Utilisation of Mobile Phones in Accessing Agricultural Information by Smallholder Farmers in Dzindi Irrigation Scheme in South Africa

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Abstract

ICTs have revolutionised agricultural information services at every level in the agricultural sector, thus impacting rural development and catalysing poverty alleviation strategies. This has largely been the case with small-scale farmers in rural areas in developing countries where mobile technologies have penetrated more than most other ICT tools. However, in some of the farming environments, mobile phone use is largely driven by agricultural extension workers. This paper seeks to examine the way mobile phones are used for information access in situations where agricultural extension workers are a critical intermediary in the agricultural information services. Interviews were conducted with 10 randomly selected farmers who were part of the Dzindi irrigation scheme. The findings were that from the variety of information available to the farmers the most important source was the extension officer. The extension officer and the radio were indicated to be the most reliable independent sources of information. The other sources, such as the radio, family members, and friends, suppliers of chemicals, books and magazines, were only considered reliable if the information could be verified or vouched for by the extension officer. Increasing the information handling skills of extension officers, training of farmers to use smart features of their phones and promoting the usual face-to-face communication and use of conventional methods, which is what usually gives rise to the mediation of mobile phones, were recommended.

Keywords: Mobile phone, Agricultural extension, Agricultural information

Introduction

Information Communication Technologies (ICTs) pervade all areas of life with different ICT tools and technologies being used in a variety of ways across the globe. The impact of ICTs on socioeconomic development, particularly in the developing world, has led to the ICTs for development (ICT4D) concept. Agriculture is the mainstay of most African economies (Ponelis and Holmner, 2015); and as such, the role of ICTs in improving agricultural productivity is of concern to the majority of development agencies working on the continent as part of their ICT4D agenda. Etzo and Collender (2010) stressed this critical role of ICTs in development, citing the informed observation of a renowned economist Jeffrey Sachs who had stated that "mobile phones are the single most transformative technology for development". With a current mobile subscription rate of over 960 million in Africa, a penetration rate of over 80%, and more than 216 million people using the Internet (Business Day, 2017), this observation

is even more insightful today than it was back then. This is huge in comparison to the traditional information sources that rural people, in particular farmers, have had access to such as neighbours, friends and relatives, radio, public extension officers, to a lesser extent – television (TV), newspapers, agro-input suppliers and even their buyers (Mittal et al, 2010). Mobile technologies have helped close the digital divide turning a continent once famed for being the black hole of information capitalism (Carmody, 2013) into a well-connected physical terrain.

In the face of all this advancement, there are still areas in South Africa, mostly poor rural communities, where lack of information still happens. Dzindi Village in Thohoyandou in the Vhembe District of Limpopo Province is one such rural area, and was the location of this study. The Dzindi Village falls under the Thulamela Municipality in the Vhembe District of Limpopo. The area has 659 households and a population of 2787 people (Statistics South Africa, 2011). The village is categorised as 100% traditional or tribal, and most of the people there earn their livelihood from subsistence farming, with 85.5 % of the population earning less than R38 200 per year. Mobile phone ownership is at 93%, and Internet access through the mobile phone is at 32% (Statistics South Africa, 2011).

The biggest producer of locally relevant agricultural information in the area is the University of Venda through its Faculty of Agriculture. The researchers surmised that if the university library could help in providing this information to farmers as part of its community engagement beyond the university walls, that would address the gap in the researcher-extension officer-farmer information provision chain. The key, however, would be to find a sustainable way of providing the information, hence the investigation into mobile phones use under extension services. Dzindi irrigation scheme was chosen because almost all its members are full-time farmers, and the extension officer who services them is a government employee whose major role is to service the farmers under the irrigation scheme.

This paper seeks to examine the way mobile phones are used for information access in situations where agricultural extension workers are a critical intermediary in the agricultural information services. This paper argues that the information intermediary role of extension workers is not diminished by the adoption of mobile technologies but rather better enabled through bringing in efficiencies that may be difficult to achieve in the traditional format of this role. Given that background, the study's objectives were to: i) find out what are the preferred sources of information by the Dzindi Irrigation Scheme small-scale farmers and the extension officer; ii) find out how both parties use mobile phones to access farming related information; iii) investigate how the farmers perceive the importance of mobile phones to their farming practice; and iv) to find out how extension services available to the farmers are enhanced by the use of mobile phones.

Literature Review

Role of mobile phones in agriculture

Mugwisi et al, (2015), citing studies in India, China and Uganda, argue for the importance of mobile phones in agriculture that can help reduce information asymmetry, increase prices and improve extension services. Mobile phones are important in helping to provide information on appropriate seed varieties, weather patterns, dealing with pests and diseases (Mabe and Oladele, 2015 and Das, 2013). Further to this, Das (2013) indicates that information on land claims, resource rights and rural infrastructural projects is also obtained through mobile devices. Through the whole agricultural cycle – from crop planning, buying seeds, planting, growing, harvesting and packing, and through to selling – extension workers can leverage ICTs such as mobile phones to provide the needed information (Asad, 2014).

Masuka et al (2016) state that both private and public agricultural information provision has enabled mobile phones to become a key tool in the communication of this kind of information. The tool has brought some advantages that include access to information on the supplies markets and prices, knowing where to sell products and applicable prices, as well as accessing data from weather advisory services and consulting with extension workers. In their study of how mobile phones are used by farmers in India to access information and their impact on farm income and cost of production, Mittal and Mehar (2012) found out that they were key to seed variety selection, best cultivation practices, protection from weather-related damage, and handling plant disease. Compared to traditional ICTs such as radio,

TV and newspapers, farmers are just passive recipients who can't interact with and assess the value and relevance of information as it is the case with mobile phone based information access. As a communication tool, then the mobile phone provides for both forward linkages to the food industry, which provides the market for the products and backward linkages to the suppliers of inputs needed.

There are, however, challenges that mobile technologies are not able to deal with that part of the environment in which farming is taking place in Africa. Such challenges include that of poor interconnectivity, power outages, poor ICT infrastructure, lack of computer literacy skills, provider-driven rather than user-driven information and so forth (Akpabio, 2007). Carmody (2013) argues that this poor enabling environment results in what he terms "thintegration", implying a surface or superficial and regressive incorporation of ICT tools that have a negative rather than a positive effect on the adopting communities. He contends that there are hierarchically structured social and economic networks that perpetuate the types and levels of power in existence both at an international and at a local level. To that extent, the mobile phone as a tool entrenches such power relations as they flow from such social networks. Carmody (2013), unlike what the economist Sachs argues above, believes that mobile phones actually entrench the continent's technological dependency and underdevelopment. Although this may be a valid argument, it does not negate the fact that mobile technologies have and continue to play a critical role in helping many get information that is critical to their livelihoods and therefore key to the development of their communities.

Despite the huge penetration of mobile phones in Africa, Aker (2011), Oladele (2011) and Mittal and Mehar (2016) indicate that government extension services are still the major source of agricultural information in developing countries, and this is supported by Benson and Jafry (2013) who put the number of extension workers in developing countries at 800 000.

Challenges of Extension Services as a Source of Information

Whereas Benson and Jafry (2013) state authoritatively that the demand-driven or participatory model is very effective, Gido et al (2014) advocates for a balanced combination of supply and demand-driven extension as informed by the unique agro-ecological and socioeconomic characteristics of the farmers concerned. Gido et al (2015) further gives the example of the Strategy for the Revitalization of Agriculture in Kenya as being an extension-driven project that is based on the generally agreed perception that extension is critical to agricultural productivity and poverty reduction. Nevertheless extension workers are also deemed not to be the best providers of agricultural information as they are likely to be prejudiced by their personal views and those of their preferred sources and the infrastructure and network support biases thereof (Wheeler et al, 2016). Issues of physical availability of extension workers is a challenge with a study by Chellapan, Swaminathan and Thiagarajan (2014) in India indicating a high extension staff to farmer ratio of 1:2000 in some areas. This also brings in implications of the timeliness of the information that farmers get as they may get information when they no longer need it, and this is a big disadvantage because, in farming, timeliness in getting the right information can mean a high rate of post-harvest wastage and famers receiving poor prices for their crops. Wheeler et al, (2016) thus advise a 'multiple sources of information' model facilitated by many channels that speak to the unique needs of different farming communities. Wheeler et al (2016) criticizes the traditional extension for being too focused on raising yields instead of aiming for sustainability.

A major critique, especially in the context of Africa, is that not only is the method too costly and ineffective but also that it can only work if the institutional frameworks that form the environment in which farming takes place are well developed and effectively operational (Wheeler, 2008). The same sentiment is shared by Ponelis and Holmner (2015) who argue that there is a threshold outside of which any form of development assistance may not be as effective without requiring that institutional quality be improved first. While acknowledging the challenges that extension has, Benson and Jafry (2013) point out that a multiplicity of factors affect agricultural production in varied and complex ways such that it is difficult to isolate one variable only, such as extension, and quantify it. Davies (2008) indicates that though studies on the rates of return of

extension to agriculture in Southern Africa are usually accepted with skepticism, there is a general agreement that extension has a generally positive impact on agricultural productivity.

Use of Mobile Phones in Extension Work

The information intermediary role of extension workers is not diminished by the adoption of mobile phones but rather better enabled through bringing in efficiencies that may be difficult to achieve in the traditional format of this role. The common error of being technocentric in many ICTD4 projects (Mamba and Isabriye, 2015) has seen many well-meaning projects, meant to improve the lives of the poor, fail as the social context of the implementation environment is ignored. An example is that made by Anastasios, Koutsouris, and Konstadinos (2010) of developed world farmers who are sophisticated ICT wise and have access to ICT tools such as farm computers and Internet access, yet they still prefer the traditional personalised communication of the extension worker and varied sources of information with a bias towards printed sources. The general bias towards face-to-face communication, as a means of getting information, that is displayed by farmers (Akpabio, Okon and Inyang, 2007, Anastasios, Koutsouris, and Konstadinos, 2010 and Mittal and Mehar, 2016) means that extension services are still a critical component of the agricultural productivity equation.

The adoption of ICTs, such as mobile phones, should thus not be erroneously perceived to mean a movement away from face-to-face communication but rather the opposite, which is leveraging ICT tools to enhance face to face communication. This means that the two aspects, mobile technologies and traditional extension services, do not have to conflict or be mutually exclusive.

In a study on mobile phone use by farmers in Pakistan, Salman (2014) indicates how their use has allowed farmers to transition to cash crops and set themselves on a path for poverty reduction and economic development. He states that access to mobile cell coverage enabled the farmers to improve farmer-to-trader coordination and reduce post-harvest losses for perishable crops, improve farmers' knowledge of the planting date and increase price of crops received by farmers. Cole (2013) evaluates

a mobile phone based extension service in India where farmers phone to get help from extension officers and other agricultural experts. Similarly, the results showed that the use of the service got farmers to adopt high-value crops and gain more knowledge of their crops. Compared to the traditional or the conventional methods, the service enabled timely access to relevant and highly practical information and advice to farmers at relatively lower cost.

Focusing on the smart aspects of mobile phones, Drill (2012) speaks of the apps that are being developed for extension use in information delivery, where information originating from local research institutions is cascaded to farmers; collaborative research, where mobile phone apps are used to collect data to be shared by researchers and other participants; and self-assessment, which focuses on use of apps for collecting data for personal decision-making. Farmers, on their part, acknowledge the importance of ICT tools in enhancing their service delivery abilities (Mabe & Oladele, 2015), though there is a general sentiment that they lack the skills to use such tools and need to be trained on them (Arokoyo, 2010; Ajayi, Alabi and Akinsola, 2013; and Mabe and Oladele, 2015).

Methodology

The approach that was chosen was that of a single case study of Dzindi Irrigation Scheme whose farmers largely survive on accessing the services of an extension worker. A comprehensive interview was conducted with the extension officer who services the 110 small-scale farmers who form the Dzindi Irrigation Scheme. The interview questions for him focused on (i) the agricultural information needs of farmers he was aware of; ii) his preferred sources of agricultural information and those of farmers and ii) his usage of mobile phones as an information access and communication tool.

Both Creswell (1988) and Green and Thorogood (2009) offer a minimum of 20 respondents as a sample size when conducting interviews for an accurate picture of the sample. However, because there is not enough consensus on the issue, Guest et al (2006), as cited in Mason (2010), recommends six as a minimum. Interviews were done with ten (10) randomly selected farmers from the 110 who were part of the irrigation scheme. The researcher had

been introduced to the famers beforehand during the farmers' weekly meeting with the extension officer. On that same day, two respondents were interviewed; and thereafter, random visits were made to the farmers twice, with four farmers being interviewed in each case. Any of the farmers belonging to the irrigation scheme who was found working on his field was interviewed. The farmers were questioned on their information needs, preferred sources of information, and use of mobile phones to communicate with the extension officer and among themselves on farming issues. Thematic analysis was applied on the data, and this was done as per the various steps provided as guidance by Braun and Clarke (2006).

Findings

From the interview transcripts, a number of issues emerged both from the farmers and the extension officer. The findings are as follows:

Farmers Preferred Sources of Information

Nine (9) of the 10 respondent farmers were males who had never lived anywhere else except Dzindi village. Only one of the respondents had only been staying in the area for just over 40 years. Eight of these men were the sole decision makers on farming issues and the other two respondents had shared decision-making powers, one with his wife and the other with his brother whom he co-shared the farm with. All the respondents were fluent in speaking, reading and writing in Venda and spoke at least Tsonga or Sepedi as a second vernacular language. On a scale of poor, fair and good in reading and writing English, nine of the interviewees indicated they were fair on speaking and reading. One (1) farmer indicated he had never been to school and was poor on all the three aspects. Household sizes ranged between three and six people. The plants that are largely planted are cabbage, maize, spinach, sweet potatoes, mustard, carrot, beetroot, and butternut.

The results from the interviews of the farmers revealed the importance of the extension officer to agricultural productivity and sustainability and the critical importance of mobile technologies in enhancing that role. The extension officer was indicated as the most important source of information by all respondents with emphasis being expressed on this point by both voice intonation and body language. Responses such as *"our Extension Officer help us a lot. He tells us what and when to plant and what fertilizers to use…we get much advice from him. He also helps us to get quality seed"* expressed such sentiments. Radio, family members, friends, suppliers of chemicals, books, magazines such as Farmers Weekly and neighbours were the other sources that farmers used. Of all these sources, the extension officer and the radio were the two sources that were deemed most reliable. One farmer even indicated that he would prefer whatever information he obtained from any other source to pass through the extension officer first to be verified to receiving it directly, say from a library such as the University of Venda Library. He implied this, stating that *"the information that I will need is when it's being brought by the extension officer."*

Extension Officer's Preferred Source of Information

Only one agricultural extension officer was attached to service the Dzindi Irrigation Scheme where he had been deployed to work by the Vhembe District Department of Agriculture for the past 20 years. Permission had to be sought from the department as part of the study's ethical clearance. Though they appreciated the interest in having a study done in their area, they lamented the lack of capacity to implement a lot of the recommendations that come from many such studies. They then indicated that theirs was just an administration role from their offices and that the extension worker would be the best person to talk, lest they speak out of turn as to what was really happening on the ground.

The extension officer also serviced other farmers in the area who were not part of the irrigation scheme. He has a diploma in Agriculture. The irrigation scheme has a physical satellite office from which the extension officer operated, and it is also the place for farmers' meetings and training. The office, however, was lacking in much of the equipment needed to service the farmers effectively. The fact that it only had a desk and some filing folders is quite telling. Even a landline telephone was not available, let alone a computer. For any ICT-related access to

dissemination or general communication, the extension officer almost entirely relied on going to the main office which is 20 km away, or using the Internet cafes in town about 10 km away, or just using his mobile device.

The extension officer indicated that he was most reliant on the Internet and the refresher courses as the major sources of information for his practice. Although not explicitly stated, he felt he had sole responsibility for finding information that met the needs of his clients with very little or no help at all from his employer. The electronic database called Extension Suite that was provided through the department's Intranet had only old materials that he already knew and so was of little use to him. The Internet was usually accessed at the Department of Agriculture main office about 20 km away, or through Internet cafes – about 10 km away in Thohoyandou town or through the use of his mobile phone if and when he had data. The challenge, however, was that at the office the connectivity was usually poor except outside office hours when there were no people. With Internet cafes, the connectivity was good but he had to bear the costs personally, and the same applied for his mobile device where connectivity was even poor at times. This he alluded to saying "…*and even on your phone if you don't have enough data bundles you have to check for whatever you're looking for fast and then you switch off.*"

Mobile Phone Usage by Farmers

All the farmers indicated that they use mobile phones to communicate agriculturally related information. Only three out of the ten farmers had smartphones with the other seven having feature phones. Only one farmer indicated he used WhatsApp, and the majority used voice calling and SMS functionalities the most. The functionalities of the owned smartphones were those such as Internet, WhatsApp, Facebook, camera and Email. However, these were mostly not used with one farmer stating that "*eeh it does have them but some of these features I am not using them, I just leave them...these things of WhatsApp I feel like they waste my time...they are difficult for us*" while the other one also similarly said "*I don't use those things, I'm an old person. I don't know those things.*" This reflected a challenge of lack of digital

literacy skills and some type of technophobia that, in some cases, deceptively manifests itself as a mere logical, and yet misinformed perception that paying attention to the smart aspects of smartphones is a waste of time. The issue of language also came up because looking for information on the Internet meant that farmers had to have good English language skills. And this is problematic because only one out of ten respondents indicated that he had good English language skills. This was in a way confirmed by the extension officer who indicated that his other challenge with communicating latest agricultural developments to farmers was that the technical language may be too difficult to rephrase for the farmers and communicate the ideas without risking losing the original meaning.

Perceived Importance of Mobile Phones to Farming by Farmers

Mobile phones are perceived as very beneficial by farmers because of the convenience they give in terms of timely and effortless communication or acquisition of needed information. One farmer eloquently articulated the critical importance of having a mobile phone to his whole farming, stating: "*it will be affected a lot, especially with customers. Because customers call and if my phone is off… just like now, I'm going to start harvesting and selling cabbages on the 20th, my phone must always be on. There are people who just have my phone numbers even the tenderpreneurs, they call and say they want cabbage or they are at the farm gate, and if I'm not on the farm, they have a problem. They even call me when I'm at home, then I will rush to the farm. Even waking up early in the morning because others come to buy early in the morning. Even the hawkers, those selling on the streets and in spaza shops, I always have their numbers. I can't afford to put my phone down. I must always have it in the pocket. If I just miss… it's not possible that the day can end without it working.*"

Mobile Phone Usage by the Extension Officer

Asked if he found a mobile phone useful in conducting his duties of facilitating access to information by farmers, the extension officer

indicated that it was key to him being effective in servicing the farmers. He explained that he spent a lot of time talking to farmers who called him on the phone asking for advice on various farming issues. He particularly believed that when connected to the Internet, a mobile phone could make a huge difference in accessing information on assisting in diagnosing problems in real time out in the field. To this effect, he stated: "*So basically that's the way I think we should do…when you're in the field if you could see some of the symptoms that you're not sure of you have got to get through the Internet very fast and then check is it what I'm seeing is it …err… do they correlate to what the information [from the internet] is telling me about and then you could really come with the answer on the spot. ..*" This was more so in the case of identifying pests and knowing what pesticides to buy. The extension officer indicated that one such case had occurred in the previous year where there was an outbreak of a pest called the whitefly. Encountering this pest for the first time, the majority of farmers confused this with the earthling fly and applied the same pesticide for the white fly. This was problematic because only the nymph of the white fly was exterminated and not the adult whitefly. He surmised that if the farmers had taken photos of the pest and sent to him on the phone, then he would have been better able to advise.

Conclusion and Recommendations

The study explored how mobile technologies are being used by farmers within an extension services environment in an irrigation scheme in South Africa. Literature analysis proved that the traditional face-to-face extension, notwithstanding all its inefficiencies and other shortcomings, was largely still the major source of agricultural information for farmers in the developing economies. The interviews done by the farmers supported these observations. The farmers expressed how both the extension officers and the mobile technologies are critical to them by finding and using information throughout the farming cycle. The extension officer acknowledged the importance of access to information and how much the Internet has the potential to help him and his work constituency. His

biggest challenge, same as the farmers, was that of high connectivity costs.

The lack of usage, and even anxiety, indicated by farmers in using the mobile phones independently to find information was a bit surprising. They instead showed a preference for using their mobile phones to call or sent text to the extension worker or other people for information. The study highlighted the need for the strengthening of the extension services through retraining and retooling the extension officers with ICT tools such as mobile technologies for them to be effective. The same also applied to the farmers who need to be encouraged to invest in smartphones that have better information handling capabilities and also to be trained in digital literacy. Having thus demystified the presumption that access to mobile phones means easy access to information, the study recommended that holistic interventions be developed that seek to integrate mobile technologies into extension services rather than usurp this key service. Going forward, future research could look into developing a framework of integrating ICTs or mobile technologies into the agricultural information advisory services within the same or other community in any resource scarce environment.

It is deduced from the study that there is need to improve the information handling skills of extension officers using digital tools such as mobile phones and leveraging their use as communication tools with the farmers. In terms of self-directed searching and finding of information there maybe need to train farmers in the use of the smart features of their phones such as web browsers and social media applications. The extension officers are ably positioned to offer such kinds of trainings during the farmer field days or weekly meetings.

The promotion of the use of conventional face-to-face meetings between the extension officer and the farmers needs to be pursued because it is still a highly preferred method of accessing information. The same goes for other ICTs such as radios with local community radios being the most appropriate to reach out in the language of the area. This is critical since the use of mobile phones by the farmers above was largely built on interactions originating from these other ways of communicating agricultural information. Another key recommendation is that since most farmers are more comfortable with using

information in their home language there is need for translating of information into the local language so that it's optimally used by those it matters most to.

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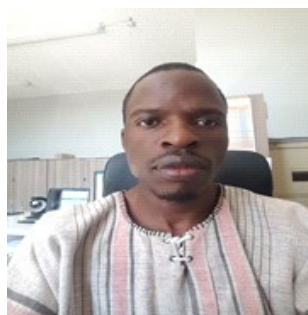
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