



Factors Influencing the Use of Mobile Phones in Communicating Agricultural Information: A Case of Kilolo District, Iringa, Tanzania

Siwel Yohakim Nyamba, Malongo R.S. Mlozi

Department of Agricultural Education and Extension

P.O Box 3002, Chuo Kikuu, Morogoro, Tanzania

ABSTRACT

This study sought to investigate factors influencing the use of mobile phones in communicating agricultural information in Rural Tanzania. Generally, it aimed at addressing the following questions: (1) in what ways do farmers make use of mobile phone technologies to meet their agricultural information needs? (2) How the uses of the mobile phones enable farmers to confront the challenges they face in their farming business? (3) What are the farmers' attitudes toward the use of mobile phone technology? Specifically, the study had three objectives: (1) to determine the extent of ownership of mobile phones by farmers in the study area. (2) to assess the type of agricultural information that farmers send and or receive using mobile phones and (3) to identify socio-economic factors influencing the use of mobile phones in the communication of agricultural information in the study area. A cross-sectional research design and simple random sampling technique were adopted, 384 respondents and 16 key informants were contacted for interview and Focus Group Discussion, respectively. Data collected were summarize, coded before being analyzed using a Statistical Package for Social Science (SPSS). The study found that, asymmetry information generates uncertainties in farming business which eventually limit the economic potential of farmers as market participants. Basically, the study results, can be interpreted that, mobile phone technology acceptance to rural Tanzania was high enough for one to accompany it with a predictable positive economic impact. In terms of access to agricultural information through mobile phones, it was evident that, people in the study area capture the advantages of increased number of mobile phone to access information related to their farming business. Most of respondents valued mobile phones as easy, fast and convenient way of communicating agricultural information. Factors that influenced mobile phone use in communicating agricultural information included mobile phone ownership, type of agricultural information to be communicated, farming system practiced, network coverage, and respondents' socio-economic characteristics. On the other hand, lack of electricity, poverty and lack of knowledge limited respondents' mobile phone ownership and use.

Keywords: *Mobile phones, Agricultural information rural-Tanzania*

1. INTRODUCTION

In agriculture, like in many other sectors, information is becoming a major input, whilst, knowledge and information plays a central role for farmers to respond to opportunities that could improve their agricultural productivity [1]. Information communication technologies (ICTs) are therefore continued to be the best hope in developing countries to accelerate their development process.

Mobile phones are one of the most exciting forms of ICTs particularly in the context of developing nations. They are speeding up ways in which farmers get, exchange, and or manipulate information. Increasingly, they enable farmers to focus and extract useful and up-to-date information from social and business networks [2]. With mobile phones farmers assert to have had made tentative decisions much more easily than without [3]. Mobile phones are, therefore, becoming increasingly important to agro-based entrepreneurs as an infrastructural device for improving efficiency of agriculture markets, promoting investment, and contributing to empowerment. Literature, for example, show that, a developing country with an average of 10 or more mobile phones per 100 people between 1996 and 2003 would have enjoyed per capita Gross Domestic Product growth of 0.59% higher than an otherwise identical country with a mobile density of less than 10 phones per 100 people [4].

This study therefore arose to observe whether mobile phone technology adoption to rural Tanzanians is high

enough for one to accompany with predictable positive economic impact. According to Tanzania Communications Regulatory Authority (TCRA), ICTs have the potential to provide solution to the existing information asymmetry in various lagging sectors, including agriculture [5]. The findings from this study found that the ownership of mobile phones by agricultural stakeholders in Kilolo division has widely spread and increasingly assist to overcome isolation and make communication between rural people, particularly farmers, easier. This concurs with what different researchers attempted to position the linkages between mobile phones, livelihoods and poverty reduction. For example, Goodman in his studies on social impacts of mobile phones in Tanzania and South Africa found mobile phones to have been used to maintain social networks and provide access to information on socio-economic opportunities [6]. Thus, mobile phones are becoming increasingly important to agro-based entrepreneurs as an infrastructure service for improving efficiency of agriculture markets, hence contributing to farmers' empowerment.

2. STUDY METHODOLOGY

Description of the Study Area and Study Design

This study was conducted in rural area of Tanzania. Tanzania is country located in East Africa between longitude 29⁰ and 41⁰ east and latitude 1⁰ and 12⁰ south, it borders Kenya and Uganda on north, Indian Ocean on East, Rwanda,



Burundi, and the Democratic Republic of Congo to the west, and Zambia, Malawi and Mozambique to the south, and is the largest country in East Africa (943,000 sq km), it comprise both the mainland and the Zanzibar island. The country has 26 regions, one being Iringa the region in which the study was conducted. The region has seven districts: Iringa rural, Kilolo, Ludewa, Makete, Mufindi, Municipal and Njombe. This study was specifically carried out in Kilolo division in Kilolo district.

A cross-sectional research design was employed in the process of data collection: data were collected once at a single point in time, involving all farmers in Kilolo division. A multistage sampling method was used in selecting respondents. One division (Kilolo) and four wards (Dabaga, Miti, Ng'uruhwe and Ukumbi) out of the eight wards were purposively selected because of better mobile phones coverage than the other four wards. Eight villages out 31 and 48 respondents from each village were selected randomly using a table of random numbers. Respondents were selected on three basis; those keeping livestock, growing crops and those doing both crop and animal farming. Purposive sampling was used in selecting Key informants for focus group discussions (FGDs) from the two farming activities.

The study employed multiple data collection tools, including interview schedules, checklist for key informants and focus group discussions. The collected primary data were verified, coded, and analyzed using Statistical Package for Social Science (SPSS) computer program, version 16, which yielded descriptive statistics such as percentages, means, and frequencies. Cross tabulations, Chi-square and regression were also performed to establish the nature of relationship between variables.

3. STUDY FINDINGS AND DISCUSSIONS

Respondents' Socio-demographic Characteristics

Of the 384 respondents, 200 (52.1%) were females, while 184 (47.9) were males. Of the 384 respondents, 271 (70.6%) were married, 25 (6.5%) never married, 56 (14.6%) widowed while 32 (8.3%) were divorced. Based on mobile phone ownership, most, 306 (79.7%) indicated that they owned mobile phones. Furthermore, of the 384 respondents, 262 (68.2%) were young, aged between 20-45 years old. This implied that over two thirds of the young respondents owned mobile phones. Such findings agree with Souters *et al* [7] and Frimpong [8] who found that majority of ICT users tends to be young adults. In case of education, most respondents, 306 (79.7%) reported that they had attained primary education and 33 (8.6%) were secondary school leavers.

Table 1: Respondents' Socio-Demographic Characteristics (N=384)

Characteristics	n	%
Respondents' sex		
Male	184	47.7
Female	200	52.3

Respondents' age

Young (≤ 45 years)	262	68.2
Old (> 45 years)	122	31.8

Respondents' marital status

Never married	25	6.5
Married	271	70.6
Divorced	32	8.3
Widow	30	7.8
Widower	26	6.8

Respondents' education level

No formal education	45	11.7
Primary education	306	79.7
Secondary education	33	8.6

Mobile phone ownership

Have mobile phone	306	79.7
Doesn't have mobile phone	78	20.3

Advantages of using Mobile Phones

The study findings revealed that mobile phones conferred diverse advantages as a communication link in isolated circumstances because of its distinct feature of mobility. Table 2, show that about half, 202 (52.6%) of the respondents reported that, mobile phones helped them to easily obtain agricultural information they needed. Respondents also named a number of virtues associated with the use of mobile phones. For example, in a Focus Group Discussants (FGDs) and Key Informants (KI), it was pointed out that farmers used mobile phones to discuss prices with buyers and crosscheck prices for their produce, instead of relying on middle people or few crop buyers prevailed in the study area. Focus group discussions further indicated that farmers communicated a range of agricultural information, specifically on better prices, input supply, better management practices and weather information which together helped them to make better choices on where and when to buy or sell their farm produce.

Mobile phones were therefore, reported to have been used to make decisions on the best time to sell crops and livestock, because farmers could get instant information on prices at different market places. Likewise, Ashraf *et al.* [9] and de Silva [10] asserted that mobile phones can facilitate a greater export orientation in agricultural practices and marketing. The findings as well supports Jensen [11] who found mobile phones to have an ability save farmers' costs, by providing quick access to agricultural information, communication with trade partners and opens new market possibilities. On the other hand, middle men showed that mobile phones improved their ability to deal with truck follow ups and ability to redirect produce shipment to other markets in case of changing market prices.

Table 2: Advantages of Using Mobile Phone in Communicating Agricultural Information (N=384)

Variable	n	%
Helps to easily get agricultural information once needed i.e. market and price information, weather and input supply etc.	202	52.6



Saving time in dealing with related parties	21	5.5
Promotes interpersonal relationships	16	4.2
Assist in obtaining agricultural information quickly	18	4.7
Helps to exchange information anytime the need arose	22	5.7
Increase income of the people in the community	8	2.1
Allow more contacts amongst farmers	12	3.1
Enhance strong social cohesion	2	0.5
Easy contact with customers/suppliers	2	0.5
Total	384	100

Factors Influencing the Use of Mobile Phone in Communicating Agricultural Information

Respondents identified factors influencing use of mobile phones in communicating agricultural information to include sex, education level, incomes, mobile phone ownership, type of farming practiced, type of agricultural information needed, and network coverage. Table 3 illustrates the results.

Of the 384 respondents, most 303 (79.0%) indicated that they used mobile phones to communicate agricultural information, of these, 237 (61.7%) indicated to had attained primary education, while 30 (7.8%) had attained secondary education. An interesting finding from the study was that, all respondents with secondary education level owned mobile phones. Such results perhaps showed that education was a factor for owning and using mobile phones. However, as indicated in the chi square results ($\chi^2 = 3.278$, and $p \leq 0.194$) literacy levels of respondents had no statistical significant influence on mobile phone use in communicating agricultural information. These results contradict with those of Alampay [13] who found that, education determines the level of both access and use of ICTs. According to him, people with tertiary level of education could have higher access and use of public telephones and cellular phones than those of lower levels. Furthermore, of the 306 respondents who owned mobile phones, most, 247 (76.3%) mentioned to earning income less than a dollar per day, while 59 (19.3%) indicated to getting incomes greater than a dollar per day. A chi-square test revealed that respondents' average daily income had a high statistical significant influence on mobile phones use in communicating agricultural information ($\chi^2 = 18.636$, and $p \leq 0.01$). Although mobile phone ownership was also common among respondents with low incomes, the study results found that use of mobile phones to communicate agricultural information was highly influenced by income levels. Such findings match with earlier studies which showed a positive correlation between incomes and mobile phone technology adoption. [12]

Table 3: Factors Influencing the Use of Mobile Phones in Communicating Agricultural Information (N=384)

Variable	Used mobile phones		Did not use mobile phones		Chi-square	
	n	%	n	%	χ^2	P-value

Respondent's education level						
No formal education	36	9.4	9	2.3	3.27	0.19 ^{ns}
Primary education	237	61.7	69	18.0		
Secondary education	30	7.8	3	0.0		
Average daily income						
< dollar per day	247	80.7	78	20.3	18	0.000*
> a dollar per day	59	19.3	0	0.0		
farming activities involved in						
Grow crops	163	42.4	41	10.7	1.03	0.59 ^{ns}
Keep animals	13	3.4	2	0.0		
Mixed farming	127	33.1	38	9.9		
Agric information needed						
Better prices	163	42.5	40	10.4	28.2	0.000*
Input supply	122	31.8	19	5.0		
Management practice	10	3.1	13	3.7		
Weather info	8	2.1	0	0.0		

Note= *.Significant at 0.05, **ns** = not statistically significant at 0.05, χ^2 chi-square value

Study results on Table 2 showed that, of the 384 respondents, most, 306(79.7%) indicated to owning mobile phones, which was a high mobile phone penetration rate compared to the entire Tanzania rate of 39 percent during the last quarter of 2005. [14] So far, mobile phone penetration rates are subject to significant measurement error, leading to potential bias in the coefficient estimates, [14] equally, the present findings should be subject to further scrutiny. A chi-square test results revealed that mobile phone ownership had a statistical significant influence on mobile phone ownership and use to communicate agricultural information at ($\chi^2 = 2.568$ and $p \leq 0.01$). Similarly, of the 384 respondents, most, 306 (79.7%) reported that they used mobile phones to communicate agricultural information (Table 3). Study results indicate that there were differences in the rate of mobile phones ownership based on the type of agricultural information that respondents needed. For example, less than half of the respondents, 163 (42.5%) reported that they used mobile phones to get information concerning better prices of agricultural produce. On the other hand, 122 (31.8%), 10 (3.1%) and eight (2.1%) reported that they used mobile phones to seek agricultural information about agricultural inputs, managerial practices, and weather information, respectively.

The type of agricultural information that respondents communicated had an influence on mobile phones use in communicating agricultural information. A chi- square test revealed that the variable had a statistical significant influence on mobile phone use to communicate agricultural information at ($\chi^2 = 28.171$ and $p \leq 0.01$). This provided evidence to reject null hypothesis (H_{01}) which stated that



mobile phone ownership had no influence on the use of mobile phone in communicating agricultural information. Of the 384 respondents, most, 302 (78.6%) indicated that they used mobile phones to communicate agricultural information, and of these, more than half had owned mobile phones for over two years. Further, Table 3 shows that, 105 (27.3%) and 108 (28.1%) of the respondents indicated that they had owned mobile phones for 25-36 months, and over 36 months, respectively. On the other hand, few respondents, 62 (16.2%) and 17 (4.4%) indicated to owning mobile phones for less than two years, with a period of ownership being between 12-24 months. A chi-square test results revealed that duration of mobile phone ownership had a statistical significant influence on mobile phone use to communicate agricultural information at ($\chi^2 = 58.793$ and $p \leq 0.01$).

Regression Estimates of Selected Variables on Mobile Phones Use

A regression analysis was run to determine the influence some selected variables on the use of mobile phones to communicate agricultural information, such variables included respondents' age, sex, marital status, income, and types of agricultural information to be communicated. Table 4, shows that with the exception of sex, all other factors were found statistically significant at ($p \leq 0.01$), suggesting that, they influenced respondents' mobile phones use to communicate agricultural information. However, the findings contradict Souter *et al.* [7] on regard to sex, these scholars found that, on average women tend to be more marginalized than men, and are therefore less likely to make frequent use of mobile phones.

As shown on Table 4 above, age, sex, incomes and marital status were positive predictor variables that influenced respondents' use of mobile phones in communicating agricultural information, hence leading to rejecting the null hypothesis I (H_{01}). The β coefficients indicated that, age, sex, income and types of agricultural information to be communicated influenced respondents' use of mobile phones by -0.364, -0.013, 0.200 and 0.088 units, respectively. The predictor variables were found to be statistically significant at $p \leq 0.01$.

H₀₂: There is no statistically significant difference between the type of agricultural information to be communicated and the use of mobile phones in communicating agricultural information.

Table 4 above, shows that the type of agricultural information being communicated highly influenced the use of mobile phones in communicating agricultural information at $p \leq 0.01$, thus, null hypothesis II (H_{02}) was rejected. Further, results on Table 4 indicates that, age, sex, and incomes were positive predictor variables that strongly influenced respondents' use of mobile phones in communicating agricultural information. Respondents' income levels and types of agricultural information to be communicated were the highest predictors that influenced their use of mobile phones for communicating agricultural information. Their predicted coefficients (β) value 0.2 and 0.088 while their p-values were 0.002 and 0.001 for income levels and type of information, respectively. Therefore, these predictors were found statistically significant. Another predictor variable was age, with coefficient (β) value of -0.364 at $p \leq 0.01$. The predicted coefficient of age was negative but statistically significant at $p \leq 0.01$. Having a negative relationship implied that more young people used mobile phone to communicate agricultural information than old people. Therefore, age was found to have an influence on mobile phones use to communicate agricultural information, and was found statistically significant at $p \leq 0.01$ (Table 4).

H₀₃: There is no statistical significant influence of Socio-economic factors on the use of mobile phones in communicating of agricultural information.

A One-way Analysis of Variance (ANOVA)-Test

For the purpose of showing differences on contribution of selected independent variables on mobile phone ownership and use in communicating agricultural information, a one-way analysis of variance (ANOVA) was carried out, the results were as illustrated in Table 5 below.

Table 4: Regression Estimates of Selected Variables on Mobile Phones Use

χ_i	β	Std error (b*)	p -value	95% confident interval	
				Lower	Upper
Age	-0.364	0.088	0.000*	-0.537	-0.190
Sex	-0.013	0.027	0.641 ^{n.s}	0.066	0.041
Marital status	0.034	0.014	0.016*	0.006	0.062
Income	0.200	0.065	0.002*	0.072	0.328
Type of agric. info	0.088	0.025	0.001*	0.038	0.137

$R^2 = 0.646$, Dependent variable: (χ_i):= Predictor variables * = Significant at 0.05, n.s = not statistically significant at 0.05.

Hypotheses testing

This study tested three hypotheses:

H₀₁: There is no statistical significant difference of mobile phone ownership in the use of mobile phones to communicate agricultural information.

Table 5: ANOVA Results on Influence of Selected Independent Variables on Mobile Phone Use

Variable	Test for Equality of Variances (ANOVA)	
	F-value	P-value
Age of respondent	9.838	0.002*



Sex of respondent	30.424	0.000*
Marital status	14.198	0.000*
Education level	0.262	0.609
Average monthly income	127.973	0.000*
Time period of mp owned	0.190	0.663

Note: $R^2 = 0.622$ *=Significant at 0.05, ns= not significant at 0.05, ANOVA=Test for Equality of Variances

An ANOVA test was used to determine if socio-economic factors had statistical significant influence on the use of mobile phones to communicate agricultural information. The results in Table 5 rejected the null hypothesis (H_3) because socio-economic factors, such as age, sex, marital status and income influenced the use of mobile phones in communicating agricultural information at $p \leq 0.01$. However, education levels and the period respondents owned mobile phone had no influence on respondents' use of mobile phone for communicating agricultural information.

Further, results in Table 5 indicated that, variables like sex, marital status and average incomes of respondents showed high statistical significant influence on mobile phone ownership and use at $p \leq 0.002$, $p \leq 0.05$, $p \leq 0.05$ and $p \leq 0.05$, respectively. Thus, the study findings showed that, mobile phones could address the digital divide between literates and illiterates in terms of technology communication as lowly educated respondents equally had mobile phones. However, as seen in Table 5, respondents' education level and period of mobile phone ownership had no statistical significant effect on mobile phone use at $p = 0.609$, and $p = 0.663$, respectively. These study findings contradict with those of Harker and Akkeren [16] and Rice and Katz [17] who found that people with higher education had more positive perceptions on mobile phones use compared to those with lower education.

As for sex, Anova-test results in Table 5 indicated that, sex had high statistical significant influence on mobile phone ownership and use at $p \leq 0.001$. These study findings contradicts Frimpong^[8] who found no differences between males and females in ICT's use. One conclusion drawn from his study was that women who were generally categorized as not being technology friendly were at least overcoming that. Females used mobile phones by less proportion as compared to males implying that agencies need to initiate gender-specific projects in rural areas for promoting mobile phone usage amongst women and reduce the gap between sexes.

Problems of Using Mobile Phones in Communicating Agricultural Information

Of the 384 respondents, few, 113 (29.4%) reported that mobile phones were too expensive in terms of buying and running costs. Lack of electric power for charging mobile phones was mentioned by 102 (26.6%) of respondents, while 79 (20.6%) said that there was poor network coverage. Other studies also commented the same; for example, Samuel *et al.*

^[14] and URT [1] have found a positive correlation between mobile phones ownership and access to electricity. Aminuzzaman *et al.*[15] argued that, despite the positive effects associated with the use of ICTs tools for enhancing livelihood opportunities, electric power and cost are hindering factors. Respondents also pointed other limiting factors limiting mobile phone use to communicate agricultural information as poverty, illiteracy and lack of awareness of whom to call for particular information.

4. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study concluded that, asymmetry information limits the economic potential of farmers as market participants. Based on the observed penetration rate (79%), it seemed that, mobile phone technology acceptance to rural Tanzania is high enough for one to accompany it with a predictable positive economic impact. Therefore, the use of mobile phone seemed to make market information available to farmers and so improved their position in the value chain by increasing their knowledge and become able to make informed decisions. Also farmers' bargaining power against middlemen increases, as such, mobile phones were said to have a great contribution to reduced information costs, simply because, as participants communicate verbally, they do sharply, cheaply and without geographical limitation. People in the study area captured the advantages of increased number of mobile phone to access information related to their farming activities. As such, their projections for food markets, weather and other information that could be useful in their context had been easy and thus improved their life standards. However, respondents' characteristics such as age, gender, daily income, and education level were found to be determinants of ownership and use of mobile phone in the study area.

RECOMMENDATIONS

Based on the conclusions above, the study would recommend the following:

1. Since mobile phones were found to have a bright future to farmers; the government should lessen mobile tariffs, particularly through encouraging rigorous competition between mobile phone providers in rural areas so that many farmers afford both buying and running cost of mobile phones.
2. The government, NGOs and other development agencies should introduce public phone booths especially in rural areas through which farmers could be capable to communicate agricultural information.



3. A discussion with key informants found that, provision of education to farmers concerning mobile phones use could make mobile phones better used in communicating agricultural information. Likewise, as portrayed in the ANOVA and regression test results, education seemed to have an influence on both ownership and use of mobile phone by farmers in the study area. Therefore, provision of education to rural people on the use, modes of application and benefits associated with mobile phones could be important.

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