Original Research Article

Effects of Agricultural Credit on Information and Communication Technology Tools' Adoption in Agricultural Extension among Smallholder Cassava Farmers in Rangwe Sub-County, Kenya

ABSTRACT

Even though Information and Communication Technology (ICT) tools have been essential in the dissemination of agricultural extension information, the majority of smallholder farmers (SHFs) were not using them to access the information. Inadequate access to agricultural credit could be one of the reasons causing the low adoption of the tools. The aim of this study was to delineate the level of agricultural credit access, sources of the credit, amount of the credit accessed, and the correlation between access to the credit and the use of ICT tools in the extension services among the farmers. A correlation research design was utilized in this study at Rangwe Sub-County, Kenya. Data were collected with the help of pretested structured questionnaire from 106 SHFs who grow cassava in Rangwe Sub-County. The data obtained were analyzed using Spearman's correlation and descriptive statistics with the aid of Statistical Package for Social Science (SPSS) Version 25 appropriately. The response rate was 100%. Descriptive results revealed that 68% of the SHFs interviewed had no access to the credit, while 32% had access. The majority (70%) of those who had the access received it from Saving and Credit Co-Operative (SACCOs). The majority (68%) received the lowest amount of credit. Spearman's correlation revealed that there was a moderate, positive correlation between access to credit and the use of the ICT tools. The correlation was statistically significant at 1% level of significance ($R = +.646^{**}$, $P = .000$, $R^2 = 0.417$). Access to credit appears to provide a positive and moderate effect on the use of the ICT tools as it predicts 42% of the use of the ICT tools in cassava production. An increase in access to agricultural credits among SHFs translates to an increase in the adoption of ICT tools in agricultural extension.

Keywords*: Agricultural extension, Access to Agricultural Credit, Information and Communication Technology tools, Agriculture*

1. INTRODUCTION

Globally, agriculture is a sector that has been negatively affected by low productivity despite the fact that it is a basic instrument for the reduction of poverty, food security increment, and enhancement of sustainable development (Tanti *et al*., 2022). Efficacious dissemination of agricultural information among the farming stakeholders is one of the major contributions to increasing agrarian productivity (Kamal *et al.,* 2022). The information may entail tillage and sowing practices, soil and water conservation techniques, improved seeds, fertilizer application, appropriate methods of pesticides, and fungicide application to crops. It may also include harvesting and post-harvesting operations (Ahmadi *et al*., 2022).

In Kenya, according to the report by the Kenya National Bureau of Statistics [KNBS], (2020), the agricultural sector contributes about 11% of her labour force and about 34% of her Gross Domestic Product (GDP). This could mean that agriculture is a basic sector in the Kenyan economy. Most of the farmers practice farming on a piece of land of fewer than 3 acres (Odhiambo, 2020). The farmers can easily adopt the novel techniques when they receive the information timely through constructive extension dissemination techniques like Information and Communication Technology (ICT) tools (Hoang *et al.,* 2022). The ICT tools refer to a set of technological devices and resources used to receive, store and communicate information. The tools are becoming crucial methods for improving agricultural production across the world (Tiwari *et al*., 2022). The ICT tools mostly used in the extension service delivery include radios, televisions, computers, phones, and the internet. The ICT tools are used to communicate agricultural extension services that include improved inputs, on-farm practices, harvesting activities, post-harvest handling, and marketing information (Mallory *et al.,* 2022).

In Rangwe Sub-County, agricultural technology has been encouraged by the government and private organizations as a crucial method to improve agrarian production. Nevertheless, the percentage of adoption of most of the technologies remains low (Ruzzante *et al.*, 2021). The Sub-County is marked by the low adoption of ICT tools in agricultural extension services delivery among smallholder farmers. The low ICT tools' adoption could be one of the major causes of low cassava productivity, mainly due to the inadequate access to agricultural extension services and improved inputs (Mallory *et al*., 2022). The adoption of ICT tools in agricultural extension requires capital to buy the tools and access the extension

services (Rengaraj & Shibu, 2022). However, the majority of smallholder farmers in the rural localities of the Sub-County have a low-income level, which may translate to inadequate capital. The low adoption of agricultural technology due to inadequate capital restricts agricultural sustainable development in Rangwe Sub-County, Kenya (Kamal *et al.,* 2022).

The smallholder farmers may require agricultural credit to adopt the modern agricultural technologies used in agricultural extension. Agricultural credit refers to funds borrowed for use in agricultural production, processing, and marketing (Moahid *et al*., 2021). The provision of agricultural credit may be one of the major means to overcome financial problems for the farmers. Agricultural credit provides enabling environment and ability for the smallholder farmers to purchase and maintain the ICT tools and subscribes to the extension services (Birke & Knierim, 2020). The types of agricultural credit available to the farmers include seasonal credit, development credit, agri-business credit, and loan size (Ullah *et al.,* 2020). In this Sub-County, there was inadequate information on the level of agricultural credit access, sources of the credit, amount of the credit accessed, and the correlation between access to the credit and the use of ICT tools in the extension services among the farmers. This study sought to fill this gap in knowledge.

2 LITERATURE REVIEW

2.1 Access Level to Agricultural Credit

Access level to agricultural credit is used in this study to mean the percent of smallholder farmers able to receive agricultural credit to be used in farm production. Tiwari, (2022) reported that smallholder farmers require funds to buy ICT tools and maintain them in good working conditions as well as subscriptions for agricultural extension services. However, the majority of smallholder farmers in the rural localities have a low-income level. This condition disadvantaged them when it comes to technology adoption (Ullah *et al.*, 2020). Access to agricultural credit could be one of the major contributions to solving farmers' financial problems. Agricultural credit is used as a method to provide short and long-term financial aid for smallholder farmers. However, the access level was low among the farmers. Some of the farmers were also reported to get less amount of credit (Meena, 2021). Hoang *et al.* (2022) conducted a study and

reported that access to credit has the potential to increase the financial ability of smallholder farmers to use ICT tools in agriculture. Although a few who accessed the credit got a small amount.

Dagunga *et al.* (2020) found that a high rate of access to credit among smallholder farmers is one of the great pillars that improve the adoption of agricultural technologies including the e-extension. The access to the credit was found to be average among the farmers. Ruzzante *et al.* (2021) reported that technology has developed a number of digital financial services that smallholder farmers can access through mobile phones. Examples of mobile financial services with low and high adoption rates included mobile loans, mobile payments, mobile money, mobile banking, and mobile savings (Martinez-Gomez *et al.*, 2022). The access level was not consistent across the farmers interviewed. This provides the gap for a study to determine access levels in other areas, especially in Rangwe Sub-County.

2.2 Sources of Agricultural Credit and Correlation

The Source of agricultural credit was operationally defined in this study as the providers of the credits to farmers. Various agencies are committed to providing agricultural credit to farmers. The credit is categorized based on the source such as institutional and non-institutional agencies (Bernards, 2022). The major sources of credit for agricultural producers include Commercial Banks, Agricultural Credit Institutions, Farm Service Agencies, and Insurance Companies (Meena *et al.,* 2021). Ullah *et al*. (2020) reported that access to agricultural loans from banks enabled smallholder farmers to adopt and use novel agricultural technologies in farming. Odhiambo (2020) also found that farmers who got flexible loans from government agencies were able to buy and use improved inputs such as seeds, fertilizers, and pesticides. Nevertheless, there was inadequate information on the effect of agricultural credit on the adoption of ICT tools in agricultural extension.

In Kenya, especially in Rangwe Sub-County, access to credit from money lending institutions is accredited as a significant accelerator in agricultural technology adoption like the use of ICT tools. The smallholder farmers may access credit from public and private institutions such as banks, farmer groups, friends, and relatives (Sa'adu *et al.,* 2022). Nevertheless, there is limited information reporting on the effect of the access level and amount and sources to agrarian technology adoption. Çetin *et al.,* (2021) found that some of the smallholder farmers who had used mobile phones to share agricultural information

had not received agricultural credit from any source. The effects of credits on smallholder farmers were not uniform across the farmers in various localities. Some literature recorded a positive correlation while others recorded a negative. The contradictions in the correlation between access to credit and technology adoption indicate a gap that this study sought to fill by determining whether access to credit correlates with the use of ICT tools among smallholder cassava farmers in Rangwe Sub-County, Kenya.

3 MATERIAL AND METHODS

3.1 Study Location

This research study was approved by National Commission for Science Technology and Innovation (NACOSTI) in license No. NACOSTI/P/21/14779. The study was conducted in Rangwe Sub-County, Kenya (Figure 1). According to Rangwe Sub-County Ministry of Agriculture Annual Report (2021), the Sub-County has an approximate area of 273.2 km^2 . It is located at a latitude of 0° 34' 30" S and a longitude of 34° 9' 20" E. The Sub-County consists of four administrative wards that include Gem East, Kochia, Kagan, and Gem West. It has a population of 3808 smallholder cassava farmers. The Sub-County receives an average annual bimodal rainfall of about 1150 mm (County Integrated Development Program [CIDP], 2021). The major economic activity is Agriculture; where the majority (60%) of the residents cultivate approximately 86% of the land and grow cassava, maize beans, sweet potato, kales, millet, pineapple, sugar cane, and rice (Cheboi et al*.,* 2021). Rangwe Sub-County was selected in the study because there was low use of ICT tools in agricultural extension despite the effort of the government to promote cassava production and the use of ICT tools in agricultural extension service delivery.

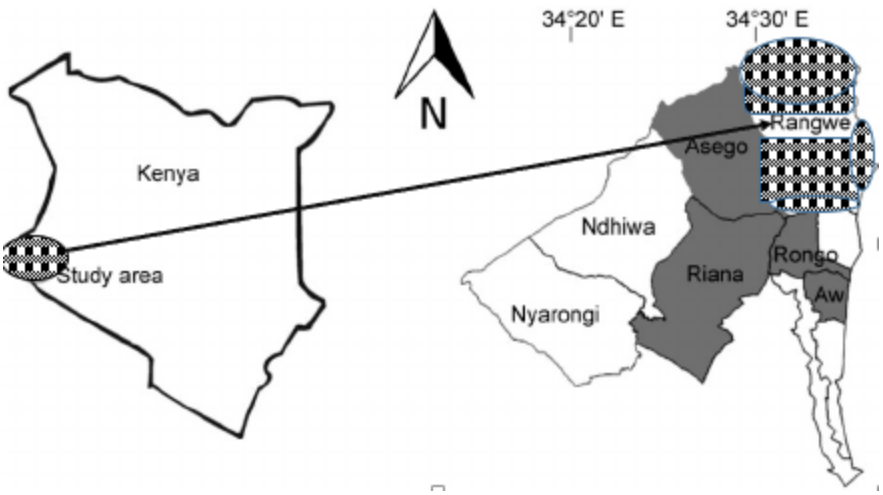

Figure 1: Rangwe Sub-County, Kenya (CIDP, 2021).

3.2 Sampling Procedure and Sample Size

The Sub-County was purposively selected for the study based on the low use of ICT tools among the smallholder cassava farmers. The appropriate number of respondents was arrived at with the aid of the Naissuma (2000) formula as illustrated.

$$n = \frac{\boldsymbol{NC^2}}{\boldsymbol{C^2 + (N-1)e^2}}$$

Where: e = Standard error, *n* = appropriate sample size, N **=** accessed population in the area, C**=** Coefficient of Variation.

$$n = \frac{3025x(0.21)^2}{(0.21)^2 + (3025-1)x(0.02)^2} = 106$$

The study expected 95% confidence (5% sampling error) to obtain an appropriate sample size of SHFs from Rangwe Sub-County.

The study employed a proportionate sampling technique to get respondents' sampling proportion from the four wards in Rangwe Sub-County. The sampling technique was appropriate due to its ability to provide sampling equity. The study also used a simple random sampling method to choose 106 SHFs in the sampling frame.

3.3 Ethical Considerations

This research study ensures numerous ethical considerations which included presenting a research permit to the Rangwe Sub-County Agricultural Ministry, conducting proper self-introduction to the farmers, and explaining the real purpose of the study. The study also respected the confidentiality, anonymity, dignity, norms, and culture of the farmers. Full consent was obtained before the data collection process.

4 RESULTS AND DISCUSSION

The study intended to describe the level of access to agricultural credit, sources of the credit, the approximate amount of the credit received, and the correlation between access to the credit and the use of ICT tools in agricultural extension. The results obtained from this study were analyzed and discussed as follows.

4.1 Level of Access to Agricultural Credit

The results revealed that 68% of the smallholder farmers interviewed had no access to credit, while 32% had access (Figure 2). These results revealed that the majority of the smallholder farmers did not receive any of the agricultural credits. This could mean that the farmers had some constraints that were preventing them from getting the credits. Some of the problems could be the requirement of expensive collateral as a security to get loans, unawareness of the credit existence, penalties when one fails to pay back the loan high-interest rates for the loans, bad myths about the loans, and wrong information concerning the credit. The low percentage receiving the credits could reveal that there is a possibility of accessing the credit. The results supported the findings of Zulfiqar (2020) that the rate of the farmers' access to agricultural credit is low. However, it opposed Odhiambo (2020) that a larger percentage of smallholder farmers are increasingly accessing agricultural loans.

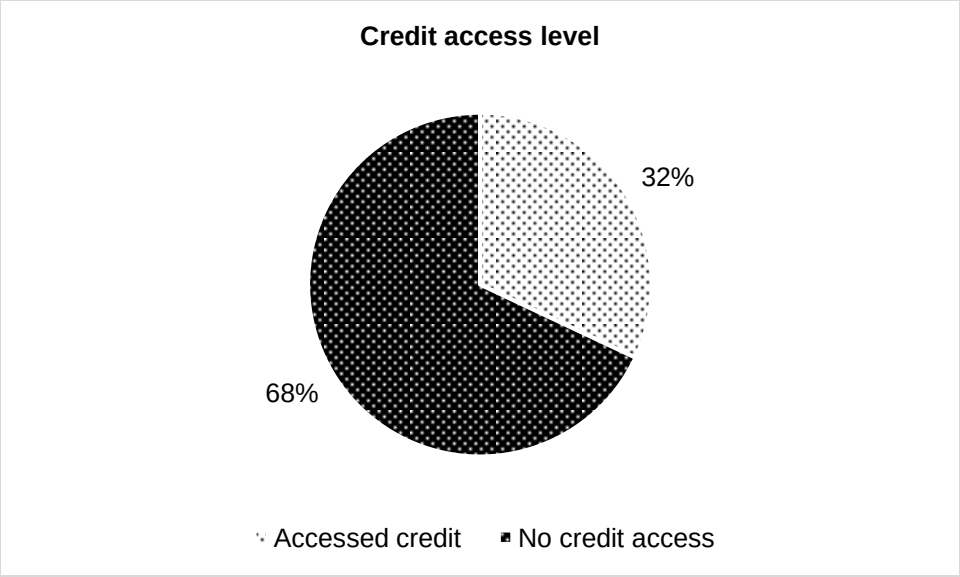

Figure 2: Credit access level

4.2 Sources of Agricultural Credit

The majority (70%) of those who had access to agricultural credit, received the credit from SACCOs followed by 21% who received it from banks then 9% received it from friends (Figure 3). The SACCOs are formed by smallholder farmers to save and borrow money. These results revealed that the SACCOs dominated the agricultural credit sector in the Sub-County. It could mean that SACCOs were more accessible, easy to get loans, and had low-interest rates compared to banks. In addition, there is no collateral required for one to access loans from the SACCOs. This encourages the farmers to join and access the credit when needed. The lowest percentage of farmers getting loans from friends could mean that the source is not reliable. These results concurred with Ullah *et al*. (2020) that smallholder farmers prefer getting loans from SACCOs compared to other sources. However, it opposed Moahid *et al*. (2021) that banks are receiving many loan borrowers due to their reliability.

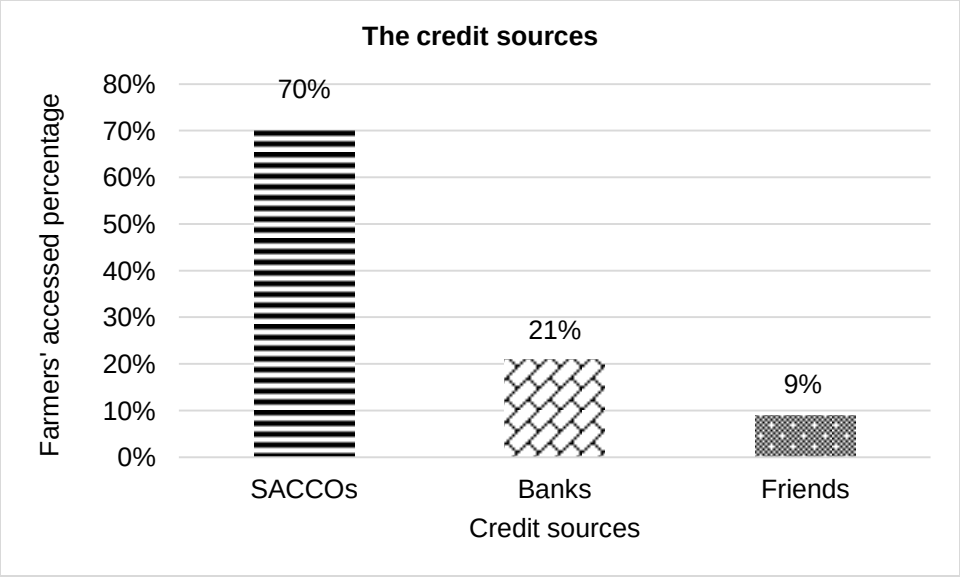

Figure 3: Credit sources

4.3 Amount of Agricultural Credit Accessed Per Year

The majority (68%) of the accessed had received credit amounts less than KES 20,000 per year, followed by 19% who had received less than KES 10,000, and lastly, 13% had received above KES 40,000 (Figure 4). The results revealed that many of the farmers who accessed the credit got the lowest amount. This could mean that the sources of the credit they preferred did not have enough credit to loan. The lowest percentage of the farmers who received the largest credit indicated that the farmers had the inadequate capacity to access huge amounts of loans. This could be attributed to the small nature of the farming enterprise. The results supported (Tiwari, 2022) that the majority of smallholder farmers borrow a small amount of agricultural credit. However, it opposed Moahid *et al*. (2021) that smallholder farmers received huge credit to improve their farming scale.

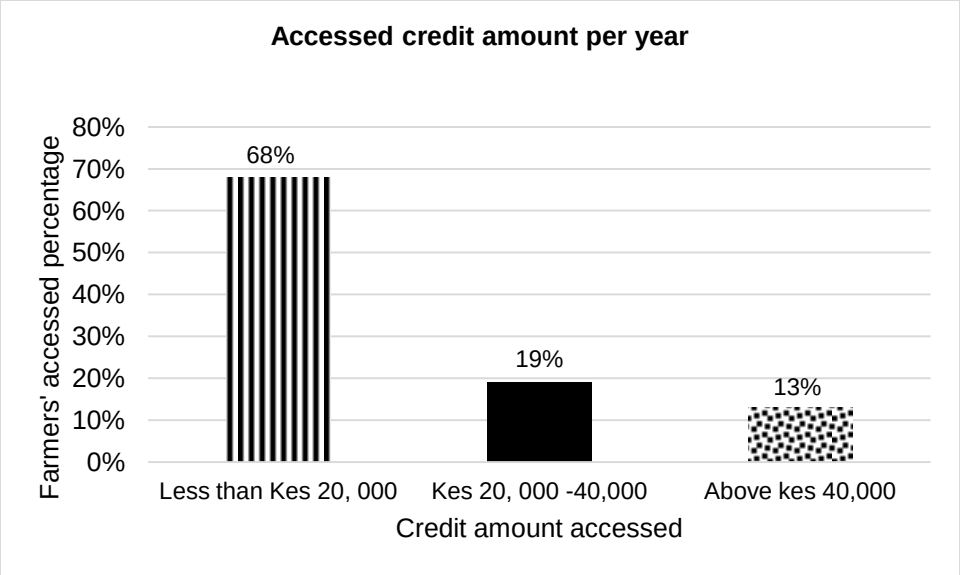

Figure 4: Amount of credit accessed per year

4.4 Access to Agricultural Credit and Use of ICT Tools

Table 1 revealed that out of those who got access to the credit (35 SHFs), the majority (28 SHFs) adopted the use of ICT tools in agricultural extension. On the other hand, out of those who did not access the credit (71 SHFs), the majority did not use ICT tools in agricultural extension services. This could mean that the access to agricultural credit among the smallholder farmers facilitated the use of ICT tools in communicating agricultural extension information. Perhaps the credit complemented their financial muscles to adopt the tools in agriculture. The results supported Ullah *et al.* (2020) that microloans increase the rate of technology adoption and amount of profits from farming among smallholder farmers. Nevertheless, it opposed Akintelu *et al.* (2021) that loans are risky and contribute negatively to technology adoption.

Table 1: Access to the credit and use of ICT tools

		Use of ICT tools		
		No use	Use	Total
Access to credit	No access	61	10	71
	Access	7	28	35
Total		68	38	106

4.5 Correlation between Access to Agricultural Credit and Use of ICT Tools

A Spearman's rank-order correlation was run to determine the relationship between smallholder farmers' access to credit and the use of ICT tools in cassava production. Table 2 illustrates Spearman's correlation of access to credit and ICT tools' usage. There was a moderate, positive correlation between access to credit and the use of the ICT tools, which was statistically significant at 1% level of significance ($R = +.646^{**}$, $P = .000$, $R^2 = 0.417$). Access to credit appears to provide a moderate guide to the use of the ICT tools as it predicts 42% of the use of the ICT tools in cassava production. The remaining (58%) unexplained variance may involve other variables. The use of ICT tools increases with an increase in access to training. The results concurred with the findings of Ullah et al. (2020) who also confirmed a relationship between access to credit and the use of technologies. However, it contrasted with the findings of Akintelu *et al.* (2021), who stated that access to credit did not influence its use

Table 2**:** Spearman's correlation of access to credit and ICT tools' usage

Number of the respondents	Correlation coefficient (R)	Sig. (2-tailed)/ P-value	R^2
106	$+0.646^{**}$	0.000	0.417

*Note: ** indicates correlation is significant at the 0.01 level (2-tailed)*

5. CONCLUSION

There was a low access level to agricultural credit with the lowest amount received. The most preferred source of credit was SACCOs. The study also confirmed that there was a statistically significant relationship between access to credit and the use of ICT tools among smallholder cassava farmers in Rangwe Sub-County, Kenya. The smallholder farmers who accessed the cred were 42% more likely to use ICT tools than those with no access. This could be because credit increases the financial ability of the smallholder farmers to spend on the use of ICT tools.

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