THE ROLE OF INFORMATION COMMUNICATION TECHNOLOGY IN FARMERS' PARTICIPATION IN COMMUNITY-BASED FARMING PROJECTS IN MANKWENG SERVICE CENTRE, LIMPOPO PROVINCE, SOUTH AFRICA

by

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MINI DISSERTATION

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ABSTRACT

The aim of this study was to investigate the role of Information Communication Technology tools in facilitating development within Community-Based Farming Projects (CBFPs) served by Mankweng Service Centre (MSC). The objectives of the study were to identify various ICT tools through which farmers get agricultural information, to determine the types of ICT-based agricultural information preferred by farmers in Mankweng, to examine the factors influencing use of ICTs by farmers in Mankweng and also to identify the challenges encountered by Mankweng farmers in their use of ICT. The study was cross-sectional in design and included 102 farmers from the Community-Based Farming Projects in Mankweng Service Centre as participants. Participants were selected using multi-stage sampling of combined cluster and systematic random sampling. Quantitative data was collected from participants using a structured questionnaire under the supervision of the researcher. Descriptive and inferential methods of analysis were employed. Data was summarised using frequency distribution of variables followed by measures of central tendency, measures of variance, and relationship of variables. Summary of findings was presented in the form of tables, figures and frequencies. Univariate regression model was used to analyse factors influencing use of ICT amongst farmers.

The findings of the study show that majority (64%) of the farmers were women and (36%) of the farmers were men. Majority of the farmers (56%) were less than 50 years of age with 79% of the farmers having no tertiary education. The results of this study also revealed that the demographics of the participants were not the critical determinant factors in ICT usage ($p>0.2$) amongst farmers. The level of education farmers acquired was rather a very important predictor of the utilization of the ICT tools available to the farmers. The study revealed cell phones to be the most commonly used ICT device followed by Radio and TV. The study revealed that the affordability of ICT devices is the main challenge which ultimately limits access.

Based on these findings, the study recommends that the Limpopo Department of Agriculture (LDoA) should make a provision of informal education sessions for farmers on the use of ICT devices, and ICT infrastructure and smart phones. In addition, the study recommends advocacy for more agricultural programmes through affordable platforms like TV and community radio stations media.

Keywords: ICT tools, Education, CBFPs, MSC, LDA, Farmers

DECLARATION

I, Ramavhale Patience Manku, declare that the dissertation hereby submitted to University of Limpopo for the degree Masters of Agricultural Management (Agricultural extension) has not been previously submitted by me for a degree at this or any other institution; that it is my work in design and in execution and that all materials contained herein have been duly acknowledged.

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Ms PM Ramavhale Date

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Lastly and most importantly, I would love to acknowledge the greatest support I receive from my loving husband Pheagane William Nkoana. Thank you for staying up all night with me and watch me write and cry, thank you for always adding hope when this journey seemed impossible.

DEDICATION

This study is dedicated to my mother Ramavhale Manyaku Florah, for teaching me life's greatest lessons and above all else, for teaching me how to stay humble and to aim for all that seems impossible. I am a product of your prayers, love, and hard work. Your love for education brought me this far. You have sacrificed your chances of going to school and gave me the opportunity to get better education. This is for you Mamma *Molotoadi 'a Hlapogadi le Mphele*.

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LIST OF ACRONYMS

CBFP	Community Based Farming Projects
FAO	Food and Agriculture Organization
ICT	Information Communication Technology
LDoA	Limpopo Department of Agriculture
MSC	Mankweng Service Centre
NGOs	Non-Governmental Organisations
PTO	Permission to Occupy
SMS	Short Message System
SPSS	Statistical Package for Social Science
TREC	Turfloop Research Ethics Committee
TV	Television

CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Background of the study

Technology is growing at a significant rate affecting all citizens in most areas of the world including South Africa. Information has become a powerful weapon for all citizens in the process of their development and empowerment. Agricultural information specifically, is one of the crucial components that has a great potential in increasing agricultural production and improving the livelihoods of the farmers and food security (Ashutosh, *et al.*, 2012). Information Communication Technology (ICT) refers to an expanding group of technologies that are used to handle specific information and aid communication (Asenso-Okyere & Mekonnen, 2012). It also refers to any device, tool or application that is used for collection, processing and storage of data and information (Deepali, 2013).

The major ICT tools used to update farmers on agricultural information and recent technologies as outlined by Abdulkareem (2012), are radio, newspaper and television while other tools that are equally important include computers, video, mobile phone, internet, e-mail and e-library resources.

The role of ICT in farming is to enhance food security and support the livelihoods of the rural poor and to increase productivity, sustainability and efficiency (Stienen, *et al.*, 2007). Furthermore, ICT strengthens the agricultural sector by provision of timely and updated information on agriculture-related issues (Das, 2014). It is against this background that this research was conducted to study the role of ICT within Community-Based Farming Projects (CBFPs) in Mankweng Service Center, Polokwane municipality of Capricorn district, Limpopo province in South Africa.

1.2 Problem Statement of the study

Usage of ICT tools is growing at a very fast rate today in South Africa and this is becoming a clear indication that times are changing with regard to information

dissemination and citizens need to adapt to this change (Hodge, 2000). While traditional methods of communication in agricultural extension are still effective, they are slowly being replaced by better and convenient ICT tools as an alternative for conveying agricultural information to the farmers. The limited visits by extension officers to farmers has got a serious implication on the development of farmers and keeping them updated with agricultural information that affects them. Accordingly, Surabhi (2012) suggested that farm visits by extension officers are expensive due to limited means of transport and remoteness of the areas serviced. Furthermore, the extension service does not cover all the intended recipients and the information they deliver is less timely. Although much is known about the role of ICT for extension officers in South Africa (Mabe & Oladele, 2012), little is known about the role and effects of ICT amongst farmers especially those around Mankweng Service Center.

According to Mwakaje (2010), ICT can be the most valuable tool for agricultural extension to deliver agricultural information that could enable increased production, timely and accurate agricultural information that can significantly reduce costs of travelling from one farmer to the next. Access to information and ways of communication have improved significantly in the last decade in South Africa (Mbagwu, Benson and Onuoha, 2018a). Potential benefits of using ICT for communication and access to information amongst farmers include development of farmers which may grow the economy and eradicate poverty (Stienen, et al., 2007).

The dissemination of agricultural information on mobile devices is assumed to be effective and spontaneous given the fact that farmers own the simplest ICT mobile devices (Mittal, Gandhi and Tripathi, 2010). The Capricorn district has got farmers registered within various Community-Based Farming Projects who can benefit from ICT usage. These identified challenges raised a need for this study to be conducted. Emanating from above, this study attempted to answer the following research questions: What are the ICT tools through which farmers obtain agricultural information? Which type of ICT-based agricultural information do most farmers in Mankweng prefer? What are the factors influencing the use

of ICTs by farmers in Mankweng? And lastly, what are the challenges hampering ICTs use by farmers in Mankweng?

1.3 Rationale of the study

Mankweng agricultural service center serves several Community Based Farming Projects (CBFPs) that could benefit from the use of ICT. This is because the information needs of the serviced farmers are growing rapidly with the introduction of modern technologies. According to Mabe & Oladele (2012), agricultural extension depends to a larger extend on information exchange amongst farmers. It has been identified as one area in which ICTs can have a particularly significant impact on the rural poor who are the critical role players of agricultural production in developing countries. Availability of increased ICT services enhance the availability of knowledge and information and further improve awareness, education, better adoption of technology, reduced transaction costs and better market efficiencies (Surabhi & Mamta, 2012). Enhanced usages of ICT speed up the development of rural farmers and have an impact on economic growth by increasing convenience and saving costs to farmers when accessing basic information (Ashutosh, et al., 2012).

ICT interventions improve the general livelihoods of the rural poor and also yield significant agricultural investment on the development of the rural families (Kamthania, 2013). The use of ICT is currently an important pillar of agricultural extension and it was recognized as an essential mechanism for delivering knowledge and information to the farmers in the changing world (Dhaka & Chayal, 2010). Furthermore, Dhaka & Chayal (2010) emphasized that effective utilization of ICT has a potential to make rural communities prosper by enabling the requisition of information in the most user-friendly, easy to access, cost effective forms and ways at the right time.

According to Stienen et al., (2007), an effective use of ICT has a potential to reduce the knowledge gap that exists between commercial and small-scale farmers. A push towards a high agricultural productivity will require agricultural system whose decision-making processes are based on available information

(Surabhi,et al., 2010). However, several challenges including unreliable electricity in rural areas, widespread of rural illiteracy and lack of basic computer skills among farmers remain (Mayzelle, et al., 2015). In the absence of information, farmers face problems of ill-advised decision-making that limit the performance of agriculture (Adegbidi, et al., 2012). Hence, this study aimed to identify various ICT tools through which farmers get agricultural information, determine the types of ICT-based agricultural information preferred by farmers in Mankweng, examine the factors influencing use of ICTs by farmers in Mankweng and identify the challenges encountered by Mankweng farmers in their use of ICT.

1.4 Aim of the study

The aim of this study was to investigate the role of Information Communication Technology tools CBFPs served by Mankweng Service Centre.

1.4.1 Research questions

This study intended to provide answers to the following research questions:

1. What are the ICT tools through which farmers obtain agricultural information?
2. Which type of ICT-based agricultural information do most farmers prefer in Mankweng?
3. What are the factors influencing the use of ICTs by farmers in Mankweng?
4. And finally, what are the challenges hampering ICTs use by farmers in Mankweng?

1.4.2 Objectives of the study

The specific objectives of the study were to:

1. Identify various ICT tools through which farmers get agricultural information.
2. Determine the type of ICT-based agricultural information preferred by farmers in Mankweng.
3. Examine the factors influencing use of ICTs by farmers in Mankweng.
4. Identify the challenges encountered by Mankweng farmers in their use of ICT.

1.5 Organizational Structure

The report of the study is structured and presented in five chapters.

- Chapter one will introduce the study by outlining the introductory concepts including the background of the study, problem statement including research questions, rationale of the study, study aim and objectives, and lastly the overall structure of the research report.
- Chapter two constitutes review of literature on similar studies and reviews conducted globally and in South Africa with specific focus to the various ICT tools and their use in agriculture and farming, determinants of ICT use by farmers, and lastly the common challenges experienced and limiting ICT use in farming.
- Chapter three outlines the methodology and analytical procedures used when conducting the study are outlined. This include research design, population and study site, methods and procedure of sampling participants, data collection tools and process and lastly the data analysis process and tests performed. Also included in the chapter is the inclusion and exclusion criteria used in the sampling process, the ethical considerations made is line with the study and attempts made to reduce bias.

- Chapter four gives a detail report of the findings of the study in the form of results and how they are interpreted.
- Chapter five presents the summary, conclusions and recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter reviews literature on the different studies in ICT for farmers, specifically the findings on use, information dissemination, knowledge, challenges and availability of ICT tools from a global to a regional perspective of farmers. Such a review includes literature on the different ICT tools that farmers are able to access and use in their daily farming activities. These tools will include radio, television (TV), print and online media, cellphones, internet and computers. Literature reviewed under this section includes the uses of such tools by the farmers, the factors affecting these uses together with the information needs of farmers, especially on what they expect to be provided with either from ICTs or extension officers. Finally, it will review the challenges that are faced by farmers with regard to the use of different ICT tools e.g. limited access, poor infrastructures for ICTs and ICT illiteracy.

The scope of this study is firmly on providing an overview on the use of ICTs by farmers. Various strategies were applied to search relevant information on ICTs. The electronic databases searched included Research gate, Mendeley, academia.edu, Google Scholar, Food and Agriculture organisation, Science direct and Wiley online library using the terms ”The use of ICT”, challenges of using ICT, types of ICT tools used in farming, the information needs for farmers via ICTs. Relevant articles published in English on reference lists were identified and retrieved from electronic and print. All included studies were thematically analysed and organised to add meaning and sequence to the study. This was done in order to ensure that there is quality, accuracy, relevance, bias and credibility of the findings.

2.2. ICT tools and use

ICT tools are a broad category of devices and services that help famers gather, store, analyse and share information (FAO, 2019). ICT tools empower rural people in a countless of ways, from cell phones that enable access to mobile banking, short message system (SMS), phone calls and satellites that provide updated weather reports to drones that allow for detailed aerial pictures. The small-scale farmers in most parts of the country still exchange organic information that is traditionally transferred through interpersonal communication with other farmers which does not require them to be literate, but there are also modern means of ICTs that can facilitate these interpersonal communications such as radio and television (Pigato, 2001). Even though there are different modes and tools through which farmers can obtain agricultural information (FAO, 2019), most small-scale farmers still rely on local groups, relatives and personal experiences in obtaining information for their daily farming practices (Olaniyi, 2010). Lastly, farmers are ready to receive information but they continue using ICT tools mainly for entertainment purposes and they have little knowledge about the importance of ICTs and how they can use them for their agricultural business related activities and self-development (Subashini & Fernando, 2018).

ICTs play an important role in the flow of information by reducing travel costs of farmers from their farms to extension officers and improving the market efficiency in agriculture for emerging farmers (Abraham, 2006). In addition to travel cost reduction, Menda (2001) outlines the role of ICT in facilitating efficient creation, storage, management and dissemination of information by tools that aids in fighting the forces that cause poverty. The use and availability of ICTs give farmers a platform to access information on weather patterns, pest control, mobile money and other factors that are essential in decision making and self-development (Sekabira, Bonabana and Asingwire, 2012).

The use of mobile devices and telephone assist in saving time because basic information can be shared through these devices rather than extension officers having to call meetings monthly to communicate what could have been shared

over these tools (Olaniyi, 2010). These devices do not only reduce costs or save time, but they also actively engage each farmer keeping them updated with all developments and new technologies.

In Mozambique, a project that provides financial education and technological tools training for farmer groups has been established to help farmers move from cash to electronic payment management. These farmers not only enter the formal financial sector, but become better informed about market prices that can increase profits and build their savings for future sustainability (Abdullah and Samah, 2013).

It is important for farmers to form corporative for technology use, this helps them in developing self-confidence and control over the use of their individual devices. The main benefit of all of these is sharing a common goal of ICT tools. With the attitude of knowledge and technology sharing, adaptation to technology becomes easy. Furthermore, the above existence of ICT cooperatives attracts farmers presenting them with an opportunity to use and adopt ICTs (Sekabira, Bonabana and Asingwire, 2012). ICT support groups are the sources of information that enable farmers to meet and share their experiences, challenges and develop new ideas (Sekabira, Bonabana and Asingwire, 2012). As the farmers share their daily struggles with regard to ICT devices and their use, they tend to share more and learn new problem-solving skills.

2.2.1. Radio and Television

A study by Nazari and Hasbullah (2008) revealed that farmers have positive attitude towards the agricultural programs that are covered by both TV & radio as ICT tools. Speeches presented by the agricultural experts during conferences and summits and are aired on TV and radio encourage farmers to use these forms of ICT tools (Nazari and Hasbullah, 2008). Kalusopa (2005) believes that farmers have positive attitude towards devices that are visual and interactive and these devices to a greater extent present agricultural information through the languages that the farmers understand the most. Apart from the use of language, TV and radio programmes are usually bringing context to challenges experienced locally

allowing farmers to relate to their daily struggles (Kalusopa, 2005; Nazari & Hasbullah, 2008). As alluded by Kalusopa (2005), Zambian small-scale farmers rated radio and TV highly as ICT tools for the dissemination of agricultural information and that these tools related requisite information needs. ICT tools were regarded an eye opener for the needs of the farmers, but extension officers hardly use these platforms to deliver their services to the farmers (Kalusopa, 2005).

Isaya, Agunga and Sanga (2018) conducted a study in Tanzania which found radio and agricultural extension workers to be the primary sources of agricultural information for women farmers. An additional finding was that farmers viewed TV as a more credible source for distributing agricultural information that is credible, updated, impartial, accurate, clear and understandable (Isaya et al., 2018).

Another study by Nzozo, Ba and Mogammbi (2016) concurred with that by Kalusopa (2005) that small scale farmers prefer using radio, television and mobile devices on daily basis due to the advantages that come with these tools. Radio is perceived a useful tool to educate farmers in presenting them with new programs that are in line with modern agricultural technologies in their fields (Nzozo et al., 2016). Radio has got the ability to disseminate information to millions of farmers dispersed around the world and those that are in remote areas through its educational impact (Nazari and Hasbullah, 2008).

Nzonzo *et al.* (2016) believe that the literacy of farmers is very important to understand such programs on radio and television to apply them appropriately into their daily farming activities. Radio stations using local languages are the most preferred because they help farmers to adopt to new technologies faster (Nzozo et al., 2016).

Rapid increase in network connections is a recent development that enables the widespread use of cellphones for short message systems (SMS), voicemail and recordings. Social media programs are a great opportunity to make information regarded valuable by farmers to be available in the most convenient way (Ashutosh, Debabrata and Rupak, 2015). In places where majority of the farmers are using TV and mobile phones to collect information related to agriculture, the

farmers are viewed as better equipped to access information that can improve the agricultural production in their areas (Armstrong and Gandhi, 2012).

Broadcast media like TV has got the potential to spread information to large audience efficiently and is regarded a very important channel just like radio and cellphones (Nazari, Bin and Hassan, 2011). In remote areas where the level of literacy is very low, the choice of any communication device is very important as they come with many challenges and advantages, TV and radio are still regarded significant in terms of transferring modern agricultural technology to both literate and illiterate farmers equally (Nazari, Bin and Hassan, 2011). One critical challenge about use of TV in broadcasting educational programs relating to agriculture and farming as alluded to by Kameswari and Kishore (2011), is the limited fulfilling ability of cognitive needs. Scheduling of agricultural programs on TV are on less favorable broadcasting time slots to farmers and further viewing TV usage as an entertainment and escape media in most parts of the world.

2.2.2 Print and online media

Newspapers and online news platforms are used to transfer information to farmers irrespective of their limited accessibility to average households due to excessive costs (Kameswari, Kishore and Gupta, 2011). Unlike the case of mobile phones, Meydani (2017) regard farmers receiving information via newspapers as passive recipients of information because the platform does not allow farmers to interact with the senders like the case of mobile phones and other communication devices do (Mittal and Mehar, 2012). While newspapers are used in agricultural industry, one communication tool that is growing rapidly is the websites which evidently minimize the usage of newspapers as a communication tool (Meydani, 2017). In contrary, a Pakistani study by Farooq et al. (2007) found a higher user rate of print media for disseminating agricultural information and these was made available through pamphlets followed by magazines, posters, newspapers, booklets and journals. As represented in the later statement the user rate was the highest with pamphlets and the rate lowest with journals in the order of their presentation (Farooq *et al.*, 2007).

Malaysian population of farmers access newspapers, magazines, agricultural brochures, posters and rural libraries at a very limited rate as compared to those in South Africa where there is higher access (Nazari and Hasbullah, 2008). An Indian based study found print media to expand the scope of communication because they are cheap and easily accessible while people can read them at better convenience. In addition the study found that print media is a permanent medium in that the message are imprinted permanently with high storage value which makes them suitable for reference and research (Purushothaman *et al.*, 2003).

On the contrary irrespective of their availability in larger quantities in the stores, it is alluded that newspapers are less trusted and minimally used by farmers in accessing agricultural information (Pigato, 2001). Another contrary view about print media, is the notion that it mainly fulfills perceptive needs and confined to men than women due to its high cost and the norms surrounding the use of public space where it was mostly available (Kameswari and Kishore, 2011). In their study, Rehman *et al.* (2011) alluded to some factors quality of information, farmer's interest, newness and timely publication as important factors that limit the strength of newspapers as good sources of information to farmers.

The literature reviewed on print and online media cites several benefits with regard to availability, accessibility and low cost of these print and online media platforms. However, it does not clearly highlight and consider the importance of language and literacy level of the farmers using these platforms to be able to interact with the sender. Does this suggest that farmers in the countries where research was conducted are literate and these platforms are in the farmers' languages? Perhaps this is be reason why Meydani (2017) regard farmers as passive recipients of information from these platforms due to the fact that they are unable to interact with the senders. Print and online media should always take into consideration the language and literacy levels of the farmers.

2.2.3 Cellphones

Cellphone use alleviate the challenges of information dissemination in markets significantly improving information flow to the underdeveloped rural areas

(Abraham, 2006). They are frequently used by farmers due to their compatibility, wide coverage properties and cost effective nature (Aboh, 2008). With market penetration of cellphones across society, cellphone usage is increasing significantly in the farming communities which according to Mittal, Gandhi and Tripathi (2010) provides a room for growth and productivity of agriculture in rural communities. This has potential impact for further growth in the future (Mittal et al., 2010).

Regardless of all the above-mentioned uses being true, a wide range of mobile phones are rarely used for the purpose of accessing agricultural information by the farmers. A large number of people in farming communities still use cellphones for social networks and for emergencies (Kameswari and Kishore, 2011).

Unlike the case of newspapers, farmers who receive information via cellphones are regarded as active recipients of information since this platform allows them to interact with the senders promptly (Mittal and Mehar, 2012). The growth of cellphones has led to an increase in updated mobile applications designed specifically for the development of agriculture (FAO, 2014). These mobile sources have also increased due to the rapid growth and diversity of the devices recently (FAO, 2014).

Cellphones have the ability to reduce travel costs in cases where farmers have to travel from one area to the other in search of exchanging agricultural information (Aker *et al.*, 2008). Subsequently, the crumbling extension services and poor market information availability has paved the way for the use of ICTs like mobile phones in broadcasting agricultural information to farmers (Mittal and Mehar, 2012).

In addition to the previously mentioned studies, Abdul and Salleh (2013) declared that communication is very important in enhancing the access of markets to farmers by using cellphones. Farmers who own cellphones use them in their farming activities for making transactions during the production process (Adegbidi *et al.*, 2012).

Smart phone technology is recently transforming access to use of ICT through social media applications like YouTube, Twitter, Facebook and WhatsApp available to young farmers to keep them interested in agricultural information at their fingertips (Irungu, Mbugua and Muia, 2015). Furthermore, majority of young farmers own

modern phones with internet connection and spent a considerate amount time on these devices therefore using mass connection to individual friends or information-sharing groups with either closed or open settings. These young farmers have active Facebook and WhatsApp accounts that they use for marketing their agricultural products and also negotiating prices with potential buyers on their personal profiles and Facebook groups (Irungu, Mbugua and Muia, 2015).

2.2.4 Internet and computers

Internet is a great tool that with potential to motivate farmers and enable information sharing amongst them. The farming industry is aware of the benefits that the internet has as an ICT tool, its ability to securely purchase goods online and sell their produce to customers through websites and social media platforms (Mbagwu, Benson and Onuoha, 2018). With internet, farmers have increased abilities and potential to receive and manage any type of information irrespective of the location of the farm which would have a challenge with the absence of internet (Park and Mishra, 2003). Mbagwu et al., (2018) further outlines that as the world approaches towards a modern way of accessing internet, the emergence of internet has brought about great possibilities in merging different communication methods, especially on the web.

There are farmers who started using data management software's for records and crop monitoring through computers. Moreover in this era of internet where information plays a vital role in farmers lives, the agriculture industry is increasingly becoming very intensive in terms of data which farmers need to collect and evaluate information from various devices (Kaloxylos *et al.*, 2012). Mobile technology in the United Kingdom was seen as having a predominantly positive impact, nurturing networks of farmers and agribusiness, so that they can support each other (Palmer, 2012). Recently, dedicated applications are being developed to further extend this impact and sustainability of such technologies (Palmer, 2012). In a study conducted in North India, computers with internet connection were limited in households due to cost, infrastructure and technological limitations (Kameswari and Kishore, 2011). In Kenya, the African drum beat was used in the past to pass information amongst farmers and other community members about funerals, fire, robbery and other burning issues but

this is been replaced by recent technology in the form of internet-based media (Opala, 2004). With the availability and use of internet, boarder and geographical distances are eliminated. The internet if well used, can be a powerful tool to bring about democracy and social participation to communities that have been traditionally undeserved (Nayak, Head and Thorat, 2010). Lastly, computers help researchers to analyze data and write papers, help managers to prepare budgets and they service instructors to produce programs and handouts. The internet makes it possible to send these documents to other people as attachments (Nayak, Head and Thorat, 2010).

2.3 Determinants affecting the use of ICT by farmers

In order for the agricultural sector to be highly productive, there should be access to appropriate agricultural information transmitted through various applicable tools. The choice of the tools should appropriate for the target groups who informed is meant for (Musa, Githeko and El-Siddig, 2013). Armstrong and Gandhi (2012), suggested several factors with potential to constrain the spread of technology through ICT tools and these factors to include the gap between the currently used technology and the technology preference of the farmers. Factors such as gender and land ownership did not have significant effects to the use of ICT tools in Armstrong and Gandhi (2012)'s study. Factors that have been discovered to determine adoption of agricultural technology include human specific factors, economic factors, technological and institutional factors (Mwangi,2015). Though the determinants of agricultural technology adoption do not always have the same effect on adoption rather the effect, this varies depending on the type of technology being introduced.

Negative perceptions about technology, low level of education, low teaching capacities, limited knowledge among extension workers, disorganization, geographical conditions, and inadequate resources and funds were according to Abdullah (2013) the main reasons for non-adaption of technology by farmers. Abdullah (2013) alluded further that farmers should have a certain level of education and be familiar with farming in order to be motivated to learn new technology. According to Adegbidi *et al.* (2012) an understanding of the factors associated with

ICT adoption by farmers and use in agriculture will enable the development of strategies to promote ICT adoption and increase the effectiveness and efficiency of information use in the agricultural sector.

2.3.1 Gender

Small-scale farming was practiced in majority by women whom according to the study by Sekabira, Bonabana and Asingwire (2012) had the primary responsibility of securing household food and were more devoted to the use of ICTs than men. Women are generally found to play an important role in the development and generation of income in agricultural production globally (Treinen and van der Elstraeten, 2018). A similar study by Freeman (2017) added that ICTs have a great potential to allow women to access the information they need through a computer or cellphone, rather than having to interact directly with fellows. Evidently in their studies more women participated in agriculture than men though comparatively men had ample time to tune into the radio throughout the day at home while women only listened to the radio in the evening after returning from their fields which accordingly created an information gap for female farmers.

Despite the promises of the digital revolution, rural women still do not have the same access and control of information and communication technologies as men (FAO, 2019). In addition, woman in rural areas have less access to information and new technologies than men, they disadvantaged when making choices about production due to the lack of information that limits their influence and choice in decision making (Nazari, Bin and Hassan, 2011).

Most rural women lack both the means and the opportunity to obtain formal education men been preferred when agricultural training opportunities arise irrespective of men having some prior formal education and a reasonable amount of knowledge (Agu, 2013). Towards an improved state of ICT affairs, there is a great need to tackle gender-based discrimination against women and girls, so that they can have the same rights and enjoy equal access to services, resources and opportunities (FAO, 2019).

Irrespective of the advances in technology in the farming sector, most of these technologies do not reach women because they receive no information about them due to the lack of cash and knowledge (Agu, 2013).

2.3.2 Age

Older famers were found to adapt less to new technology and ICT mainly because of low literacy level though those in larger farms had higher literacy levels and adapted to technology and ICT use (Batte, 2004). Young men approached ICT as a gateway to better jobs and employment outside farming but however still used ICT intensely within farming for activities such as farm planning, marketing and production (Irungu, Mbugua and Muia, 2015). In addition, Subashini and Fernando (2018) alludes that younger generation adopt easily and have greater interest is new technologies while older farmers of ages beyond 45 years still prefer the old system of sharing information amongst each other.

ICT is used to obtain reliable markets and modern production information on existing crops such as to gain better access to markets (Fair and sustainable, 2013). Majority of young people in farming are computer literate, this implies that their knowledge of ICT use is higher and that they know the use and importance of internet facilities (Ayinde *et al.*, 2015). Youth cherish technology, they obtain information from the internet and make use this platform to market and promote agriculture. To a larger extent, the youth uses the internet and social media to obtain production technologies, market information and for information sharing (Irungu, Mbugua and Muia, 2015). In contrast older farmers do not like exploring new sources of information and are also less likely to depend on multiple sources of information about their farming activities (Mittal and Mehar, 2013).

2.3.4 Level of education

Education is one of the factors that are most important in influencing the farmers' decision making in bearing with risks that are associated with new technologies and modern information sources. In most cases, farmers with better education adopt new

technologies faster, this gives them a platform to diversify the information they receive and use multiple information sources (Mittal and Mehar, 2013).

However, the literacy of farmers is important to understand such programs and apply them appropriately (Nzonzo, Ba and Mogambi, 2016). A low level of education and old age are the two crucial characteristics of the majority of farmers, these two are amongst the determinants that limit farmers to develop their situations (Nazari, Bin and Hassan, 2011). An average farmer in the Caribbean is aged over 50 years and living in rural conditions with limited schooling, they now teach high school students new technologies so that they can go home and teach their parents (Renwick, 2010). Most rural women lack both the means and the opportunity to obtain a formal education because of their poor status. There are low levels of formal education and low level of literacy among farmers and these are seen as barriers. The inability to read and write are the key factors that impede the growth of formal education and use of ICTs (Fair and sustainable, 2013).

2.3.5 Information needs for farmers

Agricultural information includes knowledge on the general aspects of agriculture and consists of innovations, ideas and agricultural technologies, which the information is needed for the development of agriculture for better the living standards (Salau, Saingbe and Garba, 2014). Listed below are the three main categories of farmer's information needs according to Ninsiima (2015):

- Know-how information which helps farmers to decide on what crops to plant and which varieties to use.
- Market information which includes price and price indicators
- Contextual information which includes weather and information on best practices.

Farmers in rural areas need market information and their locations and this access to markets will enable farmers to have information regarding farm machinery and where they can sell their produce (Mbagwu, Benson and Onuoha, 2018a).

2.4 Challenges of ICT usage

ICTs are designed to improve the living standards of the people, but they do have their own challenges which among others are high prices and tariffs in telecommunication services, lack of coordinated efforts in establishing information gateways and lack of government's involvement development of ICT strategies (Kalusopa, 2005). Apart from proper infrastructure, education and distance to markets, membership in a group positively influence the awareness and the usage of ICT tools (Lwasa *et al.*, 2013). Inadequate technical knowledge on ICTs, poor power supply and inadequate access to ICTs are highly ranked constraints for the use of ICT, while others include high cost of infrastructure, lack of physical access to ICTs and poor network connectivity in remote areas (Olaniyi, 2010). Among other obstacles faced by farmers to use ICT are the lack of knowledge on the benefits of using ICTs, lack of the relevant skills in using ICT and lack of time to use the ICT (Salleh Hassan *et al.*, 2008). As with the challenges reported in other key areas, proper design and implementation of ICTs based on a bottom-up and participatory approach within communities, can reduce the potential for information inequity when introducing community based ICTs (Treinen and Van der Elstraeten, 2018)

The introduction of mobile ICTs may overcome the existing information asymmetry and partially close the gap that exist between the availability and delivery of information (Mittal, Gandhi and Tripathi, 2010). However, developing areas do not view the lack of access to ICT as deprivation equally as the lack of food, basic health care and shelter. It is evident that access to ICT can positively impact the livelihoods of the poor and help alleviate poverty (Pigato, 2001). Aker (2008) stated that basic needs like ICT should not be undermined because they hold great for potential development team for small scale farmers and the consumers.

2.4.1 Limited access

Lack of information providers in rural areas affects the delivery of internet-based service to rural farmers. Having information agencies in rural areas makes it easier

for stakeholders in agriculture to partner and guarantee that such agencies are utilized as platforms to reach out and meet the agricultural information needs of rural farmers (Mbagwu, Benson and Onuoha, 2018b). In addition, the most important limiting factor which affects the use of ICT in agriculture is cost of technology (Adegbidi *et al.*, 2012b). However, those who could benefit the most from ICTs are also the ones least able to access and afford them. Poor rural women, despite playing a fundamental role in agricultural production, tend to have less access to ICTs than their wealthier, urban or male counterparts (FAO, 2019).

Fees of computers and costs for internet access are still high in most rural settings with low availability of internet access. Although great improvement was made in the past years, reliable network connection is a precondition for effective implementation of ICT in rural areas (Milovanović, 2014).

2.4.2 Lack of infrastructure

As a result of poor infrastructure and poor electricity connections, most rural areas are still beyond the reach of mobile signal therefore disadvantaging the disadvantaged communities (Treinen and Van der Elstraeten, 2018). Meeting rural farmers' information needs through internet-based information system in developing countries is mostly hampered by the lack of ICT infrastructure. It is difficult to connect rural farmers and provide them with internet-based information services without ICT infrastructures such as strong internet connectivity, internet service providers, etc. (Mbagwu, Benson and Onuoha, 2018).

In South Africa, agricultural intelligence solutions like Manstrat continue to improve technologies like Extension Suite Online and AgriSuite Online which are internet based agricultural information systems developed and maintained for farmers. Small-holder farmers can find out where they can buy affordable input resources, sell products and get support in their location (Zengele, 2018). The availability of information and technology centers with better infrastructure assists farmers with access to markets and the latest information(Armstrong and Gandhi, 2012).

In the presence of better ICT infrastructure, migration of youth to the cities can be reduced by encouraging access to markets, production techniques, new technologies and financing opportunities. It will also enable choice and allow young farmers to be on their farms and take full advantage of the new technologies and farming techniques that are easily accessible (Fair and sustainable, 2013).

2.4.3 ICT Literacy

ICT literacy is knowing why and when you need information, where to find it, and how to evaluate, use and communicate it in an ethical manner (Renwick, 2010). It has been reputable in the study that the level of ICT literacy among rural farmers, especially in developing countries is low and this becomes a major restriction as far as meeting the information needs of rural farmers is concerned (Mbagwu, Benson and Onuoha, 2018). the most emphasised challenge that discourages farmers using ICT is the fear to embrace new technology due to lack of knowledge (Subashini and Fernando, 2018).

Young and middle age people had more ICT skills because it has been noted that their literacy rate is high as compared to old age people (Babu *et al.*, 2015). On contrary, in Ghana there is a tool called the Talking Book, an innovative, low- cost audio computer designed for the learning needs of illiterate people living in the poorest areas of the world (Treinen and Van der Elstraeten, 2018). It is very important for farmers to have computer literacy skills in order to participate and make well informed decisions in the agricultural industry (Meydani, 2017).

2.5 Summary and conclusion of the literature review

This chapter reviewed literature from previous studies on the role of Information Communication Technology for farmers. The review included studies conducted worldwide inclusive of Africa and South Africa. ICT tools were defined by various authors as a broad category of devices and services that help farmers gather, store, analyse and share information. Cell phones, radio, TV, newspapers, internet and

computers were listed as ICT tools used in different parts of the world. Amongst the studied ICT tools, TV was seen as a credible source for the dissemination of agricultural information. TV and radio were generally useful ICT tools though they were scheduled at unfavourable times and the broadcasting language therefore affecting their effectiveness and efficiency.

Although print media is permanent and can be revisited often, farmers still prefer using the internet and accessing information via websites. While farmers who use newspapers are regarded as passive recipients of information, those that use cell-phones are regarded active recipients of information. Cell-phones reduce travel cost and are used mostly by youth for markets and social media to advertise their products.

A few studies show that internet is a powerful tool that can bring about democracy and social participation. Women in rural areas have less access to information and new technologies than men which reduces their chances in decision making as earlier indicated. It was further indicated that older farmers do not like exploring new sources of information but rather rely on older methods while young farmers cherish new technologies.

Further consensus drawn from literature is that the growth and development of farmers and their farms, timely and updated information is needed. This information should be contextualised to address the needs of the farmers. It also states that these farmers will need assistance in utilization of other tools due to illiteracy levels. Farmers in rural areas need information on markets to enable them to sell their produce on time. Inadequate technical knowledge on ICTs, poor power supply and inadequate access to ICTs are highly ranked the constraints to the use of ICTs, while among others are high cost of infrastructure, lack of physical access to ICTs and poor network connectivity in remote areas.

In the light of the above, this study seeks to investigate the role of Information Communication Technology tools in facilitating development within CBFPs served by Mankweng Service Centre. Existing literature like that by Mabe and Oladele (2012) studied ICT tools use by extension farmers but there was no focus of the use by farmers. The challenge with the phenomenon is that although ICT tools are used by

extension officers, their reach to farmers who are end-users is limited. Hence, this study intends to investigate ICT tools use by farmers focused in the CBFPs under the Mankweng Service Centre. Farmers can make videos of their products and post as a marketing strategy on social media. Anecdotal data suggests that farmers can make photos of disease attacking their products and send to scientists for advices without cost of travelling. Farmers can share ideas and their stories using ICT tools at their disposals. Farmers can have meeting using available online platforms. Farmers can also make new connections with others that are in different provinces and countries. Information sharing will be made easy for all.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter aims to describe the study area and the process followed in collecting data. Methods and tools of data collection and analysis used in this study are explained in this chapter. Information on socio-economic characteristics of farmers in the Community Based Farming Projects is described and organised. This chapter also highlights the tools used to access agricultural information and documented the information needs for farmers and challenges of ICT usage.

3.2 Study design

Quantitative cross-sectional descriptive study was conducted among farmers who are active participants in Community Based Farming Projects. A cross-sectional study is a study in which the investigator measures the outcome and the exposures in the study participants at the same time (Setia, 2016). This study employed a cross-sectional approach because it takes place once and allows the researcher to investigate a number of characteristics against a single factor. This type of study provides a quick picture of correlations that may exist at a given point.

3.3 Description of the study area

The study was conducted in the Community Based Farming Projects (CBFPs) of the Mankweng Service Centre in the Polokwane Municipality of Capricorn District, Limpopo province, South Africa (Figure 1). Limpopo Province is one of South Africa's nine provinces and it is found in the Northernmost part of the country. This province was formerly known as Northern Province and its name has since been changed to Limpopo province and its capital city is now known as Polokwane. According to StatsSA, (2011) the land area of Limpopo Province amounts to 125 745 square kilometres which is 10.4% of the total area of South Africa. It is the fifth largest province in South Africa with a population size of 4 995 462 people (StatsSA, 2011).

Limpopo consists of five districts namely Capricorn, Vhembe, Sekhukhune, Mopani and Waterberg. This study was conducted in Capricorn District, under Polokwane municipality. The Polokwane municipality lies on 1303m above sea level with climate considered to be a local steppe climate. Annual rainfall is estimated around 598mm with average temperature in the region of 17.3°C (Climate-Data, 2019).

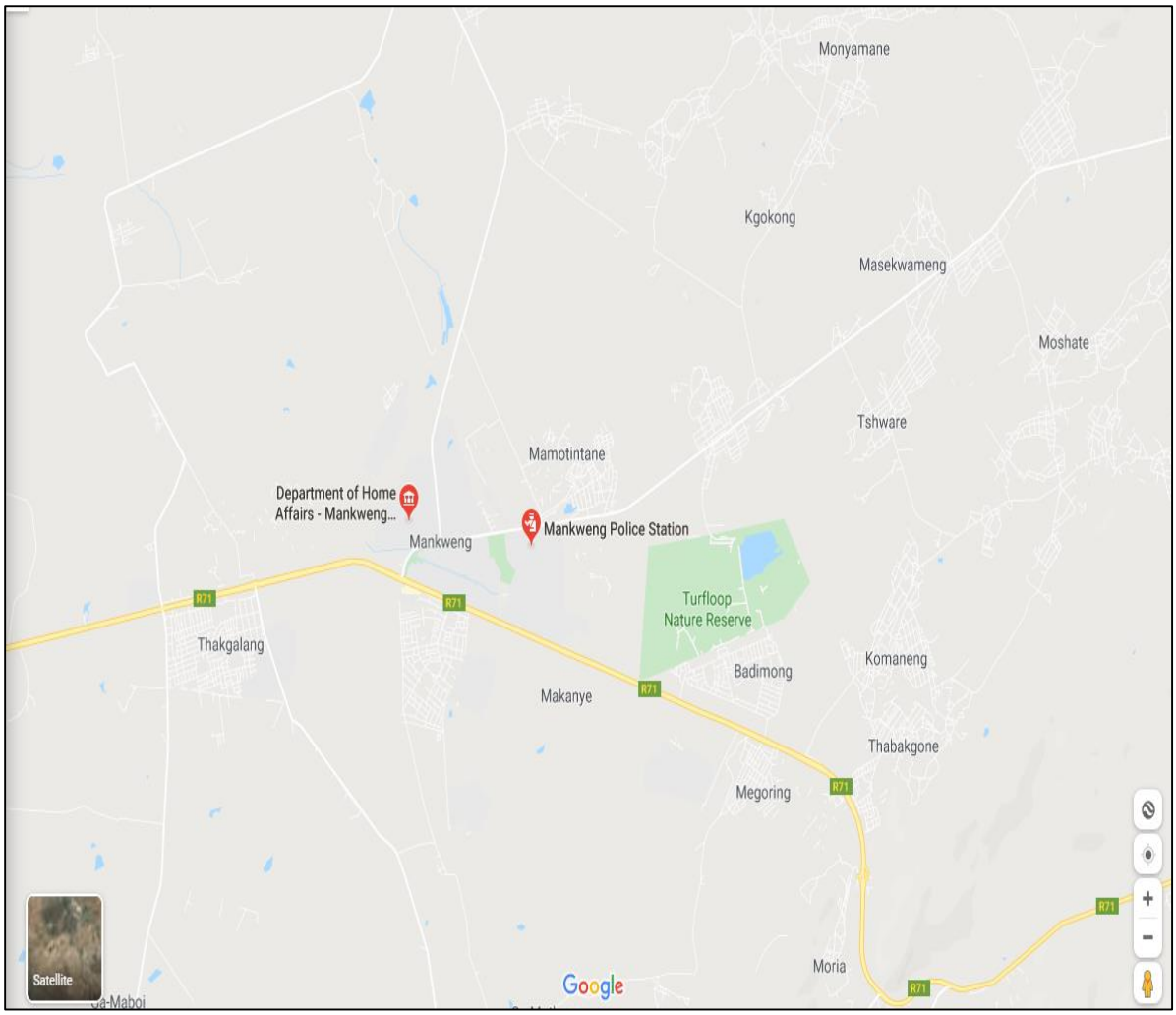

Figure 1:Map showing the Mankweng service centre of the LDoA

(https://www.google.com/maps/search/mankweng+service+centre+LDoA/@-23.875585,29.6978749,12.75z)

The service centre studied is situated in the areas under the tribal and traditional leaderships of Kgoshi Dikgale, Kgoshi Mothiba and Kgosi Mamabolo. Farmers in these areas are predominately small-scale in nature as defined by their production farming land size been a hectare or less. The farming lands are afforded to the

farmers by traditional councils under an agreement called Permission To Occupy (PTO).

3.4 Population

The population of this study included actively participating farmers of the Community Based Farming Projects registered with the Mankweng Service Centre of the Limpopo Department of Agriculture. Mankweng Service Centre had 273 active farmers registered within 12 CBFP spread across the centre at the time of the study *(see Table 3.1).*

Table 3.1: Number of farmers per study area

	CBFP	No. of active registered farmers
Dikgale	5	126
Mamabolo	4	81
Mothiba	3	66
Total	12	273

Source: Preliminary survey data

As stated in the table Dikgale had the highest number of participants followed by Mamabolo and then Mothiba. Besides the number of participants, the number of projects also followed the trend with Dikgale recording the highest and Mothiba the lowest.

3.5 Sampling Technique and Sample Size

3.5.1 Sample Size

In order to estimate the sample size for known population sizes which was the case in this study, a sample size calculation by Yamane (1967) sourced from SampleWebc *(http://samplewebc.blogspot.com/2019/06/sample-size-formula-by-yamane.html)* was used. This formula calculated a sample size of 162 from a population of 273 farmers at 95% confidence level and 0.05 margin of error. This is illustrated below.

$$n = \frac{N}{1 + N * (e)^2}$$

n - the sample size

N - the population size

e - the acceptable sampling error (0.05 with 95% confidence level)

Figure 2 Yamane formua for calculating sample size

From the formula above

N (population size) = 273

E (margin of error) = 0.05 (therefore setting the confidence level at 95%)

Therefore n (sample size) = $N/(1+N(e)^2)$

= $273/ (1+273(0.05)^2)$

= 162.3 ≈ 162 participants

The study used stratified random sampling to select the participants of the study from the twelve CBFPs.

3.5.2 Sampling Technique

Sampling technique is a process of selecting the individuals from a population targeted for the study (Martinez-Mesa, Gozalez-Chica, Duquia, Bonamigo and Bastos, 2016). In this study the proportionate stratified random sampling was used. The sample size of each stratum in this technique is proportionate to the population size of the stratum when viewed against the entire population. This means that each stratum has the same sampling proportion. For example, with 12 strata of 50, 12, 12, 2, 50, 11,50, 5, 20, 21, 25, and 15 population sizes respectively, and the researcher chose sampling proportions. The twelve strata are represented as follows: Robala (stratum A), Mathomo-mayo (stratum B), Phela-ke-phele (stratum C),Mogabane

(stratum D), Tiyangmatla1 (stratum E), Seobi (stratum F), Sebaya (stratum G), Mondale (stratum H), Dalmada (stratum I), Phela-o-phedishe (stratum J), Kgolokgolo (stratum K), Jack-mafarane (stratum L). These stratum are from the three areas as follows : A-E Mankweng strata (126), F-H Dikgale strata (66) and I-L Mamabolo strata (81).

Table 3.2: Stratum with sample sizes

Stratum	**Population Size**	**Proportion (%)**	**Sample size**
A	50	18	30
B	12	4	7
C	12	4	7
D	2	1	1
E	50	18	30
F	11	4	7
G	50	18	30
H	5	2	3
I	20	7	12
J	21	8	12
K	25	9	15
L	15	5	9
	273	**100**	**162**

The same sampling proportion for each stratum was used regardless of the differences in population size of the strata. It is much like assembling a smaller population that is specific to the relative proportions of the subgroups within the population(Opara, 2008).

3.5.3 Content validity

Content validity refers to how well an instrument includes a representative sample of questions that relate to the content domain being measured. To ensure content validity of the questionnaire, review of literature was done. The questionnaire developed was checked and critiqued by the supervisors to determine whether it contains items that can measure the study objectives. The supervisors also proposed possible questions to be included. In addition, a peer review by my colleagues from University of Limpopo was done specifically to check for face validity of the questionnaire i.e. clarity of printing, font size and type, adequacy of workspace, and language. After the questionnaire was checked by the supervisors and peers, corrections were made. The final questionnaire was developed for the study.

3.6. Data Collection

Data collection is defined by Burns and Grove (2009) as the process of gathering information from respondents using predefined data collection instrument. A questionnaire was used to collect the data from selected respondents. The tool and process used are defined below. Data was collected over ten days, at different sites.

3.6.1 Data collection tools

Data was collected using self-administered questionnaires under supervision by the researcher. According to Bourque & Fielder (2003) self-administered questionnaires are instruments used to collect data from the respondents of a study using paper-and-pencil techniques. The advantage of this method is that it is cost effective and gives the respondents enough time to honestly answer the questions. The questionnaire was divided into two sections (Section A and Section B). Section A was comprised of six questions that were aimed at gathering the demographic factors of the farmers in Mankweng CBFPs and Section B compromised of eight questions that aimed at answering the proposed research questions of the study.

3.6.2 Data collection process

The researcher collated pre-arranged CBFP meeting dates from the service centre office and arranged the data collection dates in line with these set meeting dates. The various CBFP farmers were alerted of the study through their respective coordinators and were also informed about the intentions of the researcher to collect data for the study during their pre-arranged meetings. Data collection times were set with respective sites to ensure that the data collection process did not interfere with the set meetings and allowed meetings to coordinated and data to be collected after the meetings. This further assisted in ensuring availability of selected potential participants. As a result, the participants at various clusters were available at the set time of data collection. In the day of data collection, available farmers were officially briefed about the study and its intentions, and further invited to participate. They were informed autonomy to give consent for participation, rights of voluntary withdrawal of consent and other ethical considerations as required by the Turfloop Research Ethics Committee. Those that agreed to participation by signing consent forms were included in the study. Questionnaires were distributed by the researcher to the respondents and asked to complete and return. The respondents who were not able to read or write, were assisted in reading and answering the questions.

3.6.3 Inclusion and exclusion criteria:

All farmers registered within the CBFPs were included in the study but those that had not planted for the 12 months preceding the data collection period were excluded they were regarded inactive participants at the time. It was assumed they would not have given current information as required in cross-sectional studies.

3.7. Data analysis

The researcher evaluated the completeness of the questionnaires and assigned them identification numbers to be used when loading data for analysis. Data was captured using Statistical Package for Social Sciences (SPSS) version 26.0 for analysis.

Using descriptive analysis data was summarized and presented in the form of bar graphs, pie charts, histograms and tables based the frequency distribution. Measures of central tendency, measures of variability and relationship of variables were conducted. Collected data was summarized through various forms of presentation. Univariate regression model was used to analyze factors influencing use of ICT tools by farmers. The variables used in the regression model are further described in the table below.

Table 3.3: Variables used in Univariate regression model for the use of ICT tools by farmers.

Variable name	**Definition**	**Type of unit of measurement**	**Prior expectations (+/-)**
Dependent variable			
Use of ICT	The use of ICT tools by farmers	Nominal; Dummy (1= Yes 0= No)	
Independent variables			
Age of farmer	Respondent's age at last birthday	Nominal; Dummy (1= 18-29 2= 30-39 3= 40-49) 4= 50+)	+/-
Gender of farmer	Whether the farmer is male or female	Nominal; Dummy (1= female 0= male)	+/-
Level of education	The highest grade or school level the farmer completed	Nominal; Dummy (1= primary 2= secondary 3= tertiary)	+/-

No. of family members in my household	The total number of family members including the farmer	Nominal; Dummy (1= 1-3 2= 4-6 3= 7-9 4= 10+)	+/-
Farming experience (years)	The number of years in farming	Nominal; Dummy (1= less than 1 2= 1-3 3=4-6 4= 7+)	+/-

3.8. Multicollinearity

The nature of independent variables in the study such as gender, age group of the farmer, number of members in the household, highest level education of the farmer and farming experience of the farmer could have also been classified into categories. However, when data was analysed with such classification, the problem of the dummy variable trap which results from multicollinearity was experienced. Multicollinearity occurs when two or more predictors in the model are correlated and provide redundant information about the response according to Phelan et al. (2010). To address this challenge, the nature of these independent variables was then classified as dummy variables guided by the literature reviewed.

3.9. Limitations of the study

Some of the limitations of the study were identified and are indicated below: -

- The study was conducted at Polokwane District focusing only on Mankweng service centre. The findings can therefore not be inferred to other centres with different characteristics like CBFP located in more urbanised or semi-urbanised areas. Farmers in urban areas are more exposed to technology than those in rural areas. Therefore, the results of this study cannot be generalised. In addition, Mankweng service represents a smaller fraction the many in the municipality and Province.

- Language is a barrier especially in countries with low literacy level. While this has not been studied thoroughly as a determinant factor elsewhere, it is a feeling of the researcher that farmers could prefer certain devises or media specifically print, TV and radio due to their ability to present information in the local and indigenous languages. Therefore, language as a determinant factor for ICT use could have been included in the study.
- The response rate of over 70% was acquired. Though this is beyond acceptable response rate, this could have been better but was limited by availability of the farmers based on the set period meeting times. With efforts of extension officers, there was massive drive and recruitment hence a higher response rate was anticipated given the reduced sample size.
- Long distance and poor infrastructure were a challenge of reaching other farmers. This challenge was surmounted by the help of the extension officer who arranged a meeting with the farmers and the survey was collected after the meeting in order not to disrupt their meetings and to reduce costs of travelling by the research team. Research team was therefore able to visit a site only once, distributing and collecting questionnaires on the same day.
- Some of the farmers were unable to read effectively with understanding and had to be assisted by the research team.
- There was no piloting of the questionnaire although it was given to experts for validation.

3.10. Conclusion

This chapter has provided an overview of the study area, data set and the methods used to analyse the data. The study used descriptive analysis to address the objectives of the study. The study intended to to investigate the role of Information

Communication Technology tools in facilitating development within CBFPs served by Mankweng service centre.

CHAPTER 4: RESULTS AND DISCUSSIONS OF THE STUDY

4.1 Introduction

This chapter presents and discusses results of the study emanating from analysis of the data collected. It includes the empirical results and the descriptive statistics. It shows how the set objectives were analysed for better understanding of the expected outcomes as weighed against the results. The sample size of 162 active registered farmers participated in this study giving a response rate of 73.5%, which is higher than the recommended response rate of 60% (Fincham, 2014). The possibly reasons for high response rate in this study was that the researcher was able to talk to potential participants before recruitment, answer any queries about the study and arrange appointments at a time that suited the farmers.

The results and discussion of the study are organized into four sections. The first section discusses the demographic characteristics of the study participants, the second section focusses on the ICT tools through which farmers get agricultural information, while the third section documented the various types of ICT based agricultural information preferred by farmers. The third theme discusses the actors influencing the use of ICT by farmers and the last section focusses on the challenges encountered by farmers in the use of ICT.

4.2 Demographic characteristics of the study participants

The characteristics of the participants including age and gender distribution, level of education, number of family members in households of farmers and the farming experience are presented in this section.

4.2.1 Gender

The gender of the respondents is indicated in Figure 4.1

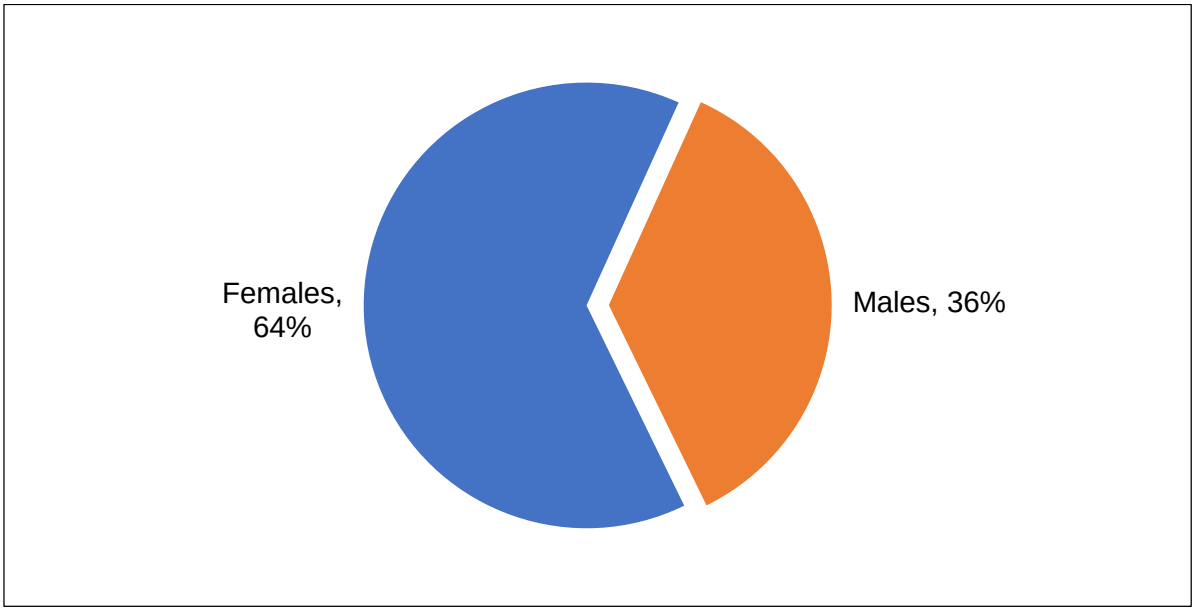

Figure 4.1 Gender of the farmers

The result shows that the majority (64%) of the active farmers in the present study were women, which is in agreement with other studies of Sekabira, Bonabana and Asingwire (2012); Reinen and van der Elstraeten (2018). This study found that only 36% of the population were males. Furthermore, both males and females are able to access ICTs. Levi (2015) alluded that there is no association between the gender of farmers and their use of ICT.

4.2.2 Age

The age categories of respondents are indicated in Figure 4.2.

In the study 44% of the farmers were older farmers of the age category 50 years and above. Twenty-four percent (24%) of the farmers were of the age category 40 to 49 years, 20% were of the age category 30 to 39 years and 12% of the farmers were less than 30 years old of age. Majority (68%) of the participants in this study were beyond the age of 39 years. In contrary, a study conducted by Dhaka and Chayal (2010) indicated that majority of the respondents belonged to middle age group

followed by young age and old age group. Young age group is getting involved in making use of ICT tools for getting useful information (Kabir, 2015).

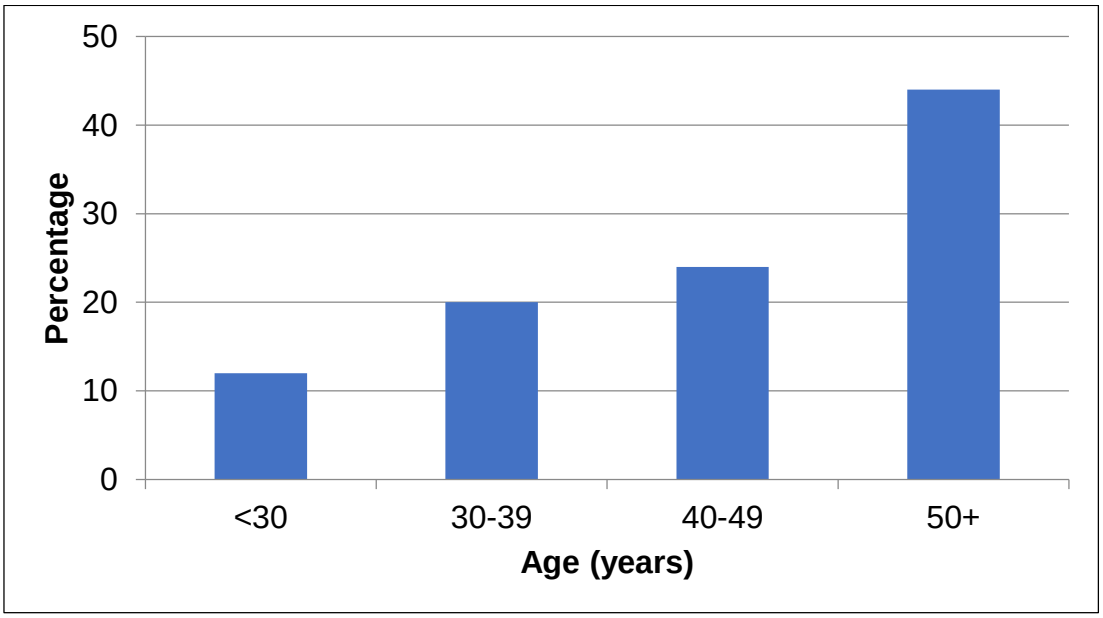

Figure 4.2: Age distribution of the farmers

4.2.3 Level of education

The level of education of respondents is indicated in Figure 4.3.

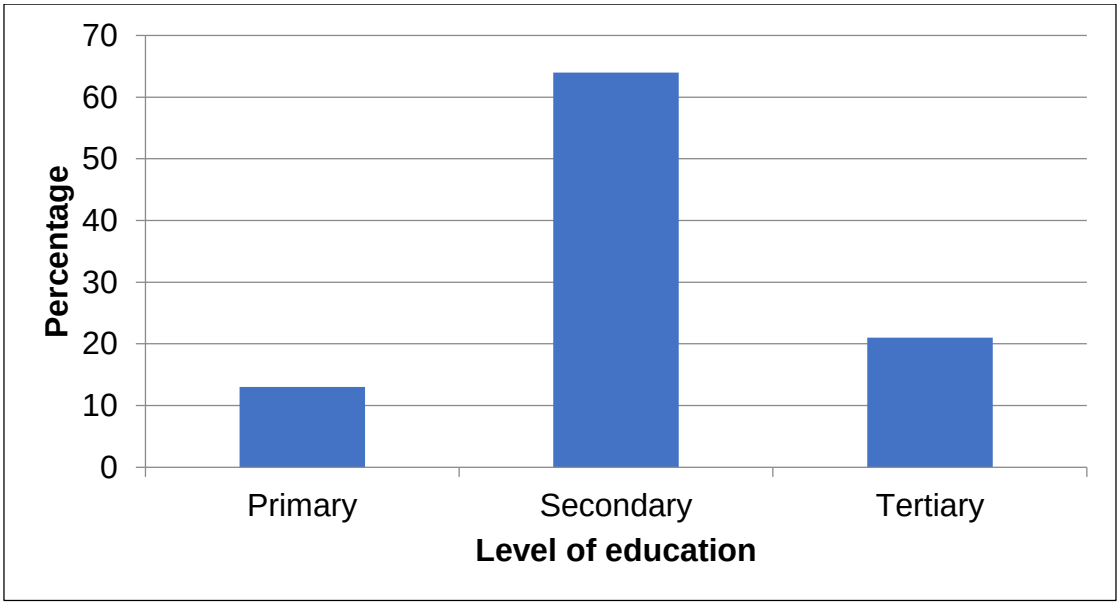

Figure 4.3: Level of education of the participants

Farmers with low education (12%) are in the minority in the projects. The majority of farmers have secondary (64%) and few farmers (21%) have tertiary education and primary education (12%) as indicated in Figure 4.3. In contrast, in India most farmers had tertiary qualifications related to agriculture (Chandre Gowda & Sreenath Dixit, 2015) while in this study, only 21% have tertiary education. There are low levels of formal education in this study among farmers and this suggests that farmers must be capacitated on ICT devices they feel comfortable with for self-development. The level of education of farmers has got a positive correlation with the use of ICTs (Musa, Githeko and El-Siddig, 2013) .

Farmers with better education adopt new technologies faster, this gives them a platform to diversify the information they receive and use multiple information sources(Mittal and Mehar, 2013).

4.2.4 Number of family members in the household

The number of family members in the household is indicated in Figure 4.4.

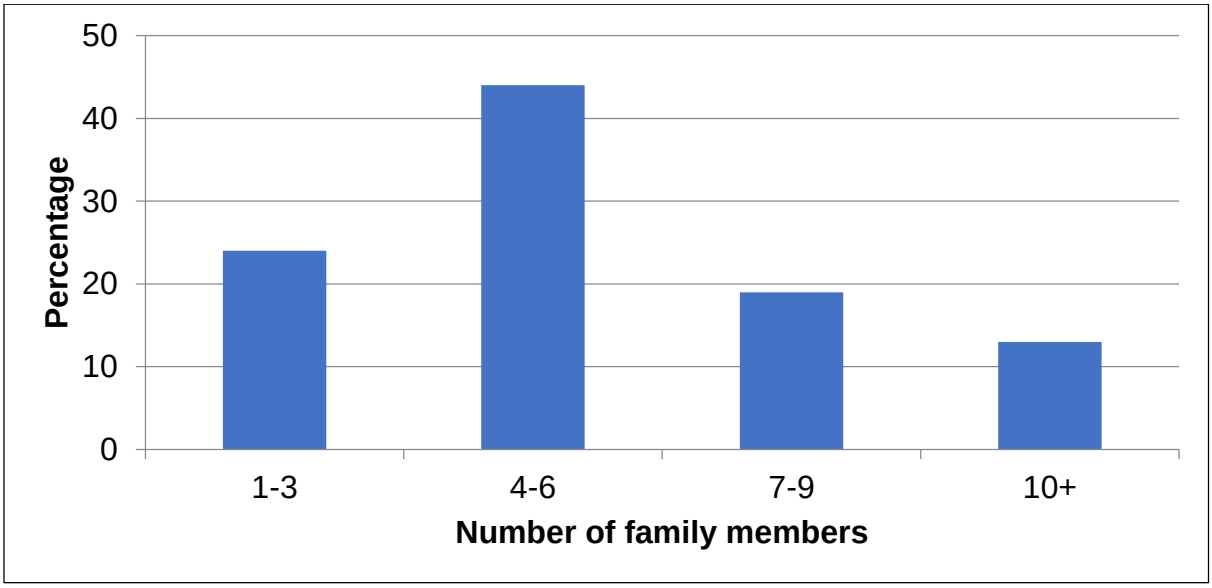

Figure 4.4; Number of family members in the farmers' household

In Figure 4.4, the frequency distribution shows that majority of the farmers were from households with 4 to 6 family members, followed by those with 1 to 3 family members and lastly 19% and 13% were frequencies for farmers with households having 7 to 9

and more than family members respectively. The household with huge number of family members will benefit with the availability of several ICT tools within that household (Ezeh, 2013).

4.2.5 Farming experience

Farming experience of respondents is depicted in Figure 4.5

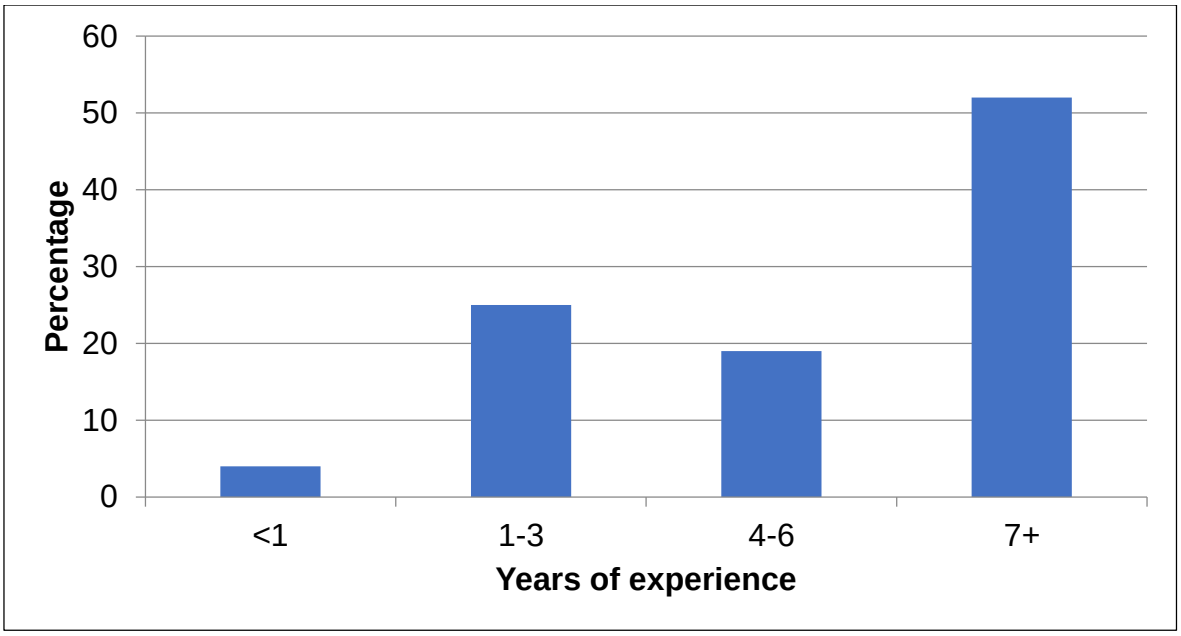

Figure 4.5: Farming experience in years

Regarding farming experience, most of the participants had a significant farming experience determined by number of years of farming. Slightly more than half (52%) had seven or more years of farming experience and only (3%) had less than one year of farming experience. Farmers who have more years of experience are more likely to read, research, watch agriculture related channels and connect with other farmers using ICT tools for self-development than those who just started farming (Manfre *et al.*, 2011).

4.3 ICT tools through which farmers get agricultural information

The tools used by respondents are indicated in Figure 4.6.

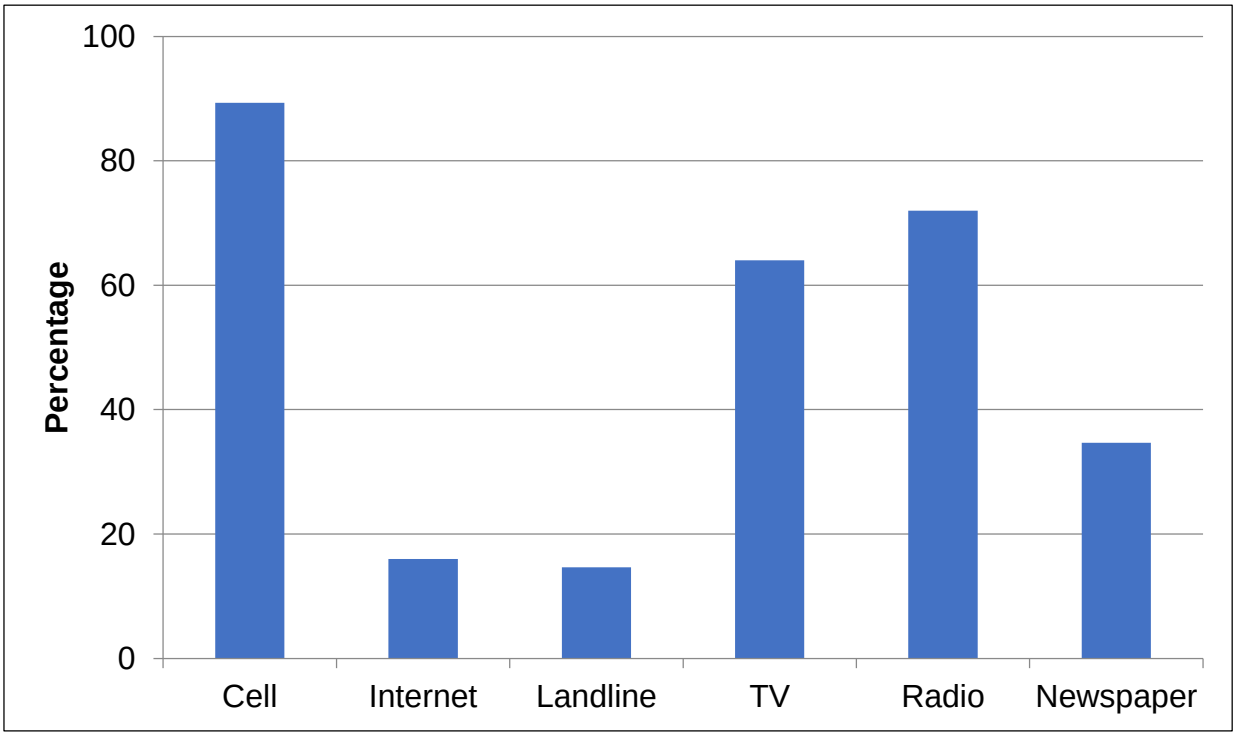

Figure 4.6 ICT tool used by farmers

According to Figure 4.6, this study found cell phones, radio and TV to be the most commonly used devices by farmers at 89%, 72% and 64% respectively. Newspapers, internet and landline were the least used tools with percentages of use at 35%, 16% and 15% respectively. The findings agreed with that of Armstrong and Gandhi (2012) which suggested usage of cell phones and radio to be most common and that users of these devices were better equipped with information than others. Studies by Nazari and Hasbullah (2008) and that of Pigato (2001) concur with the findings of this study regarding usage of newspapers. In this study fewer (35%) farmers used newspapers and regarded them to be costly and to require some form of literacy. The usage of newspapers was low in the mentioned studied above, and it concurs with this study where newspapers were the least used though they surpass internet and landline use. On the other hand, several studies have shown that TV & Radio, cellphone, voice mail, SMS, Internet and computers are commonly ICT tools used by farmers for the dissemination of agricultural information (Abraham, 2006; Nazari and

Hasbullah, 2008; Armstrong and Gandhi, 2012; Nzonzo et al., 2016). Despite the poor network coverage, lack of electricity and the cost of ICT tools as limiting factors to the use of internet and landline, in this study the use of landline and internet are of less significance given the nature of the population who are mostly in informal settings. However, with the advance and availability of ICT tools farmers in this informal setting could access internet using wireless internet and government can support and capacitate farmers to take this advantage.

In addition to the types of ICT devices farmers use, figure 4.7 below illustrates the number of ICT tools each farmer has access to.

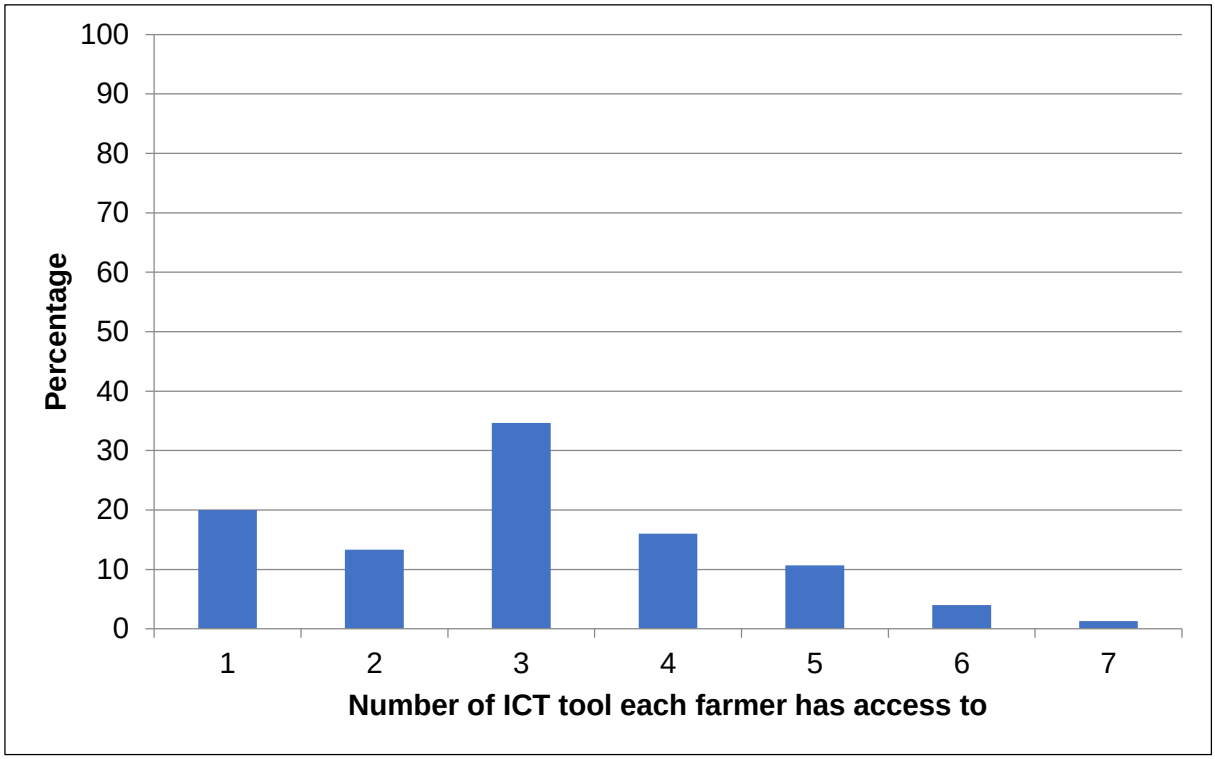

Figure 4.7: Number of ICT tool farmers had access

The results of the study reveal that majority of the farmers (34%) have access to three devices, while 15% of the farmers owned about four devices and 20% of the farmers owned only one ICT device. About 12% farmers have two devices while only 11% of the farmers had five devices. The results of study also show that remaining categories

of six and seven have 5% and 1% respectively. ICTs play an important role in the flow of information by reducing travel costs of farmers to extension officers at service centres. ICTs also play a great role in facilitating efficient creation, storage, management and dissemination of information by tools that aids in fighting the forces that cause poverty. The use and availability of ICTs give farmers a platform to access information that is essential in decision making. When farmers use more devices, it will give them and extension workers options to choose which one is effective and reliable and what it could be used for. So that extension workers and farmers can be able to collaborate.

4.4 Types of ICT based agricultural information preferred by farmers

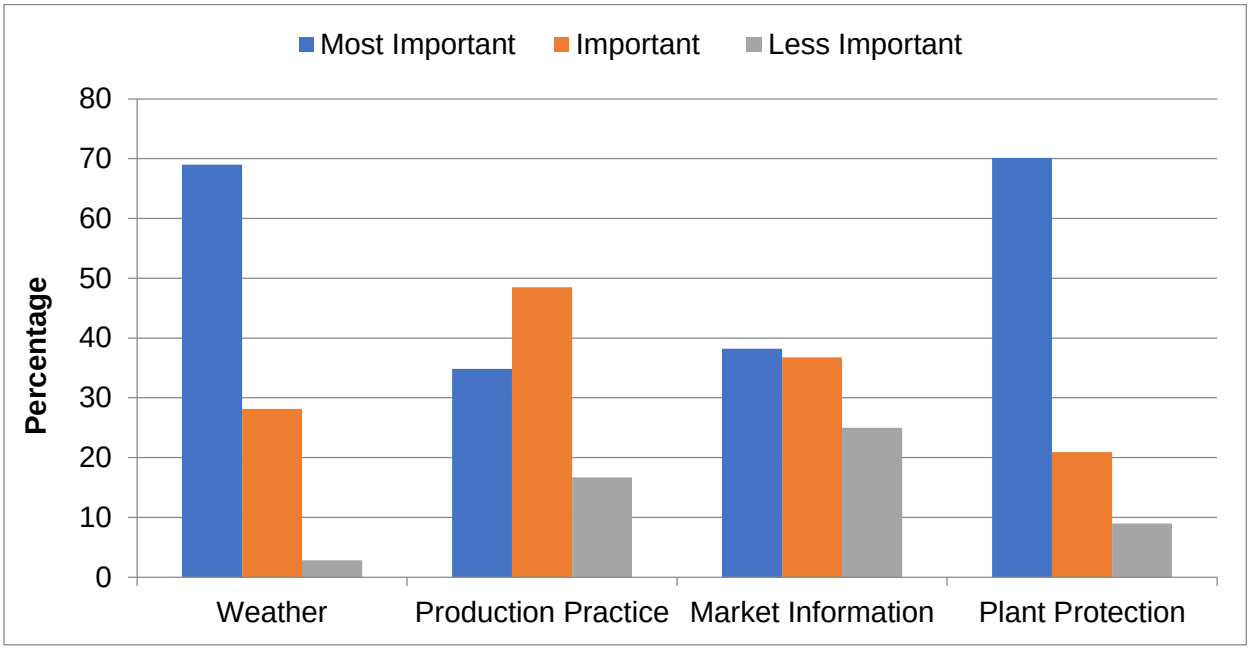

Figure 4.8: Farmers perception regarding the type of information they rate important

The results of the study indicate that the most important ICT based agricultural information preferred by farmers is on access to plant protection was rated most important (70%) and important (21%), while weather forecast was rated most important (69%) and important (28%). Access to production practices (49%) was regarded as important ICT based agricultural information preferred by farmers. The less important information in this study was market information (25%), production practices (17%), plant protection (9%) and weather (3%) respectively. The reason

market information was rated the less important (25%) in this study, was that majority do not produce for selling but for household use. Farmers in the study rated production practices the second less important (17%) agricultural information because they plant the similar crops continuously. These results are in contrary with that of Dhaka and Chayal (2010). The knowledge of production practices is passed from one generation to the next.

In my opinion farmers value the information on weather highly in this era of climate change. Such information enables the farmers to know exactly when to start planting and the type of crops they can produce given the weather patterns. While production of crops may flourish, farmers feel the need and importance of having updated information on the pests and diseases that have a huge threat on their produce. Climate affects crop yields in several ways and it impacts agricultural inputs such as water for irrigation, amounts of solar radiation that affect plant growth and the prevalence of pests. While the of impact differs greatly by region, climate change is expected to impact on agricultural productivity and changing crop patterns (Meena, Singh and Singh, 2012). This information will allow farmers to be ready and start exploring solutions of how they can eradicate such challenges.

4.5 Factors influencing the use of ICT by farmers

Table 4.2: Variables used in Univariate regression model for the use of ICT tools by farmers.

		Univariate Regression	
		Coef (95%CI)	p-value
Gender	Male	Ref	
	Female	-0.38(-1.1;0.31)	0.276
Age (years)	<30	Ref	
	30-39	-0.38(-1.5;0.83)	0.535
	40-49	-1.00(-2.2;0.17)	0.092
	50+	-1.00(-2.1;0.06)	0.063
Level of education	Primary	Ref	
	Secondary	-0.16(-1.2;0.87)	0.754
	Tertiary	0.09(-1.1;1.3)	0.884
No. of family members in my household	1-3	Ref	
	4-6	-0.48(-1.3;0.4)	0.269
	7-9	-0.60(-1.7;0.4)	0.253
	10+	-0.39(-1.5;0.8)	0.504

Farming experience (years)	<1	Ref	
	1-3	0.44(-1.4;2.3)	0.635
	4-6	0.12(-1.8;1.9)	0.900
	7+	0.41(-1.4;2.2)	0.645

Farmers were asked to indicate factors that influence their use of ICT tools. Univariate regression was used to analyse the identified determinants' factors of ICT usage. As revealed in Table 4.2, gender, age and number of family members in the household were not significant factors of the farmer's likelihood to use of ICT ($p>0.2$). However, level of education and farming experience were significant.

The results show that both males and females can access ICTs, the regression model indicates that there is no association between gender of farmers and access to ICTs. This implies that the use of ICTs is not significantly influenced by gender of the farmer, these results are like those of Levi, (2015).

This study revealed that farmers aged forty years and above were unlikely to use ICT tools as compared to those aged thirty-nine years and below. This study is consistent with the results of one study have shown that older farmers are less likely to use ICT tools (Nazari, Bin and Hassan, 2011). Young adults in the age groups of 30-39 years were found to use the ICT tools ($p>0.535$) as compared to other age groups. This could be that young adults in farming were likely to be computer literate and understand the importance of ICT compared to the elders (Ayinde *et al.*, 2015; Babu *et al.*, 2015). In addition, the old people are less interested in changing their conditions and ways of farming as they are comfortable with what they have learned over the years (Kabir, 2015).

The results in table 4.2 show that farmers with tertiary education will use ICTs unlike those with primary education and that there is a positive correlation between tertiary educational level with ICTs. Other authors in parallel to this study have indicated that high level of education is a very important predictor for the utilization of the ICT tools (Nazari et al., 2011). Education changes the way people react to certain situations, the illiterate people find it difficult to use different ICT tools (Kabir, 2015).

The study further identified that the number of members in a household have got a negative correlation with the use of ICTs and therefore it was not consistent with literature. In contrary, a household with huge number of family members will benefit with the availability of several ICT tools within that household (Ezeh, 2013). This is not the case in this study. The number of members in a household was not associated at all with the use of ICT services, indicating that all farmers, irrespective of their family size, were using them. It means that farmers' number in a household has no bearing on their use of ICTs (Dhaka and Chayal, 2010).

Farming experience has got a positive correlation with the use of ICTs. Farmers with one to three and seven years of farming experience use ICTs more than those with four to six years of farming experience. Farmers who have more years of experience are more likely to read, research, watch agriculture related channels and connect with other farmers using ICT tools for self-development (Manfre *et al.*, 2011).

4.6 Challenges encountered by farmers in the use of ICT

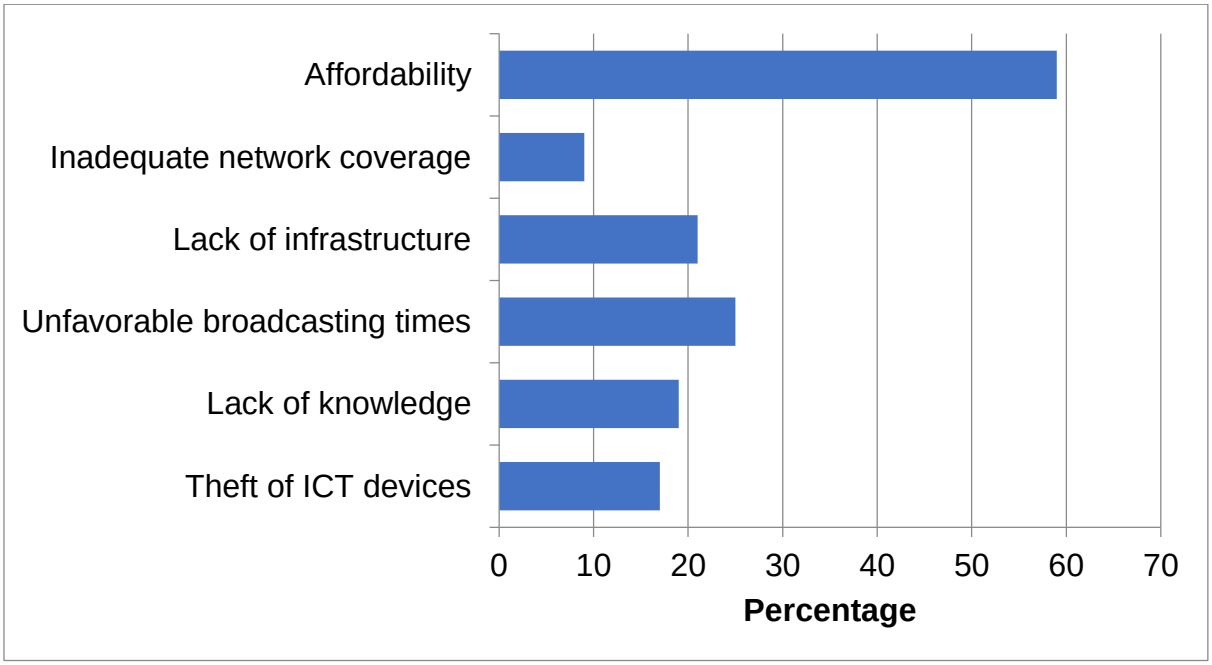

Figure 4.9: Challenges faced by individual farmers limiting their use of ICT

There are various challenges associated with an inadequate use of ICT tools. Farmers were asked to indicate pre-selected challenges that they personally experience when using the ICT tools and the findings are indicated in Figure 4.9. The

majority of respondents indicated affordability as one of the challenges and it was rated 59%, followed by unfavorable TV and radio broadcasting times rated 25%. The findings of these study concur with those of Olaniyi (2010) who stated that other leading challenges on the use of ICT tools are infrastructure and poor network overage. About 20% of the farmers regarded challenges such as inadequate technical knowledge on ICTs, poor power supply, high cost of infrastructure, lack of physical access to ICTs, lack of information, poor infrastructure, poor electricity and poor network connectivity particularly in remote areas as insignificant to their use of ICT.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of the study and indicates the summary, conclusion and recommendations of the study. The recommendations discussed are suitable to enhance the use of ICT tools in facilitating the development of farmers using updated information and available technologies.

5.2 Summary of the findings of the study

The aim of this study was to investigate the role of Information Communication Technology tools in facilitating development within Community Based Farming Projects served by Mankweng Service Centre. The objectives of the study were to identify various ICT tools through which farmers get agricultural information, determine the types of ICT-based agricultural information preferred by farmers in Mankweng, examine the factors influencing the use of ICTs by farmers in Mankweng and identify the challenges encountered by Mankweng farmers in their use of ICT tools. This study was cross-sectional in design and consisted of 102 farmers from the community-based farming projects in Mankweng Service Centre. Data was collected from these farmers using self-administered questionnaires under the supervision of the researcher. The data collected was analysed using descriptive statistics and univariate regression model. The findings of this study were summarised using tables, figures and frequencies.

The results of the study revealed that majority of the farmers were women. Majority of the farmers who participated in the study were less than 50 years of age. The findings of the study also show that most of the farmers do not have professional farming qualification. Majority of the farmers have got significant farming experience. The commonly used ICT tool used by the farmers was cell phone, radio. The findings of the study indicated that the most important ICT based agricultural information is access to plant protection and weather information. The main challenges farmers are

faced with regard the use of ICT tools are: affordability followed by unfavourable broadcasting times then the lack of ICT infrastructure. The results of the study also found out that the farmers in the CBFPs in Mankweng can also be characterised by their age, level of education, number of family members, gender and farming experience in years. The study also indicated that most of the farmers in Mankweng CBFPs are female and own the simplest ICT devices – cell phones. The results also indicated that these farmers only have secondary and primary education respectively. These demographic factors like gender, age and number of family members in a household were not the most important factors of the participant's likelihood to use ICT tools. The findings of the study indicate that education and farming experience are a very important predictors for the use of ICT tools. Farmers of the study were exploring new sources of information and using multiple sources to acquire information which was not the case in the findings by Mittal and Mehar (2013) who studied the similar variables.in other studies, income and social category of farmers are the most important demographic factors affecting the implementation of ICT based information systems (Makaje, 2010). This study found that the longer farmers take in the farming system, the more interest they gain with regard to new information and technologies. They can interact with information and use it effectively based on prior knowledge. In this study, age was not significantly associated with ICT tool use, however, young adult in the age groups of 30-39 years were more likely to utilize the ICT tool compared to elders. This could be that young adults in farming are likely to be computer literate and understand the importance of ICT as compared to the elders.

5.3 Conclusions

This research was proposed to answer the following questions; What are the ICT tools through which farmers obtain agricultural information? Which type of ICT-based agricultural information do most farmers prefer in Mankweng? What are the factors influencing the use of ICTs by farmers in Mankweng? And finally, what are the challenges hampering ICTs use by farmers in Mankweng?

The results of this study revealed that the demographic factors like gender, age and number of members in a household are not the most important factors of the farmer's

likelihood of the use of ICT (p>0.2). Furthermore, in this study, education is a very important predictor for the utilization of the ICT tools available to the farmers. Majority of the farmers were women. In contrary to the study of (Usman *et al.*, 2012), majority of the people that engage in agriculture and use ICT for agricultural developments were males. Similar to the study of Usman *et al.* (2012), 56% of the farmers were less than 50 years of age. This study found that 64% of the farmers have secondary education, this finding is similar to the study of Adamides and Stylianou (2013).

With regards to the first objective, that is, to identify various ICT tools through which farmers get agricultural information, it can be concluded that the farmers in the CBPFs in Mankweng own the simplest ICT device that is cell phone. These devices can enable the farmers to access agricultural information on time. The ICT tools identified by the study are: Cell phone (89%), was the most used ICT device followed by Radio (72%), TV (64%), newspaper (35%), internet (16%) and Landline (15%). These results oppose those of Musa, Githeko and El-Siddig (2013), that shows 21.9% of farmers are using radio, 15.33% of farmers are using print media, 14.6% of farmers are using TV, 10.22% are using mobile phone and 3.28% of farmers are using the internet. The reason why radio was placed in the first place was because of the simple information it sends to the farmers. The information provided by radio can easily be understood by all the farmers as most of the radio programs are in vernacular.

The conclusion regarding the second objective of this study, that is, the most preferred ICT based agricultural information by farmers: the highest was plant protection (70%), weather (69%), market information (38%) and production practices (35%). This result is in contrary to the study of Usman *et al.* (2012) that revealed market information to be perceived as one of the most relevant ICT services. The reason market information was rated the less important (25%) in this study, was that majority of the farmers do not produce for selling but for household use. Farmers in the study rated production practices the second less important (17%) agricultural information because they plant similar crops continuously with knowledge of production practices passed from one generation to the next.

The third objective, that is, to identify the factors influencing the use of ICT tools by farmers. They were found to be gender, age, level of education, number of family

members in the household and farming experience. Number o family members and gender were found not to be the important factors of the farmer's likelihood to use of ICT ($p>0.2$). Young adults in the age groups of 30-39 years were found to use the ICT tools ($p>0.535$) as compared to other age groups. Levi (2015), like the findings of this study, alludes that the gender does not have influence on the use of ICTs.

The conclusion regarding the fourth objective was that , the most common challenges faced by farmers in deciding to use ICT tools were affordability (59%) followed by unfavourable broadcasting times(25%) lack of infrastructure(21%), lack of knowledge (19%), theft of ICT devise (17%) and inadequate network coverage (9%).These identified challenges deny the farmers with updated agricultural information and limits their contact with other farmers. Similarly to the study of Makaje (2010), cost, availability, knowledge and reliability, also the lack of infrastructure in many rural areas is a challenging factor in relation to the use of ICTs. This results in bad networking amongst farmers. The use of ICT tools highlighted will help farmers in CBFPs to harness information in improving rural livelihoods. This study adds to the literature that aims to understand and explain the role of ICTs and the factors that facilitate it. This study focused on farmers than extension officers and builds on theoretical understanding of technology use by farmers.

5.4 Recommendations

This study therefore came to the following recommendations: -

- Extension activities should be intensified among farmers. There should be emphasis on providing literacy programmes for them to enhance their ability to use ICT tools.
- The LDA can negotiate the broadcasting times that are suitable to the farmers on community radio stations. This will help farmers access updated agricultural information with the language that they understand the most.

- Non-Governmental organizations (NGOs) and other service providers to give support to farmers by provisioning tools and skills training for ICT. This will help build the capacity of the farmers
- Education was found to be significant which implies that more emphasis should be given to the development of educational programmes for farmers especially youth and women. The result of this study calls for policy transformation to focus on developing educational programmes for all who are practicing agriculture in CBPFs.

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ANNEXURE A: QUESTIONNAIRE

SECTION
A Demography

(Tick which is appropriate with an X)

1. Gender

Male		Female	

2. Race

African		Coloured		Indian		White	

3. Age group (Years)

18-29		30-39		40-49		50 and above	

4. Level of education

Primary		Secondary		Tertiary	

5. Number of family members in my household

1-3		4-6		7-9		10 or more	

6. Farming experience in years

less than 1		1-3		4-6		7 or more	

SECTION B

1. Which What ICT tool (s)/device (s) do you have access to?
   (Tick which is appropriate with an X)

Cell phone	
Internet	
Landline	
PC	
TV	
Radio	

News paper	

2. Which information do you access from ICT tools? (Tick which is appropriate with an X)

Weather	
Production Practices	
Market information	
Plant protection	
Other (specify: ____	

3. Which information do you value the most for your project? Rate the importance of the following to your project (Tick the appropriate box with an x)

	Most important	Important	Less important
Weather			
Production Practices			
Market information			
Plant protection			
Other			

4. The following are the benefits of ICT, which one applies to your project? (Tick the most appropriate box with an X)

Direct access to information		
Reliable and timely information		
More subject matter coverage		
Minimises the time and distance barriers		
Reduction in transaction costs		
Improve quality and decision making		Other: Specify _____

5. What challenges are you faced with in your project regarding the use of ICT? (Tick which is appropriate with an X)

Theft of ICT devices	
Lack of Knowledge	
Unfavourable broadcasting times	
Lack of infrastructure	
Inadequate network coverage	

Affordability	
Other	

6. Where do you access agricultural information from? (Tick which is appropriate with an X)

Farmers	
Input dealers	
Radio	
Television	
News paper	
Extension workers	
Other	

7. How do you value the importance of the following information by rating each 1-6 (Rank the importance of the following information to your project.) The most important is 1 and 6 is the least important

Seeds	
Fertilizer	
Chemicals	
Harvesting and Marketing	
Weather	
Farm machinery	

8. Do you use ICT for any of the following potential benefits below? Tick the most important with an X

	YES	NO
Access to information		
To connect with other farmers		
To keep updated with weather		
To access markets		
To seek information on latest news		
To apply new techniques in the project		

ANNEXURE B: REQUEST TO CONDUCT STUDY

BOX 01

SOVENGA

0727

University of Limpopo

P O BOX

SOVENGA

0727

APPLICATION FOR CONDUCTING RESEARCH

DEAR SIR/MADAM

I hereby apply to conduct a study in relation to the usage of Information Communication Technology in your project. I am currently a registered student with the University of Limpopo, Turfloop Campus, studying to obtain a Master's degree Agricultural management.

The objectives of the study are to:

- To identify various sources through which farmers get agricultural information.
- To describe the type of information valued by most farmers in Mankweng.
- To investigate the effectiveness of the information they receive.
- To identify the challenges farmers are face with regarding the use of ICT.

I hope my application will be acknowledged.

Yours sincerely

Ramavhale P.M

ANNEXURE C: CONSENT FORM

UNIVERSITY OF LIMPOPO (Turfloop Campus) ENGLISH CONSENT FORM

Statement about the participation in a research study

Topic of the study: THE ROLE OF INFORMATION COMMUNICATION TECHNOLOGY FOR FARMERS PARTICIPATING IN COMMUNITY BASED FARMING PROJECTS IN MANKWENG SERVICE CENTRE, LIMPOPO PROVINCE, SOUTH AFRICA.

I have read the information about the aims and objectives of the proposed study and have had the opportunity to ask questions and adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressured to participate in any way. I know that sound recordings will be made of me during the research interview.

I understand that participation in this study is completely voluntary and that I may withdraw from it at any time and without supplying any reasons. I know that this study has been approved by the research team, Ethics and Publications Committee of the Faculty of Science and agriculture, University of Limpopo (Turfloop Campus). I am fully aware that the results of this study will be published and confidentiality of my information will be maintained.

I hereby consent to participate in this study.

_____ _____

ANNEXURE D: ETHICAL CLEARANCE TREC

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING: 05 November 2019

PROJECT NUMBER: TREC/513/2019: PG

PROJECT:

Title: The Role of Information Communication Technology for Farmers Participating in Community Based Farming Projects in Mankweng Service Centre, Limpopo Province, South Africa.

Researcher: PM Ramavhale
Supervisor: Prof EM Zwane
Co-Supervisor/s: Mr CK Mphahlele
Mr EM Letsoalo
School: Agricultural and Environmental Sciences
Degree: Master of Science in Agricultural Management

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:

i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.

ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.

iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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