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Understanding Roles of Different Stakeholders Influencing the Use of Mobile Phones to Access Agricultural Information: A Case of Kilolo and Kilosa Districts, Tanzania

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Abstract

The study investigated roles of different stakeholders influencing the use of mobile phones in accessing agricultural information in Tanzania. While information is becoming an important ingredient in agriculture, farmers in Tanzania suffer the problem of lacking access to agricultural information. Promisingly, mobile phone technology has become the most valued infrastructure which gives people access to information and services they need. Actually, the subscription of mobile phones in Tanzania is ubiquitous and is ever-growing. However, many farmers are not fully utilizing the potential that the technology prevails. There is an apparent disparity between mobile phone subscriptions which is increasingly being adopted on one hand and their uptake into farming practices. The question is, why farmers not fully utilizing the potential the technology prevails in agriculture and how could they be helped? The research adopted a multi-stage sampling technique whereby, initially two districts were purposively selected followed by a simple random sampling technique to obtain 240 respondents. Data collection methods used was: interviews, key informants interviews, and focus group discussions. Quantitative data were analyzed using Statistical Package for Social (SPSS), whereby some descriptive statistics including frequencies, means, percentages and standard deviations were determined. Chi-square tests and regression analysis were also performed to test for the relationship between variables and determine variables that are the best predictors, respectively.

Keywords:

Multistakeholders Roles, Mobile Phones, Agricultural Information Access, Tanzania

1. Introduction

Information has always been an important component of agricultural development processes. From the time when people started growing crops and keeping livestock, they tried to search for information. Irrespective of location and type of agricultural enterprises, the most commonly searched information by farmers has been the know-how aspects which gives people fundamental agricultural facts. A number of studies, for instance; Meyer, (2015), and Koutroumpis, (2011); highlights that information has consistently been a significant element in the development of any farming community and has over a long period of time shaped the way in which farmers think and act. Equally, they have portrayed that improved agricultural yields would be realized when farmers are well informed.

Equally, in Tanzania the some key challenges facing agriculture; one being failure to access marketing information in crop and livestock fields (URT, 2008). Essentially, poor access to agricultural information has been one potential explanation for the stagnating growth of agricultural performance in developing countries and has made farmers vulnerable to several risks, both during farming, transportation as well as during marketing of their crops (Foster and Rosenzweig, 2010; World

Bank, 2005; Arokoyo, 2003 and Lwoga et al., 2010). This has constrained efforts to improve agricultural development.

Of the many reasons, one common explanation for farmers' failure to access agricultural information has been under-utilization of Information and Communication Technologies, ICTs (Arokoyo, 2003; URT, 2006; URT, 2008; World Bank, 2008). ICT has increasingly being regarded as one of the forces for positive change in agriculture and rural development (Buncombe, 2012; World Bank, 2010; ITU, 2016). Also, studies by Prahalad (2004) and Jensen (2007) indicate that, where ICT is well utilized in agriculture, farmers have been able to access agricultural information such as weather, recommended agronomic practices and price information. Actually, this is not a physical productivity enhancement, but for the farmers it is as good as that, since the income realized per unit may definitely go up. There could be other ICT income-enhancing effects to farmers; for example, with information, farmers become able to better plan for their operations and make concrete strategic decisions (Mittal et al., 2010).

1.1 Why mobile phones?

In practice, many small-scale farmers rely on a limited number of middlemen or traders to receive price information, given that search costs for finding information elsewhere are often high (Eggleston et al., 2002). Various options are in place attempting to improve information accessibility to farmers through ICTs; including the use of radio, television, telephones, and print media such as newspapers. However, many of these options have their limitations; for instance, newspapers tend to be concentrated in urban areas and require literacy, internet access is low and TV and radio have limited information range and provide one-way communication (Aker, 2011; Hellstrom, 2010). Another important challenge is that the majority of farmers live in rural areas where technical and economic feasibility of fixed line infrastructure is limited.

Actually, mobile phone is the most valuable infrastructure which gives people access to the services they need to create a more promising future (ITU, 2011; Patel et al., 2012; UNCTD, 2007; Furuholt and Matotay, 2011). Its popularity bases on the fact that, mobile phone technology is perceived as a low cost and a widely available communication tool that holds considerable promise for knowledge mobilization in the agricultural sector (Qiang et al., 2011).The technology is also widely available and less inhibited by traditional access barriers such as infrastructure such as electricity and to some extent language and literacy (Muthee and Mhando, 2006; Aker, 2011; Carmody, 2012; Siyao, 2012). Its penetration in rural areas of the developing countries is also growing strongly (ITU, 2012; and Montoya, 2008; Sife et al., 2010; URT, 2010). Definitely, subscription to the technology in Tanzania is pervasive and its penetration in rural areas is also growing strongly (ITU, 2013).

1.2 Multi-stakeholders engagement

Since the 1960s, agricultural extension has been solely put forth as a means of reducing information irregularities related to technology adoption in both developed and developing countries (Anderson and Feder, 2007).

In Tanzania, a similar approach has been in use whereby agricultural information has mainly been disseminated through agricultural extension officers and farmer-to-farmer extension. However, the growth of extension staff in most areas has not matched with the increasing number of farmers. The traditional extension system has thus been criticized for high costs, problems of scale and low levels of accountability which leads to ineffective and inefficient agricultural extension service delivery (Anderson and Feder, 2007). Thus, the traditional agricultural extension methods have been cited as barriers to improving the livelihood of farmers in developing countries including in Tanzania (De Silva et al., 2011;).

Of late, however, there are many players taking part in providing agricultural information and other extension services. The extension role is now involving multiple actors such as extension agents, researchers, traders, NGOs, and other private sectors. Therefore, farmers are getting information through a wider range of stakeholders than ever before, hence the term multi-stakeholders. This agree with what a study by Goodman (2005) suggested that in order to create socially responsible and lasting impact, any technology and or innovation must be mobilized in cooperation of varied stakeholders.

Similarly, other scholars have found that facilitation positively impacts actual use of any particular technology (GAO and Deng, 2012; Tao, 2008; Imet al., 2011; Yu, 2012; Chang et al., 2007; Venkatesh et al., 2003). Therefore, the study on which this paper based; assessed the roles of inter-linkage and support among different stakeholders in the use of mobile phones in communicating agricultural information. The assumption was that, valuable and sustainable phone applications are likely to develop within an environment that encourages collaboration between actors.

1.3 Mobile phone subscriptions in Tanzania

Mobile phone technology has been the fastest growing medium technology in Tanzania in recent years compared to other ICTs like radio, television, and newspapers (ITU, 2011; Waverman et al., 2005; Sanga et al. (2013). As indicated in Table 1, the uptake of mobile phones in Tanzania has been growing enormously and continues to grow, for instance, from 110 518 subscribers in the year 2000 to 25 827 518 in 2011 (TCRA, 2011). Hence, the increasing penetration of mobile phones, especially in rural areas could be a unique opportunity that could provide farmers with relevant information for their farming businesses.

However, many Tanzanian farmers are not fully utilizing its potential (Jain et al., 2014). There is an apparent disparity between mobile phone subscriptions which is increasingly being adopted on one hand and their application into farming practices on the other hand. Thus, many farmers in Tanzania still suffer from deprived access to agricultural information.

Poor access to agricultural information is one of the constraints to small scale agricultural production of Africa's population (Jensen, 2003). It seems that support is necessary for both delivery and sustainability of mobile services. According to Gollakota (2008), information alone to farmers is not sufficient and so suggested some structural and financial solutions for support as well. Other scholars hints out that; support and shaping efforts are necessary if we are to advance technological achievements (Duncan, 2013).

From such backdrop the study assumes that there is a need for sorts of support to users of mobile phones in communicating agricultural information so as to make them better off and able to purchase information services. Nevertheless, the main challenge is the knowledge of the types of support farmers need and the specific stakeholders to help them in order that they can efficiently and effectively use mobile phones to communicate agricultural information for improved agricultural productivity. Therefore, the study sought to find out roles, resources and or activities that different stakeholders could play to support the use of mobile phones to communicate agricultural information in Tanzania.

This study was justifiable by the reasons that; of late, it is not clear what are the specific roles and or supports that different stakeholders could play to support the use of mobile phones to communicate agricultural information in Tanzania are not well known, thus the study aimed to address this. The knowledge of kinds of support needed for effective use of mobile phones to communicate agricultural information is expected to offer insights to mobile phone service providers and agricultural communicators to effectively plan and serve their clients. Addressing roles played by different stakeholders could also enable policy makers and other development partners to see the potential that different stakeholders have in supporting the use of mobile phones to communicate agricultural information for future spread of the technology.

The overall objective of the study was to establish roles of different stakeholders influencing farmers' use of mobile phones to access agricultural information in Kilolo and Kilosa Districts in Tanzania. Specifically the study sought toclassify roles played by particular stakeholders that could enhance the use of mobile phones in accessing agricultural information.

1.4 Embracing Gaps in Literature

By and large, studies in the field of mobile phone technology have been distinguished into three main dimensions which are studies on determinants of mobile adoption, impacts of mobile phone use and interrelationships between mobile technologies and users. A number of research gaps cut across the empirical literature on mobile phone usage in farming business. For instance, while several studies provide evidence on the key role that mobile phones are playing in improving information transmission, less or little has been documented about the roles that different stakeholders could play to enhance the use of mobile phones in agriculture.

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 phones wherebythe subscriptions of mobile phones in these districts has been growing over time (Sife et al., 2010; Nyamba and Mlozi, 2012). Another reason for selecting the two districts is the presence of agricultural research center and a 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.

Table 1. Mobile phone subscriptions in Tanzania

Year	Mobile subscribers	Changes	Percent increase
2000	110 518	-	-
2001	275 560	165 042	149.3
2002	606 859	331 309	120.2
2003	1 298 000	691 141	113.8
2004	1 942 000	644 000	49.6
2005	2 963 737	1 021 737	102.2
2006	5 608 532	2 644 795	89.2
2007	8 322 857	2 714 325	48.4
2008	13 006 793	4 683 936	56.3
2009	17 469 486	4 442 693	34.3
2010	21 158 364	3 688 878	21.2
2011	25 827 518	4 669 154	22.1

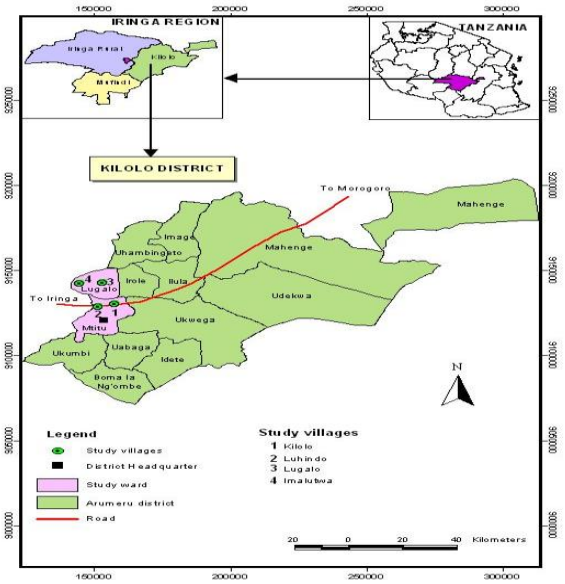

Figure 2. Map of Kilolo District showing study villages

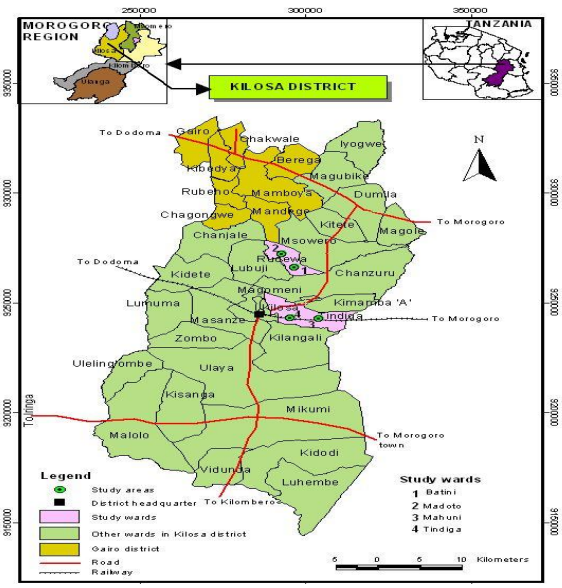

Figure 2. Map of Kilosa District showing study villages

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, for instance, 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 to result in a sampling distribution that is very close to the normal distribution (Saunders et al., 1994).

2.4 Data collection and Analysis

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, 2006). 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.

Data Analysis

Quantitative data collected from interviews were coded and summarized 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 descriptive 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. The established theme roughly captures important information about the data in relation to the research question and or meaning within the data set. Largely, the qualitative 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 Roles different stakeholders play to enhance the use of mobile phones to access agricultural information

The study determined that; a successful use of mobile phones in accessing agricultural information is a product of interactive processes of diverse stakeholders. Evidently, as evidenced during Focus Group Discussion each stakeholder have differently roles they play to enhance the use of mobile phones in accessing agricultural information. Table 2 demonstrates such roles, entirely, their roles included; provision of subsidy, devising policies, knowledge creation, digital literacy support, promotion of mobile phone use in agriculture, enhancing interactions amongst stakeholders, enabling connectivity and network coverage, technical support and control over arbitrary charges. Legends used include (++), (+) and (-) which denotes; fully, partly and not involved, respectively. Thus, if labeled (++) implies that the stakeholder is entirely responsible and accountable for such a role, while the other two legends agree that a particular stakeholder is somewhat responsible (+) or absolutely not responsible (-).

3.2 The roles of telecentres

Figure 3 indicates respondents' views on what they believed telecentres could help them in using mobile phones to communicate agricultural information. Of the 240 respondents, over one-third 88 (36.7%), perceived that telecentres have a responsibility to create awareness about mobile phone apps to under-served communities.

Other important aspects respondents mentioned included the need for telecentres to train people on the use of mobile phones to communicate agricultural information 64 (26.7%). Equally, respondents mentioned that telecentres could get involved with content creation and adapt to local context through agricultural experts 52 (21.7%). Other aspects named by the respondents included the anticipation that telecentres could connect farmers to traders and input dealers. Having expertise to assist farmers on technical aspects related with the use mobile phone and other Ixias one of the strength with telecasters.

Table 2. Roles of different stakeholders in using mobile phones to communicate agricultural information

Stakeholders	Roles										
	Financial subsidy	Policy devising	Knowledge creation	Digital literacy provision	Campaign for MP use	Enhance interactions	Enable connectivity	Skilled personnel	Set price and payments	Design mobile Apps	Develop technology
Fellow Farmers	+	-	+	+	-	+	-	-	-	+	+
Extension Agents	-	+	+	++	++	++	+	-	-	+	-
Agricultural Researchers	+	++	++	-	++	+	+	+	-	++	++
Input dealers	-	-	-	+	++	++	+	-	-	-	-
Traders	++	-	-	+	+	+	+	-	-	-	-
Mobile-phone company	+	+	+	++	++	++	++	++	++	++	+
Government	+	++	++	+	++	++	++	++	+	++	+
Telecentres	-	-	+	++	++	+	+	++	-	+	+

Legend: ++ fully responsible, + somewhat responsible - not responsible

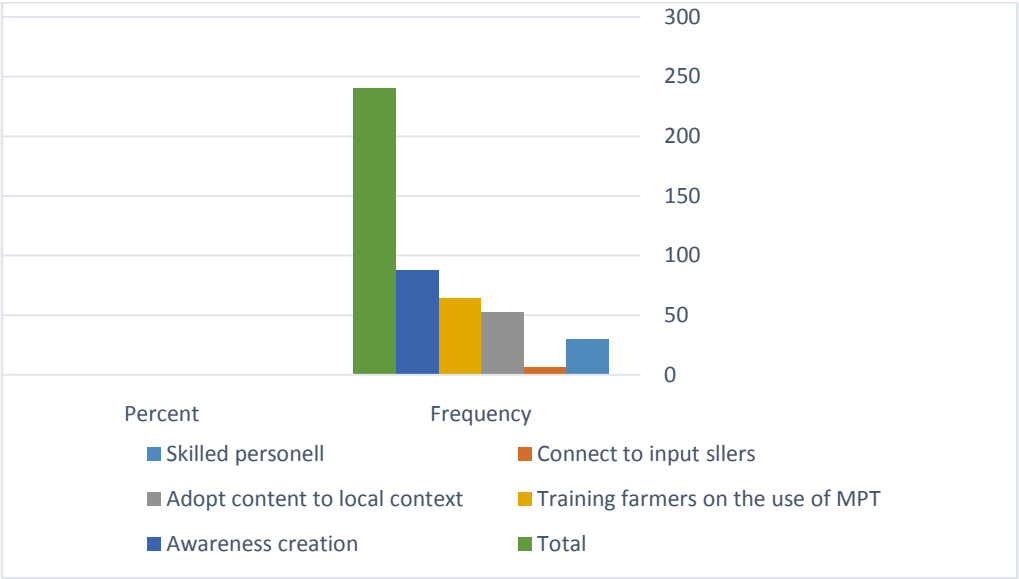

Figure 3. The Role of Telecenter

Yet again, a discussion with representatives of the two telecentres visited indicated that a telecentre in Kilosa (KIRSEC) was active in helping farmers use mobile phones to communicate agricultural information as compared with Kilolo telecentre. KIRSEC reported to have been using two approaches to reach farmers: first, the centre had computers through which farmers registered their mobile phones numbers for receiving SMS for new agricultural inputs arrivals. Secondly, KIRSEC broadcasted its programmes through the Kilosa Farmer Voice Radio (KFVR) owned by the Kilosa District Council. Moreover, the proprietor of KIRSEC reported that the centre responded to farmers' questions through the KFVR. But, the in-charge of the Kilolo telecentre revealed that the centre was not well-known to the communities, as it covered a small area of the District and was mainly used as a training centre for farmers and business people on computer use. Further, Kilolo telecentre was reported to be only used by few people particularly people dealing with Internet and SIM banking rather than farmers.

3.3 Roles of the government

Almost two-fifths (39.2%) thought that, the government has a responsibility to expand mobile phone access to underserved communities. Other important aspects farmers mentioned included government subsidy on both buying and operation cost of mobile phones to enable access (17.5%) and the government getting involved with content

creation through agricultural experts (16.7%). Other roles that the government needs to play included provision of digital literacy, provision of laws and policy regulation and motivation through promotions.

A further discussion with key informants, one from the Ministry of Agriculture, Food Security and Cooperatives indicated that the government of Tanzania is already taking some initiatives to address information asymmetry in agriculture through mobile phones; for instance, one official said that:

There are efforts by the government to push forward the use of mobile phones to communicate agricultural information including welcoming investors to scale-up some agricultural mobile phone applications or programmes.

3.4 The Interactive role amongst stakeholders

Table 3 shows the nature of interaction between stakeholders and its contribution to the title role of the study; the relations were labeled as either strong (++), moderate/weak (+) and bad (-) or exploitative relationships (E). However, only a few pairs had strong linkages, for example; farmers with input dealers, government with researchers, government with mobile phone companies. Other links showed moderate and or weak relations. Furthermore, exploitative relations were also reported to exist, for example, the interaction between traders. The reason for the existence of exploitative relationship was that, each of the traders was after making profit, and did not inform fellow traders about where a traded product was obtained. Equally, input suppliers were found to be selfish, and did not refer customers to other shops if they missed a particular product. An input dealer would rather ask a customer to come back for the missed product rather than referring to fellow input dealers. For instance, one FGDs member contended that; Input suppliers do not cooperate amongst themselves, to clarify this he said:

If a buyer misses a product in one shop, the vender does not refer the customer to another shop; instead he/she asks him or her to come later. It becomes easy for venders to buy a product for a customer from a fellow input seller than referring him or her to a shop having the product worrying of losing such customer(s) in the future.

Given a set of diverse players in agriculture, it was necessary that the nature of their interactions is determined. The researchers therefore, analyzed mobile phones' based interactions amongst stakeholders and determined their influence on accessing agricultural information. Figure 4 depicts interactions amongst stakeholders (i.e. government, mobile phone companies, input suppliers, traders, seed multipliers, researchers, extension agents, telecasters and farmers as noted during the FGDs. Their linkage was assessed based on the nature of knowledge sharing, information exchange, joint planning and or resource sharing. Farmers represent the central focus of the networking and are placed at the middle of the main square of the Venn diagram. The thickness of the arrows signifies strong links and relationships in terms of powers and effect. Thick arrows indicate strong linkage while the thin ones denote weak relations and or linkages. Thick arrows also imply that there is clear knowledge of services provided by a particular stakeholder including its relevance and accessibility. Important identified is that; farmers had direct and strong links with input dealers, fellow farmers and extension agents. Also, the government had a strong link with mobile phone companies, seed multipliers and information processors.

Table3. Mobile phone based interactions amongst stakeholders

Table3. Mobile phone based interactions amongst stakeholders	Farmers	Extension Agents	Researchers	Input dealers	Traders	Phone Companies	Government
Farmers		(-)	(-)	(++)	(+)	(-)	(-)
Extension Agents	(-)		(-)	(-)	(-)	(-)	(+)
Researchers	(-)	(-)		(-)	(-)	(+)	(++)
Input dealers	(++)	(-)	(-)	E	(-)	(-)	(-)
Traders	(+)	(-)	(-)	(-)	E	(-)	(-)
Phone Companies	(-)	(-)	(+)	(-)	(-)		(++)
Government	(-)	(+)	(++)	(-)	(-)	(++)	

Legend**:** E-exploitative or bad linkage, (-) Weak **l**ink (+) moderate linkage; (++) good/strong relationship

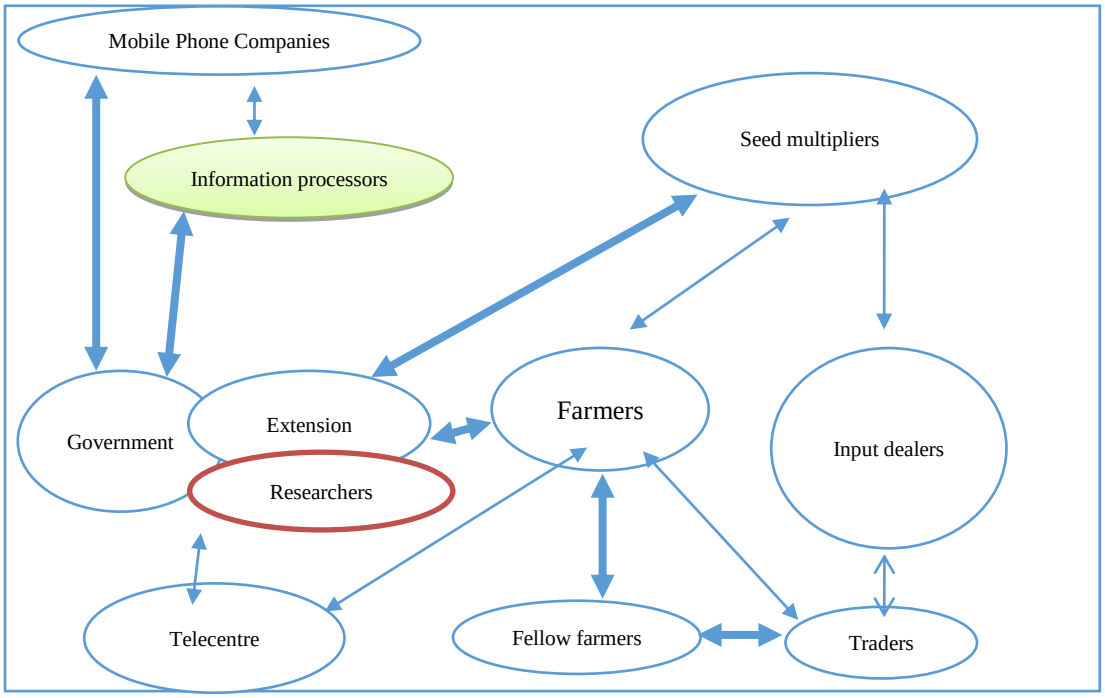

Figure 4. Nature of interactions amongst stakeholders

Basically, interactions amongst stakeholders found to have a significant influence on the use of mobile phones in accessing agricultural information. The findings are in line with findings by Klerk and Saayman (2012) who found that, in order for one player to acquire and use agricultural information through mobile phone, link with other stakeholders is inevitable. A well-adjusted interaction allows for greater openness, and, hence, facilitates transfer of knowledge (Kale et al., 2000). Other studies (Wang et al., 2012; Watson, 2012) hyped that networking is a critical component of the knowledge management dispensation, whose absence would make it difficult to set knowledge into motion.

4. Conclusions and recommendations

The study identified some roles that different stakeholders need to play in order to enhance the use of mobile phones in communicating agricultural information. The government of Tanzania, for example, has the role of promoting the use of mobile phones in communicating agricultural information. The most effective government strategy to promote the use of mobile phone has been to involve the private sector to invest in mobile phone development. Other plans that the government has include supporting mobile phone use through building infrastructure such as, rural electrification, allowing more mobile phone service providers for reduced running cost. Clearly, during FGDs it was revealed that investors could become motivated to invest and offer their services in remote areas if they were supported and motivated including good roads and power sources. Recommendations as follow:

Local government authorities should improve telecentres so that they can grow into real centres for training smallholder farmers in ICTs, including mobile phones.

As evidenced in the results section, farmers had more contacts with input sellers compared to other stakeholders. This could be interpreted that there is a need to encourage the relationship between smallholder farmers with input suppliers almost certainly in the expense of other group of stakeholders. Consequently, the government authorities, through researchers, would also think to liaise with mobile phone service providers to subsidize smallholder farmers' linkage with input suppliers, for instance; providing free texts or calls.

Based on the fact that multi-stakeholder networking brings stakeholders together and ensures knowledge sharing among actors, local government authorities in Kilolo and Kilosa district should regularly organize meetings with various stakeholders for exchange of ideas meant to increase mobile phone use in communicating agricultural information.

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