traditional ordinal logistic regression was found not suitable. Multinomial logit (MNL) model which can deal with the multiple choices and the unordered problem was preferable for the analysis of the savings platform choice by farmers. The model has been widely used in empirical studies with multiple choices (Chalwe, 2011; Moturi *et al*., 2015). One of the strengths of MNL model is that it has simple mathematical computation (Gujarati & Porter 2009). However, MNL has the problem of independence from irrelevant alternatives (IIA). The IIA problem arises from the assumption that the random errors of the residuals are independent and homoscedastic. Therefore, the ratio of the choice probabilities of any two alternatives is affected by other alternatives which are not in the choice set (Luce, 1959; Ben-Akiva & Lerman, 1985). An important implication of the IIA problem is that removal (or introduction) of irrelevant alternatives from (into) the choice s*et al*ters the relative chances of choosing one alternative over the other and thereby imposes a systematic influence on parameter changes (Hausman & McFadden, 1984). The presence of IIA problem is tested using either the Hausman-McFadden or Small and Hsiao test (Hausman & McFadden, 1984). Correction of IIA problem is made by employing other statistical methods which relax the assumption, these include: Multinomial Probit, Nested Logit (McFadden, 1981), and Random Parameter Logit model (RPL) (Train, 1998).

In selecting any of the savings' instruments options the respondent considers the costs and benefits associated with the use of the savings platform based on how it would lead to maximization of their utility (Chalwe, 2011). The net benefit to farmer i for using savings alternative j is given as Y_{ij}^{*} and is modelled as (Chalwe, 2011):

$$Y_{ij}^{*} = X_{ij}\,\beta^{'} + \varepsilon_{ij} \tag{4}$$

where x_{ij} denotes the vector of characteristics of farmer i and savings option j, β are parameters to be estimated and ε_{ij} the error term assumed to be a logistic distribution. In Equation 4, Y_{ij}^{*} is not observed; instead, observed is the choice made by the respondents (Gujarati & Porter, 2009). Each respondent will fall into the j^{th} category, j = 0, 1, 2, 3, with some probability. Let P_{i0}, P_{i1}, P_{i2} and P_{i3} be the probabilities associated with these four possible savings instruments choices available to farmers. The probability P_{ij}, of respondents selecting a particular savings alterative depends on the characteristics of the chooser and the choice represented by vector X_{ij} with ε_{ij} assuming a logistic distribution (Wulff, 2015). This is captured by the following multinomial logit in Equation 5 (Wulff, 2015):

$$P_{ij} = \frac{\varepsilon^{xi\,\beta^{'}}}{\sum_{j}^{m} = 0\ \varepsilon^{\,xi\beta^{'}}}\ where\ j = 0...m \tag{5}$$

where m = 4. The likelihood function for the multinomial logit model can be written as (Chalwe, 2011):

$$L = \Pi_{i=1}^{n} P_{i0}^{\ y_{i0}} ...\ P_{i4}^{\ y_{ij}} \tag{6}$$

Equation 6 gives the density function for a multinomial logit for one observation while Equation 7 gives the likelihood function for a sample of n independent observations with j alternative options (Chalwe, 2011):

$$L_n = \Pi_{i=1}^{n}\Pi_{j=0}^{m}\ P_{ij}^{\ y_{ij}} \tag{7}$$

Taking logs on Equation 7 gives the following log likelihood function in Equation 8 (Maddala, 1999):

$$L = lnL_n = \sum\nolimits_{i=1}^{n}\sum\nolimits_{j=0}^{m}\ Y_{ij}\,lnP_{ij} \tag{8}$$

where $P_i j$ is a function of parameters β and regressors defined in Equation 4 with first order condition for the Maximum Likelihood Estimates of $\hat{\beta}$ given by Equation 9 (Maddala, 1999):

$$\frac{\partial L}{\partial \beta} = \sum\nolimits_{i=1}^{n}\sum\nolimits_{j=0}^{m}\ \frac{Y_{ij}}{p_{ij}}\frac{\partial P_{ij}}{\partial \hat{\beta}}\ = 0 \tag{9}$$

The probability of a farmer selecting the first option (base category) j = 0 has been normalised to zero since all the probabilities must sum up to 1 (Maddala, 1999). Therefore, out of the four choices, only three distinct sets of parameters were identified and estimated. The probability of the respondent using any of the alternatives instead of the base category is given by Equation 10 (Wulff, 2015):

$$P_{ij} = \frac{exp\ (X_i\beta^{'})}{1 + \sum_{j=0}^{4} exp\ (X_i\beta^{'})}, where\ j\ =\ 0, 1, 2, 3 \tag{10}$$

The estimated coefficient for each choice, therefore, reflects the effect of x_{ij} on the likelihood of the respondent's choosing a particular savings platform relative to the reference. While predicted probabilities provide us with information about the direction and magnitude of the relationship, it may be difficult to precisely determine whether a relationship can really be established (Wulff, 2015). To further make sense of our results, we used marginal effects. The marginal effects (ME) are defined as the slope of the prediction function at a given value of the explanatory variable and thus inform us about the change in predicted probabilities due to a

Table 1: *Definition and expected signs of the variables included in multinomial logit.*

Variable	*Meaning*	*Unit Measurement*	*Expected Sign*
HHSIZE	Household size of the farmer (No.)	Continuous	-
AGE	Age of the woman in years	Continuous	+
EDU	Number of years of formal schooling completed by woman farmer	Continuous	+
DIST_FINANCE	Distance to financial institution (km)	Continuous	-
VALUE_MAIZE	Value of maize harvested (UGSH)	Continuous	+
MAIZE_PLOT	Maize plot size in ha	Continuous	+
FARM_SIZE	Entire farm size in ha	Continuous	-
Financial capital			
INC_1	Income allows building savings (%)	Categorical	+
INC_2	Allows to save little (%)	Categorical	+
INC_3	Income not sufficient to save (%)	Categorical	-
INC_4	Income equals expenses (%)	Categorical	-/+
Threat to food availability			
DROUGHT	1=average of those that experienced drought shocks 0= otherwise)	Dummy	-
FOOD_SECURITY	Dummy on food security (1= average of those that worry having food; 0= not worry)	Dummy	-

change in a particular predictor (Bowen & Wiersema, 2004). Even though marginal effects for a multinomial model may be complicated to derive, they have a quite distinctive and simple form (Wooldridge, 2010). For a continuous independent variable, Equation 11 shows the marginal effects (ME):

$$ME_{ij} = \frac{\partial P_{ij}}{\partial X_{ik}} = \frac{\partial Pr(y - j \mid X_i)}{\partial X_{ik}} = P_{ij}\,(\beta_{kj} - \hat{\beta}_i) \qquad (11)$$

where $\hat{\beta}_i = \sum_m^2 \beta_{km}\, Pr\,(y = m \mid X_i)$ is a probability weighted average of the coefficients for different choice combinations, β_{km} (Wulff, 2015). Following this the multinomial logit model was used and fitted into the data as Equation 12 indicates:

$$\begin{aligned} Y_{ij} = \beta_0 &+ \beta_1 HHSIZE + \beta_2 AGE + \beta_3 EDU + \\ &\beta_4 DISTFINANCE + \beta_5 VALUEMAIZE + \\ &\beta_6 MAIZEPLOT + \beta_7 FARMSIZE + \beta_8 INC_1 \\ &+\beta_9 INC_2 + \beta_{10} INC_3 + \beta_{11} INC_4 + \\ &\beta_{12} FOODSECURITY + \beta_{13} DROUGHT + \varepsilon_{ij} \end{aligned} \qquad (12)$$

where Y_{ij} represents the probability of saving in the different savings instruments. The definition, measurement, and hypothesized signs of the regressors are given in Table 1. The selection of the independent variables is informed by the literature including studies such as Bendig *et al*. (2009), Rahji & Fakayode (2009) Kibet *et al*. (2009), Awunyo & Hassan (2014), Zeleke (2019) and Nwosu *et al*. (2020).

2.4 Model diagnostic tests

Different diagnostic tests were carried out in the data, these include, multicollinearity, heteroscedasticity and IIA tests. The effect of multicollinearity problem is solved by removal of highly correlated predictors with high variance-inflating factor (VIF) in the model. The VIF values of the estimated coefficients for continuous variables in the model were much less than the critical values hence showing that there was no problem of multicollinearity (Appendix II). The presence of IIA problem was tested using the Hausman-McFadden test. The β estimates of the savings choice alternatives were not significantly different hence the model passed the test, and it was concluded that IIA holds (Appendix III). The STATA software was used to analyse the results.

3 Results

3.1 Respondents' socio-economic profiles

Among the women interviewed, the average household size was seven persons, with no statistical difference between households that had savings and those with no savings, at the time of the interview (Table 2). The average age for the women farmers indicated a statistical difference between

Table 2: *Descriptive statistics by the savings status of maize farmers at the time of the study.*

Variable	*Full sample (n=360)*	*With savings (n=240)*	*Without savings (n=120)*	*Mean difference*
Household size (No.)	6.84	6.88	6.74	-0.15
Age (years)	39.92	39.77	37.16	-2.60*
Years of education	7.55	7.52	7.61	0.09
Distance to finance institution (km)	2.93	3.01	2.78	-0.42
Value of maize harvested (UGSH)	1749	1455	2368	930
Physical capital				
Maize plot (ha)	2.9	3.0	2.6	-0.39*
Farm size (ha)	3.85	3.93	3.68	-0.24
Financial capital (% of women)				*Chi Square*
Income that allows to build savings	17	23	7	-15***
Income that allows to save little	34	39	21	-18***
Income equal expenses	10	4	23	19***
Income not sufficient to save	39	34	48	13***
Threat to food availability				
Food security (1= worry about food 0=otherwise)	0.42	0.27	0.16	-0.11
Drought (1= experienced drought 0= otherwise)	0.12	0.07	0.05	-0.02

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Source: Survey data, 2018.

those that had savings and those with no savings painting a description that most younger women did not have savings at the time of the study while the older were reported to have savings. Education variable had no significant difference between the savings and non-saving women at the time of the interview. The average distance to a financial institution was about 3 km from the farmer homestead and had no significant difference for the women that had saved and those that did not have savings. The average value of the maize sold was UGSh.1749 with no statistical difference between the savers and non-savers and the average land holding size was 3.85 ha. The maize plot average size was 1 ha with significant differences between the women with savings and those with no savings. The income categories reported showed significant differences between the savers and non-savers. For instance, while women that in the category of income that allowed to build savings accounted for 17 % of the sample, this group accounted for a much larger proportion of women that reported having savings and for a much lower proportion of women that did not make any savings (Table 2). This finding points to the possibility of a strong positive association between household income and participation in saving. The average of women farmers that experienced drought showcases no significant difference between those that had savings and those without. Additionally, food security variable was captured by indicating the average of those that worried about food and those that did not and there was no significant difference between respondents that had saved and those that had not saved at the time of the study.

3.2 Farmer saving behaviour

The distribution of income between the savers and non-savers in the three districts of the study site indicates differences between high- and low-income earners. Respondents in Tororo and Bulambuli district reported respondents with income that allowed building savings had savings (Fig. 1). However, the trend is different in Soronko district as respondents with less income saved more than those with high incomes. In Bulambuli district none of the middle earners

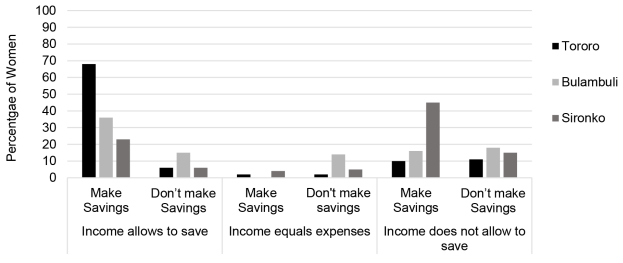

Fig. 1: *Income categories for women that had savings and those without in the three study districts.*

with income that equalled expenses did make savings however about 16 % of respondents with less income that did not allow saving made savings. It was unlikely that women with

incomes that do not allow saving saved more than high income holders with incomes that allowed building savings in Sironko districts as 45 % of women with income not sufficient to save did save. The women (49 %) reported that the major reason for saving was to earn interest from the money saved in VSLAs and banks. The second reason was to set money aside for school fees (22 %) (Fig. 2). Additionally, saving households mentioned that they used their savings to purchase agricultural inputs used in maize production.

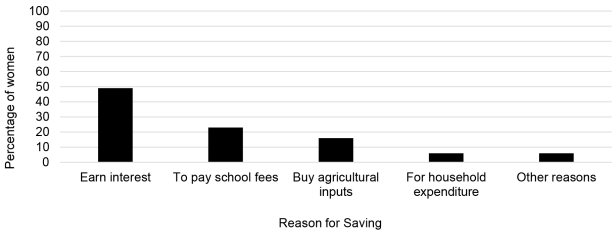

Fig. 2: *Women maize farmers' reasons for saving.*

Majority of the women (70 %) reported that the major consideration for increased savings was the expectation for increased farm income. As presented in Table 3, the average total deposit (current savings) among the respondents that saved via formal and informal instruments was approximately Uganda Shillings (UGSh) 492,092 (United States Dollar (USD) 133.63 as of January 2020). Respondents that saved in banks recorded the highest mean amount of savings (UGSh. 2,057,662), followed by those that saved at home (UGSh. 829,747) and the least amount saved was recorded in VSLAs (UGSh. 262,950). The difference in deposits in the three savings instruments was statistically significant as the p-value was zero.

Table 3: *Average deposits in the savings instruments (Uganda Shillings) among respondents in Eastern Uganda.*

Savings instruments	*n (% of total)*	*Mean (UGSh)*	*P value*
VSLA	144 (59)	262,960	0.00***
Home	53 (22)	829,747	0.00***
Banks	47 (19)	2,057,662	0.00***
Total savings	244 (100)	492,092	0.00***

VSLA: Village Savings and Loans Associations; 3,665 UGSh equals 1 US$

Non-parametric (kernel) estimates of the densities of the log of reported household deposits in VSLAs, at home and banks were obtained to explain the distribution of the amount saved by the women farmers in different savings instruments. While bank deposits varied widely, VSLAs and home deposits were more tightly distributed and with lower variances as Fig. 3 displays.

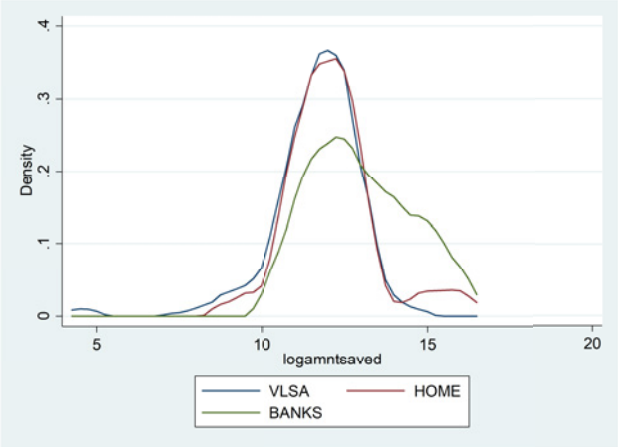

Fig. 3: *Densities of log of deposits in the three savings instruments*
.

3.3 Factors influencing farmers' choice of a savings instruments

The marginal effects of the variables hypothesized to influence the choice of saving are presented in Table 4 and the coefficient estimates in Appendix IV. The Pseudo R^2 of the multinomial logit indicated a good fit. Out of thirteen variables for the VSLA saving platform, four were significant. For savings in banks, seven variables were significant, and four variables were significant for savings at home platform. Variables found to be significant were age, years of education, the distance to financial institution, farm size, maize plot size, Income category that allowed to build savings and income category with income that was not sufficient. Value of maize sold food security and shock experience for droughts were not significant variables. The coefficient estimates and marginal effects for each variable are discussed in the discussion section. The results indicated that the choice for a saving instrument for the women maize farmers is influence by socio-economic factors in Uganda.

4 Discussion

According to Basu *et al.* (2004), rural households in Africa place value on the availability of secure savings to smoothen consumption expenditures by cushioning them against income fluctuations caused by external shocks. Some of the mentioned reasons for savings by Basu *et al.* (2004) differ with those in the current study as most women mentioned that they saved their money to earn interest. The

Table 4: *Marginal effects of determinates of choice of savings instruments among women farmers in Eastern Uganda (No savings category was the base outcome)*

	Save with VSLAs (n=144)		*Save with banks (n=47)*		*Save at home (n=153)*	
Variable	*ME (dy/dx)*	*Z*	*ME (dy/dx)*	*Z*	*ME (dy/dx)*	*Z*
Household size (No.)	0.06	0.24	0.09	−0.06	0.01	0.32
Age (years)	0.03	1.97*	0.04	1.89*	0.01	0.82
Years of education	0.01	0.02	−0.12	−1.78*	0.00	0.01
Distance to nearest financial institution (km)	−0.04	−2.06**	−0.08	−2.01**	−0.04	−2.41**
Value of maize harvested (UGSH)	−0.03	−0.04	0.00	0.04	−0.01	−0.21
Physical capital						
Maize plot (ha)	0.04	0.06	0.36	2.34**	0.06	1.76*
Farm size (ha)	0.00	0.01	0.05	1.68*	−0.02	−0.02
Financial capital						
Income that allows to build savings	0.08	0.06	0.04	2.14***	0.13	1.62**
Income that allows to save little	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Income equal expenses	−0.24	−2.32**	−0.10	−4.10	−0.15	−5.35
Income not sufficient to save	−0.08	−0.02	−0.28	−2.07***	−0.03	−2.57***
Threat to food availability						
FOOD_SECURITY (1 = average of those that worry about food 0 = otherwise)	−0.16	−1.98*	0.02	0.06	0.01	0.02
DROUGHT (1 = average of those that experienced drought 0 = otherwise)	0.03	0.13	0.01	0.01	0.00	0.06

ME: Marginal effects; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$;
Psuedo-R^2=0.000; Wald chi^2=116.95; Log likelihood= -295.83. Source: Survey data, 2018.

savings instruments that were reported as a source of interest were the banks and VSLAs with interest rate at 9 % and 10 % at the time of study in 2018. Of the interviewed rural women 40 % reported to save with VSLAs, while 15 % saved at home and only 13 % saved with commercial banks. The high level of savings with VSLA could be because women interviewed were members of farmer groups, in which they shared ideas on maize production, hence they were well acquainted with the running of socio-development groups. However, low levels of savings with banks reported could be a result of access barriers such as high bank charges and financial illiteracy among smallholder farmers in developing countries (Antwi & Chagwiza, 2019). For the 32 % of women farmers that did not have savings at all, almost half of them (47 %) mentioned that they had never heard of savings before the training during the survey. This result suggested that the training coordinated by CIMMYT during the data collection was a demand to address financial illiteracy and savings information for women farmers in rural districts of Uganda.

The respondent's age had a significant effect on choice of a savings instrument among women farmers in Eastern Uganda. A one-year age increase increased the probability to save in VSLAs and banks by 3 % and 4 % over not saving, respectively. Hence, depicting that older women were more likely to save in VSLA and banks rather than saving at home and not saving at all. The education variable was significant for savings in the bank and indicated that a one-year increase in the level of education resulted in an 10 % decrease of choosing to save in banks. This designates a not common relationship between education and savings. The reason could be due to the available education in the rural schooling system in Uganda which does not teach on savings and financial investment matters, hence low acquaintance of the women on importance of savings and financial education. Additionally, women education level in Uganda has continued to be low due to gender inequality in the distribution of education linked to growing disparities in the social context (Deininger & Okidi, 2003). Assumption that older women that save in other instruments such as VSLAs train their younger daughters on savings justifies the elucidation

that local education can be useful in imparting knowledge on savings, however local education was not considered in this study. Beisland & Mersland (2012) found education to be a strong predictor of saving in Uganda as people (particularly men) with a higher education level chose to save in formal institutions, whereas only half of the no-education did the same, suggesting that choosing to save in formal saving is an increasing function of the level of education.

The distance to the nearest financial institution had a negative and significant effect on the likelihood to choose to save in banks, at home or with VSLAs over not having savings. This result suggested that the decision to save in banks, at home and VSLA is not influenced by the distance among the Ugandan women and therefore there could be other factors that strongly influence their decision to choose different savings instruments. Literature shows that the distance to financial institution is one of the factors that influence saving behaviour (Demirguc-Kunt *et al*., 2018; Sun *et al*., 2020). For instance, Bessir (2018) study indicated that 20 % of the people without bank account in Ethiopia cited the distance to the bank as the main reason why they did not have a savings account, suggesting that if the distance was shorter, they would have saved in banks. In the current study the negative relation between the distance variable and the likelihood to save in banks can be explained by other factors such as income and financial illiteracy which at the time of data collection, a training on the importance of making savings in both formal and informal institution was accentuated.

As the maize plot size increased, the likelihood to save in banks and home increased. This result suggested that having larger maize plots would result in increased harvest and income and hence the likelihood to choose to save. The marginal effect estimates showed that holding other factors constant if the size of the maize plots increases by one hectare the probability to save in banks and home increased by 36 % and 6 % respectively. This result can be linked to the household size and overall farm sizes of the women. A higher number of persons was reported for the women with savings at banks and home. Therefore, suggesting that the increased likelihood of having savings at banks and home could be because of available family labour in maize plots that facilitated maize production hence increased yield and incomes. Additionally, the overall farm size was larger for the women saving in banks and home than VSLA, hence signifying the farm allocate to maize was also high resulting in more incomes and the likelihood to save. Moreover, the marginal effects indicated that a one hectare increase in the overall size of the farm would result in an increase in probability to choose to save in banks by 4.6 %. This result agreed with Akudugu, (2012); Nayak, (2013); Zeleke & Endris (2019) studies, and a recent study by Mulatu (2020) in Ethiopia that reported similar outcomes in that, as the farm size increased the farmers' savings increased too, as households who owned larger land size produced more output which resulted in higher farm income and saving.

It was expected that women with incomes that allowed to build a savings category would have savings and vice versa. The marginal effect of annual income category that allowed to build savings was 0.041, meaning that there was an increase of 4.1 % chance in choosing to save in banks if income increased by one UGSh, while holding other things constant. However, women that had income that did not allow savings had a negative relation with choosing to save with banks and at home. This result indicated the obvious case of people with little incomes inability to have savings. Previous literature has generally indicated that incomes significantly influence savings within households (Kibet *et al*., 2009; Beckman *et al*., 2013; Antwi & Chagwiza, 2019). In the current study it was noted that women with high incomes chose to save in the formal platform, banks, unlike VSLAs; this result concurred with Nwosu *et al*. (2020) study that found that with a rising income, the average propensity to save informally declines while the fraction of income saved in the formal sector increases in Nigeria. Moreover, Carpenter & Jensen (2002) also revealed that higher incomes are associated with increased likelihood to save among poor households in Pakistan.

The overall results indicate that majority of rural women maize farmers had savings and about 32 % did not have savings. Most women made savings in VSLAs and a handful had savings in banks, however the amount saved was nibble due to income constraint. Therefore, there is the need to inform women on the available financial products that suit their income capacity and farm needs and avail consistent practical financial literacy training to mobilize savings while considering different factors that influence women decision to save. Key factors such as income, education, age, and farm size were reported to influence women decision to save. Hence these factors ought to be considered by financial institutions, policy makes, development partners and research organizations to provide financial products that suite farmer needs and allow sustainable financial progress and development for rural women empowerment. Further, the banking sector could focus on structures and technologies that allow rural women to make savings and access financial products and services that facilitate increased farm and maize production.

Supplement

The supplement related to this article is available online on the same landing page at: https://doi.org/10.17170/kobra-202104133656 .

Acknowledgements

We are grateful to the Bill and Melinda Gates Foundation (MNGF) and United States Agency for International Development (USAID), who through CIMMYT, financed this study. The contents and opinions expressed herein are those of the authors and do not reflect the views of supporting institutions. The usual disclaimer applies.

Conflict of interest

The authors declare that they have no conflict of interest.

References

Addai, B., Gyimah, A. G., & Owusu, W. (2017). Savings habit among individuals in the informal sector: a case study of Gbegbeyishie fishing community in Ghana. International Journal of Economics and Finance, 9(4), 262–272.

Akudugu M. A. (2012). Estimation of the Determinants of Credit Demand by Farmers and Supply by Rural Banks in Ghana's Upper East Region. *Asian Journal of Agriculture and Rural Development*, 2(2), 189–200.

Allen, H. (2006). Village Savings and Loans Associations: Sustainable and Cost-effective Rural Finance. *Small Enterprise Development*, 17(1), 61–68.

Antwi, M., & Chagwiza, C. (2019). Factors influencing savings among land reform beneficiaries in South Africa. *International Journal of Social Economics*, 47(3), 34–48.

Awunyo, D. V., & Hassan, R. M. (2014). Drivers of demand for formal financial services by farmers in Ghana. *International Journal of Agriculture and Forestry*, 4(4), 261–268.

Basu, A., Blavy, R., & Yulek, M. (2004). *Microfinance in Africa: Experience and lessons from selected African countries*. IMF Working Paper WP/04/174.Washington DC, International Monetary-Fund.Availableat: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.527.3114\&rep=rep1\&type=pdf. Last accessed 11.12.2020.

Beisland, L. A., & Mersland, R. (2012). The use of microfinance services among economically active disabled people: Evidence from Uganda. *Journal of International Development*, 24, S69–S83.

Beck, T., & de la Torre, A. (2007). *The basic analytics of access to financial service: Financial markets, institutions, and instruments*. World Bank Policy Research Working Paper (4026). Available at: https://ideas.repec.org/p/wbk/wbrwps/4026.html. Last accessed 3.1.2020.

Beckmann, E., Hake, M., & Urvova, J. (2013). Determinants of households' savings in Central, Eastern and Southern Europe, focus on European economic integration. *Oesterreochische National Bank / Austrian Central Bank*, 3, 8–29.

Ben-Akiva, M. E., Lerman, S. R., & Lerman, S. R. (1985). *Discrete choice analysis: theory and application to travel demand*. (Vol. 9). MIT press.

Bendig, M., Giesbert, L., & Steiner, S. (2009). Savings, credit, and insurance: Household demand for formal financial services in rural Ghana. GIGA Working Paper No.94. Available at: https://ideas.repec.org/p/bwp/bwppap/7609.html Last accessed 04.02.2020.

Bessir, M. (2018). *Financial inclusion in Ethiopia: 10 takeaways from the latest Findex*. World Bank Blog. Available at: https://blogs.worldbank.org/africacan/financial-inclusion-in-ethiopia-10-takeaways-from-findex-2017. Last accessed 19.11.2020.

Bowen, H. P., & Wiersema, M. F. (2004). Modeling limited dependent variables: methods and guidelines for researchers in strategic management. *Research Methodology in Strategy and Management*, Emerald Group Publishing Limited, Bingley (1), 87–134.

Branch, B., & Klaehn, J. (Eds.) (2002). *Striking the balance in microfinance: A practical guide to mobilizing savings*. Pact Publications.

Carpenter, S. B., & Jensen, R. T. (2002). Household participation in formal and informal savings mechanisms: evidence from Pakistan. *Review of Development Economics*, 6(3), 314–328.

Chalwe, S. (2011). *Factors influencing bean producers' choice of marketing channels in Zambi*a. University of Zambia. Available at: http://crsps.net/wp-content/downloads/Dry\,\%20Grain\,\%20Pulses/Invenotired\,\%206.11/Inventoried\,\%206.8/4-2011-12-127.pdf. Last accessed 2.11.2020.

Deininger, K., & J. Okidi (2003). Growth and poverty reduction in Uganda. 1999-2000: panel data evidence. *Development Policy Review*, 21(4), 481–509.

Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The global findex database 2017: Measuring financial inclusion and the Fintech Revolution*. The World Bank, doi:10.1596/978-1-4648-1259-0.

Dupas, P., Karlan, D., Robinson, J., & Ubfal, D. (2018). Banking the unbanked? Evidence from three countries. *American Economic Journal: Applied Economics*, 10(2), 257–297.

Dupas, P., & Robinson, J. (2013). Why don't the poor save more? Evidence from health savings experiments. *American Economic Review*, 103(4), 38–71.

Friedman, B. M. (2000). The future of monetary policy: the central bank as an army with only a signal corps? *International Finance*, 2(3), 321–338.

Gujarati, D. N., & Porter, D. C. (2009). Basic econometrics. Boston, Mass: McGraw-Hill.

Hausman, J., & McFadden, D. (1984). Specification tests for the multinomial logit model. *Econometrical: Journal of the Econometric Society*, 4, 1219–1240.

Kasirye, I. (2007). *Vulnerability and poverty dynamics in Uganda. 1992-1999.* Research Series No.51. Economic Policy Research Center. Available at: https://mpra.ub.uni-muenchen.de/8557/1/MPRA_paper_8557.pdf. Last accessed 3.11.2020.

Kibet, L. K., Mutai, B. K., Ouma, S. A. & Owur, G. (2009). Determinants of household savings: case study of smallholder farmers, entrepreneurs, and teachers in rural areas of Kenya. *Journal of Development and Agricultural Economics*, 1(7), 170–187.

Luce, R. D. (1959). On the possible psychophysical laws. *Psychological review*, 66(2), 81–90.

Rahji, M. A. Y., & Fakayode, S. B. (2009). A multinomial logit analysis of agricultural credit rationing by commercial banks in Nigeria. *International Research Journal of Finance and Economics*, 24(4) 34–54.

Maddala, G. S. (1999). On the use of panel data methods with cross-country data. *Annales d'Economie et de Statistique*, 4(5), 429–448.

McFadden, D. (1981). *Econometric models of probabilistic choice. Structural analysis of discrete data with econometric applications*. Cambridge, MA: MIT press (198272).

McFadden, D. (2000). Disaggregate behavioral travel demand's RUM side. *Travel behavior research*, 1(2) 17–63.

Moturi, W., Obare, G., & Kahi, A. (2015). Milk Marketing Channel Choices for Enhanced Competitiveness in The Kenya Dairy Supply Chain: A multinomial Logit Approach. Conference paper for Ag-Econ Serach (No. 1008-2016-80202).

Mulatu, E. (2020). Determinants of Smallholder Farmers' Saving: The Case of Omo Microfinance Institution in Gimbo District of Kaffa Zone, Southern Ethiopia. *International Journal of Accounting, Finance and Risk Management*, 5(2), 93–105.

Nayak, S. (2013). *Determinants and pattern of saving behavior in the rural households of western Uganda*. MSc Thesis; Makerere University, Uganda.

Nwosu, E. O., Anumudu, C. N., & Nnamchi, C. E. (2020). Microeconomic Determinants of Household Savings in Nigeria. *Journal of International Development*, 32(2), 150–167.

Onyilo, F., & Adongo, A. (2019). Agricultural cooperative marketing and credit policy reform in Uganda: An opportunity for poverty reduction. *African Journal of Food, Agriculture, Nutrition and Development*, 19(1), 14156–14170.

Sun, S., Nabunya, P., Byansi, W., Bahar, O. S., Damulira, C., Neilands, T. B., & Ssewamala, F. M. (2020). Access and utilization of financial services among poor HIV-impacted children and families in Uganda. *Children and Youth Services Review*, 109, 10–30.

Small, K. A., & Hsiao, C. (1985). Multinomial logit specification tests. *International economic review*, 26(3), 619–627.

Train, K. E. (1998). Recreation demand models with taste differences over people. *Land economics*, 74(2), 230–239.

Tsuru, K. (2003). *Depositors' selection of banks and the deposit insurance system in Japan: Empirical evidence and its policy implications*. Research Institute of Economy, Trade, and Industry (RIETI) Discussion Paper Series, (03-E), 024.

Uganda Communications Commission (UCC) (2017). *Quarterly statistics on key communications indicators as of Dec 2016*. Uganda Communications Commission. Available at: http://www.ucc.co.ug/files/downloads/Quarterly_Statistics_on_Key_Communications_Indicators_as_of_Dec_2016.pdf. Last accessed 3.12.2019.

USAID (2018). *Country Development Cooperation Strategy, USAIDN Uganda*. Available at: https://www.usaid.gov/sites/default/files/documents/1860/CDCS_FINAL_26092017.tags_.pdf Last accessed 2.2.2020.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data (2nd ed.)*. Cambridge MA: The MIT Press.

Wulff, J. N. (2015). Interpreting results from the multinomial logit model: Demonstrated by foreign market entry. *Organizational research methods*, 18(2), 300–325.

Zeleke, A. T., & Endris, A. K. (2019). Household saving behavior and determinants of savings in financial institutions: The case of Derra District, Oromia Region, Ethiopia. *Research Journal of Finance and Accounting*, 10(23), 2222–2847.