

# Technological Factors and Utilization of Formal Financial Services by Smallholder Farmers in Kenya

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**Abstract:** Financing agriculture has become a critical service in enabling the full realization of the agricultural sector's potential. The allocative efficiency of financial services provided by financial institutions in Africa to the agricultural sector remains low. Further, several institutions aimed at facilitating small holder farmers' access to credit have failed to deliver it at the right time and in the right proportions. Nevertheless, in the advent of new financial regimes and innovations such as financial technology, the uptake and utilization of financial services among the small holder farmers in Kenya was expected to increase. This, however, has not been the case. Hence this study which sought to determine the influence of technological factors on the utilization of formal financial services among small holder farmers. The target population for this study was small holder farmers from Nakuru, Busia and Kirinyaga Counties in Kenya. A study sample size of 496 small holder farmers was obtained through purposive and stratified random sampling techniques. Data was collected using researcher developed questionnaire. Quantitative data was analyzed using multiple linear regression analysis with the aid of stata. The findings revealed that technological factors did not have any significant effect on utilization of formal financial services among small holder farmers. This was because the farmers were yet to appreciate and fully take advantage of technology enabled financial services to increase their levels of inclusion. From the findings of the study, the recommendations were that at the national level, policy makers should encourage more investment in the digitalization of small scale farming activities so as to encourage more technology adoption.

**Keywords:** Technology, Financial Inclusion, Formal Financial Services, Smallholder Farmers

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## 1. Introduction

### 1.1. Background of the Study

Financing agriculture has become a critical service to enable the full realization of the sector's potential. Agricultural finance refers to financial services including savings, insurance, transfers and loans, potentially needed to power and steer the agricultural sector, that is, financing of farming and farm related activities including input supply, processing, whole - selling and marketing. Most of these activities are conducted in rural areas, in addition to large processing facilities and agribusinesses as well as largely subsistence-level smallholders located in urban and peri-urban areas [1]. Financial services provided by formal and informal financial institutions in Africa allocate approximately five (5) percent of domestic resources to the

rural and agricultural sector hence affecting capital investment by smallholder farmers that could facilitate credit to buy seed, fertilizer and other equipment during planting season. However, in many cases this is not the case, to the extent that many interventions aimed at facilitating farmers' access to credit have failed to deliver it at the right time and in the right proportions. [1], expounded on this concern by stating that except in the case of double or triple cropping, credit obtained after harvest does not directly solve the seasonal need for working capital to plant a new crop. Financial institutions' low presence in rural areas reflects the risk profile of the agricultural sector that is frequently not fully understood and often informal in nature. However, efforts to finance agriculture in the past in Kenya have been focused on large scale farming and even these have failed leading to abandonment of the financing schemes. For small scale farming which have been virtually excluded from the

mainstream financing, financing still presents a considerable challenge despite the financial revolution taking place in the country. Most of them have demonstrated comparably low utilization of formal financial services against other sectors.

It is imperative to understand the distinction between access to financial services and usage of financial services as a critical way of comprehending the level of financial inclusion. Access to financial services implies the absence of obstacles to the use of these services and the possibility to use it, whereas, usage of financial services means actual use of financial services [2]. Access is different from use in the sense that all those who have access need not necessarily use formal financial services [3]. Moreover, usage which goes beyond the basic adoption of banking services, usage focuses more on the permanence and depth of financial service besides the use of the financial product. Hence determining usage requires more details about the regularity, frequency, and duration of use over time. To measure usage, it is critical that information reflect the user's point of view, that is, data gathered through a demand-side survey. To conclude, impact measures the changes in the lives of consumers that can be attributed to the usage of a financial device or service. Comparative data on farmers who received payments from the agricultural products among the middle level income economies shows that Kenya seems to be trailing behind and has not fully utilized the financial Institutions to receive payments which stand 12.5%, compared to Cash at 94% and Mobile Phone at 30.4%. Comparative data on the usage of financial institutions to receive Agricultural products remittances shows Ghana is at 5.8%, South Africa at 35.6%, Nigeria at 16.5% and Botswana at 17.9% among the selected African Countries [4]. This raises a lot of concern about the low level of usage of financial institutions by the Agricultural sector in Kenya.

### **1.1.1. Financial Technology**

Technology usage in finance has been rapidly increasing in the developing world - Kenya included - in the last two decades. A growing number of sections of Africa have encountered noteworthy advances in monetary consideration, utilizing computerized money related administrations and portable budgetary administrations [5]. Computerized innovation assumes a basic part in the day to day lives of numerous, especially needy individuals in developing countries. Digital financial services provide the means to overcome such obstacles, and can contribute to national economic growth and financial inclusion. Digital finance has been internationally regarded as an adequate means of providing opportunities to promote financial inclusion through reduction of costs of providing these services [6]. Advanced account administrations are an inexorably turning into an essential part of the nexus amongst improvement and money related consideration. The utilization of computerized money related administrations has become essential of late among numerous individuals who have practically zero past involvement with formal monetary administrations [7].

The expansion of digital payment platforms has offered

the opportunity to link poor people with providers of savings, credit, and insurance products [8]. Further, advanced account administrations developments and business sector improvements have opened open doors for lower-salary individuals with deficient money related administration choices [9]. In Kenya, digital financial services have been a runaway example of overcoming adversity and the entrance to a formal budgetary administration enhanced from 19% in 2006 to 67% in 2013, which corresponds with the ascent of computerized money related administrations in Kenya. A large portion of the country tenants in Kenya have replied that they have used either or a blend of monetary administrations that is banks, funds and credit co-agents, microfinance establishments, computerized monetary administrations suppliers or casual gatherings [10], Kenya has made critical steps in progressing monetary incorporation as of late, as confirmed by an increment of 33 percent in the level of record infiltration at a formal budgetary foundation or portable cash supplier somewhere around 2011 and 2014. Rampart of the advancement in Kenya's monetary incorporation scene has been credited to the nation's energetic versatile cash biological system, which includes extraordinarily large amounts of take up [7]. However, the impact of these innovations in financial access on the small holder utilization of formal financial services in Kenya has not been established.

### **1.1.2. Small Holder Farmers**

There is no universally agreed definition of family farms, most definitions are purely for analytical purposes or for implementation of government programs. The common denominator in most definitions considers the aspects of use of family labor and the farm managed by the family [11]. Existing definitions of smallholder farming tend to obscure important differences between households engaged in agriculture. In the past the common term for small-scale farmers who rely mostly on household labor, and who sell at least part of their produce for cash, was 'peasant', and this is still a key term for some analysts [12]. In most developing countries including Kenya, small holder farmers are defined based on various attributes comprising firstly, the level of production: They produce small volumes of produce mainly for household consumption and income. Secondly, they have small plot/farm sizes. Lastly, they mainly depend on family labor. Out of these however, size of land is the most commonly used. FAO's criterion of plot size is widely used, with 'smallholder farmers' being those who farm plots of 2 hectares or less. This is according to survey data from Ghana, which showed farm size as the classification variable, and defined small holders as farmers who operate farm size smaller than 10 hectares and greater than 0.1 hectares ("virtually landless"). [13].

### **1.1.3. Financial Services Utilization Among Small Holder Farmers in Kenya**

The information in table 1 shows the access of formal financial services based on livelihood in Kenya. It depicts that those who access formal financial services (Commercial

Banks) and derive their livelihood from “Agriculture” are 31.8%, compared to “Employed” at 78.9%, “Own business” at 57%, “Casual” 32.1%, “Dependents” 30.3% and others 29.8%. This shows that the access levels of farmers, majority of whom are in the rural areas, is still low. The access to other financial services (Saccos, Mobile money) is high among the farmers at 36.4% compared to those in

employment (17.2%) and those who own businesses (29.4%). Besides, the percentage of farmers accessing informal financial services is 9.2%, which is the highest compared to other players. The picture is even dim when you consider that those farmers excluded from financial services are at 21.7% compared to those in employment at 2.6%.

*Table 1. Access Strand by Livelihood in Kenya (%).*

Access	Agriculture	Employed	Own business	Dependent	Other	Casual
Formal prudential	31.8	78.9	57.0	30.3	29.8	32.1
Formal non-prudential	36.4	17.2	29.4	33.6	15.3	39.5
Formal registered	0.9	0.1	0.1	0.4	0.0	0.3
Informal	9.2	1.2	6.3	8.5	3.3	7.8
Excluded	21.7	2.6	7.2	27.2	51.6	20.4
Total	100.	100.	100.	100.	100.	100.

Source: Fin Access (2016)

The information in table 2 below is about usage of financial services. As shown, the uptake of formal financial services from banks indicate that people who earn their living from Agriculture are trailing at 26% compared to those who are employed (77.2%), casual laborers (29.8%), owners of businesses (51.5%), dependents (27.4%), and others (51.2%). Among the users of mobile bank accounts, Agriculture is 9.9%, Employed is 32.4%, Casual labour is

16.9%, own business is 25.4%, Dependent is 11.9%, and others are 26.9%. Comparing other formal financial services like pension and insurance shows that Agriculture lags behind in utilization of formal financial services. It therefore means that the formal financial sector tends to be tilted away from those who derive their livelihood from agriculture since they have low uptake of formal financial services.

*Table 2. Usage of Financial Service Providers by Livelihood in Kenya (%).*

	Agriculture	Employed	Casual labour	Own business	Dependent	Other
Bank usage (overall)	26.0	77.2	29.8	51.5	27.4	51.2
Mobile bank accounts	9.9	32.4	16.9	25.4	11.9	26.9
Banks (excluding mobile bank accounts)	21.2	71.7	20.5	42.5	21.3	47.5
SACCO	12.8	38.0	4.8	12.8	3.4	17.0
Mobile financial service	64.6	93.2	68.2	83.7	59.8	57.7
Microfinance	2.9	4.0	1.8	7.2	2.6	5.4
Insurance	17.8	66.5	13.4	27.6	11.1	27.6
Pension	5.4	53.8	8.8	9.1	3.5	15.1

Source: Fin Access (2016)

## 1.2. Statement of the Problem

From the foregoing, smallholder farmers in Kenya face many challenges in accessing financial services including limited access to financial markets. However, many reforms have been undertaken by the government and donor communities including financial sectors but rural farmers have remained in poverty with limited access to safety nets like loans to mitigate against hunger and disease. Farmers’ access and efficient utilization of credit finance is imperative in increasing farm productivity and reducing poverty levels in agrarian societies. In view of the low utilization of formal financial Services by the smallholder farmers in Kenya, there is need to determine suitable financial inclusion approaches that could raise the level of utilization of the formal financial services among the small holder farmers and hence increase the productivity in the agricultural sector. Whilst significant advances have been made in financial technology products, their penetration and usage among small holder farmers in utilizing financial services remains unestablished. Therefore, the study sought to determine the influence of technological

factors on the utilization of formal financial services among small holder farmers.

## 1.3. Objective of the Study

The objective of the study is to determine the influence of technological factors on the utilization of formal financial services among small holder farmers.

## 1.4. Research Hypotheses

$H_0$ : There is no significant relationship between technological factors and utilization of formal financial services by smallholder farmers

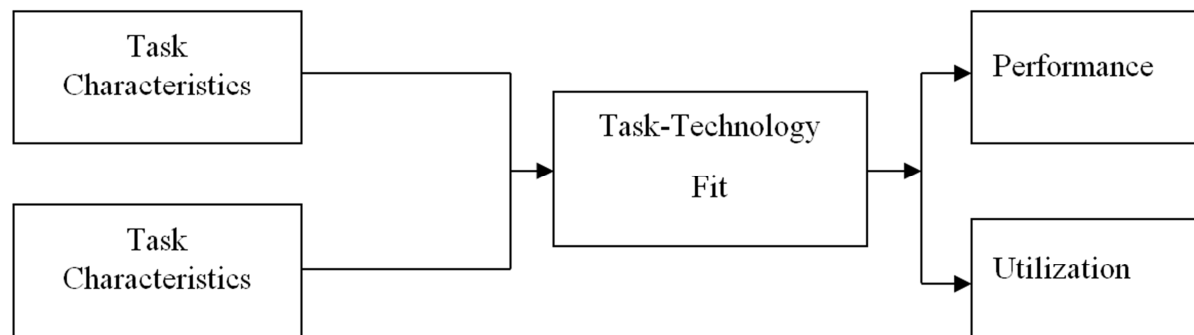
# 2. Literature Review

## 2.1. Task Technology Fit (TTF) Theory

It is recorded that positive impact on individual performance is more likely if the capabilities of information communication and technology (ICT) match the tasks that

the user must perform (Goodhue & Thompson, 1995). The factors of interest in measuring task-technology fit include floatability, authorization, and compatibility, ease of use/training, production timeliness, systems reliability and relationship with users. Figure 1 below depicts a Task Technology Fit model, whereby, the success of an

information system is dependent on the fit between task and technology. This success could be individual performance [14] or group performance [15]. Task-technology fit has been shown to be generally relevant for mobile information systems [16].



Source: Goodhue and Thompson (1995)

**Figure 1.** Task-Technology Fit Diagram/Schematic of Theory.

Studies on mobile information system technology have focused mainly on the functionality that is provided by the technology, paying less attention to the context in which the technology is being used [17]. Non-functional features, such as weight and size, play a more prominent role in mobile than in non-mobile use contexts [18, 19], while functional requirements may shift depending on whether the business context is mobile or non-mobile [16, 17, 20]. Observable changes of business tasks with respect to technology requirements, require the assessment of the applicability of the theory of task-technology fit to mobile technologies and mobile use contexts, and careful determination of the needs for theory adjustments and extensions [21, 22].

There exist a very high awareness of mobile phone-based money transfer services among the smallholder farmers and that there is predominant use of remitted funds for agricultural related purposes (purchase of seed, fertilizer for planting and topdressing, farm equipment/implements, leasing of land for farming, wages for labour) [23]. The study however, concludes that there is need to expand the coverage of MMT services in rural areas since it resolves an idiosyncratic market failure that farmers face namely access to financial services. [24]. The share of commercial banks' loans to agriculture has been very low compared to manufacturing, trade, and other services sectors, hence affecting expansion and technology adoption. This study will therefore consider the impact of technology on utilization of formal financial services by the small holder farmers [24].

## 2.2. Effect of Technology on Utilization of Formal Financial Services

Penetration of financial services has risen, and there is need to address the take-up of mobile finance applications that move beyond mobile transfers to encompass mobile payments and account-based services, thus addressing a broader range of financial needs. Mobile networks can

support the financial needs of poor and marginalized groups, if those who do not own phones, or lack access within their immediate vicinity are helped to access. Research into more innovative, intermediated solutions, effective participation and inclusion of appropriate community-based groups in mobile financial services is necessary. [25]. Mobile finance applications is 'transformational' since they target the currently unbanked populations, leading to greater financial inclusion [26].

Mobile-phone-based money-transfer service - 'M-PESA'- owned by Safaricom is widely used by many Kenyans [27]. By the year 2009, Safaricom's M-Pesa network has approximately 9,000 agents [28], compared with the bank network of 996 branches [29]. A study investigated the capacity of the mobile technology in their ability to cause transformational shift in the Kenyan market and whether there is evidence that this expansion is overcoming barriers to access by the previously unbanked population such as employment, gender, age, education and location. The M-Pesa was reportedly perceived not as a substitute but as more of a complementary service to core banking services. Can this complementarity be harnessed to enhance access for the unbanked, given that the core financial services exhibit strong entry barriers? [30].

Sorensen conducted a study of the effect of agency banking on financial inclusion in Kenya. Secondary data was used for this study since it was easily accessible, cheaper and accurate due to the regulations around submissions by Central Bank of Kenya. The study concluded that agency banking has the effect of increased financial inclusion in the country significantly [31]. The research found that the levels of financial inclusion are low and that there is a notable gap not bridged by formal banking framework. It further notes that agency banking is facing a lot of challenges from the increase in mobile penetration in the country and mobile money transactions. However, the study did not put into consideration

the primary data. [32], analyzed the impact of mobile money use among smallholder farm households. The factors influencing the adoption of this innovation was analyzed with a probit model while impact was analyzed using panel models. The findings suggested that mobile money services can be welfare-enhancing for smallholder farm households, who constitute the majority of the rural poor. In Kenya, mobile money also seems to be widely accessible.

A study carried out by Mitchelle on the effect of digital finance on financial inclusion in the banking industry in Kenya. The Research design used was descriptive statistics. Target population for this study comprised of 44 banking institutions in Kenya, of these 43 were commercial banks and 1 was a mortgage financial institution as at 31<sup>st</sup> December, 2015. The study used a sample of 13 banking institutions in Kenya. However, the study was only limited to the banking sector. Findings of the study found an insignificant negative relationship between agency banking measured in terms of the number of agents, mobile banking measured by the number of mobile banking transactions and internet banking measured in terms internet banking transactions with financial inclusion in the banking industry in Kenya. The study concluded that digital finance doesn't have any correlation on financial inclusion in banking sector in Kenya since banking institutions adopt digital financial services to lower operating cost associated with opening and operating branches to improve their profitability and financial performance and not to foster financial inclusion. The study recommended that to ensure the usage and adoption of digital financial services banks should create more awareness of such services and offer them at lower cost to enhance their usage [33].

### 3. Methodology

The study adopted a cross-sectional survey research design since it allowed the collection of data from several cases in different contexts at the same time while ensuring that a variety of views over the same issue are captured in a short time increasing the external validity of the study. The study covered smallholder farmers from Nakuru, Kirinyaga and Busia Counties in Kenya. These locations are within the same Livelihood Zones. Livelihood zones are areas within which people share broadly the same pattern of livelihood, that is, the same production system - agriculture or pastoralist as well as the same patterns of trade and exchange [34]. Nakuru County falls within the Highland Tropics, the county is one among those that harbor many different cropping and livestock activities and is viewed as the bedrock of food security in Kenya. An estimated 80% of residents depend on agriculture for their livelihoods, with major farm enterprises among smallholder farmers being maize, beans, Irish potatoes, pyrethrum, vegetables, zero grazed dairy cows, sheep and goats. It serves as a representative cosmopolitan agricultural county. Kirinyaga County is a county in the former Central Province of Kenya. Agriculture is the backbone of County's economy, with a

mix of agro and livestock farming. Busia County in the former Western Province is the gateway to Kenya from neighboring Uganda. Agriculture is the main economic activity in the county among the small scale farmers, with production of maize, beans, groundnuts, cassava, sorghum, vegetables and fruits.

In this study, the population includes small holder farmers from three counties in Kenya. The Target population of 2,875,325 comprised smallholder farmers from Nakuru, Kirinyaga and Busia Counties. In sampling small holder farmers, a simple random sampling approach was used. In the first stage, a purposive sample of three counties of Nakuru, Kirinyaga and Busia was made and a selection of two Sub-counties in each County done. In stage two, a stratified proportionate to size random sampling (sampling proportionate to the total number of farm families per county) was made for Nakuru, Kirinyaga and Busia respectively. The counties therefore, formed the strata. Finally, in stage three, the smallholder farmers in each sub-county were selected through snow-balling. A total of 496 smallholder farmers were selected in Nakuru, Kirinyaga and Busia counties. Data was collected using copies of a researcher developed semi-structured questionnaire which were administered to randomly selected small holder farmers. Descriptive, correlation and multiple linear regression analyses were then conducted using SPSS software in order to address each study objective.

## 4. Results and Discussions of Findings

### 4.1. Introduction

The response rate for the instrument is given in Table 3.

*Table 3. Response rate among respondents.*

County	Target	Achievement	% Achievement	Variance
Busia	99	113	114	0.14
Nakuru	214	292	136	0.36
Kirinyaga	71	91	128	0.28
Total	384	496	129	0.29

The initial sample for the study was 384 small holder farmers. However, a total of 496 respondents were interviewed across the three agrarian counties of Nakuru (58.9%), Busia (22.8%) and Kirinyaga (18.3%). Ideally, the target sample comprised of 384 small holder farmers and these results indicate a 129% achievement rate, which is over and above the target (Table 3). This high response rate could be attributed to good logistical preparations prior to and during the field work by the research team, which enhanced social acceptability of the enumerators by potential respondents and facilitated their movement in the study sites.

### 4.2. Financial Technology Adoption

The study first sought to establish the levels of mobile phone ownership among respondents and presents the results in Table 4.

**Table 4.** Mobile phone ownership among respondents.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	475	95.8	95.8	95.8
	No	21	4.2	4.2	100
	Total	496	100	100	

The respondents were asked if they own a mobile phone. The results show that 95.8% of the respondents own a mobile phone. This falls within the same range of 96% as put by the communication commission of Kenya [35]. Those without a mobile phone are 4.2%. An analysis of a survey of mobile phone ownership and usage across Kenya in 2009 showed that distinct regional, gender-associated, and socioeconomic variations existed with mostly low ownership among rural communities and poor people [36]. The most recent studies have shown that the gap between those with Mobile phones and

those without seems to have narrowed in Kenya as compared with other regions. [37], suggest that mobile phones could go a long way toward helping to surmount some of the barriers that hinder unbanked adults from accessing financial services. The implication of having a mobile phone is beneficial since it brings within reach a wider range of financial services through mobile based money platforms.

There was also need to establish the perceived benefits of technology among the small holder farmers. The results are presented in Table 5.

**Table 5.** Perceived benefits of technology.

Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	$\chi^2$	$p > \chi^2$
Technology is good for making life easy	0.4	0.4	2.8	58.5	37.9	710.13	0
Technology changes too quickly for me to keep up	5.8	25	26.8	37.3	5	197.11	0
I do not like learning how to use new technology	32.9	40.9	18.1	6	2	278.98	0
I like to learn about new ways technology is being used	1.4	5	19.4	46.4	27.8	328.94	0
I would feel disconnected without technology	2.8	3	4.8	50.2	39.1	518.46	0
Using technology is one of my favorite things to do	1.8	8.3	30.4	42.5	16.9	271.54	0
Technology enables me keep in touch with my friends and family	1.4	0.8	2.4	46.6	48.8	634.38	0
Technology makes me worry about the privacy of my information	16.5	15.9	17.3	38.1	12.1	105.63	0
Technology makes it easy for me to easily access information regardless of where I am	1	1.6	5.4	50.6	41.3	570.98	0
Technology has had little impact in my life	71.2	17.1	6.5	3.8	1.4	847.43	0

Although Majority of respondents (58.5%) agree that technology is good for making life easy, they also agree (37.5%) that it is changing too quickly for them. 40.9% respondents seldom do not like learning on how to use new technology. Similarly, 46.4% of the respondents often like to learn about new ways technology is being used. Whereas 50.2% of respondents would often feel disconnected without technology, 42.5% of the respondents often prefer Using technology as one of their favorite things to do. 46.6% of the respondents indicate that technology often enables them keep in touch with their friends and family 38.1% of the respondents said that technology makes them worry about the privacy of their information 50.6% of the respondents

Technology makes it easy for them to easily access information regardless of where they are. 71.2 % of the respondents pointed strongly disagree that technology has had little impact their lives. These findings suggest that respondents were slow in embracing the use of technology to enhance utilization of formal financial services.

### 4.3. Utilization of Formal Financial Services

The respondents were also asked to rate their levels of utilization of formal financial services offered by their banks. The results are presented in Table 6.

**Table 6.** Utilization of formal financial services.

Utilization of formal financial services on	Most frequently	Frequently	Moderate	Seldom	Never	$\chi^2$	$p > \chi^2$
Deposits	10.6	45.8	36.7	6.4	0.4	211.83	0
Cash withdrawals	9.1	43.9	36	10.6	0.4	187.55	0
Accessing loans	1.1	4.2	18.9	7.6	68.2	407.02	0
Input loan	1.9	5.3	1.9	90.9	0	612.46	0
Insurance	0.4	2.3	1.1	2.3	93.9	902.40	0
Financial Literacy	0.4	2.7	6.8	1.9	88.3	771.76	0
Investment Opportunities	0.8	1.9	4.5	2.7	90.2	813.01	0
Safe documents	0	0.4	1.5	3	95.1	691.79	0
Pension	1.1	2.3	0.8	0.8	95.1	930.21	0

The results show that majority (45.8%) of the respondents frequently utilize of formal financial services for saving. This is in line with the study which found out that basic savings products, eliminating account opening costs in Kenya significantly increased uptake, overall savings, and investment levels among market vendors [38]. Overall, savings accounts for low income households demonstrate strong potential to improve client welfare. Often the beneficial impacts of savings accounts require account features that help people overcome behavioral biases such as fortifying willpower and memory. The findings also indicate that most of the respondents had never accessed loans from their banks (68.2%).

Most of the other services are largely never or seldom used; 90.9% of the respondents seldom Input loans. The respondents who never use Insurance services are 93.9%, This is in line with the study by, Karlan et al., which argued that despite the potential of insurance products to provide a “risk floor” for farmers and encourage higher productivity investments and behavior, uptake at market prices is extremely low so micro insurance is not at scale anywhere except when heavily subsidized by government [39]. There was also poor uptake of financial literacy services 88.3% Investment Opportunities 90.2%, safe custody of documents 95.1%, and Pension 95.1%. The results show the need for increased used of formal financial services. Despite the fact that financial inclusion begins with having an account, its rewards stem from actively using that account in the management of risk, utilizing it for savings and making or receiving payments from the account. This study implies therefore, that there is need to increase account ownership as

well as assist people who have accounts make better use of them by accessing services.

#### 4.4. Factor Analysis for Technological Factors

The factor analysis for technological factors results are presented in Table 7.

Table 7. Technological factors.

Technological factors	Initial	Extraction
Use of Mobile phone in Depositing	1	0.904
Use of Mobile phone in Withdrawals	1	0.909
Use of Mobile phone in Paying for utilities like electricity, water	1	0.687
Use of Mobile phone in Buying goods	1	0.641
Use of Mobile phone in Paying fees	1	0.165

In the independent variable, technological factors, the variable indicator with highest factor loading was Use of Mobile phone in withdrawals resulted to increased utilization of formal financial services” with factor loading of 0. 909 While the item with the lowest factor loading was Use of Mobile phone in paying fees with factor loading of 0.165. This item was dropped from the analysis. The remaining four items were therefore retained for further analysis.

#### 4.5. Regression Analysis of Technological Factors on Financial Utilization Among Farmers

Bivariate regression analysis was used to determine the relationship between the independent variable and all the dependent variable in the three counties; Busia, Nakuru and Kirinyaga. The results are summarized in Table 8.

Table 8. Regression Coefficients.

County		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Busia	(Constant)	-0.8412	0.5597		-1.503	0.1378
	Technology Factors	-0.0076	0.0063	-0.0830	-1.2151	0.2288
Nakuru	(Constant)	-0.6776	0.6169		-1.0983	0.2745
	Technology Factors	-0.0095	0.0070	-0.0934	-1.3546	0.1784
Kirinyaga	(Constant)	-1.9131	3.0311		-0.6312	0.548
	Technology Factors	0.0430	0.0433	0.3159	0.9927	0.3539

The results in Table 8, technological factors were found not to be significant in all the three counties leading to the acceptance of the hypothesis;

*H<sub>04</sub>: There is no significant relationship between technological factors and utilization of formal financial services by smallholder farmers*

Imperatively we now state that technological factors did not significantly affect utilization of formal financial services by smallholder farmers in the country. This finding was consistent with that of mitchelle concluded that digital finance doesn't have any correlation on financial inclusion in banking sector in Kenya since banking institutions adopt digital financial services to lower operating cost associated with opening and operating branches to improve their profitability and

financial performance and not to foster financial inclusion [33]. The insignificance of technology factors in the model could also be explained by Simiyu *et al* who observed that access to MMT has had both negative and positive implications for gender roles and the former may prove a social cost to innovation [40].

## 5. Conclusions and Recommendations

### 5.1. Conclusions

Technological factors were found not to have any significant effect on utilization of formal financial services among small holder farmers. Technology was, however, found to be insignificant in all model estimations across the three counties. Other findings had revealed that majority of

the respondents were not able to cope with the rapidly changing technologies and this lowered their appreciation of technology making them slow to adopt the technology for utilization of financial services. Hence, technology could not have a significant impact on their utilization of formal financial services most of which were now being operated on a technology platform. This was because the farmers were yet to appreciate and fully take advantage of technology enabled financial services to increase their levels of inclusion.

### 5.2. Recommendations

The current research established the effect of financial inclusion on utilization of formal financial services of smallholder farmers in Kenya. The moderating role of the informal financial services was also explored.

It emerged from the findings that the farmers' appreciation of technology for financial services was low. This was due to the fact that technology was evolving rapidly and they could not keep pace. Therefore, the study recommends that the financial technology (FinTech) firms come with simplified applications that are relatively stable over a long time and that are easy to migrate to so as to encourage farmers to subscribe to them. At the national level policy makers should encourage more investment in the digitalization of small scale farming activities so as to encourage more technology adoption.

### 5.3. Limitations of the Study

While this study produced meaningful results, it was prone to several limitations which in turn provide avenues for further research. First, the study focused only on three Counties of Busia, Nakuru and Kirinyaga. A study based on three counties limits the generalizability of the results across all Counties. Although industry and area specific research enhances internal validity, consideration should be taken when generalizing to other sectors and the population. Secondly, the variables included in the conceptual framework are not complete. Other factors could provide more insight on the effect of financial inclusion on utilization of formal financial services of smallholder farmers in Kenya.

Thirdly, the results of this study are based on self-reported data of the smallholder farmers. Though they are quite reliable, information that is generated by respondents is not the only source of information that can explain their levels of utilization of formal financial services. At the same time questionnaire and interview schedules though good tools for data collection, panel data could yield more information. Fourthly, the undertakings by smallholder farmers have long term effects that can only be evaluated through a study for the same smallholder farmers for a long period of time. As this study used a onetime response on the questionnaire is used to assess their perspective of the issues under study, a longitudinal study on the impact on the utilization of formal financial services would yield more results.

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