

Full Length Research Paper

Determinants of Access to Credit Financial Services by Smallholder Farmers in Kenya

Joyce C. Kiplimo¹, Evans Ngenoh^{2*}, Walter Koech² and Jullius K. Bett³

¹International Maize and Wheat Improvement Centre (CIMMYT), P. O. Box 1042-00621, Nairobi, Kenya.

²Department of Agricultural Economics and Agribusiness Management, Egerton University, P. O. Box 536-20115, Egerton, Kenya.

³Central Bank of Kenya (CBK), P. O. Box 60000-00100 Nairobi, Kenya.

Received 17 July, 2014; Accepted 27 July, 2015

Credit financial access has been argued to be the engine of sustainable rural development and a factor necessary for household food security and poverty reduction. This study sought to establish the main factors that affect smallholder farmers' access to credit financial services in Kenya. The logistic regression results indicates that, the marginal effects of education level, occupation and access to extension services were statistically significant with positive effects on access to credit financial services. However, total annual household income and the distance to the credit source were statistically significant with negative influence on access to credit financial services. Overall, this paper concludes with implication for policy to establish credit/loans offices close to farmers in order to reduce lending procedures, risks, and educate them on perceptions on loan repayment. Moreover, the government should enhance the enforcement of credit input services in the form of in-kind lending to reduce fungibility into consumption expenditures. Finally, to realize food security, increased economic outcomes, and reduce poverty, it would be necessary to invoke enabling policy mechanisms to realizing equitable access to credit by smallholder farmers.

Key words: Determinants, credit access, credit financial services, smallholder, Kenya.

INTRODUCTION

At the global level, agriculture is considered as a critical development tool in accomplishing the first Millennium Development Goal (MDGs), which is, to halve the proportion of people suffering from extreme poverty and hunger by 2015 (United Nation, 2006; World Bank, 2008). In Africa, agriculture provides the opportunity to stimulate

growth in other sectors of the economy, boost food security, and ultimately reduce poverty. Due to several factors such as war, lack of knowledge on agricultural resource management, drought, limited land or farming space, financing, climate change, floods and global warming, agricultural productivity in Africa has been on a

*Corresponding author. E-mail: ken.ngenoh@gmail.com, Tel: +254 721 538 378.

declining trend (World Bank, 2013). Scaling out technological innovations requires a functioning supply of necessary inputs (including seed, fertilizers, and pesticides), effective knowledge dissemination, and produce marketing that is, a full input to output value chain approach. Forward and backward linkages through input and output markets depend on a relatively stable demand for inputs and supplies, and the reliable supply of marketable produce (Atieno, 2001). The Kenyan government appreciates the challenge of developing a policy framework that enhances agricultural production through intensification and commercialization of the agricultural sector in many of its development strategies for example Kenya Vision 2030 (RoK, 2008).

Agricultural credit is an essential element for agricultural growth in developing countries. It is a temporary substitute for personal savings and it accelerates technology change to stimulate agricultural production by enhancing smallholder farmers' productivity, asset formation, food security and subsequently, rural agricultural income (Kimuyu and Omiti, 2000). In India and Brazil, for example, agricultural financing is given very high priority. The World Bank through its private financing arm, International Finance Corporation (IFC), among other banks has also promoted agricultural credit (World Bank, 2013). The availability of formal finance to the smallholder farmers is essential, if they are to produce a marketable surplus and thereby contribute to the development process (World Bank, 2008). Poor access to credit by smallholder farmers who are the majority of the sector drivers is among the major constraining factors (Freeman et al., 1998; World Bank, 2013).

Studies in the focus areas of this study in Kenya have cited low credit access to be featuring prominently as one of the major constraints to improved input use, productivity gains, rural poverty and the national economy (Freeman et al., 1998; Odendo et al., 2002; RoK, 2006; Mwangi and Sichei, 2011; Inganga et al., 2014; and Karanja et al., 2014). In addition, Freeman et al. (1998), points out that, credit from formal financial institutions in Kenya and Ethiopia has enable smallholder farmers to draw upon finances beyond their own resources and take advantage of productive opportunities. A report by the Central Bank of Kenya indicates that agriculture is the most underfinanced sector, receiving only an average of 3.3% of the total credit extended to the economy (Mwangi and Sichei, 2011; RoK, 2012; and Karanja et al., 2014). This is far below the Maputo declaration of having up to 10% of the country's credit allocated to the Agricultural sector. Zeller et al. (1998) concluded that there is low level of participation in agricultural credit programs among the households, which are women-headed and are living in areas with higher variation in rainfall. This has led the agricultural credit programs to shy away from these areas because of higher expected loan default rate. Financing

the agricultural inputs and labor wages therefore requires liquid cash that often is not readily available with the smallholder farmers and hence, it is essential to expand the status of rural credit at large to improve agricultural productivity (Karanja et al., 2014).

Smallholder farmers have become an important contributor to the Kenyan economy. Lack of appropriate credit financial services is one of the major problems experienced by smallholder farmers and is a major constraint to smallholder commercialization in developing countries (Freeman et al., 1998). In the recent past, the Kenyan agricultural productivity has been declining posing a threat to its food security and increasing poverty (Foster and Ouma, 2009). One important way to enhance productivity is by improving access to credit facilities to farmers to enable them afford technologies and other essential inputs for production. The Kenyan government, through the Vision 2030, has identified poor access to and the cost of rural financial services as major contributing factors to the decline in agricultural productivity and hence low level of commercialization. The rural coverage of financial services in Kenya, like in many other Sub Sahara Africa countries, is currently estimated at just 10% whereas those operated by formal financial organizations are usually not accessible to farmers, particularly in the more remote areas where the banking infrastructure tends to be under-represented (Mutua and Oyugi, 2006).

The credit problem is further aggravated by the inability of formal institutions to lend to smallholder farmers due to lack of farm records, lack of tangible collateral such as titles to land, and lack of valuable assets. The situation is compounded by inadequate laws to help speed up liquidation of assets for the benefit of lending institutions when borrowers default. In spite of attempts by the government to diversify, formal credit channels through the rolling out the Women Enterprise Fund (WEF) and the Youth Enterprise Fund (YEF), many households in rural areas still have credit constraints (Owuor, 2009). In trying to overcome access to credit financial services obstacles, many smallholder farmers resort to forming credit groups through which they mobilize funds to loan to each other (Owuor, 2002). However, such credit is limited in amounts due to low funds mobilization restricted by membership and geographical spread and hence forcing them to seek additional credit from other financial institutions. Despite these efforts, access to credit financial services from formal financial institutions by smallholder farmers in Kenya is limited and its drivers are not evident. Therefore, this research study, aimed at answering the question: How do we improve the productive performance of the smallholder farmers in order to increase their farm incomes given resource levels? It's against this backdrop that we seek to identify the factors that drive access to credit financial services by smallholder farmers as well as the potential of improving access to credit financial services towards the

Table 1. Sampled counties and households.

Counties	Total no. of selected divisions	Total no. of villages	No. of households sampled			
			Male headed	Female headed	Total	
					Actual	Targeted
Bungoma	10	20	131	19	150	150
Siaya	7	43	110	39	149	150
Western Kenya region	17	63	241	58	299	300
Embu	5	31	83	28	111	100
Tharaka Nithi	3	44	83	18	101	100
Meru	3	39	87	15	102	100
Eastern Kenya region	11	114	253	61	314	300
Total sample	29	117	494	119	613	600

improvement of profitability and producer income in Kenya.

As a poverty reduction strategy, credit financial services access has played an important role in supporting smallholder farmers to improve their production and living standards. Improved rural credit financial system is therefore crucial in achieving pro-poor growth and poverty reduction among the rural communities (Okurut et al., 2004). Given that a large part of Kenya's population is engaged in agriculture, it would be useful to identify innovative options, and appropriate strategies for improving productivity through credit access and institutional arrangements that would serve as an input for policy makers in formulating rural credit policy. Access by smallholder farmers to rural financial services will have a potential to make a difference in agricultural productivity, food security and poverty reduction. This is because households that access adequate liquidity and information are able to participate in input markets through the purchase of productivity enhancing inputs and hence produce more which will increase their participation in the output markets.

MATERIALS AND METHODS

Study area and data

The study was conducted in Western (Bungoma and Siaya counties) and Eastern (Embu, Meru, and Tharaka Nithi counties) regions of Kenya. Both primary and secondary data were used in this study. The primary data was derived from the International Maize and Wheat Improvement Centre (CIMMYT) baseline household survey that was done towards sustainable intensification of Farming systems for food security and poverty alleviation in Kenya. Broad based crop and livestock production and marketing data, basic socioeconomic profiles of the households, input and output markets were collected together with demographic and administrative information. A total of 600 households were targeted for this survey (300 in each region) but the study actually conducted 613 smallholder household in both regions (Table 1). The number of villages surveyed in each division was proportional to the total number of households in each of the division. The survey villages

were randomly picked from the list prepared for each division in each county. Finally, the number of households surveyed in each village was randomly picked and was proportional to the number of households in that village. The secondary data was from publications on credit financial services, internet, Ministries of Agriculture, Livestock Development and Marketing, Central Bureau of Statistics, Government reports, savings and credit cooperatives (SACCOs), microfinance institutions and other development organizations working in these two regions.

Nature and composition of smallholder households

Majority (80.6%) of the surveyed households were male headed, while 19.4% were female-headed households (Table 2). The average age of the household head was about 50.31 years with 6.97 years of formal education. Tharaka Nithi county reported relatively younger household heads on average (44.38 years) while Siaya county reported the oldest household heads on average (53.35 years). On the other hand, Bungoma county reported higher average years of formal education by the household heads (8.89) while Meru county reported the lowest level of formal education by the household heads (6.02). The results also showed that farming is the main occupation of the household heads in these five districts (74.2%), followed by self-employment off-farm (10.4%) and then salaried employment (8.2%). Though over 70% of the household heads reported that farming was their main occupation, less than 50% of these household heads reported that they provided 100% of their labour on their farms (Table 2). The variation in the proportion of households by gender providing different proportions of farm labour (Table 2) differed across the surveyed counties significantly. To corroborate these findings, Siaya County, which reported the highest proportion of households headed by females, also reported the highest proportion of household heads providing 100% of their labour on their own farms (Table 2). Similarly, as clearly indicated in Table 2, Bungoma and Meru counties reported the lowest proportion of female headed households, and accordingly, reported the smallest proportion of their household heads providing 100% of their labour to their own farms.

Further analyses showed that majority of the household heads were protestant Christians (50.2%) with about 31% reporting that they were catholic Christians. Generally, speaking over 90% of the surveyed households were headed by Christian household heads with less than 1% reporting that they were headed by Muslim household heads. The variation in proportions of household heads professing different faiths varied significantly across the five surveyed counties. Siaya county reported the least proportion of

Table 2. Household socioeconomic characteristics as per County.

Characteristics	Bungoma (N=150)	Embu (N=111)	Tharaka Nithi (N=101)	Meru (N=102)	Siaya (N=149)	Total (N=613)
Female headed households (%)	12.7	25.2	17.8	14.7	26.2	19.4
Age of the household head (years)*	49.07 (15.39)	52.11 (14.74)	44.38 (13.46)	51.63 (14.03)	53.35 (14.35)	50.31 (14.76)
Education of the household head (years)*	8.89 (3.91)	6.14 (8.92)	7.08 (3.40)	6.02 (12.40)	6.21 (3.99)	6.97 (7.10)
Main occupation of the household head (% households)						
Farming (crop + livestock)	64.7	74.8	83.2	77.5	75.2	74.2
Salaried employment	10.0	9.0	4.0	9.8	7.4	8.2
Self-employed off-farm	12.7	8.1	9.9	7.8	12.1	10.4
Casual labour on-farm	2.0	3.6	3.0	0.0	0.0	1.6
Casual labour off-farm	8.0	2.7	0.0	3.9	3.4	3.9
Others	2.7	1.8	0.0	1.0	2.0	1.6
Own farm labour contribution of the household head (% households)						
100%	32.0	40.5	54.5	31.4	55.0	42.7
75%	19.3	24.3	17.8	29.4	7.4	18.8
50%	14.0	19.8	12.9	10.8	15.4	14.7
25%	22.7	9.0	10.9	16.7	11.4	14.5
10%	5.3	1.8	4.0	4.9	2.7	3.8
Not a worker	4.0	4.5	0.0	4.9	6.0	4.1
Others	2.7	0.0	0.0	2.0	2.0	1.5
Religion of the household head (% households)						
No religion or atheist	0.0	0.0	0.0	0.0	1.3	0.3
Orthodox Christian	0.7	0.0	0.0	0.0	0.0	0.2
Catholic	34.0	30.6	38.6	33.3	21.5	31.0
Protestant	56.0	56.8	55.4	60.8	28.9	50.2
Other Christian	8.7	10.8	5.0	4.9	48.3	17.5
Muslim	0.7	0.0	0.0	0.0	0.0	0.2
Tradition	0.0	0.0	1.0	0.0	0.0	0.2
Others	0.0	1.8	0.0	1.0	0.0	0.5
Marital status of the household head (% households)						
Married living with spouse	73.3	70.3	86.1	78.4	65.1	73.7
Married but spouse away	13.3	3.6	1.0	8.8	9.4	7.8
Divorced/separated	0.0	4.5	4.0	2.0	0.7	2.0
Widow/widower	12.7	15.3	6.9	5.9	23.5	13.7
Never married	0.7	1.8	1.0	2.0	1.3	1.3
Others	0.0	4.5	1.0	2.9	0.0	1.5
Household size (number of persons)	6.57 (2.74)	4.48 (1.99)	4.88 (1.65)	4.94 (1.95)	6.96 (3.10)	5.74 (2.64)

household heads professing catholic faith and protestants, but reported the highest proportion of household heads professing other Christian faiths (probably *Legio Maria*). It is also strikingly important to note that only Bungoma county reported that some of the households were headed by Muslim household heads though the proportion was extremely small (<1%). Majority of the household heads in the surveyed sample were married and living with their spouses (73.7%) followed by 13.7% who reported that they were either widows or widowers. Another striking observation is the distribution of the household heads across the five counties who were divorced or separated and those who were widows or widowers.

The results showed that eastern Kenya counties had a relatively high proportion of household heads that were divorced or separated compared to the western Kenya counties. On the other hand, Siaya county reported the highest proportion of households that were widowed. This could perhaps be attributed to the rampant HIV/AIDS pandemic.

The model

The study determined the factors that influence credit financial services access by smallholder farmers in Kenya by using Logistic regression model. Access to credit in this study refers to actual receipt of credit financial service from a given source. The response variable in this case is dichotomous (binary choice variable); includes a "yes" or "no" type (those that received or those that did not receive the credit financial services respectively) variable. The three most commonly used approaches to estimate such dummy dependent variable regression models are (1) the linear probability model (LPM), (2) the logit, and (3) the probit. They are applicable in a wide variety of fields (Gujarati, 2004). According to Brooks (2008), LMP is a simple and obvious, but unfortunately a flawed method for dealing with binary dependent variables. Brooks (2008) further argued that, both the logit and probit are non-linear models and is estimated using Maximum Likelihood (ML) method. These two models are able to overcome the limitation of the LMP by using a function that effectively transforms the regression model so that the fitted values are bounded within the (0, 1) interval. In addition, Wooldridge (2002) noted that both Logit and probit models guarantee that the estimated probabilities lie between the logical limit of 0 and 1.

Due to these advantages, the Logit and the probit models are the most frequently used models when the dependent variable happens to be dichotomous (Maddala, 1983; Gujarati, 2004). The logit and probit models are quite similar in most applications. The main difference between the two is in the nature of their distribution of the errors, which is captured by Cumulative Distribution Function (CDF). Probit has a normal distribution while logit has a logistic (slightly flatter tails) distribution and therefore, the choice of probit versus logit regression depends largely on the distribution assumption one makes. Due to its comparative mathematical simplicity, many researchers have used the logit regression model in practice. Sirak and Rice (1994) argues that logistic regression is powerful, convenient and flexible and is often chosen if the dependent variables is of categorical nature and/or it is not normally distributed. Therefore, since the dependent variable in this study is categorical, a binary Logit model was used to identify the factors that influence access to credit services amongst smallholder farmers. This is because of the nature of the dependent variable and the resultant predicted probabilities that gives predicted values at substantively meaningful values of explanatory variables.

Following Maddala (1983); and Brooks (2008), the cumulative logistic probability model is econometrically specified as:

$$P_i = F(Z_i) = F\left(\alpha + \sum_{i=1}^n \beta_i X_i\right) = \frac{1}{1 + e^{-Z_i}} \quad (1)$$

Where, P_i is the probability that an individual access credit given X_i . X_i Represents the i explanatory variables; e Denotes the base of natural logarithms, which is approximately equal to 2.718; α and β_i are parameters to be estimated.

Central to the use of logistic regression is the logit transformation of p given by Z . That is, to get linearity, we take the natural logarithms of odds ratio equation (1), which results in the logit model as given by:

$$Z_i = \ln\left(\frac{P_i}{1-P_i}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \quad (2)$$

Where Z_i is the indicator of smallholder farming household access to credit financial services or not, P is the probability of the event's occurrence, X_i is a vector of household socio-economic, demographic, institutional, and communication characteristics. B_0 is a constant, β_i are corresponding vectors of regression and ε is disturbance term.

$$Z(1/0) = \beta_0 + \beta_1^* (AGE)_i + \beta_2^* (EDU)_i + \beta_3^* (MARST)_i + \beta_4^* (GNDR)_i + \beta_5^* (TSLSZ)_i + \beta_6^* (MNOCCP)_i + \beta_7^* (HHINCM)_i + \beta_8^* (DIST)_i + \beta_9^* (GRPMEM)_i + \beta_{10}^* (HHSZ)_i + \beta_{11}^* (EXTS)_i + \varepsilon \quad (3)$$

RESULTS AND DISCUSSION

Descriptive statistics

The data profiling the smallholder farmer's level of access to credit financial services are studied here. The data has been analyzed using descriptive statistics. As shown in Figure 1, results of the survey indicates that only 42.58% of the respondents in the study areas had access to credit financial services, while 57.42% did not have any access to credit financial services. This shows that smallholder farming in these regions are not sufficiently funded given the low levels of access to credit financial services, which could otherwise have helped them to acquire new and appropriate farming technologies. In addition, this implies that the potential for improving the access to financial credit by smallholder farming households is immense. The reasons for low levels of access may either be due to few and inaccessible credits markets or to credit markets completely missing in the study area.

The results further shows (Figure 2¹) that while, 58.24 and 41.76% for those farming households who did not access credit financial services were from Eastern and Western parts of Kenya respectively. In overall, the farming household that accessed credit financial services were 29.89, 29.12, 14.94, 14.56 and 11.49%, from Siaya, Bungoma, Embu, Meru, and TharakaNithi counties respectively. However, 21.88% of the farming household did not access credit financial services from Bungoma County, followed by 19.89% from Siaya and Embu counties, while 19.03 and 18.75% were from Meru and

¹ This figure describes the status/level of credit financial services access (Percentage of household who actually receipt credit versus their counterparts) in the two regions (Eastern and Western) as well as the counties within the regions.

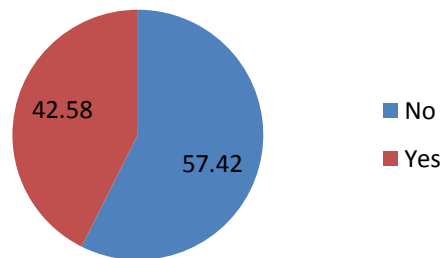


Figure 1. Percentage of smallholder households' accessing credit financial services.

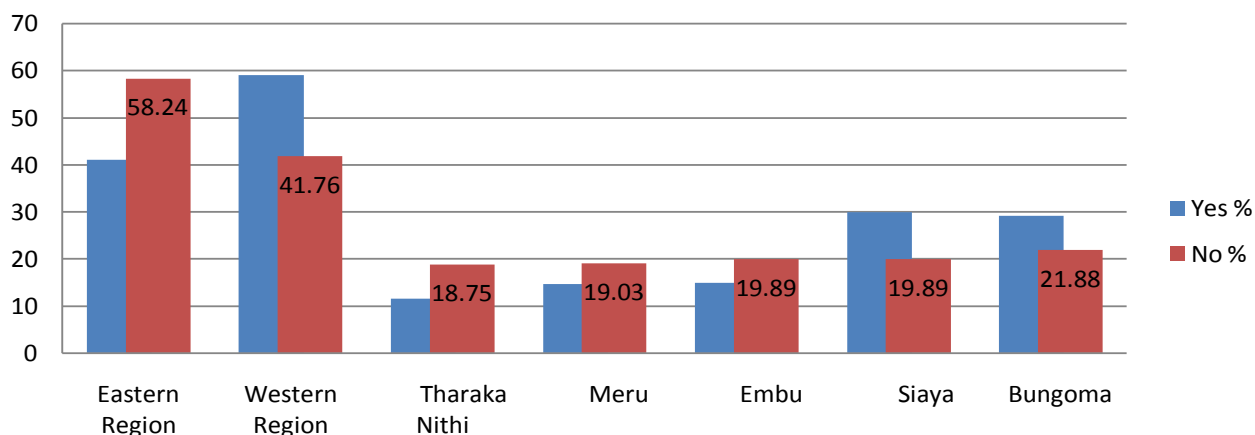


Figure 1. Percentage level of smallholder credit financial services access by region and counties. This figure describes the status/level of credit financial services access (Percentage of household who actually receipt credit versus their counterparts) in the two regions (Eastern and Western) as well as the counties within the regions

Tharaka Nithi counties respectively. The results revealed that Western Kenya, have a higher level of access to credit financial services compared to Eastern Kenya region.

The characteristics of smallholder farming households in the study area are in relation to the eleven variables that were hypothesized to have an effect on access to credit financial services. This includes; age, gender, level of education, marital status, group membership, household size, total land size, main occupation, level of total household income, extension services and distance to financial institutions. Cross-tabulation was used to analyze and test these variables because cross-tabulation provides a way of analyzing and comparing the results for one or more variables with the results of another (or others). To establish whether there is a significant difference between the means and frequencies, t-test results for continuous variables and Pearson chi-square test results for categorical variables were used for comparison. A 5% level of significance was used as a benchmark for the whole analysis. The descriptive results of the categorical variables are presented in Table 3. The results indicates that farmers who did not access credit financial services are

dominated by those who are purely salaried employed which constitute 84.09% followed by those who are self-employed off-farm, farming, off-farm casual labour and on-farm casual labour which comprise of 7.67, 5.11, 2.27 and 0.85% respectively. On the other hand, those who accessed credit financial services constituted 83.14% of the salaried employed, 8.05% of the self-employed outside their farm, 3.45% are in farming, 3.07% are those who are in on-farm casual labour, and 2.30% are those who are in off-farm as their main occupation. Further, the result indicates that the two categories are statistically significantly different at 5% level of significance with X^2 of 12.965 and a P-value of 0.044. The farmers with salaried employment as the main occupation tend to easily access credit financial services due to the fact that they tend to have collateral, they also find it easy to repay the credit irrespective of the performance of their agricultural activities.

The results on gender show that among those farmers who did not access credit financial services, 41.19% were female and 58.81% were male. On the other hand, those who managed to access the credit financial services comprised of 47.13% female while the male constituted a total of 52.87%. According to the results, the marital

Table 1. Summary of the attributes of smallholder farmers' based on access to credit.

Variable	Farmers' who access credit		Farmers' who did not accessed credit		X ² /P-Value
	Frequency	Percentage	Frequency	Percentage	
Main occupation					
Salaried employment	296	84.09	217	83.14	
Farming	18	5.11	9	3.45	
Self-employed off-farm	27	7.67	21	8.05	12.965 (0.044)
On-farm casual labour	3	0.85	8	3.07	
Off-farm casual labour	8	2.27	6	2.30	
Gender					
Female	145	41.19	123	47.13	
Male	207	58.81	138	52.87	2.144 (0.143)
Marital status					
Married living with spouse	279	79.26	178	68.20	
Married but spouse away	14	3.98	33	12.64	
Divorced/Separated	6	1.70	5	1.92	18.618 (0.005)
Widow/Widower	43	12.22	39	14.94	
Never married	10	2.84	6	2.30	
Group membership					
Yes	249	70.74	192	73.56	
No	103	29.26	69	26.44	1.466 (0.080)
Extension service access					
Yes	56	15.91	51	19.54	
No	296	84.09	210	80.46	1.371 (0.241)

*** (p<0.01), ** (p<0.05),* (p<0.10).

status of the respondents between those who accessed credit and those who did not were statistically significantly different at 5% level of significance as shown by X² of 18.618 and P-value of 0.005. This implies that farmers who are married and living with their spouses find it easy to access credit because they tend to reach a concrete agreement on the kind of investment, as well as on how to repay the credit. It further indicates that, among those farmers who did not access credit financial services 79.26% were married and living with their spouse, and 12.22, 3.98, 2.84 and 1.70% were widow/widower, married but spouse away, never married and those who are divorced/separated respectively. While among the category of those who managed to access credit 68.20% were married and living with spouse, and 14.94, 12.64, 2.30 and 1.92% were widow/widower, married but spouse away, never married and those who are divorced/separated respectively. Among the farming households who fail to access credit, 15.91% accessed extension services and 84.09% did not access the extension services. Those farming household who accessed credit, 19.54% accessed extension services while 80.46% did not. The results indicate that there was no significant difference between the two categories of smallholder farming households. Farmers should be

encouraged to join extension package programs so as to benefit from the technical advice on new and appropriate agricultural technologies to boost their Agricultural production and enhance rural development. These include easy access to credit, capacity building, training services, and other related services.

Table 4 show that the households who accessed credit financial services had a minimum of 1 person and a maximum of 20 people while those who did not manage to access credit financial services had a minimum of 1 person and a maximum of 18 people. The mean for the two categories of farming households were significantly different at from zero with a mean of six people in each category. The findings of this study were in agreement with Marge (2003), who found out that large household size positively influences access to credit financial services implying that it improves the family business through provision of more labour. In terms of age, most of the farming household in both categories of those who accessed credit financial services and those who did not were of the same age category as indicated by their mean age of 48.57 and 47.86 years respectively in each category. The means were significantly different at from zero. The youngest farmer among the farming households who accessed credit service was 20 years

Table 4. Summary of the characteristics of smallholder farmers in relation to access to credit.

Variable	Farmers accessing credit				Farmers not accessing credit				t-test
	Mean	Min.	Max.	Std. Dev.	Mean	Min.	Max.	Std. Dev.	
Age (Years)	48.57	20	95	14.7602	47.86	18	85	15.416	-3.571***
Education (Years)	14.46	2	46	14.7908	12.54	2	46	12.5369	-3.425***
HH size (No)	5.55	1	20	2.5099	5.99	1	18	2.800	-4.092***
Distance (KM)	5.27	0.2	40	12.0498	5.52	0.25	40	8.8074	-3.724***
Land size (Acres)	2.84	0.25	96	5.9068	2.66	0.1	19	2.673	-3.656***
ln(Annual income) (KShs)	10.17	7.09	15.25	1.2187	10.32	7.59	14.09	1.0826	-3.348***

*** (p<0.01), ** (p<0.05), * (p<0.10).

old while the age of the oldest farmer was 95 years. Among those farming households who did not access credit financial services, the youngest farmer was 18 years old and oldest farmer was 85 years old. The results concurs with Faturoti et al. (2006) who concluded that, farmers with more years have acquired more assets that can act as collateral to credit access for acquiring new farm technologies.

Per capita land size results indicate that farming households who accessed credit financial service with the smallest land size were 0.25 acres and the one with the largest land size had 96 acres. However, among those farming households who did not access financial credit services, the smallest land size were 0.1 acres and the largest being 19 acres. There was a significant difference between the means, where the average land size for households who accessed credit financial services was 2.844 acres; while for the farming households, which did not access credit financial services in the study area was 2.66 acres. The results agree with the findings of Marge (2003) who concluded that large farm sizes have positive effect on financial credit access due to their ability to benefit from economies of scale and the ability to repay back the credit finances. Household income had big figure and hence was converted to natural logs and the results showed that, all farming household contacted were able to get some income but it differed across the two categories of farmers. In terms of education level, majority of the farming households in both categories of those who accessed credit financial services and those who did not were able to access education. The results indicated the mean education level for both categories as 14.79 and 12.54 years respectively, and they were significantly different. The households with minimum level of education among the farming households who accessed credit service was 2 years while the farmer with the maximum education level was 46 years. The same observation was also noted in those farming households who did not access the credit financial services.

The distance in kilometres between the farming household and the credit sources in the study area varies in both categories. Among the farming households

who accessed credit financial services and those who did not, the results indicated that the mean distance for both categories were 5.94 and 6.11 km respectively. The two means were statistically significantly different. The minimum distance among the farming households who accessed credit service was 0.2 km, while the maximum distance was 40 km away from the credit source. On the other hand, the distance ranged from 0.1 to 19 km among the farming household who did not access the credit financial services in the study area.

Logistic regression model results

The findings of the factors influencing smallholder farmer's access to credit financial services in the study areas using logistic regression analysis are presented here. The variables that were perceived to affect access to credit financial services by smallholder farmers in Kenya were estimated using a binary logistic regression model. The marginal effects are for discrete change of different dummy variables from 0 to 1. Therefore, the results in Table 5 indicates that, the marginal effects of education level, occupation (Salaried and off-farm self-employment), and access to extension services show significant and positive effects on access to credit financial services. However, distance to credit source and total income are significant but have negative effects on access to credit financial services by the smallholder farming households in the two regions. The variables gender, marital status, age, and group membership, household size, land size, were not significant but had negative influence on access to credit financial services by the smallholder farming households in the two regions. The results further indicates that, education level in years of schooling were statistically significant with positive effects on access to credit financial services in the study area. This implies that, increase in the number of schooling years, increases the probability of accessing financial credit services from various financial institutions. The findings of this study concur with the findings of Hussein (2007) who concluded that higher level of education is associated with the ability to access and

Table 2. Summary of the determinants of access to credit by smallholder farmers' in Kenya.

Variables	Parameters	Marginal effects	Standard error	P-value
Determinant factors				
Gender (0,1)	GNDER	-0.819905	0.04326	0.058*
Marital status (0,1)	MARST	0.001145	0.00247	0.643
Age (years)	AGE	-0.000097	0.00147	0.948
Education level (years)	EDU	0.000230	0.00154	0.031**
Household size (No.)	HHSZ	0.014918	0.00842	0.077
Off-farm casual labour	MNOCCP-1	-0.054030	0.10284	0.599
On-farm casual labour	MNOCCP-2	-0.008194	0.07720	0.915
Salaried employment	MNOCCP-3	0.326295	0.13189	0.013**
Self-employed off-farm	MNOCCP-4	0.354186	0.14498	0.015**
Distance to credit source (Kms)	DIST	-0.000945	0.00194	0.026**
Group membership (0,1)	GRPMEM	0.002973	0.00262	0.257
Total land size (Acres)	TLSZ	0.002758	0.00479	0.564
Extension service access (0,1)	EXTS	0.066273	0.05519	0.030**
Total Household income (KShs)	HHINCM	-0.028777	0.01967	0.043**
Diagnostic statistics				
Log likelihood	-401.42907			
LR $\chi^2(14)$	23.30			
Number of observations	605.0000			
Prob> χ^2	0.0000			

*** (p<0.01), ** (p<0.05),* (p<0.10).

comprehend information on credit terms and conditions, and ability to complete loan application forms properly. The results were also in line with the findings of Johnson and Morduch (2007) where they concluded that farmers with higher levels of education have a tendency of taking much of their time in other off-farm occupational activities, which empowers them to obtain assets that can enable them access credit financial services. On the other hand, Ajibefun and Aderinola (2003) noted that, higher level of education can also be a necessary factor in disseminating information on new farming technologies since they are in better position to understand them and can get access to them since they are in a position to acquire them due to their off-farm income.

Distance to credit source was also significant with negative marginal effects on the smallholder farming household in the study areas. The results implies that, the probability of accessing credit facilities from the study area increase with distance to the nearest financial services provider. There is therefore, need to take steps to take credit services to the people, especially in the rural areas. The results of this study concurs with the findings of Hussien (2007) who affirmed that farm households tend to be discouraged to borrow when credit sources are located further away from their farming operations. In addition, Johnson and Morduch (2007) indicated that farming household who are nearer to the credit sources have positive effect on credit financial

access but on the contrary, being close to credit source, does not in itself guaranteed the access to credit financial service. The farming house annual income was significant with negative marginal effects in explaining access to credit financial services in Kenya. This result indicates that, an increase in income will lead to a positive contribution towards accessing credit financial services in the study area. This finding concurs with the findings of Kumar (2005), who cited income to be among the important determinants but also concluded that there were a negative relationship between access to credit financial services and household income due to the fact that as farmers accumulates more income, they tend to shy away from credit sources. However, in a situation of transitory changes in smallholder farming households' income definitely affects the household consumption and hence need for more funding through credit financial seeking. Marge (2003) indicated that, a transitory change on income is a factor, which is necessary for a positive effect on access to financial credit services due to its effect on consumption. Moreover, Leavy and Poulton (2007) concluded that in rural Africa, many smallholder farming households obtain half or more of their income from non-farm sources. The results further indicates that, those household with household heads' main occupation being salaried employed or self-employed outside the farm were both significant with positive marginal effects on the smallholder farming household access to credit

financial services in the study area. This implies that having other sources of income other than farming in the study area will lead to an increase in the probability of accessing credit financial services. On the other hand, those farmers who are taking much of their time in other income generating activities such as business and formal employment tend to accumulate more assets that will finally acts as collateral when seeking credit financial services. The results conform to the findings of Ojo (2003) which concluded that farmers should be encouraged to diversify their activities so as to improve on their ability to access more productive resources. Access to extension services by smallholder farmers was significant with positive marginal effects on access to credit financial services. This implies that, an improvement of extension services in the study area will lead to a positive contribution towards accessing credit financial services in the study area as was the case with that of Beck (2007), who he noted that extension services play a crucial role in empowering farmers with farming techniques, knowledge and management skills. However, Owuor (2009) revealed that extension service in Kenya have become demand driven and hence no longer benefit smallholder farmers.

Conclusion

Based on the study findings, we affirm policies that are geared towards the development of effective training programs that would include; insurance to mitigate the risks in farming, financial literacy programs to familiarize smallholder farmers with the skills required to effectively understand, assess and utilize credit financial services to enhance their agricultural activity. This is because education and salaried employment positively influenced credit financial services access. This implies that those with less level of education could not have access to full-time employment and therefore, such financial and savings literacy programs can be incorporated into school curricula to help overcome the underlying barriers to accessing credit at an early age and put both gender at an equal footing. In addition, there is need to sensitize smallholder farmers to adopt modern technologies such as M-Banking to address the distance to the market challenges. Finally, the establishment of credit/loans offices close to farmers and operated by bank officials who would be familiar with farmers in the area would reduce lending procedures, risks and educate them on perceptions on loan repayment. To achieve this objective, agent-banking model coupled with the incorporation of the private sector and government extension officers should be used in a way that reaches poor farmers, create the right incentives for success, finding real business leaders and giving them the tools to efficiently and effectively serves the smallholder farmers. Generally, the study recommends that measures geared towards

reduction of information asymmetry like assessing the household characteristics, increased sharing of information, increased income need to be enhanced to help deepen access to credit financial services by smallholder farmers.

Conflict of Interest

The authors have not declared any conflict of interest.

ACKNOWLEDGEMENT

We acknowledge the financial support for the study to the International Maize and Wheat Improvement Centre (CIMMYT). In addition, we would also like to appreciate the entire research team for the much-accredited support while collecting the data. We are responsible for any errors of omission or commission.

REFERENCES

- Ajibefun IA, Aderinola EA (2003). Determinants of Technical Efficiency and Policy Implication in Traditional Agricultural Production: Empirical Study of Nigerian Crop Farmers. Work in Process. Report presented at the Bi-annual Research Workshop of AERC, Nairobi, Kenya, May 24th - 29th.
- Atieno R (2001). Formal and Informal Organizations' Lending Policies and Access to credit by Small-scale Enterprises in Kenya: An Empirical Assessment. African Economic Research Consortium. Nairobi. Research paper 111.
- Beck T (2007). Financing constraints of SME's in developing countries. Evidence, determinants and solutions. *J. Int. Money Fin.* 31(2):401-441.
- Brooks C (2008). *Introductory Econometrics for finance*. Cambridge: Cambridge University Press.
- Faturoti BO, Emah GN, Isife BI, Tenkouano A, Lemchi J (2006). Prospects and determinants of adoption of IITA plantain and banana based technologies in three Niger Delta States of Nigeria. *Afr. J. Biotechnol.* 5(14):1319-1323.
- Foster D, Ouma S (2009). "Financial Access National Survey 2009: Dynamics of Kenya's Changing Financial Landscape." Financial Sector Deepening of Kenya. Nairobi, Kenya. Available online at www.fsdkenya.org
- Freeman HA, Ehui SK, Mohammad AJ (1998). Credit constraints and smallholder dairy production in the East African Highlands: application of a switching regression model. *J. Agric. Econ.* 19:33-44.
- Gujarati DN (2004). *Basic Econometrics*. 4th Edition. McGraw-Hill Book Company. New York.
- Hussein H (2007). "Farm Household Economic Behaviour in Imperfect Financial Markets." Doctorial Thesis, Swedish University of Agricultural Sciences, Uppsala.
- Inganga BW, Njeru A, Ombui K, Ondabu IT (2014). Factors affecting Customer Demand of Financial Services Offered by Commercial Banks in Nairobi county. *Int. J. Sci. Res. Pub.* 4(11):1-25.
- Johnson S, Morduch NZ (2007). Financial exclusion in Kenya: an analysis of financial service use. Report for DFS, Kenya and FSD, Kenya, Nairobi, Kenya. Accessed at http://www.fsdkenya.org/pdf_documents/09-11-20_Financial_exclusion_in_Kenya.pdf
- Karanja JG, Mwangi AK, Ngigi NS (2014). Analysis of factors influencing access to credit services by women entrepreneurs in Kenya. *Res. J. Fin. Account.* 5(11):34-41.
- Kimuyu P, Omiti J (2000). Institutional Impediments to Access to Credit

- by Micro and Small-Scale Enterprises in Kenya. IPAR Discussion Paper Series No. 026/2000
- Kumar A (2005). Access to Financial Services in Brazil: A Study (Washington, DC: World Bank).
- Leavy J, Poulton C (2007). Commercialization in Agriculture, Future Agricultures. Accessed at: <http://www.futureagricultures.org/pdf%20files/commercialisations%20theme%20paper%20final.pdf>
- Maddala GS (1983). Limited-Dependent and Qualitative Variables in Econometrics. Cambridge: Cambridge University Press. P. 401.
- Marge S (2003). Banking sector development and credit constrained households in Estonia.
- Mutua JM, Oyugi LN (2006). 'Access to Financial Services and Poverty Reduction in Rural Kenya'. NEPRU Working Paper No. 108.
- Mwangi IW, Sichei MM (2011). Determinants of Access to Credit by Individuals in Kenya: A Comparative Analysis of the Kenya National FinAccess Surveys of 2006 and 2009. *Eur. J. Bus. Manage.* 3(3):206-226.
- Odendo M, De Groot H, Odongo O, Ocho P (2002). Participatory Rural Appraisal of Farmers' Maize Selection Criteria and Perceived Production Constraints in the Moist Mid-altitude Zone of Kenya. IRMA Socio-Economic Working Paper No.02-01. CIMMYT and KARI, Nairobi.
- Ojo SO (2003). Productivity and Technical Efficiency of Poultry Egg Production in Nigeria. *Int. J. Poult. Sci.* 2(6):459-464.
- Okurut N, Schoombe A, Van der B (2004). Credit demand and credit rationing in the informal financial sector in Uganda. Paper to the DPRU/Tips/Cornell Conference on African Development and Poverty Reduction: The Macro-Micro Linkage. P. 1-28.
- Owuor G (2002). Impact of Financial Self-Help Groups' Credit on Agricultural production. The Case of Maize Production in Siaya-Kenya. Unpublished Masters Thesis. Egerton University, Kenya.
- Owuor G (2009). Is Micro-Finance Achieving Its Goal Among Smallholder Farmers in Africa? Empirical Evidence from Kenya Using Propensity Score Matching. Paper submitted for Visual Presentation at the XXVII International Conference of Agricultural Economists, 16-22 August 2009, Beijing, China.
- Republic of Kenya (RoK) (2006). Central Bank of Kenya Monthly Economic Review. Nairobi: Government Printer. P. 13.
- Republic of Kenya (RoK) (2008). Kenya National Bureau of Statistics, Economic Survey Report 2008. Ministry of Planning and National Development, Government Printers.
- Republic of Kenya (RoK) (2012). Kenya National Bureau of Statistics Economic Survey report 2012. Ministry of Planning and National Development: Government Printer.
- Sirak M, Rice JC (1994). Logistic Regression: An Introduction. In B. Thompson, ed., *Advances in Social Science Methodology*, Greenwich, CT: JAI Press 3:191-245.
- United Nations (2006). The millennium Development goals Report 2006. United Nations Wealth differentiated constraints and priorities. *Agric. Econ.* 37:225-237.
- Wooldridge A (2002). The Role of Financial and Business Development Services (BDS) in Micro and Small Enterprise (MSE) Development in Ethiopia. Addis Ababa: Associations of Ethiopian Microfinance Institutions.
- World Bank (2008). Agriculture for development. World Development Report 2008. Washington DC: World Bank and OUP Press.
- World Bank, (2013). World Development Report 2013. Washington DC: World Bank and OUP Press.
- Zeller M, Diagne A, Mataya C (1998). Market access by smallholder farmers in Malawi: implications for technology adoption, agricultural productivity and crop income. *J. Agric. Econ.* 19:219-229.