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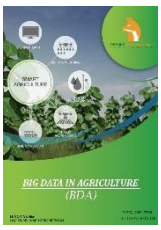

REVIEW ARTICLE

USING MOBILE PHONE FOR AGRICULTURAL INFORMATION DISSEMINATION BY FARMERS IN MASHONALAND WEST PROVINCE OF ZIMBABWE

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ABSTRACT

Information is key in farming, as it plays an imperative role in improving agricultural production, thereby improving rural livelihoods for farming communities. Mobile phone (m-phone) service and technology is a useful tool used by agricultural stakeholders in the dissemination of agricultural information to farmers. This paper investigated how mobile phones are used to transmit agricultural information to farmers in Mashonaland West Province of Zimbabwe. The paper study used a quantitative research approach consisting of a questionnaire administered to 384 farmers and 13 network providers. SPSS and content analysis were used to analyse data collected following the three research objectives, that are, to assess the level of mobile phone access and the brands of mobile phone available among the Mashonaland West farmers, to identify how mobile phones can be used to meet the information needs of the farmers in Mashonaland West Province of Zimbabwe and to analyse the sources and channels of disseminating agricultural information available to farmers in Mashonaland West Province. Results indicate that majority 96% (369) of the farmers have access to a cell phone while 4% (15) mentioned that they had no access to a cell phone, most farmers are willing to receive agricultural information through their mobile phones. The results showed that most of the farmers 186 (48.4%) were not aware of the available mobile phone sources and channels of communicating agricultural information to farmers as 160 (41.7%) respondents aware of the Eco-farmer platform, 75 (19.5%) aware of Kurima Mari platforms and none aware of Esoko and e-Mkambo platforms. The results, therefore, indicate that although some farmers were aware of the available platforms like Eco-Farmer but were not using this platform to get agricultural information.

KEYWORDS

agricultural information, network providers, disseminating, communicating, Eco-Farmer

1. INTRODUCTION

Generally, agriculture is essential for the improvement of livelihoods. Farmers need to get agricultural information for them to improve on their farming skills, which will result in an increase in agriculture production and rural development. As a result, agricultural knowledge accessibility is influenced by the communication links and resources needed for the dissemination of information. A variety of channels can be used to disseminate agricultural information to farmers and these can be in print or electronic formats. Electronic formats include Information and communication technologies such as: digital personal assistants (PDAs), imaging and acoustic technologies, geographic information systems (GIS), CD-ROMs, radio, smart cards, radio-frequency identification devices (RFID), mobile phones, websites and blogs and emails (Mangstl, 2008). The cellular phone's SMS-application has been seen as the main ICT channel used to transmit information in Africa (Bertolini, 2004). This is mostly because of its merits, which are greater than other ICT channels. Aside from being mobile, the mobile phone is simple to safeguard (Donner, 2006). The mobile phone does not depend on physical infrastructure, since it is reachable through radio waves, and requires only basic literacy/expertise to operate (Rashid and Elder 2009).

The mobile phones allow for data transmission and can be affordable by the majority poor rural people (Bertolini, 2004; Rashid and Elder 2009).

However, there are a number of obstacles that impede the diffusion of farming information to the farmers using the mobile phones especially in developing countries and these include poor infrastructure and (costs and lack of technical expertise connectivity, education level (Ali, 2012; Kaku and Aba, 2007; RaJ, 2012; Saravanan, 2011; Okello-Obura et al., 2013; Cloete and Ikoja-Odongo, 2009; Raj, 2012).

1.1 Purpose of the study

The purpose of this study was to investigate the use of mobile phones in disseminating agricultural information to farmers in Mashonaland West Province of Zimbabwe, with a view to cover the gaps created by the available initiatives.

1.2 Objectives of the study

The explicit objectives of this study were:

- To identify how mobile phones can be used to meet the information needs of the farmers in Mashonaland West Province of Zimbabwe.
- To assess the level of mobile phone access and the brands of mobile phone available among the Mashonaland West farmers.
- To analyse the sources and channels of disseminating agricultural information available to farmers in Mashonaland West Province.

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2. Theoretical Framework

A theory in research, is defined in a study as an attempt to develop a general explanation for some phenomenon focusing on determining cause-effect relationship (Best and Kahn, 2004). Some researcher define a theory as the language that allows researchers to make sense of similarities and differences from observation to observation while in other study, author describes a theory as asystematic observation and explanation of aspects that relates to a particular life (Rudestam and Newton, 2007; Babbie, 2010). A researchers further states that today's social theory deals with, 'what is and not with what should be' (Babbie, 2010). This means that a theory in research should focus on how things are and why they are like that.

This study adopted the diffusion of innovations theory (DIT) by Rogers. The diffusion of innovation theory (DOI), which was found by Rogers, clarifies how innovations or new initiatives are accepted. In a study stated that "diffusion is the process by which an innovation is communicated through certain channels, over time, among the members of a social system" (Rogers, 1995). The diffusion theory comprises four basic elements, namely: innovation, time, social system and communication channels. All these elements were necessary as this study.

2.1 The diffusion of innovations theory

The four main aspects of the diffusion of innovation as stated are innovation, communication channels, time and social system (Rogers, 2003). These four aspects eachplayed an important role in this research. This research focuses on closing the digital divide created by available initiatives like Eco-Farmer and e-Mkambo. This can only be achieved through the application of the diffusion theory's four main elements in the research. In this case, a new innovation in the area will be the use of the mobile phone to disseminate agricultural information. The mobile phone will be the communication channel while the farmers and other stakeholders represents the social system.

2.2 Related studies

2.2.1 ICT applications in agriculture

Several ICT applications can be used to improve agriculture. The applications vary according to its intended purpose and the accessibility of necessary infrastructure. These applications have the ability to record information, produce duplicates of the recorded information, transfer large quantities of knowledge and information over long distances at a very low cost and facilitate interaction in information communication and knowledge sharing (Singh, 2012). Richardson argue that whichever ICT that is used to develop the lives of the poor rural communities which plays an indirect or direct role towards enhancing agricultural production, post-harvest and marketing activities, contributes to the reduction of poverty (Richardson, 1997). The ICTs applications which are in use in e-agriculture comprise of the following: knowledge management systems (KMS), wireless communication, radio-frequency identification (RFID), phones, geographic information systems (GIS), digital personal assistants (PDAs), CD-ROM, smart cards, radio, and precision agriculture (PA) (Singh 2012; Taylor and Whelan, 2013).

2.2.2 Level of mobile phones access

ICTs, which include cell phones have the ability to make better the circulation of agricultural information and improve the livelihoods of people. Global cellular phone exposure grew from 12% in 1999 to 76% in 2009 (Tegegn and Dafisa, 2017). In a study on the utilisation of cell phones for agricultural purposes in Nigeria, some researchers found that 98.7% of the research participants had access to cell phones with 90.5% being mobile phone owners (Asa and Uwem, 2017).

Zimbabwe has a high mobile subscription rate. With three mobile phone service providers POTRAZ reported that Zimbabwe's cellular phone distribution rate increased from 97% to 100.5% in the second and third quarter of 2017 (POTRAZ, 2017).

2.2.3 The use of mobile phones in agriculture

Since the e-agriculture community was established, several organizations have commenced e-agriculture actions, either on large or on a small scale. Illustrations of such schemes are: Manobi, e-Choupals, Gyandoot, the Evergreen Farming Group (EGF) and Participatory 3D mapping just to cite a few. The majority of these initiatives comprise of the fundamental purpose of giving essential, reliable, and appropriate information to farmers. Bertolini observes that the mobile phone short message service-application is the major vital rising ICT application in use for transmitting information in Africa (Bertolini, 2004). In a study, state that since 2000, the cellular phone technology has been broadly accepted in most developing countries, and studies has shown that the use of cell phones has enhanced farmers' market access and income (Sekabira and Qaim, 2017).

Numerous factors contribute to the reasons cell phones are believed to be of importance in development; a number of such factors were mentioned by various researchers who say that, mobile phones are portable and offer protection to holders, cell phones need not to depend on physical visible infrastructure like phone wires and roads but require basic literacy ability, cell phones allow information transmission and can be afforded by the poor rural populations (Donner 2006; Rashid and Elder 2009; Bertolini 2004; Rashid and Elder, 2009). Some researchers agree with the other scholars as they opine that mobile phones have three advantages over other ICTs, because they have easy access to customised content, are mobile and time-saving (Mittal and Tripathi, 2009).

In recent study, authors has argue that cell phones are the ICTs that are mostly adopted by farmers, as they are easy t to keep, provide cost-effective advantages and enhance the societal rank of its users (Aker and Mbiti, 2010). In their study to find out if mobile phones can improve agricultural outcomes in Niger, some researchers note that farmers who have access to cell phones and know how to use them to get information have increased the quantity of crops they produce and this has resulted to increase in the production of their cash crops from one cash crop to, at least, two (Aker and Ksoll, 2016). Aker in a study in Niger on mobile phones and agricultural markets found that cell phone exposure has resulted in the reduction of millet consumer price distribution by 10-15 percent (Aker, 2010). There are several successful mobile phone based agricultural information dissemination projects globally. The successful projects include: e-Choupal, Reuters Market Light (RML, Manobi, Web Portal, ONASA, CocoaLink, NAFIS and KACE, just to mention a few

2.2.4 Mobile phone agricultural initiatives in Zimbabwe

In Zimbabwe, there are also some mobile phone and other ICT-based agricultural information dissemination initiatives. The available platforms include e-Hurudza, Eco-Farmer, Esoko, Kurima Mari and e-Mkambo.

2.2.4.1 e-Hurudza- Zimbabwe

E-Hurudza is an electronic farm manager platform, which provides agricultural information to farmers. It was developed by a Zimbabwean company to support the Zimbabwean government's land reform programme (Chisita, 2010). However, this platform was developed in the laboratory and no groundwork was done (Musungwini, 2016). The Department of Agricultural Extension Services (AREX) distributes the e-Hurudza software to farmers and trains them on how to use it. E-Hurudza requires a computer, printer and relevant infrastructure.

2.2.4.2 Eco- Farmer

According to a study, EcoFarmer is an e-agriculture service available to Zimbabwean farmers (Econet Wireless, 2018). Established and launched by Econet Wireless in 2013, the service is a weather-indexed natural disaster insurance service that assists Zimbabwean smallholder farmers to acquire insurance cover at eight cents for each day. The eight cents is taken away from the farmers' prepaid cell phone account daily throughout the farming season. This service is available to Econet subscribers and ecocash registered users only. When a family is completely registered and pays subscriptions on a daily basis, he or she will get:

- Every day's weather information from a weather station connected to his/her field.
- Market and farming tips
- Daily rainfall information
- Weekly best agricultural practices
- Weekly crop information
- Monthly free market pricing requests
- Loan ranking
- Free adverts and marketing relations

- Financial linkages

The Eco-Farmer platform permit farmers to make a monetary claim, if their crops fail due to both excessive and inadequate rain. If there is a drought, farmers get US$100 for each 10kg of seed which was grown. The scheme is an innovative weather inspection network, which allows Econet to know accurately how much rain fell on the farmer's field. This service was popular with smallholder farmers in Mashonaland West Province, improvement areas were identified and are being resolved, so that the programme can be expanded to other provinces.

2.2.4.3 Esoko

Launched by the Zimbabwe Farmers' Union (ZFU) in 2012, Esoko is a mobile platform, which uses the SMS platform to send agricultural information to ZFU member farmers (ZFU, 2013). Esoko is currently providing agricultural information on 33 commodities to 17 fresh produce markets across Zimbabwe. Esoko provides its services to over 170,000 smallholder farmers (Odhunze and Hove, 2015). Esoko is a for profit platform, which originated from Ghana and is being used in other countries, including Kenya, Uganda, Malawi, Nigeria, Sudan and Mali (NewsDay, 2012).

2.2.4.4 Kurima Mari

Kurima Mari is a Shona phrase which means farming for money (Dzenga, 2016). This is an agricultural information dissemination platform introduced in Zimbabwe in 2015 to provide information on agricultural production and marketing of agricultural products to assist farmers to expand their profits through agriculture (Dzenga, 2016). The Kurimamari platform gives specific information on crops, livestock, tips on markets and links to experts. The platform is a harmonized project of the Ministry of Agriculture and Zimbabwe Livelihoods and Food Security Programme (LFSP), a local non-governmental organisation. It is funded by DFID (the United Kingdom's Department for International Development), and is being put into operation in Mutasa, Makoni, Mutare, Gokwe South, Kwekwe, Shurugwi, Guruve and Mt Darwin districts. It targets smallholder farmersand the platform can only be used on smart phones (Nyakudya, 2017). The challenge with the Kurima Mari application is that it can only be accessed on smart phones, which some farmers do not have.

2.2.4.5 E-Mkambo

Mkambo is a Ndebele word for Market, hence e-Mkambo means e-Market (Kabweza, 2014). e-Mkambo is a mobile agricultural information dissemination services which was launched in 2012 by Knowledge Transfer Africa (KTA) in partnership with AfrosoftHoldings (Muza, 2013). Kabweza (2013) summarises e-Mkambo services as follows:

- Getting information regarding the entire products that is sold at the markets through the City Councils, monetising this data and sending this data to financial institutions and farmers, who will use it to identify which crops are on demand or are fetching a lot of money on the markets, so as to provide short term loans to farmers and traders.
- Organising sellers at marketplaces, like Mbare, into clusters to facilitate the acquiring of loans from the banks and use the clusters as security.
- Providing premium SMS services to farmers with instructions on enhancing their farming practices, marketing intellect, what to produce so as to produce the products which are on demand from buyers.
- Established a call center to compliment the SMS to communicate information back and forth with farmers.

However, the e-Mkambo service is only accessible to farmers who go to markets to sell their produce (Musungwini, 2016). This highlights that all other farmers, who do not go to sell their produce to markets, do not have access to this service.

2.3 Challenges to mobile phone and other ICTs usage in agriculture

Challenges refer to any obstructions that deter the execution and the smooth running of a project. For instance, these obstacles may lead to the discontinuation of a project. Whilst ICTs have the capability of improving people's lives in all areas of human growth, there are some barriers that may cause sluggish execution, especially in third world countries. Unless ICTS are implemented effectively, present socio-economic discrepancies such as people's access to vital needs may get worse (Jamwal and Padha, 2009). However, in spite of the obstacles, some researcher opine that if ICTs are taken up efficiently, they can enable the empowerment of communities with improved access to knowledge, services and networks (Jamwal and Padha, 2009). Ali said that the key obstacles to the successful execution of ICT-based information dissemination services in agriculture consist of: connectivity, funding, infrastructure and equipment, education level, language, content and acceptance by parent organisations and target population, and also shortage of suitable technology (Ali, 2012). Chauhan commended that barriers to correct execution of e-agriculture in India consist of (Chauhan, 2018):

- Inadequate organisational capability to convey farmers' exact services.
- Inadequate agricultural infrastructure and support facilities
- Lack of knowledge concerning appropriate agricultural methods, amongst farmers.
- Rights problems of the public and government-generated data
- Agricultural content establishment and its upgrade
- Unavailability of general agricultural platforms for farmers in India

Inadequate utilisation of ICT for agricultural purpose

- Lack of "Agricultural Think-Tanks"

In Zimbabwe, no access to ICTs like personal computer and inadequate access to the internet are the key obstructions towards the production and diffusion of agricultural information, from libraries and research organizations (Mugwisi et al., 2014). To be successful in introducing ICT-based information distribution services, it is essential to initially predict the confrontations and the obstacles before execution, and to make sure how such obstacles can be dealt with.

2.3.1 Education level

Education level is the point an individual has reached in education, varying from primary, secondary and tertiary. The education level of respondents is important in data compilation and in adopting to new innovations. The education levels of stakeholders do have either an optimistic or pessimistic function on the acceptance of any new technology. A high level of education positively persuades acceptance and a low level of education negatively influence acceptance (Ali, 2012; Franklyn et al., 2012). A group researcher establish that high level of education increases one's personal feelings towards innovativeness and change (Ango et al., 2013). Furthermore, in other study author argue that the degree of education influences a person's understanding, adoption and access of new farming practices (Okwu et al., 2007). The literacy level of farmers play an important role in their utilisation of cell phones to access farming information, and in navigating through their phones, thus, affecting their mobile phone usage and consequently, the adoption (Okello-Obura et al., 2009). Nevertheless, Zimbabwe has a very high literacy level; hence, the education level challenge should not be an obstacle to the use of cell phones by Zimbabwean farmers.

2.3.2 Adoption, funding, cost and technical expertise

Adoption refers to the approval by the main organisation and the end-users of an innovation whereas funding means the financing of all what is needed to sustain a given project. In addition, cost refers to the charge required in establishing an Information and Communication Technology-based services, and technical expertise are the necessary abilities to run and start using the service. In India, author establishment that the majority of ICT-based agricultural information dissemination platforms were put into operation as testing projects and when the period they were supposed to run as pilot projects expired the projects were discontinued or were put into practice on a small scale (Raj, 2012). Saravanan also discovered that efforts to continue pilot projects are in no way taken seriously in most developing countries, asin most cases farmers are reluctant to finance the services as they believe that the state must provide for agricultural extension services (Saravanan, 2011).

The majority of these projects are financed by donors, and by the time the donor eventually leaves, the organization which will be supposed to implement the project because of lack of funds to continue with the project will simply discontinue the project or operate it at on a small-scale basis. The additional problem which may lead to a project discontinuation is inability to persuade end- users to accept the innovation. For an innovation to be accepted by its intended audience it must be prove that it is of greater advantage when it is compared to existing options. A group researcher assessed the sustainability of projects which were financed by donors in Kenya, and they found that sustainability is a challenge, not only

in Kenya, but in most developing countries (Oino et al., 2015). Several factors affect sustainability and the factors are simple and complex, internal and external (Oino et al. 2015).

The other blockade is the ICTS' high costs. A group researcher indicate that the ICTs' soaring costs block the majority of farmers and organisations from executing and using information systems which are ICT-based (Franklyn et al., 2012). Some researchers propose that governments ought to participate in funding agricultural services which are ICT-based (Franklyn et al., 2012). In other study, authors note that ICT invention need management that function at national level where strategic monetary decision are implemented (Easdown and Starasts, 2004). ICTs are expensive standard for getting information, as they present numerous technological tools which are required before putting in place, and there is need for training intended audience on the use of the new technology (Churi et al., 2012). An additional aspect which is associated with cost is affordability and this also influence acceptance, implementation and use of a new technology. A group researchers state that, those farmers who get lesser income do not easily accept and make use of new farming technologies (Ango et al., 2013). Their major reason for adopting being affordability as these farmers are unable to pay the expensive charges associated with ICT tools, modern machinery and service costs, and they also lack digital literacy expertise. Lack of an understanding of ICT and poor access to Information and Communication Technologies influence the acceptance of ICTs within the agricultural sector (Franklyn et al., 2012).

2.3.3 Infrastructure

Insufficient rural Information and Communication Technology infrastructure hold back the usage of ICTs in the majority of rural communities. For example, the result of a research which was conducted in India indicate that, within the three villages where this research was conducted, not a single person had access to the internet had a computer (Raj, 2012). There are a lot of technological connections which are required to connect the rural population to the internet; such technologies comprise of: functioning telecommunications infrastructure, costly computer software and hardware and Internet Service Provider (ISP) infrastructure (Easdown and Starasts, 2004). Terrible infrastructure is another challenge that institutions are facing in the implementation information services which are ICT. A researcher conducted a research in Kenya, and found that (Kibet, 2011):

"Poor rural roads and other key physical infrastructure have led to high transportation costs of agricultural inputs and products. It also leads to spoilage of perishable commodities during transportation. This causes high losses to farmers".

Cadilhon made visits to ILRI Water and Food project and CGIAR projects in two districts of Ghana and found that poor infrastructure deter growth in Ghana's agricultural sector (Cadilhon, 2013). As a result of poor infrastructure, the connectivity becomes poor, leading to the opening of emails on the internet and responding to these emails taking long. Majority of farmers in these regions own cellular phones and are able to call traders of agricultural produce to confirm the market prices so that they make informed decisions on when and where to sell their produce.

2.3.4 Connectivity

Experimental research supports that Information and Communication Technologies have a productive influence on the improvement of every country (Kuhlmann, 2005). On the other hand, connectivity is one of the causes of inadequate ICT usage, particularly with the rural farming communities (Franklyn et al., 2012). Most of the families in rural communities in the third world nations are do not have electricity; for those who have electricity, power cuts are regular. Due to no electricity or regular power cuts there is no or poor connectivity in most areas. In addition, a group researcher argues that broadband price is high for people who live in the remote rural communities (Purnomo and Lee, 2010). This adds to restricted use of Information and Communication Technologies, as broadband connection can be afforded by only a minority. Nevertheless, the International Telecommunication Union (ITU) reports between 2012 and 2017 broadband contributions grew by 20 per cent, with the less developed countries having the utmost growth rate of mobile broadband subscriptions (ITU, 2017).

The cell phone network connectivity can also affect the usage of cell phones in information distribution. In Ghana, research found that the at times text messages and phone calls may possibly not go through due to network congestion (Cadilhon, 2013). Cadilhon declare that "I have been negatively impressed by the state of infrastructure in this otherwise dynamic mixed crop and livestock production area…. Dismal infrastructure can stop the agrion production and marketing system from working" (Cadilhon, 2013).

2.3.5 Language

The vital requirements for growing knowledge and information e-agriculture schemes is investing in making technical agricultural information available in local languages by re-packaging it (Mangstl, 2008). While researchers and extension officers are busy transforming research contributions into indigenous languages, Zimbabwe is still faced with scarcity of research materials which is re-packaged into local languages (Mugwisi et al., 2014). Research input customization and localization is a difficult task, however, can be improved by using Information and Communication Technologies in agriculture (Raj, 2012). Agricultural information needs to be re-packaged into indigenous languages, and in appropriate formats. In addition to challenges similar to having no access or restricted access to agricultural information, Zimbabwean farmers also face problems of getting information which is packaged in indigenous languages as the available information is in English. There is a likelihood that the information which is available in English is not understood by its target audience. Using ICTs to distribute agricultural information can aid in the re-packaging of agricultural information into multi-languages and also improve on the accessibility of information in remote areas.

2.3.6 Age

Research show that age is essential in influencing mobile phone acceptance and usage. In their study, a group researcher establish that young people take up new technology, without difficulty, more than old people; and that they have a positive attitude to new technology, more than old people (Okello et al., 2012). Usage of cell phone in agriculture is contrary linked to age (Okello et al., 2012).

3. METHODOLOGY

The study was done in Mashonaland West Province of Zimbabwe. Mashonaland West is one of Zimbabwe's ten provinces, is has an area of 57,441 km^2, with Chinhoyi as its capital (Zimbabwe National Statistics Agency (ZimStat, 2012). Mashonaland West Province consists of a population of 1,893,584 which is 12.5% of the total population of Zimbabwe (ZimStat, 2023). Of its total population of 439 687 people live in Communal areas, 60 118 are living in Small Scale Commercial areas, 47 436 are living in Large Scale Commercial areas and 690 429 are staying in Resettlement areas (ZimStat, 2023). The province is divided into 13 districts and this study was conducted in the four districts with the highest populations namely Chegutu, Hurungwe, Makonde and Zvimba.

Positivism research philosophy and quantitative research methodology were followed in this study as the study dealt with a large sample. However, qualitative data was also collected, using the same data collection instrument, on questions which requested additional information through the 'other (specify)'. Qualitative data, which was collected through the 'other (specify)' option was converted into quantitative data using content analysis. Qualitative data from the literature review was also considered, and since this data could not be converted into numbers, content analysis was, therefore, used to analyses this data. The study employed the survey plan for the purposes of collecting data where two structured questionnaires were used as the data collection tools. One questionnaire was for farmers and the other questionnaire was for network providers and other stakeholders in the agricultural sector. Both questionnaires were generally comprised of closed-ended questions and very few open-ended questions. To maintain anonymity in this study, it was not obligatory for respondents to divulge their names or identities on the questionnaire, but only on the consent letter that they signed.

Simple random and stratified sampling were the sampling methods used to come out with a sample for the study. Data collection was done in 20 days from 10th – 29th January 2019. SPSS (the statistical package for the social sciences) software was used to analyse data for this research. This was used to indicate the proper statistical measures like percentages and frequencies. Tables and graphs were used for data presentation. Content analysis was used to analyse data from the few open-ended responses generated from the 'other (specify)' options in the questionnaires and the secondary data from the literature review.

4. RESULTS

4.1 Objective 1

To assess the level of mobile phone access and the brands of mobile phone available among the Mashonaland West farmers.

4.1.1 Mobile phone access

It was inquired if respondents have any access to cell phone. Figure 1 below illustrates that 96% (369) of the population indicated that they have access to a cell phone while 4% (15) mentioned that they had no access to a cell phone.

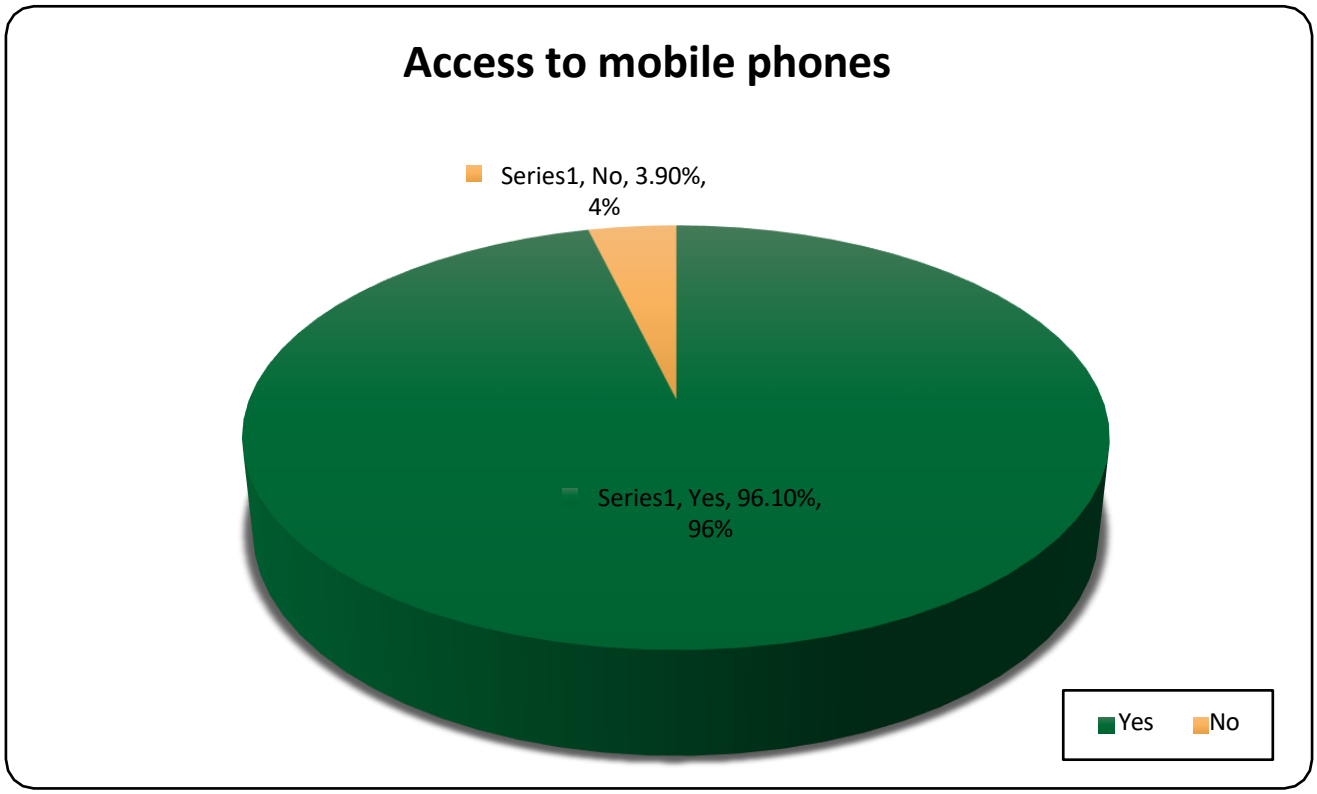

Figure 1: Mobile phone accesses

The 96% access rate was a clear demonstration that the province has a high mobile access rate. This has a positive impact on the possibility that most of the farmers are capable of using cell phones to get agricultural information. In a study in Nigeria in a research on the utilization of cell phones in agriculture, 98.7% of those who took part in the study were reported to have access to mobile phones (Asa and Uwen 2017).

4.1.2 Mobile phone ownership

This question aimed at ascertaining that respondents own mobile phones. Table 1 shows the results. Eighty-one percent (311) of the farmers owned mobile phones while 19% (73) did not possess cell phones.

Table 1: Mobile phone ownership

Own mobile phone	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	311	81.00		
No	73	19.00		
Total	384	100		

Table 1 demonstrates that out of the 311 (81%) respondents with mobile phones, 262 (68.2%) were males and 49 (12.8%) were females. The study is on the use of mobile phone and the results indicate that although 81% (311) respondents owned such devices, yet 96% (369) had access to mobile phones. The results therefore show that although some respondents did not own phones, they were able to access these gadgets from other sources. The study did not, however, prompt this question further.

4.1.3 Phone type

Respondents who specified that they own mobile phones were asked the type of phone they possessed; that is, smart or ordinary phone. Table 2 shows that of the 311 (81%) respondents who own mobile phones, 209 (54%) males and 21 (6%) females have smart phones, while 53 (14%) males and 28 (7%) females have ordinary phones. POTRAZ (2017) reported that the mobile phone penetration rate for Zimbabwe increased from 97% in the second quarter of 2017 to 100.5% in the third quarter.

Table 2: Phone Type

Gender	Type of phone				
	No Phone	Smart phone	Ordinary phone		
Male	40 (10.4%)	209 (54.4%)	53 (12.8%)	302	78.6%
Female	33 (8.6%)	21 (5.5%)	28 (7.3%)	82	21.4%
Total	**73 (19%)**	**230 (60%)**	**81 (21%)**	**384**	**(100%)**

The study revealed that Mashonaland West Province, besides having many farmers who own and have access to mobile phones, has a high rate of those who own smart phones. This is an indication that mobile phones applications, which require the use of smart phones, have a high rate of adoption, given that 230 (60%) of the respondents had smart phones.

2.1.1 Internet Access

Respondents with mobile phones were asked whether they had access to the internet on their phones and Table 3 shows the results.

Table 3: Internet Access

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	211	67.8	67.8	67.8
No	100	32.2	32.2	100.0
Total	**311**	**100.0**	**100.0**	

Responses showed that 211 (67.8%) participants had access to the internet while 100 (32.2%) said they did not have access to the internet. However, lack of access to the internet on smart phones was not seen as obstacles to the dissemination of information through mobile phones, Because farmers could still access information via SMS on any mobile phone type.

2.1.2 Mobile Network subscription

This question intended to establish the network(s) to which respondents subscribe. Table 4 gives the names of the networks the farmers who own mobile phones subscribed to.

Table 4: Mobile Network subscription

Network Provider	Frequency	Percent
Econet	273	87.8
Netone	209	67.2
Telecel	84	27
Total	**566**	**182.0**

*multiple responses generated

The question allowed for multiple responses. The results revealed that 273 (87.8%) farmers subscribe to Econet, 209 (67.2%) to NetOne and 84 (27%) to Telecel and the total adds up to 566 subscribers. This shows that some respondents subscribed to more than one mobile network. The results agree with POTRAZ's (2018) second quarter report that Zimbabwe has a high mobile penetration rate. POTRAZ (2018) reports that a total of 12,152,471 people that is 87.7% of the total population of Zimbabwe were active mobile network subscribers, with Econet having a market share of 65.8%, NetOne 23.9% and Telecel 10.3%. The rate of mobile network subscribers had increased by 3.1% when compared to the first quarter of 2018 (POTRAZ 2018).

2.1.3 Network service provision perception

The perception of farmers on the service provision by network providers was also measured. Table 5 illustrates the farmers' perception on the network providers' service.

Table 5: Network service provision perception among farmers

Network Service	Frequency	Percent
Excellent	0	0
Very Good	9	2.9
Good	249	80.1
Bad	46	14.8
Very Bad	7	2.2
Total	**311**	**100**

Responses indicated that 249 (80.1%) mentioned that the network reception was good, while 9(2.9%) indicated that it was very good; 53 (17%) indicated that network provision was bad to very bad. The findings from the farmers concurred with the findings from the network providers that at least 75% of the province had network coverage, regardless of poor connectivity in some areas. As indicated in previous chapters, empirical studies confirmed that poor connectivity and poor infrastructure are the major obstacles to the use of ICTs in agriculture (Kuhlmann, 2005; Kibet, 2011; Franklyn et al., 2012; Cadilhon, 2013). However, the findings of this study confirmed that the province's network coverage was good, as only a smaller percentage (17) indicated that it was bad to very bad.

2.2 Objective 2

To identify how mobile phones can be used to meet the information needs of the farmers in Mashonaland West Province of Zimbabwe.

2.2.1 Access to agricultural information on mobile phone

Farmers were asked whether they receive agricultural information on their mobile phones. Table 6 shows their responses.

Table 6: Access to agricultural information on mobile phone

Access	Frequency	Percent
Yes	134	43.1
No	177	56.9
Total	**311**	**100.0**

Of the 311 farmers who said they had mobile phones, 134 (43.1%) responded that they were receiving agricultural information on their mobile phones and 177 (56.9%) said they were not receiving information on agriculture through their cell phones. For those who indicated that were receiving agricultural information on their mobile phones, the researcher noted that the majority were receiving this information through farming WhatsApp groups. Table 5.4 showed that there were 273 (87.8%) Econet subscribers, however there were only 134 respondents who said they were receiving agricultural information through their mobile phones, which shows that regardless of subscribing to Econet, farmers were not subscribing to the Eco-Farmer platform, Econet's agricultural information dissemination platform. Econet frequently sends all Econet subscribers SMS asking them to subscribe to the Eco-Farmer platform, but the results of this study show that few farmers are subscribing to Eco-Farmer.

Scholarly information has revealed that the ICT's cell phone application is the ICT application which was mostly adopted by farmers to share agricultural information, as they are handy in handling, they provide economic advantages and enhance the social status of users (Aker and Mbiti, 2010). In India, RML uses the mobile phone SMS platform to transmit agricultural information packaged in local languages through the use of all mobile handsets to over one million registered farmers on a daily basis (Samhita, 2012).

2.2.2 Interest in accessing agricultural information on mobile phone

Respondents who responded that were not receiving agricultural information on their mobile phones were asked to indicate whether they have interest in receiving agricultural information on their mobile phones or were not interested. Table 5.7 shows the results.

Table 7: Interest in accessing agricultural information on mobile phone

Interested	Frequency	Percent
Yes	175	98.9
No	2	1.1
Total	**177**	**100.0**

Out of the 177 respondents who indicated that were not receiving agricultural information though cell phones, 175 (99%) showed that they have an interest in receiving agricultural information on their phones. This is an indication that farmers are very excited about receiving agricultural information through cell phones. However, they are not receiving this information because they are not aware of the available platforms or are not able to pay the subscriptions. In a similar study found that 65% of the respondents were willing to receive agricultural information through their cell phones, 22% were not willing and 135 were undecided (Islam and Grönlund, 2011).

2.2.3 Current information being received through mobile phones

Those who took part in the study were required to specify the information they were currently receiving on their mobile phones. Results are indicated in Table 8.

Table 8: Current information being received through mobile phones

Type of Information	Frequency	Percent
Crop production	63	16.4
Livestock production	67	17.4
Poultry production	95	24.8
Horticulture	20	5.2
Bee farming	1	0.3
Aquaculture	1	0.3
Crop Insurance	25	6.5
Credit and loans	40	10.4
Weather forecasting	80	20.8
Agriculture products markets and prices	82	21.4

Table 8 (Cont): Current information being received through mobile phones		
Agriculture machinery	24	6.3
Planting methods	12	3.1
Pesticides	38	9.9
Other	38	9.9

*Table indicates multiple responses

Responses indicate that farmers were receiving varied information. Table 8 shows poultry production as the information mostly received by the majority (95; 24.8%) of farmers, respectively followed by agriculture products markets and prices (82:21.4%) and weather forecasting (80:20.8%). The findings agree with who affirmed that the mobile phone technology has widely improved farmers' market access and income (Sekabira and Qaim, 2017). The least information being received by farmers on their mobile phones include bee farming (1:0.3%) and aquaculture (1:0.3%) and this could be because they are not major activities in the districts. Respondents indicated that they were also receiving other information that was not specified in the questionnaire, and this included information on training and/workshops.

Results from this study agree with other similar studies which confirm that farmers were receiving agricultural information on mobile phones and the information they received included weather information, fertiliser, disease, pest, weed and livestock management, markets and market prices (Chhachhar et al., 2014; Chhachhar and Hassan, 2013; Tadesse and Bahiigwa, 2015). Although results show that farmers were receiving agricultural information on their mobile phones, the percentages were very low; all below 50%, compared to the percentage of farmers eager to get information through their mobile phones 99% (Table 5-7). This portrayed that most farmers in the province are eager to receive agricultural information on their phones but are not getting that service mainly because they are not aware of the available platforms, and they cannot afford the high costs of mobile data.

2.3 Objective 3

To analyses the sources and channels of disseminating agricultural information available to farmers in Mashonaland West Province.

2.3.1 Knowledge on information dissemination platforms

Respondents were asked if they were aware of any of the available information dissemination platforms. Table 5-9 shows the results.

Table 9: Knowledge on information dissemination platforms		
Platform	**Frequency**	**Percent**
Eco-Farmer	160	41.7
Esoko	0	0
e-Mkambo	0	0
Kurima Mari	75	19.5
None	186	48.4

*Table indicates multiple responses

The results showed that most of the participants 186 (48.4%) were not aware of the available platforms, with 160 (41.7%) respondents aware of the Eco-farmer platform, 75 (19.5%) aware of Kurima Mari platforms and none aware of Esoko and e-Mkambo platforms. The results, therefore, indicate that although some farmers were aware of the available platforms like Eco-Farmer but were not using this platform to get agricultural information. Stakeholders are not using the information dissemination platforms like Eco-Farmers, while findings showed that 41% of the farmers were aware of the Eco-Farmer platform. The Eco-Farmer platform has been reported to be the most popular with smallholder farmers in Mashonaland West Province (African farming and Food Processing 2013). However, the fact that this platform is not being used by the farmers who are aware of its existence could be due to its high subscriptions rates of eight cents per day, and also because it is available to Econet subscribers and ecocash registered users only (Econet Wireless, 2018).

2.3.2 Access formats

Respondents were required to specify in what format of they were receiving agricultural information.

Table 10: Access formats		
Format	**Frequency**	**Percent**
Print	248	64.6
Voice	356	92.7
Video	166	43.2
Audio-visual	121	31.5
SMS	256	66.7
MMS	48	12.5
Other	0	0

*Table indicates multiple responses

Table 5.10 illustrates that respondents were receiving agricultural information in print 248 (64.6%), voice 356 (92.7%), video 166 (43.2%),

audio visual 121 (31.5%), SMS 256 (66.7%) and MMS 48 (12.5%) formats. Most of the farmers were getting information in the form of print and voice and these are the formats which can be provided through field days, other farmers, neighbours, friends, extension workers and the radio. The radio was found as the cheap and most popular channel for communicating information in several studies in most developing countries, as face-to-face communication with extension officers is limited because of poor farmer-to-agricultural extension officer ratio (Nyareza and Dick 2013; Norin. n.d.; Daniel, 2012). Unlike extension officers, the radio can reach more people at a given time (Mtega, 2018).

In addition, 256 (66.7%) (Table 10) respondents indicated that were receiving information in SMS formats; However, 230 (60%) (Table 2) respondents pointed out that they have smart phones. This implies that the type of phone is not an obstacle in receiving SMS, which can be received on any phone type. Respondents also mentioned that were receiving information through video and audio-visual (Table 10). Since video is part of audio-visual it can be concluded that respondents just mentioned these two as they were options available on the questionnaire and the researcher did not probe further on this.

2.3.3 Farmers' formats preferences

This question required the farmers to specify their format of preference in receiving agricultural information. The question allowed for multiple responses.

Table 11: Farmers' formats preferences		
Format	**Frequency**	**Percent**
Print	263	68.5
Voice	360	93.8
Video	225	58.6
Audio-visual	186	48.4
SMS	321	83.6
MMS	63	16.4

*Table indicates multiple responses

Table 11 shows that 263 (68.5%) respondents prefer print format, 360 (93.8%) voice, 225 (58.6%) video, 186 (48.4%) audio-visual, 321 (83.6%) SMS and 63 (16.3%) multi-media service (MMS) formats. Three hundred and eleven (81%) respondents indicated that they own mobile phones; however, 369 (96%) respondents had access to mobile phones. Similar studies agree with the findings; for instance, a group researcher revealed that farmers prefer receiving agricultural information through personal contact, cell phone's voice and SMS applications, a cell phone helpline, formal and informal education, television, print and radio (Babu. et al.,

2011). A group researcher found that farmers' preferred format of information was: video documentaries, radio broadcasts, extension publications and personal contact (Sani et al., 2015). In Nigeria, found that rural farmers prefer receiving agricultural information through extension officers and the television if they can (Ogidi, 2014).

2.3.4 Mobile phone usefulness in disseminating agricultural information

Respondents were asked if they think that mobile phones can be useful in the dissemination of agricultural information and Table 12 shows the responses.

Table 12: Mobile phone usefulness in disseminating agricultural information

Useful	Frequency	Percent
Yes	384	100
No	0	0
Total	**384**	**100.0**

From the results, all the 384 (100%) respondents agreed that cell phones are useful in agricultural information distribution.

Farmers were asked how cell phones can be used to meet their information requirements, and this was an open-ended question which required qualitative data. The common responses were; "through SMS", "through voice calls" and "through online videos". Farmers were also requested to indicate the benefits of receiving agricultural information via their cell phones. The Majority of the farmers mentioned that "mobile phones are cheaper", "mobile phones are faster in transmitting information" and "mobile phones are cheaper and faster in transferring information".

Respondents were also asked how mobile phones can be used to meet their information needs and the responses were:

- Information could be sent to farmers through SMS
- Information could be sent to farmers through voice calls
- Information could be sent to farmers through online videos.

3. CONCLUSIONS

Taking from the findings of the study, the following conclusions were drawn:

Conclusion on the kind of information farmers' access through the mobile phone application

The study concluded that the types of information being accessed by farmers through mobile phones vary. This include information on poultry production, agriculture products and markets, weather forecasting, livestock production, crop production, pesticides, crop insurance, agriculture machinery, horticulture, planting methods, trainings and workshops, bee farming and aquaculture. The number of farmers who access agricultural information using mobile phones is low, considering that 57% of the respondents were not receiving agricultural information using their mobile phones. The study also concluded that the few farmers who access agricultural information through their mobile phones are not receiving it from the available agricultural information dissemination platforms, but from WhatsApp groups.

Conclusion on how mobile phones can be used to meet the information needs of the farmers in Mashonaland West Province of Zimbabwe

Mobile phones can be used to meet farmers' information requirements, as all the 384 respondents agreed that mobile phones can be helpful in the distribution of agricultural information through using voices calls, SMS and video mobile phone applications. The study also concluded that the majority of farmers in the province have access to mobile phones, with most of them actually owning mobile phones.

Conclusion on the level of mobile phone access and the brands of mobile phone available among Mashonaland West farmers

Majority of farmers in the province have access to mobile phone, and most of them actually own mobile phones. This is evidenced by the fact that 96% of the respondents had access to mobile phone, while 81% own mobile phones, and some farmers subscribe to more than one network provider. The study as well concludes that most of the farmers in Mashonaland West Province own smart phones and can access the internet. However, the study surmised that, regardless of farmers having access to mobile phones, there is still a gap in receiving agricultural information from agricultural information dissemination platforms like Eco-Farmer and Kurima Mari, which are the only platforms a few of the respondents and stakeholders specified that they were aware of.

RECOMMENDATIONS

Recommendations on the kind of information farmers access through mobile phone application

The recommendations on the kind of information farmers' access through the mobile phone application are as follows:

The findings revealed that very few respondents were accessing information through the mobile phones SMS application. The information they were accessing through mobile phone SMS platform was not coming from the available agricultural information dissemination platforms, because both respondents and stakeholders were not aware of the other agricultural information dissemination platforms; and the few who were aware were not using the platforms due to high data subscription costs. Therefore, it is recommended that the available agricultural information dissemination platforms should extend their coverage and hold awareness campaigns so that their targets become aware of their existence.

Recommendations on how mobile phones can be used to meet the information needs of the farmers in Mashonaland West Province of Zimbabwe

The study established that the use of mobile phones can be more useful, effective and efficient in bridging the information gap created by the available agricultural information distribution platforms for the Mashonaland West Province farmers; therefore it is recommended that:

- The government introduces a platform, which uses cell phones to distribute information on agriculture to farmers.
- The platform should be funded by the state, and farmers will be accessing information for free, or at subsidised rates that all farmers can afford.
- The service should operate through Information Centres.
- The Information Centres should be based in the local extension offices.
- English, Shona and Ndebele should be used as the languages of communicating the information to the farmers.
- In policy terms,government, agricultural institutions, agricultural information providers and agricultural stakeholders should work together to create an agricultural information database that can act as a focal point for sharing information and knowledge.
- The 'One Stop Shop' should be web-based and should link with farmers through mobile their phones

Recommendations on the level of mobile phone access and the brands of mobile phone available among the Mashonaland West farmers

The results established that most of those who took part in the study had access to mobile phones, with most respondents owning smart phones, and subscribing to more than one network. It also established that network reception was mostly good. It is, therefore, recommended that a platform which uses mobile phones to transmit agricultural information to the farming community in Mashonaland West Province be established as most of the farmers have access to mobile phones.

REFERENCES

Aker, J.C., 2010. Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger. American Economic Journal: Applied Economics Available: http://www.aeaweb.org/articles.php?doi=10.1257/app.2.3.46 (Accessed 11 July 2023).

Aker, J.C., and Ksoll, C., 2016. Can mobile phones improve agricultural

outcomes? Evidence from a randomized experiment in Niger. Food Policy, 60, Pp. 44-51. Available: https://www.sciencedirect.com/science/article/pii/S0306919215000330 (Accessed 24 July 2024).

Aker, J.C., and Mbiti, I., 2010. Mobile phones and economic development in Africa. Journal of Economic Perspectives, 24 (3) Pp. 207-232. Available: http://sites.tufts.edu/jennyaker/files/2010/09/aker_mobileafrica.pdf (Accessed 04 September 2023).

Ali, J., 2012. Factors affecting the adoption of Information and Communication Technologies (ICTs) for farming decisions. Journal of Agricultural and Food Information, 13 (1), Pp. 78-96. Also available: http://www.tandfonline.com/doi/pdf/10.1080/10496505.2012.636980 (Accessed 9 May 2023).

Ali, J., and Kumar, S., 2011. Information and Communication Technologies (ICTs) and farmers' decision-making across the agricultural supply chain. International Journal of Information Management, 31, Pp. 149–159.

Ango, A.K., Illo, A.I., Abdullahi, A.N., Maikasuwa, M.A., and Amina, A., 2013. Role of Farm-Radio Agricultural Programmes in Disseminating Agricultural Technology to Rural Famers for Agricultural Development in Zaria, Kaduna State, Nigeria. Asian Journal of Agricultural Extension, Economics and Sociology, 2 (1). http://archive.paparesearch.co.in/id/eprint/1684/1/Ango212012AJAEES1988.pdf (Accessed 20 July 2023).

Asa, U.A., and Uwem, C.A., 2017. Utilisation of mobile phones for agricultural purposes by farmers in Itu area, Nigeria. European Scientific Journal.13 (19). Available: https://eujournal.org/index.php/esj/article/viewFile/9643/9228 (Accessed 22 August 2024).

Babu, S.C., Glendenning, C.J, Okyere, K.A., and Govindarajan, S.K., 2012. Farmers' information needs and search behaviors: Case study in Tamil Nadu, India. https://ageconsearch.umn.edu/record/126226/?v=pdf (Accessed 22 June 2023).

Bertolini, R., 2004. Making information and communication technologies work for food security in Africa. http://www.ifpri.org/sites/default/files/publications/ib27.pdf (Accessed 20 June 2023).

Cadilhon, J., 2013. When dismal infrastructure affects the entire agrifood system. Available: http://www.e-agriculture.org/blog/when-dismal-infrastructure-affects-entire-agrifood-system (Accessed 22 June 2023).

Chauhan R.M., 2018. Advantages and challenging in e agriculture. Oriental. Journal of. Computer Science. and Technology, 8 (3). Available: http://www.computerscijournal.org/?p=2966 (Accessed 27 June 2023).

Chhachhar, A.R., Qureshi, B., Khushk, G.M. and Maher, Z.A., 2014. Use of mobile Phone among farmers for agriculture information. European Journal of Scientific Research, 119 (2), Pp. 265–271. Available: http://www.europeanjournalofscientificresearch.com (Accessed 20 May 2023).

Chhachhar, R.A., and Hassan, M.S., 2013. The use of mobile phone among farmers for agriculture development. International Journal of Scientific Research, 2 (6), Pp. 95–98. Available: http://www.europeanjournalofscientificresearch.com (Accessed on 29 May 2023)

Chisita, C.T., 2010. An investigation into the use of ICT in the provision of agricultural information to small scale farmers in Harare. http://conference.ifla.org/past-wlic/2010/85-chisita-en.pdf (Accessed 22 June 2023).

Churi, A.J., Mlozi, M.R.S., Tumbo, S.D., and Casmir, R., 2012. Understanding farmers' information communication strategies for managing climate risks in rural semi-arid areas, Tanzania. International Journal of Information and Communication Technology Research. 2 (11). Available: http://esjournals.org/journaloftechnology/archive/vol2no11/vol2no11_6.pdf (Accessed 20 June 2023).

Daniel, J., 2012. Sampling essentials: practical guidelines for making sampling choices. Available: www.sagepub.com/upm-data/40803_5.pdf (Accessed 30 June 2023).

Donner, J., 2006. The Social and economic implications of mobile telephony in Rwanda: an ownership/access. Typology Knowledge, Technology, & Policy. Summer, 19 (2), Pp. 17-28. Available: https://link.springer.com/article/10.1007/s12130-006-1021-7 (Accessed 22 September 2023).

Dzenga, L., 2016. Kurima Mari: Future of communal farming Available: http://www.herald.co.zw/kurima-mari-future-of-communal-farming/ (Accessed 27 June 2023).

E-agriculture, 2017. Available: http://www.e-agriculture.org/e-agriculture (Accessed 09 August 2024).

Easdown, W., and Starasts, A., 2004. Constructing useful information for farmers– the role of IT. http://regional.org.au/au/asa/2004/symposia/4/3/238_easdownwj.htm (Accessed 27 April 2023).

Econet Wireless. 2018. Econet launches eco-farmer for Zimbabwe's smallholder farmers. African Farming and Food Processing, 7 October. Available: http://www.africanfarming.net/crops/agriculture/econet-launches-eco-farmer-for-zimbabwe-s-smallholder-farmers (Accessed 27 March 2023).

FAO. 2005. E-agriculture: a definition and profile of its application. Available: https://www.slideshare.net/sarper/e-agriculture-a-definition-and-profile-of-its-application (Accessed 29 August 2023).

FAO. 2007. e-Choupal connects farmers of India. Available: http://www.fao.org/e-agriculture/news/e-choupal-connects-farmers-india (Accessed 06 September 2023)

GSMA (Global System for Mobile Communications Association). 2018. The Mobile Economy: Sub-Saharan Africa. 2018; UK, London.

International Journal of Education and Development using Information and Communication Technology (IJEDICT) 6 (3), Pp. 19-36. Available: https://files.eric.ed.gov/fulltext/EJ1085021.pdf (Accessed 27 April 2023).

ITU, 2017. ITU releases 2017 global information and communication technology facts and figures. Available: https://news.itu.int/itu-releases-2017-global-information-and-communication-technology-facts-and-figures/ (Accessed 06 September 2023).

Jamwal, S., and Padha, D., 2009. A Study of Information and Communication Technology in the Area of Agriculture and Rural Development in J&K State. Available: http://www.academia.edu/482977/ (Accessed 07 July 2023).

Kabweza, L.S.M., 2014. Zimbabwe's telecoms stats (2013): 103.5% mobile penetration rate. Available: http://www.techzim.co.zw/2014/01/zimbabwes-telecoms-stats-2013-103-5-mobile-penetration-rate/ (Accessed 03 July 2023).

Kibet, C., 2011. Major Challenges facing Kenyan Agricultural sector. Available: http://extensionconference2011.cta.int/node/111 (Accessed 3 July 2023).

Mangstl, A., 2008. Emerging issues, priorities and commitments in e-agriculture. Agricultural Information Worldwide, 1 (1), Pp. 1-6. Available: ftp://ftp.fao.org/docrep/fao/010/ai258e/ai258e00.pdf (Accessed 09 May 2023).

Mittal, S., and Tripathi, G., 2009. Role of mobile phone technology in improving small farm productivity. Agricultural Economics Research Review 22 (451-459). Available: https://ageconsearch.umn.edu/bitstream/57502/2/15-S-Mittal.pdf (Accessed 04 September 2023).

Mugwisi, T., 2013. The information needs and challenges of agricultural researchers and extension workers in Zimbabwe. Available: http://www.lis.uzulu.ac.za/etds/tmugwisi/Tinashe%20Thesis%20P

rinted%20June.pdf (Accessed 04 July 2023).

Mugwisi, T., Ocholla, D., and Mostert, J., 2014. An Overview of the information needs of agricultural researchers and extension workers in Zimbabwe. Libri., 64 (1), Pp. 85–108.

Musungwini, S., 2016. A model for harnessing the power of mobile phone technology to improve smallholder agriculture in Zimbabwe. In O. P. Zacarias, & C. W. Larsson (Eds.), Proceedings of the 5th International Conference on M4D Mobile Communication Technology for Development: M4D 2016, General Tracks (pp. 237-252). Karlstad, Sweden: Karlstad University Studies.

Muza, O., 2013. eMkambo: A market -driven agricultural solution platform. Available: https://www.newsday.co.zw/2013/02/emkambo-a-market-driven-agricultural-solution-platform/ (Accessed on 3 November 2023).

NewsDay, 2012. Esoko search for local partners. Available: https://www.newsday.co.zw/2012/02/2012-02-28-esoko-search-for-local-partners/ (Accessed 13 July 2023).

Norin, P., n.d. Communication Channels for Agricultural Information to Farmers: A Case Study in Kampong Speu Available; https://uc.edu.kh/The_UC_Occasional_Paper_Series.php (Accessed 12 June 2023).

Nyakudya, M., 2017. NGO, govt introduce digital extension for smallholder farmers. Available: https://www.newsday.co.zw/2017/02/ngo-govt-introduce-digital-extension-smallholder-farmers-2/ (Accessed 27 June 2023).

Nyareza, S., and Dick, A.L., 2012. Use of community radio to communicate agricultural information to Zimbabwe's peasant farmers. Aslib Proceedings, 64 (5), Pp. 494-508, Available: https://doi.org/10.1108/00012531211263111 (Accessed 12 June 2023).

Odunze, D.I., and Hove, T.M., 2015. An analysis of the impact of the use of mobile communication technologies by farmers in Zimbabwe. A case study of Esoko and EcoFarmer platforms. Available: http://www.globdev.org/files/SigGlobDev_2015_paper_15_0.pdf (Accessed 30 October 2023).

Ogidi, A.E., 2014. Modern channels of information used for agriculture in rural farm communities in Nigeria. SCSR Journal of Development. Available: https://www.academia.edu/12562998/Modern_Channels_of_Information_used_for_Agriculture_in_Rural_Farm_Communities_in_Nigeria (Accessed 18 April 2023).

Oino, P.G., Towett, G., Kirui, K.K., and Luvega, C., 2015.The dilemma in sustainability of community-based projects in Kenya. Global Journal of Advanced Research., 2 (4), Pp. 757-768. Available: http://gjar.org/publishpaper/vol2issue4/d177r18.pdf (Accessed 06 September 2023).

Okello, J., Kirui, O.K., Njirani, G.W., and Gitonga, Z.M., 2012. Drivers of use of information and communication technologies by farm households: The case of smallholder farmers in Kenya. Journal of Agricultural Science, 4 (2), Pp. 111–124. Available: https://doi:10.5539/jas.v4n2p111 (Accessed 13 July 2023).

Okello-Obura, C., Minishi-Majanja, M.K., Cloete, L., and Ikoja-Odongo, J.R., 2009. Assessment of business information access problems in Uganda. The Canadian Journal of Library and Information Practice and Research, 2 (2). Available: https://journal.lib.uoguelph.ca/index.php/perj/article/view/306 (Accessed 13 July 2023).

Postal And Telecommunications Regulatory Authority Of Zimbabwe (POTRAZ). 2015. Postal and Telecommunications Sector performance report . 4. Available: https://www.potraz.gov.zw/images/documents/Sector_Perfomance_march.pdf (Accessed 6 November 2023).

POTRAZ. 2017. The status of mobile penetration and active mobile subscriptions in Zimbabwe. Available: https://www.techzim.co.zw/tech_events/ (Accessed 15 March 2023).

POTRAZ. 2018. Abridged postal & telecommunication sector performance report second quarter 2018. Available: https://t3n9sm.c2.acecdn.net/wp-content/uploads/2018/10/Abridged-Sector-Performance-report-Second-Quarter-2018-final.pdf (Accessed 27 May 2023).

Purnomo, S.H., and Lee, Y.H., 2010. An assessment of readiness and barriers towards ICT programme implementation: perceptions of agricultural extension officers in Indonesia.

Raj, S., 2013. Agriculture prototype for knowledge facilitation among tribal farmers of North-East India: innovations impact and lessons. The Journal of Agricultural and Extension. 19(2):113-131. Available: http://dx.doi.org/10.1080/1389224X.2012.718247 (Accessed 25 June 2023).

Rashid, A.T., and Elder, L., 2009. Mobile phones and development: An analysis of IDRC-Supported Projects. Electronic Journal of Information Systems in Developing Countries. 36 (2). Available: https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1681-4835.2009.tb00249.x (Accessed 27 June 2023).

Richardson, D., 1997. ICTs-transforming agricultural extension: report of the 6th consultative expert meeting of CTA's observatory on ICTs. Available: http://internships.cta.int/observatory2003/Proceedings2003.pdf (Accessed 16 May 2023).

Rogers, E.M., 2003. Diffusion of innovations. 5th. ed. Free Press: New York.

Sekabira, H., and Qaim, M., 2017. Can mobile phones improve gender equality and nutrition? Panel data evidence from farm households in Uganda. Available: https://www.sciencedirect.com/science/article/pii/S0306919217303093 (Accessed 20 July 2023).

Singh, B., Narwal, R.S., Malik, J.S., and Singh, C.C., 2003.Communication sources used by extension personnel and farmers Available: http://agris.fao.org/agris-search/search.do?recordID=IN2006000057 (Accessed 20 June 2023).

Taylor, P.C., and Medina, M.N.D., 2013. Educational research paradigms: From positivism to multiparadigmatic. Journal for Meaning- Centered Education,1. Available: http://www.meaningcentered.org/journal/volume-01/educational-research-paradigms-from-positivism-to-multiparadigmatic/ (Accessed 22 April 2023).

Tegegn, M., and Dafisa, A., 2017. Review on potential of mobile phone usage in agricultural information dissemination in Ethiopia. International Journal of Scientific and Research Publications, 7 (12). Available: http://www.ijsrp.org/research-paper-1217/ijsrp-p7212.pdf (Accessed 22 August 2023).Zimbabwe Farmers' Union. 2013. Available: https://www.facebook.com/ZimbabweFarmersUnionZFU/posts/zfu-esoko-as-farmers-continue-to-face-marketing-challenges-the-zimbabwe-farmers-/478176872299384/ (Accessed 27 April 2022)

Zimbabwe National Statistics Agency (ZimStat), 2023. Mashonaland West Province report. Harare: ZimStat.