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Socio Economic Characteristics Enhancing Farmers' Use of Mobile Phones to Access Agricultural Information in Tanzania

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Abstract

This paper sought to address the effect of farmers' socio-economic characteristics on their use of mobile phones to access agricultural information. Largely, literature acknowledges that information is becoming an important ingredient in agriculture. Similarly, literature reports farmers in Tanzania lacking access to agricultural information something which greatly constrains efforts to improve agricultural development. One good thing is that, mobile phone technology which is ubiquitously being subscribed to in Tanzania is believed to have the potential to address information irregularities in various business setups including in agriculture. The question a researcher asking why farmers in Tanzania not fetching the potential mobile phones offers for agricultural development. Through face-to-face approach, 240 individual respondents were interviewed. A regression analysis ruled out variables that significantly influenced farmers' use of mobile phones to access agricultural information, including their; age, marital status, literacy levels, farming systems, farm size, income levels, sources of agricultural information, awareness, type phone owned whether featured or simple phone, frequent of contact with other sources, skills in using mobile phones to access agricultural information, supports from others, scale of production and distance from market. The study concludes that; the named variables above have an influence on the use of mobile phone to access agricultural information. Therefore, we recommend that, whatever efforts meant to address the need for mobile phone application in agriculture by farmers, one must consider such variables before embarking on other capabilities.

Keywords: Socio-economic characteristics, mobile phones, access to agricultural information

1. Introduction

1.1 Background information

There is a far reaching hope in literature that mobile phone technology has a wide range of applications in various business activities (Michael et al. 2016; Sylvain *et al*., 2017; Wu and Wang, 2005; and Frempong *et al.* 2008). Good enough, in Tanzania subscription of mobile phone technology is ubiquitously with plenty of opportunities. However, it is largely acknowledged that, worldwide rural Tanzanians still suffers the problem of accessing information that could help in making timely and accurate farming decisions (Anandaraja *et al*, 2006). This means, farmers in Tanzania are not fully making use of the technology in their farming business. Most farmers who have mobile phones only use them as a social communication tool. As a result, many farmers lack access to the services that mobile phones offers that could have improved their farm productivity.

The overall objective of this study was to determine farmers' characteristics that influence their use of mobile phones to communicate agricultural information. So, this paper presents details of the dynamics in socio-demographic characteristics amongst farmers and the way(s) they influence farmers' use of mobile phones to communicate agricultural information. The findings of the study shade light to planners and other development associates to follow

on these characteristics when trying to engage farmers in using mobile phones to communicate agricultural information. Based on the situation, the researcher strived to answer the following research question:

How socio-economic characteristics influence the use of mobile phones in accessing agricultural information?

1.2 Theoretical framework

This study is explained through innovation-diffusion theory (Rodgers, 2003) which is also referred to as Rogers' innovation diffusion theory. The theory explains adoption process and the determinants of technology adoption. With regard to technology adoption, the underlying assumption of the innovation-diffusion theory is that the technology could be both technically and culturally sound but adoption may be hampered by one's behavioral jurisdiction (Shampine, 1998). This implies that, adopters' characteristics might largely determine the adoption behavior of an adopter unit. Therefore, understanding the influence of farmers' characteristics on adoption and use of mobile phone technology in farming is essential as it inform why the adoption and use may be slow at times across individuals. So far is not clear how farmers' characteristics have an influence on the use of mobile phones to communicate agricultural information.

1.3 Literature review

1.3.1 Mobile phone coverage, adoption and usage in the Africa

While infrastructure investments still remain low in many developing countries, one of the most dramatic changes over the past decade has been an increase in mobile phone coverage and adoption. The number of mobile phones per 100 people in developing countries often exceeds access to other information technologies, such as landlines (Jensen 2010), newspapers and radios (Aker and Mbiti 2010). In sub-Saharan Africa, for example, less than 10 percent of the population had mobile phone coverage in 1999, increasing to over 60 percent of the population in 2008 (Aker and Mbiti 2010). Coinciding with this growth in coverage has been an increase mobile phone adoption and usage, even in some of the world's poorest countries. Yet, due to high prices of advanced mobile equipment and poor infrastructure in rural areas of the developing countries, the use of mobile technology is still limited. In Africa for example, according to Ramburn and van Belle (2011) and Beuermann *et. al*.(2012, even in Mauritius which has one of the most sophisticated cellular markets in Africa, advanced mobile data services (apart from SMS) have still not entered the lives of most mobile subscribers. A survey conducted by Souter *et al*. (2005) in Tanzania, India and Mozambique presents some empirical data, relating to the use of mobile phones in these countries. The results show the importance of information to people's livelihood and general well-being, ranging from information about family members, information related to crops management, market prices, government and legal requirements to mention a few.

1.3.2 Mobile phone and agricultural development

There is widespread theoretical and empirical literature identifying the determinants of agricultural performance in different contexts (Conley and Udry 2010; Madlen *et al*., 2016; Thomas, 2018; Kevin *et.al.*,2015).). While the findings slightly differ based on context, numerous studies have identified the importance of information for better performance of agriculture. Different studies have highlighted the various contributions that the mobile phone brings to individuals in a developing economy. For instance, According to Sridhar & Sridhar (2006), Gruber & Koutroumpis (2011), Anwar, and Johansson (2015), a mobile phone is said to be able to provide farmers with relevant and up-to-date agricultural information that positively would better influenced their income. In its Mobile Development Report, Nokia recommends that, in order to enhance rural development, mobile phones could be used in the following four levels (Sood, 2006): To provide communication, provide access to information, passive or inter-passive consumption of media and interact with systems, institutions, communities and other users. A study by Salia *et al.* (2011) in Ghana has indicated that use of mobile phones enabled fishermen to improve their incomes, expand their markets, feel more secure at sea and remain in closer touch with both families and other fishermen. More examples with promising improved livelihood for African fishermen are presented by Myhr and Nordstrøm (2006) from Tanzania. In Tanzania, the uptake of mobile phones has been strong too and continues to grow, by December 2011 there were 25 827 518 mobile phone subscribers (ITU, 2012). The rapid adoption of mobile phones has generated a great deal of speculation and optimism regarding its effect on economic development.

2. Materials and Methods

2.1 Description of the study location

The study was conducted in two Districts; Kilolo and Kilosa Districts in Iringa and Morogoro regions, respectively. The two districts were purposively selected based on several reasons, including evidence of having active members using mobile phone (Sife *et al.*, 2010) for Kilosa and Kilolo, respectively. Equally, the subscriptions of mobile phones in these districts have been growing over time (Sife *et al.*, 2010). Again, the main economic activity in both districts is farming, so majority of their residents are farmers, either crop producers or livestock keepers. Another reason for selecting the two districts is the presence of agricultural research center and telecentre in each of the two Districts. Also, the two Districts are well dispersed, one in southern and other in central parts of the country something that ensures well geographical spread for generalization.

Kilolo District (Figure 1) is one of the three districts of Iringa region of Tanzania. Its geographical coordinates are 8°S and 35^0 51'E. It borders Morogoro region to the north and East, Mufindi district to the South and Iringa Rural district to the West. According to the 2012 census, the district is administratively divided into three divisions (Kilolo, Mazombe and Mahenge), 12 wards, 83 villages, 415 hamlets and 42 002 households. The twelve wards are; Bomalang'ombe, Idete, Ilula, Image, Irole, Lugalo, Mahenge, Mtitu, Udekwa, Uhambingeto, Ukwega, and Ukumbi.

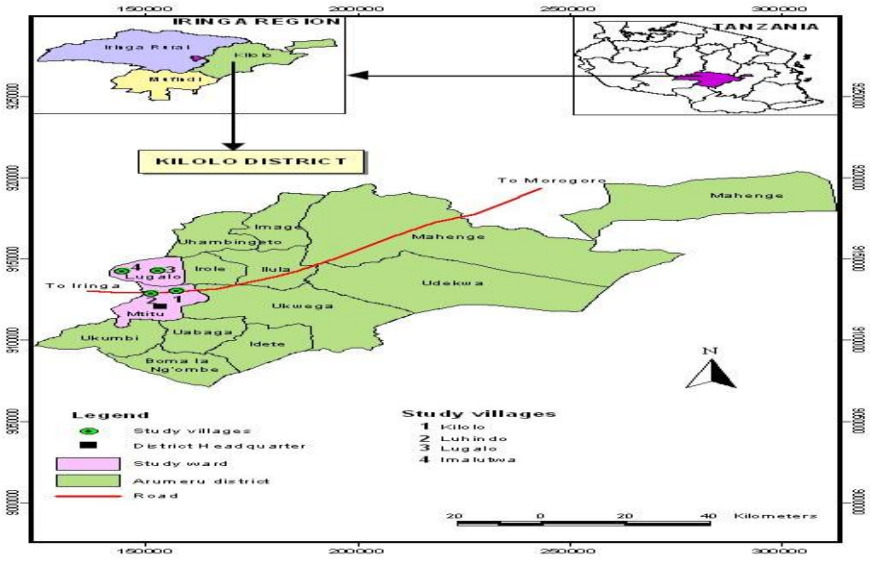

Figure 1. Map of Kilolo District showing study villages

Kilosa District

Kilosa District is located in Morogoro region (Figure 2), its location is approximately 300 km inland from the coast and Dar es Salaam, along the old East African caravan routes stretching from Bagamoyo to the eastern part of Democratic Republic of Congo (Benjaminsen *et al.*, 2009). Today, Kilosa is one of six districts within Morogoro region, it is 14,245 km^2 making up about 20 per cent of the region (KDC, 2010). The district lies between 6°S and 8°S, and 36°30'E and 38°E. It borders Tanga Region to the north and Morogoro District to the east. In the south, it is bordered by Kilombero District and part of Iringa Region (KDC, 2010). Rainfall distribution is bimodal in good years, with short rains (October–January), followed by long rains (mid-February–May). Mean annual rainfall ranges between 1,000 and 1,400 mm in the southern flood plain, while further north (Gairo Division) has an annual rainfall ranging from 800 to 1,100 mm. The mean annual temperature in Kilosa is about 25°C. According to the 2002 census, there were 489,513 people living in Kilosa.

Further, more than 80 per cent of people in Kilosa depend on agriculture (KDC, 2010) and with its varied conditions, ranging from a plateau characterized by seasonally flooded plains, to mountainous areas with altitudes surpassing 2000m, Kilosa District offers a variety of agro-ecological conditions for farming (Maganga *et al.*, 2007). A variety of crops is grown in the district including maize, rice, millet, cassava, beans, bananas and cowpeas. Besides food crops, the main cash crops are sisal, cotton, coffee, wheat, cashew nuts, coconuts, sugar cane and tobacco. Some of the food crops are also used as cash crops. Small-scale farming – where the average farmland is less than one

hectare – represents 90 per cent of agriculture, with large-scale farming representing the other 10 per cent (KDC, 2010).

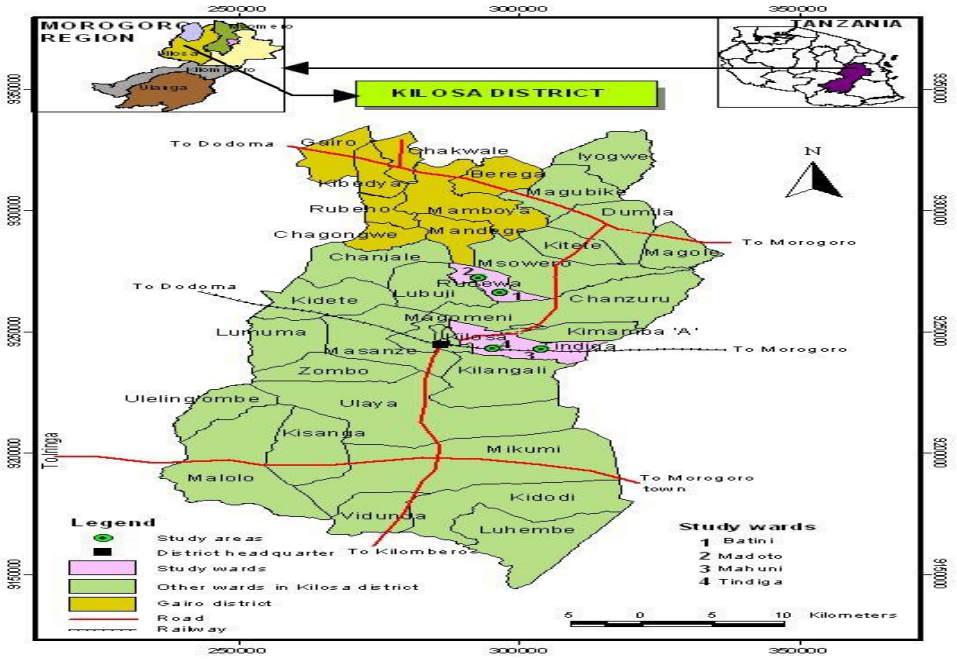

Figure 2. Map of Kilosa District showing study villages

2.2 Sampling procedure

Both probability and non-probability sampling techniques were used to obtain the sample. First, the two districts were purposively selected based on several reasons, one being similar economic activities in both districts which is farming. Another reason for selecting the two Districts was that both had agricultural research centres i.e. Dabaga for Kilolo and Msimba for Kilosa and a telecentre in each District things that reflected their commonality. A Purposive sampling was used to select the wards and villages to be included in the study. Four wards were selected, namely Mtitu and Lugalo in Kilolo District, while in Kilosa District, Tindiga and Rudewa wards were selected based on availability of mobile phone network availability. Then, in each ward, two villages were selected based on similar criteria making a total of eight study villages, which were, Luhindo, Kilolo, Imalutwa and Lugalo in Kilolo District while that of Kilosa were Madoto, Rudewa, Malui and Tindiga.

2.3 Research Design and sample size

The study adopted a cross sectional research design and data collected were mainly quantitative. In order to provide equal chance for each individual to be included in the sample, a simple random sampling technique was adopted. The National Agriculture Input Voucher Scheme (NAIVS) register was used as a sampling frame. The register(s) had names for all farmers in the selected villages and their mobile phone numbers though few had no phones. Simple random sampling technique was used to obtain a minimum sample of 30 respondents in each village for face to face interviews. Thus, 30 respondents with mobile phones were enumerated in each village. A sample of 30 or more is believed result in a sampling distribution that is very close to the normal distribution (Saunders et al., 2007).

2.4 Data collection and Analysis

2.4.1 Data collection

Primary data were collected from 240 respondents using face- to -face interviews. Interview method is known to be a very appropriate method of collecting data for descriptive or exploratory studies, and suitable where individuals are the unit of analysis for personal attributes (Rossie and Freeman, 1993). Also, is considered suitable to gain responses from large sample size and set of questions in a short period of time and gives room for researchers to generalize findings to a wide population (Neuman, 2003). Individual interviews taped respondents' socio-demographic data, informational needs, extent of mobile phone access and use, access to agricultural information, their views, important challenges faced, source including their initiatives to actively support the use of mobile phones.

On the other hand, Focus Group Discussions and key informant interviews were also held to discuss with various stakeholders on aspects of mobile phone use in agriculture. Further primary data were complemented by secondary data obtained from various sources; documents reviewed comprise of government reports, publications, journals, books, and website. Information collected included mainly factors affecting adoption of technologies and the way forward.

2.4.2 Data Analysis

Quantitative data collected from interviews were coded and summarised prior to analysis, the analysis was done using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics like frequencies and percentages were established. The essence was to determine the extent of mobile phone usage among respondents, type and sources of agricultural information that respondents needed. Other statistics such as chi-square test and regression analysis were also carried out to test for relationship between variables and rule out which variable really affected the dependent variable, respectively. Thus, the best predictors were identified from the list of potential independent variables.

Qualitative information collected from the FGDs and Key informant interviews were conceptualized, summarized, coded and categorized using content analysis. Both FGDs and Key informant interviews were recorded and transcribed into practical themes by the researcher for discussion. The researcher sorted phrases and issues that recurred during discussion and established themes. According to Braun and Clarke (2006), a theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set. According to the present study, arrangements of commonly recurring themes revealed some patterns and processes related to mobile phone use and supports availed to smallholder farmers in the study area. Largely, the results are concurrently presented with quantitative findings in chapter four in a way that the qualitative results elaborate and complement quantitative findings.

3. Results and Discussion

3.1 Farmers' demographic characteristics

Of the 240 respondents, 38.3% indicated that their ages were between 46-60 years, 35.4% were aged 36-45 years, 21.3% aged between 25-35 years and 3.3% were above 60, while few, four (1.7%) were below 25 years old. This implied that, over half of the respondents were youth, aged 45 years old or less (Table 2). Majority of the respondents 73.3% were males and majority 88.7% were married. Regarding their literacy level, most of the respondents, 82.9% had attained primary school education, 10.8% had secondary school education, a few 3.8% had no formal schooling and only 0.8% indicated having college and or university education.

Two demographic variables, literacy level and age had a statistically significant influence on the use of mobile phones to communicate agricultural information. A chi-square test confirmed that respondents' literacy level significantly influenced the use of mobile phones in accessing agricultural information at $\chi 2 = 22.394$, and $\rho \leq 0.012$. Equally, Asongu (2013) and Onwuemele (2011) found similar results, that education determines the level of both access and use of ICTs. According to the two authors, people with tertiary level of education had higher access and use of public telephones and cellular phones than those of lower levels. These findings also agree with those of Sikundla *et al*. (2018) and Will (2018) who together found people with high levels of education to have more positive perceptions on mobile phone use compared to those with lower education.

Furthermore, results in Table 2 indicate that age was a predictor variable for acquiring and using mobile phones in communicate agricultural information. A chi-square test revealed that age had an effect on respondents' ability to use mobile phones to communicate agricultural information, which was statistically significant at $r = 12.804$, $\rho \leq 0.012$. Based on age and literacy, we partly reject the null hypothesis that, socio-demographic variables had no statistical significant influence on farmer's acquisition and use of agricultural information through mobile phones. However, other variables, such as Gender and marital status had no statistical significant influence on the use of mobile phones to communicate agricultural information.

Table 2. Respondents' socio-economic characteristics influencing the use of Mobile Phones to access agricultural information (N=240)

Variable	Frequent	Percent	Use or Not		$\chi 2$	ρ -value
			Yes	No		
Age						
Below 25	4	1.7	3	1	12.804	0.012*
25-35 years	51	21.3	44	7		
36-45 years	85	35.4	82	3		
46-60 years	92	38.3	90	2		
Above 60 years	8	3.3	8	0		
Gender						
Male	176	73.3	166	10	0.091	0.763
Female	64	26.7	61	3		
Marital status						
Single	27	11.3	201	12	0.174	0.676
Married	213	88.8	26	1		
Literacy levels						
No formal schooling	9	3.8	7	2	22.394	0.000**
Primary education	199	82.9	190	9		
Secondary education	26	10.8	26	0		
College or University	2	.8	2	0		
Adult education	4	1.7	2	2		

Source: Survey data 2014, **Significant at $\rho \leq 0.01$, *Significant at $\rho \leq 0.05$

3.2 Off-farm activities, income levels and farming system

Study results in Table 3 indicate other respondents' characteristics that affected their use of mobile phones to communicate agricultural information, including their involvement in off-farm activities, income levels and farming system involved. For instance, of the 240 respondents, 15.75% mentioned that apart from farming activities, they were also engaged in off-farm activities which included tailoring 5%, buying and selling agricultural products 3.8%, formal employment 1.4% local brewing 2.9%, and food vending. Results indicatethat, off-farm activities had a statistically significant influence on the use of mobile phones to communicate agricultural information at $\chi 2 = 89.88$, $\rho \leq 0.01$. Respondents explained that, off-farm incomes provided them with extra money which they used to buy air time for the mobile phones.

Also, of the 240 respondents, 70% reported that they earned incomes less or equal to Tshs1700, 11.7% earned between TZS 1700-3400 and 12.5% got incomes above TZS 3400. A chi-square test revealed that income had an effect on the use of mobile phones to communicate agricultural information by farmers at $\chi 2 = 6.493$, $\rho \leq 0.039$ (Table 3). Similar conclusions were established by Qiang *et al.* (2012) who found a positive correlation between incomes and the adoption and use of mobile phones. However, the results differed with those of Mwombe *et al*. (2013) who found incomes having no effect on the use of mobile phones as a source of information for banana production and marketing among farmers in Gatanga District, Kenya. Other studies which found similar results include (Sajda, 2015; Mwalupaso and Tian, 2019). In case of farming system, of the 240 respondents, 70% were crop producers, 15.4% mixed farmers and 9.2% were livestock keepers. A chi-square test indicated that farming system had an influence on the use of mobile phones to communicate agricultural information as farming systems were statistically significant at $\chi 2 = 8.062$, $\rho \leq 0.018$ (Table 3).

3.3 Farm size, scale of production and market location

Moreover, statistical analysis results (Table 3) indicate other independent variables that had a statistically significant effect on the dependent variable, including respondents' farm sizes, scale of production and market locations. Regarding farm sizes, the results showed that, of the 240 respondents, 69.17% were small-scale farmers with land sizes up to two and half acres of which most, 92.8% owned mobile phones, which perhaps they used to communicate agricultural information. A chi-square test revealed that farm size had a statistically significant influence on the use of mobile phones to communicate agricultural information at $\chi 2 = 6.488$, $\rho \leq 0.011$ (Table 3). The findings are Similar to that of Lee and Bellemare (2013) who acknowledged that heterogeneity among farms and farm sizes can often explain why not all farmers adopt an innovation in the short-or long-run terms. However, other studies Marie *et al*. (2019) went further by differentiating that farm size may be significant for early adopters than in later stages.

Conversely, there is some contradicting consensus between various scholars about the influence of farm size in technology adoption and use. In some studies (Parvan, 2010; Wamala and Svensson (2018) farm size has been considered an important attribute influencing technology adoption and use (Parvan, 2010; Ronald et.al., 2018). Studies show that, farmers with larger farms are more likely to adopt new technologies because they can spread costs over a wide range of outputs than it is possible with small-scale farmers. Other studies (Vinish and Keun 2018) show that technology adoption results from a complex combination of several variables that cannot be captured by one or a few variables. The value of information technology in farming is affected by goals and competences of the farmers, and other characteristics of the farm, one being the size of the farm (Rougoor *et al*., 1998).

Another aspect that played a significant role as a determinant of mobile phone use to communicate agricultural information was scale of production. The study hypothesized that, farmers with large scale farm could generate more incomes, which partly could be used to buy mobile phones and use them. The study findings show that scale of production had a statistically significant influence on respondents' use of mobile phones to communicate agricultural information at r = 5.546, $\rho \leq 0.019$. Similar findings were found by Khanna *et al.* (1999) in the Midwest, USA who indicated that adopters of ICTs, among other things, also had higher crop yields and that adoption tended to skew positively to large famers than to small-scale farmers. However, they noted that the higher adoption rates by large-scale farmers could not have been solely due to high production, but more to their ability to hire professional services, access to credit and technical information and more contacts with extension agents and consultants.

Market location is another important aspect that affected the use of mobile phones to communicate agricultural information. Statistics (Table 3) indicate that, of the 240 respondents, 59.2% sold their agricultural products in local markets within their villages. Having over half of the respondents selling their products in local markets implied that, many farmers had limited contacts with outside consumers. According to Rogers (2003), selling into distant markets expose farmers to ideas and opportunities beyond their local social system.

Table 3. Other characteristics influencing the use of mobile phones in to communicate agricultural information (N=240)

Characteristics	Use MP to communicate agricultural information		Chi-Test	
	Yes	No	$\chi 2$	ρ -value
Off-farm activity				
None	194 (80.8%)	3 (1.2%)	89.878	0.000**
Tailoring	12 (5%)	0 (0%)		
Buy-sale agro-products	9 (3.8%)	10 (4.2%)		
Local brewing	7 (2.9%)	0 (0%)		
Formal employment	4 (1.7%)	0 (0%)		
Food vending	1 (0.4%)	0 (0%)		
Income levels				
Less than Tshs 1700	169 (70.4%)	7 (2.9%)	6.493	0.039*
Tshs 1700-3400	28 (11.7%)	0 (0%)		
Beyond Tshs 3400	30 (12.5%)	6 (2.5%)		
Farming system				
Crop production	168 (70%)	7 (2.9%)	8.062	0.018*
Livestock production	22 (9.2%)	0 (0%)		
Mixed farming	37 (15.4%)	6 (2.5%)		
Farm size				
Less than 1 acre	56 (23.33%)	3 (1.2%)	6.488	0.011*
Between 1-2.5 acres	99 (41.25%)	8 (3.3%)		
2.5-5 Acres	44 (18.3%)	1(.4%)		
Above 5 Acres	28 (11.7%)	1(.4%)		
Scale of production				
Only for home use	69 (28.8%)	(0%)	5.546	0.019*
Some surplus for sale	158 (65.8%)	13 (5.4%)		
Market location				
Market within my village	170 (70.8%)	13 (5.4%)	7.537	0.023*
Markets outside my village	57 (23.8%)	(0%)		

**Significant at 0.01, *Significant at 0.05

Furthermore (Will, 2019) acknowledged that the use of mobile phones could improve the economic opportunities among farmers and traders by allowing them to access consumers who were not previously accessible due to boundaries imposed by traditional social network linkages and geographic constraints. Other studies (Katengeza *et al*., 2011; Lwasa *et al.,* 2011: Stan and Mira 2019) demonstrate that, greater distance of farmers from the markets implied greater intensity of mobile phone use. Likewise, Hansen *et al.* (1990) indicated that benefits derived from telecommunications were related to distances and were high in rural areas. Principally, if farmers are unable to secure price information from various markets in which they could sell their products; this could results into income losses.

3.4 Regression Analysis

To understand the effect of selected independent variables on the dependent variable, a logit regression analysis was conducted. This was essentially carried to rule out which attributes really affected the dependent variable. Based on the results (Table 4), hypothesis I was partly supported due to that among other socio-demographic variables age and literacy level were found statistically significant on the use of mobile phones to communicate agricultural information at t = -1.977, $\rho \leq 0.01$ and t = 1.131, $\rho \leq 0.01$, for age and literacy level, respectively. Therefore, the results gives evidence to partly reject null hypothesis I which stated that, respondents' socio-demographic variables have no statistically significant influence on their use of mobile phones to communicate agricultural information.

As for Gender, the results supported the hypothesis that, there were no statistical significant differences between Genderual categories on mobile phone usage to communicate agricultural information. These results contradict the findings (Obong *et al*. (2018). Determinants of mobile phones usage in sweet potato vine business in Gulu district northern Uganda. According to Komunte, 2015; Issahaku et al. (2018) on average women tend to be more marginalized than men in technology adoption. However, the findings are similar to that of Frimpong (2009), Asongu (2017) and Bhandari (2019) who together found no differences between males and females in ICT adoption and usage. One inference drawn from the studies by Ryan, Frimpong and Singh was that, women who were generally categorized as not being technology friendly are currently at least coming up.

Further, the study found that, farm physical characteristics such farm size under cultivation, scale of production and market location had an influence on the use of mobile phones to communicate agricultural information (Table 4). Farm size had a statistical significant influence on the use of mobile phone to communicate agricultural information at (t =1.362, $p < 0.05$). On the other hand, scale of production and distance from market were also found statistically significantly affecting the use of mobile phone in accessing agricultural information at (t = -1.639, $p < 0.1$) and (t =5.2, $p < 0.05$), respectively. As such, the results reject null hypothesis II which anticipated farm contextual characteristics to have no statistically significant effect on the use of mobile phones to communicate agricultural information.

Table 4. Regression estimates for the effect of selected variables on the use of mobile phones in to communicate agricultural information

Variable (χ)	Unstandardized Coefficients		*Beta*	t	Sig
	B	Std Error			
Interaction with others	.039	.009	.275	4.289	0.000*
Support from others	.002	.004	.018	.616	0.009*
Type of information needed	.016	.011	.043	1.435	0.02**
Type of mobile phone owned	.028	.035	.023	.807	0.21 ns
Age	-.015	.008	-.059	-1.977	0.050**
Marital	.036	.021	.050	1.666	0.098^{ns}
Literacy	-.005	.012	-.012	-.1.131	0.01*
Gender	-.009	.010	-.032	1.042	0.298^{ns}
Farm size	.009	.007	.038	1.362	0.011**
Scale of production	-.006	.004	-.050	-1.689	0.07ns
Distance from Market	.126	.024	.265	5.200	0.03**
Membership in farmer organizations	-.015	.024	-.030	-.604	0.39^{ns}
Daily income	.008	.008	.030	.976	0.09^{ns}
Source of information	.008	.004	.069	2.200	0.029**
Awareness about applications	.029	.016	.055	1.776	0.04**
Other communication ways	.014	.006	.085	2.252	0.026**
Skills in using mobile to CAI	.003	.006	.017	.406	0.01*

$R^2 = 0.71$, ** significant at 5%; *significant at 1%,

Implications

The findings from the study are useful for the policy makers to understand socio-demographic characteristics at individual level and consider them when designing mobile based programmes. This means, for any mobile phone intervention to succeed, organizers need to rigorously understand and consider the influence of demographic attributes at individual level which may hamper individual's ability to use the mobile phones to communicate agricultural information and act accordingly.

4. Conclusion and Recommendation

The study concludes that, socio demographic characteristics of farmers such as age and the level of education are significantly related to a farmer's decision to use mobile phones to communicate agricultural information. Equally, contextual factors such as distance from market, scale of production and farm size have an influence on the use of mobile phones to communicate agricultural information. Therefore, we recommend that, any kind of efforts meant to address the need for mobile phone application in agriculture, first need to understand individual farmers' characteristics before focusing on other capacities and act accordingly.

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