

**FACTORS INFLUENCING ACCESS TO AGRICULTURAL INFORMATION BY
SMALLHOLDER FARMERS THROUGH ICT CHANNELS IN DEIYA LOCATION
KIAMBU COUNTY**

By

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**A Dissertation submitted in Partial fulfillment of the requirements for the award of the
Degree of Master of Science in Agriculture in Information and Communication
Management in the Department of Agricultural Economics, University of Nairobi**

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DECLARATION

This project report is my original work and has not been presented for a degree in any other University

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DEDICATION

I dedicate this work to my Husband Joseph Kiragu Mbatia and our children Waithera, Mbatia and Nungari for their love, sacrifice, support and encouragement during the course of my studies

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Overall I would like to thank Almighty Lord for his favour. I am grateful to my supervisors Dr. F. Mugivane and Mrs G. Irura for their unwavering dedication, encouragement, support and wise counsel during the entire period of my study. The university of Nairobi is highly appreciated especially the department of agriculture economics where this study was supervised.

I am thankful to the Director KARI for according me the time to study. I extend my sincere thanks to smallholder farmers in Ndeiya location for their provision of information during data collection for this study. I appreciate Mr. T. Kibet for his guidance in data analysis.

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I am grateful to the enumerators for their efficiency and dedication in assisting me in data collection. God bless you all.

ABSTRACT

This study was carried out to assess the influencing factors in accessing agricultural information through selected ICT channels. Systematic sampling technique was used to interview 217 sample population from Ndiuni sub location, Ndeiya Location. Structured pre-tested questionnaires were administered in a face-to-face interview. Data was collected and analysed in line with the study objectives by presentation using percentages and frequencies in tables, bar charts, graphs and pie charts. Chi-square test was employed to test for the hypothesis. The tests revealed that significant relationship exist between age and education of smallholder farmers and access to agricultural information through different ICT channels. Findings indicated that the radio was the most used channel especially by farmers above the age of 40 years and those with little formal education. This was attributed to the radio programmes being presented in Kiswahili and the local language. Television, Mobile Phones and Computers were preferred by young farmers below the age of 40 years. Despite majority of the farmers owning mobile phones, the study revealed that the channel was used mostly for chatting and money transactions as compared to searching for information. However, a few young farmers below the age of 40 years and with college and university education use the mobile phone to access agricultural information. Overall, this study established the need to create awareness and to educate farmers on the use of ICT information communication channels especially the computers. The information generated from the study will be used by information providers to make appropriate contribution to the advancement in dissemination of information to the farmers for knowledge in better farming practices. The study will enhance adoption of agricultural technologies for improved livelihoods.

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ABBREVIATIONS AND ACRONYMNS

AIRC	Agricultural Information Research Centre
BBC	British Broadcasting Corporation
CBO	Community Based Organisation
CCK	Communication Commission of Kenya
CD-ROM	Compact Disc Read Only Memory
DStv	Digital Satellite Television
FAO	Food and Agriculture Organisation
GOK	Government of Kenya
ICT	Information Communication Technology
IT	Information Technology
KARI	Kenya Agricultural Research Institute
KBC	Kenya Broadcasting Corporation
LINKS	Livestock Information Network and Knowledge System
MoIC	Ministry of Information and Communication
NEPAD	New Partnership for Africa's Development
NALEP	National Agriculture and Livestock Extension Programme

NAFIS	National Farmers' Information Service
NGO	Non-governmental Organization
RCI	Radio China International
RFI	Radio France International
TV	Television
UNDP	United Nations Development Programme
VOA	Voice of America

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

In most developing countries, agriculture is the most important economic activity providing food, employment, foreign exchange and raw materials for industries (Tadesse, 2008). However, linkages between farmers, extension agents and research systems in Africa are weak with little interaction which does not reflect their priorities in research which leads in some cases to farmers adopting less than 10 percent of the crop varieties that they are offered (NEPAD, 2003). There is lack of effective mechanisms to transfer innovations from research to the extension system because communication strategies are not effective; hence the failure of extension services to reach farmers (ibid). In some cases in East Africa, national ministries of agriculture have attempted to integrate ICTs into information delivery (Aker, 2010). One promising area for agricultural extension to reach a large number of farmers is using information communication technologies (ICTs): mobile telephony, innovative community radio and television programs, mobile phones in combination with radio, video shows, information kiosks, web portals, rural tele-centers, farmer call centers, video-conference, offline multimedia CDs, open distance learning, etc. (FAO, 2006). Technologies that are used to handle information and aid communication include hardware, software, and media for collection, storage, processing, transmission and presentation of information in any format (i.e., voice, data, text and image). Many of these initiatives use mobile phones, internet-based service and e-learning (Aker, 2010). In his conclusion, Aker says that the growth of ICT in developing countries offers a new technology and new opportunities for accessing information in poor countries. ICT-based

agricultural extension will bring incredible opportunities and has the potential of enabling the empowerment of farming communities (Okyere, 2012). Half or more of Africa's smallholder farms are below 1.5ha in size with limited or no potential for area of expansion (Jayne et al 2003). According to Kenya 2009 population and Housing Census highlights (GOK, 2009), Kenya's agriculture is predominantly small-scale with farms averaging 0.2–3 ha. It is further highlighted that small-scale production accounts for 75 per cent of the total agricultural output and 70 per cent of marketed agricultural produce. The adoption process of agricultural technologies depends primarily on access to information and on the willingness and ability of farmers to use information channels available to them (Murage, 2011). The Government of Kenya, through the Ministry of Information and Communication (MoIC), recognizes that the provision of Information and Communication Technology (ICT) improves communication and facilitates information flow (Kenya ICT Board 2010). However, the ICT sector is currently more active in urban areas, resulting in wide regional disparities in the distribution of ICT facilities, (ibid). The advent of the internet and ICTs in Kenya has already created significant opportunities for greater access to information and knowledge with internet use having grown modestly (about three million Kenyans – approximately 8% of the population – have access to the internet), the use of mobile phones has grown and it is currently estimated at 13 million subscribers, over one third of the population (Munyua, 2001). Despite this growth, in the rural areas where agriculture is the main economic activity, digital services do not always reach the communities creating urban/rural digital divide (FAO, 2006). The use of ICTs to improve information flow and to connect people within the rural areas has proved that illiteracy of farming communities may no longer be an excuse to deny some form of extension system, (ibid). The linkage of Radio and TV Stations with conventional and cellular telephony and the Internet has been considered promising

but has not yet been exploited fully. The advantage in using new ICT is primarily in reducing time and distance in accessing information but it has offered little advantage (FAO, 2006).

1.2 Statement of the Problem

One of the biggest challenges facing Kenya and other developing nations which need to be addressed urgently is that agricultural technology, innovations and other research findings do not get to the farmers who need it most (Kim Nahm-Su, 2011). Need of agricultural information is the basic necessity for the farmers as it will play a pivotal role in enlightening them, raising their level of knowledge and eventually helping in their decision making process regarding farming activities (Sharker,2008). Effective communication in dissemination of agricultural technological information from research systems to the farmers' is one input in transfer of agricultural technology (Malham, 2007). Failure to make the investments that would develop and nurture the capacity for technology dissemination and adoption has plagued the development of agriculture in Africa (Mokwunye, 2010). A large part of the population in sub-saharan Africa depends on agriculture to provide food as a source of livelihood for the rural poor and to alleviate poverty and assure sustenance and rural development (Suhas, 2011). Kenya's main economic activity is predominantly agriculture and it is the main productive economic sector in Kiambu County, a rich diverse agro-ecological zone, with forest, tea and coffee zones, (ibid). About 70 percent of the district's population relies on agriculture for their livelihood and most of those engaged in agriculture practice smallholder farming. There are 174,165 smallholdings in the district, an indication that the number of persons employed in smallholder farming is big. The farming methods used in Kiambu County are outdated and do not maximize produce as per the full potential of the farms (KARI Annual Report 2009). Limited access to timely and accurate information has been identified as a major hindrance to the development of rural agriculture in

Kenya which has impacted negatively on the socio-economic wellbeing of agricultural producers, resulting in high poverty levels (Adolwa, 2010). Diffusion of ICTs (mobile phones, internet, radio and television) is highly uneven, concentrated in urban areas leaving some rural areas almost untouched (Gillwald, 2010). Agricultural land available to the household and per person in Kiambu has declined since 1979 from 1.13ha and 0.23ha, respectively to the current 0.75ha and 0.19 ha, respectively with serious negative implications for agricultural productivity in Kiambu County (Jaetzold, 2006). As farming enterprises in Kiambu become more complex, there will be need for more specialized extension advice, (ibid).The current actual land use activities in Kiambu involve mainly the growing of tea, food crops, vegetables and fruits. The most important food crops are maize and beans as well as Irish potatoes with tea as the dominant cash crop (Jaetzold, 2006). Presently, both the extension service and the service providers and their clients are experimenting with new digital opportunities that can be effectively used to exchange, process, manage and communicate information and knowledge (Orokoyo, 2003).

1.3 Objectives of the Study

The general objective of this study is to examine factors that contribute to the access of agricultural information by smallholder farmers through ICT channels in Kiambu County.

The specific objectives of this study are:

1. To asses Information Communication Technology channels used in accessing agricultural Information by small holder farmers.
2. To establish influence of farmer' selected socio – economic characteristics on access to Information through Information Communication Technology (ICT).

3. To determine factors limiting smallholder farmers' access to agricultural information through Information Communication Technology.

1.4 Hypothesis

H₀₁ Socio-economic characteristics of smallholder farmers do not influence access to ICT disseminated information.

H₀₂ Socio-economic characteristics of smallholder farmers influence access to ICT disseminated information

1.5 Justification of the Study

The study is expected to contribute to the advancement of knowledge to farmers for better farming practices. Appropriate development and implementations of ICT agriculture communication sources and channels were looked into. The study will accelerate adoption of agriculture technology on the basis of the findings. This will be made possible by improving dissemination and access of ICT agricultural based information.

1.6 Limitations of the study

A limitation is an aspect of the study that the researcher knows may adversely affect the results of the study, but over which he/she has no direct control over (Orodho, 2010). The study dealt with selected ICT channels; radio, TV, mobile phone and computer used in communicating agriculture information to smallholder. The study was limited to smallholder farmers in Ndeiya location, Kiambu County due to financial and time constraints.

1.7 Operational Definitions of Terms

This is a general term meaning the application of scientific research and new knowledge to agricultural practices through farmer education. Extension is essentially education and it aims to bring about positive behavioral changes among farmers. Extension information providers will be playing a role in dissemination of agricultural information through ICT.

CD-ROM: Compact disc that contains data accessible to, but not writable by, a computer for data storage and music playback. CD-ROMs are popularly used to distribute computer software, including video games and multimedia applications. The researcher came across CD-ROM for agriculture information storage and access for information.

Communication: This is the process through which people exchange meanings. In this study communication was an ingredient of change agents' strategies for inducing change.

Communication Channels: A medium through which a message is transmitted to its intended audience, such as print media or broadcast (electronic) media. The study looked at the radio, television, mobile phone and the computer as channels of communicating agricultural information.

Computer: This is a device that can be programmed to carry out a finite set of arithmetic or logical operations. Since a sequence of operations can be readily changed, the computer can solve more than one kind of problem. The computer was the device for access of agricultural information and communication via internet.

Computer Hardware: Computer hardware refers to the physical parts or components of computer such as monitor, keyboard, hard disk, and mouse. The computer played a role in the study as a tool for information dissemination via internet and e-mail.

Computer Software: These are computer programs that provide instructions to the computer on what to do and how to do it. It is one or more computer programs and data held in the storage of the computer for operation of data processing system.

Data: This is information that has not been organized to be meaningful. Unprocessed data refers to a collection of numbers and characters Data was collected and analysed during the study.

Data Transmission: Sending and receiving data via cables (e.g., telephone lines or fibre optics) or wireless relay systems. The researcher looked at how data is transmitted from the source to the end users/stakeholders.

Distance Education or Distance Learning: This is a field of education that focuses on teaching methods and technology with the aim of delivering teaching, often on an individual basis, to students who are not physically present in a traditional educational setting such as a classroom. It has been described as "a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both".

Electronic Mail (e-mail): Exchange digital messages from one sender to one or more recipients across the internet or other computer networks. The e-mail is used mostly by the elite and the study compared its usage in the agricultural field.

Farmers Call Centre: Today, in Kenya, a group of farmers are picking up their mobile phones for instant help. These farmers are dialing into a call center where agricultural experts respond immediately (in Swahili, English and other relevant local languages) to questions ranging from climate and weather information, to advice on land preparation, pest management, harvesting and marketing of produce, as well as the location of agro-dealers and sources of capital. The study touched on these centres investigating in mobile phone use.

Information Communication Technology (ICT): Any device, tool, or application that permits the exchange or collection of data through interaction or transmission. The study looked at the Computer, Radio, TV and Mobile Phone as channels of communication. The researcher expected these to be some of the points where farmers access ICT agriculture information from.

Information Kiosk (or Information Booth): Dispenses free information in the form of maps, pamphlets, and other literature, and/or advice offered by an attendant. Computerized kiosks may store data locally, or retrieve it from a computer network. Some computer kiosks provide a free, informational public service, while others are commercial.

Internet: Connects millions of computers globally for the exchange of data news and opinions. The internet was the device considered for conveyance of information from agricultural information providers.

Media: Transmit information electronically and comprise television, radio, film, movies, CDs, DVDs, and other devices such as cameras and video consoles. The study looked at media transmissions, radio.

Mobile Phones: Connects to a cellular network to make or receive telephone calls over a radio link. The mobile phones are widely used and the study looked at it in relation to agriculture information sharing.

Radio: Transmits signals through space with frequencies by electromagnetic waves below visible light called audio waves. The study examined the radio as a channel which communicates agriculture information verbally in different foreign and local languages targeting the farmers.

Tele-centre is a public place where people can access computers, and other digital technologies that enable them to gather information, create, learn, and communicate with others while they develop essential digital skills. While each tele-centre is different, their common focus is on the use of digital technologies to support community, economic, educational, and social development—reducing isolation, bridging the digital divide, promoting health issues, creating economic opportunities, and reaching out to youth. The study investigated whether Kiambu has tele-centres and their popularity in accessing information access through computer.

Television: (TV): It is a transmission medium that receives black and white or coloured images. Sound may or may not accompany the images. The study looked at TV as an audio visual medium for transmitting agriculture information on better farming practices from media houses to the public.

Video: Electronically captures, records, process, store, transmit and reconstruct a sequence of still images representing scenes in motion. The video was incorporated with TV and compared with other information channels of information in the study.

Video Conferencing: Allows two or more locations to communicate by simultaneous two-way video and audio transmissions. This was examined as part of communication through the computer.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This section highlights the major concepts reviewed and found to be of relevance to this study. It looked at how smallholder farmers' access information disseminated through ICT channels for agricultural technology transfer. It gave an overview of smallholder farmer's socio-economic factors, providers of agriculture information, information communication services, channels of information communication and theoretical perspective on diffusion of agriculture innovation.

2.2 Small Holder Farmers Socio-economic Factors

Smallholder farmers' personal profile includes age, gender and educational attainment of the sampled respondents. These characteristics were used to find out if they related to the choice of agricultural information channels preferred by smallholder farmers.

2.3 Providers of Agricultural Information

Sources of agricultural knowledge include scientific research and indigenous knowledge. After the creation, sourcing or accumulation of information, the information has to be disseminated to users to support the innovation process. Information and communication technology (ICT) play a critical role in facilitating rapid, efficient, and cost effective knowledge management. In a number of Sub-Saharan African countries, smallholder farmers get technology-related advice as well as location-specific market information on inputs and outputs through ICT kiosks (UNDP, 2012). Furthermore, mobile telephone service is being used to deliver agricultural information to users, (ibid). ICT in the agriculture sector facilitates information sharing within and among a

variety of agriculture sector networks including researchers, exporters, extension services and farmers (Jayathilake, 2008). Information is a key resource for agriculture and rural development communicating information as a major function of extension aim at the promotion of Agricultural development (Sanusi, 2010). With the advent use of new ICT, especially computers, the Internet and cellular telephony, there is an ongoing transformation of agriculture through innovation that is largely enabled through information sharing and exchange between agricultural communities (Maru, 2008). The digital divide is not merely a problem of access to ICT, it is part of a larger developmental problem in which vast sections of the world's population are deprived of the capabilities necessary to use ICTs, acquire information and convert it into useful knowledge (Xiaolan, 2011).

Kenya Agriculture Research Institute

The Kenya Agricultural Research Institute (KARI) is a Parastatal established by the Government of Kenya under the Science and Technology Act Cap 250 to carry out Agricultural Research to support Crop and Livestock Production sectors of the country. Beside this core function, the Institute collaborates closely with the farmers, pastoralists, extension staff and other National and International Development Partners. KARI manages thirty-three (33) Centers inclusive of the sub-centers located all over the country with a view of developing and disseminating technology, tailored to meet the needs of different categories of farmers in various Agro-ecological zones and Socio-economic circumstances. ICT based technology transfer approach is one of the approaches used in scaling-up technologies in the KARI website. Registered users can access a question form when logged on and ask a question. The question is answered online through the same channel (www.kari.org).

Agricultural Ministries

Forms of ICTs such as the Internet and email are being adopted at district and provincial agricultural offices and the ministry of agriculture to improve communication of agricultural information (Kiplang'at 2004). For Information Centre (AIC) on the other hand has also been elevated to status of a division within the Ministry of agriculture with specific role of information acquisition, processing, packaging and distribution. The centre has been mandated to repackage agricultural information for extension workers and farmers. Extension materials are produced and distributed to extension workers across the country to assist them in disseminating agricultural information to farmers. This has proved very useful.

National Extensions Services

Agricultural extension has now become recognized as an essential mechanism for delivering information and advice as an "input" into modern farming. Agricultural Extension, which depends largely on information exchange between and among farmers and a broad range of other actors, is an area in which ICT can have significant impact. Research Scientists can relate directly with the farmers through ICTs. Frontline extension workers, who are the direct link between farmers and other actors in the agricultural knowledge and information system, are well positioned to make use of ICT to access expert knowledge or other types of information that could be beneficial to the farmers (Salau, 2008).

The continuing rapid development of telecommunications and computer-based information technology (IT) is the biggest factor for change in extension, one which will facilitate and reinforce other changes with many possibilities for the potential applications of the technology in

agricultural extension (FAO, 1993; Zijp, 1994). IT brings new information services to rural areas over which farmers, as users, have much greater control than over current information channels. Even if every farmer does not have a computer terminal, these could become readily available at local information resource centres, with computers carrying expert systems to help farmers to make decisions. However, it will not make extension workers redundant. Rather, they will be able to concentrate on tasks and services where human interaction is essential - in helping farmers individually and in small groups to diagnose problems, to interpret data, and to apply their meaning (Leeuwis, 1993). The future will call for more able, more independent, more client-oriented extension workers. The emphasis will be on the quality of interaction between agent and client rather than on the movement of "messages" through a hierarchical system, (ibid).

Private Sector

As a result of ineptness in the public extension system, a third type of extension service private agricultural extension system has emerged comprising of private companies, nongovernmental organizations (NGOs), community-based organizations (CBOs), and faith-based organisations (Nambiro et al 2005; Rees et al 2000). Privatisation is used in the broadest sense of increasing private sector participation, which does not imply a transfer of state-owned assets to the private sector. The government has embarked on a decisive move to revise the national extension policy by preparing the National Agricultural Sector Extension Policy (NASEP) and the NASEP Implementation Framework (Republic of Kenya 2005a).

2.4 Channels of Information Communication

Farmer's preference in information dissemination pathways and media is important in determining adoption of technologies and productivity (Mbugua, 2012). Agricultural researchers and extension workers previously used conventional communication channels to disseminate agricultural information to farmers and other stakeholders (Kiplagat, 2004). The channels have been used widely and they have been monologue and have not allowed much interaction Kiplagat asserts. New ways of communication are being adopted via ICTs such as the Internet, email, mobile phones, and electronic sources among others he says. ICTs are, therefore, innovations that are perceived as new by both the agricultural researchers, extension workers and farmers and have been adopted to facilitate communication of agricultural information (ibid)

Radio

Most FM radios have scored high in popularity and listenership because of their special and focus in broad casting to local audience in local languages (Sanusi, 2010).Agricultural Agricultural programmes are also aired through the national and private radio stations. The farmers have diverse channels of accessing agricultural information.

There are four international broadcasting stations such as the British Corporation (BBC), Radio China International (RCI), Voice of America (VOA) and Radio France International (RFI), all satellite-fed broadcast interlinked with FM broadcast. There are many radio stations; the commercial free-to-air radio market is characterized by audience fragmentation along class, ethnicity, race and clutter. Indeed, a few stations such as Capital FM, Classic 105, KISS 100, and Citizen Radio are distinct in terms of audience.

Television

There are about four main for-pay television channels such as Multi-Choice's DStv, Zuku and more recently Star Times. Free-to-air television stations in Kenya are; KBC TV 47 channels, Family TV 3 channels, Citizen TV 11 channels, NTV 7 channels, KTN 9 channels, STV 6 channels, KISS TV 1 channel, SYR TV and EATN TV.

Computers

Close to 80 per cent of Kenyans in rural areas have no access to an internet connection of any kind and the rest have to travel long distances to the nearest town to access the services through a cyber cafe (Henderson, standard newspaper 2013). According to the communications commission of Kenya (CCK) less than three percent of the population is connected to broadband survive, with over 90 per cent of the 14 million internet users accessing the internet through their mobile phones. The government recently removed the taxes on computers and their accessories. It is expected that agricultural libraries and information centres will take advantage and adopt appropriate outlets in the provision of agricultural information. Cyber Extension has to be introduced to promote the use of online networks, computer-aided communication and information technology, browsing of websites and familiarizing farmers with digital interactive multimedia to facilitate transfer of technology for higher farm production and productivity (Anandaraja, 2006).

Mobile phones

Technologies involving use of short messaging services with the mobile phones have been developed in Kenya for example NAFIS which is an information Service developed by the National Agriculture and Livestock Extension Programme (NALEP) to enable farmers get

extension information simply by calling the service or browsing the NAFIS website. It is a voice/web information service for providing agricultural extension information. It is a highly innovative system that is updated through the Web by field extension officers. NAFIS is a dynamic system that has been developed to exploit mobile telephone and internet technologies. It provides information through a detailed website and also through mobile phones. Information is entered locally through the internet by extension officers and accessed via this website or through mobile phones, thereby reaching as many farmers as possible (<http://www.nafis.go.ke/>)

M-Kilimo is a unique and innovative service aimed at providing agricultural information, advice and support over the phone to smallholder farmers. The Kenya Farmer's Helpline was launched in October 2009 by KenCell, with the objective of providing high quality and reliable information to farmers to enable them to make more informed decisions on land preparation, planting, pest management, harvesting, post-harvest and marketing of agriculture produce including climate and weather information, (<http://www.m-kilimo.com/>).

LINKS is a Livestock Information Network and Knowledge System which provides regular livestock prices and volume information on most of the major livestock markets in Ethiopia, Kenya and Tanzania along with information on forage conditions, disease outbreak, conflict and water supply to support decision making at multiple scales.

LINKS livestock market monitoring system is a mechanism through which collection; analysis and dissemination of information needed to help producers, middle men and traders are organized and systematized. This system provides near real time market information which is available on request via SMS text message system, email, World Space radio systems and on the

Airtel's 'Sauti ya Mkulima' Project set to empower 250,000 Kenyan farmers through mobile farming tips (Mutai, 2012), (<http://www.lmiske.net/Pages/Public/Home.aspx>).

2.5 Theoretical perspective on diffusion of agriculture innovation

Diffusion of innovation theory has been chosen as the theoretical framework of this study. The theory application indicates its strength in description of the four key elements of the theory. The objectives of the study suggest a theoretical framework that has components of technological innovation, adoption, diffusion and communication. Rogers theory was found to encompass all the components. The theory has also been widely applied to investigate diffusion of agricultural innovation (Rogers & Scott 1999, Rogers 1995). Thus the theory's application to information technology and agriculture made it the most appropriate theoretical framework in this study.

The characteristics of innovations that will influence adoption include; Relative advantage compared to other innovations, Compatibility with other existing values and past experience, Complexity in its usage, Triability in terms of experimentation on a limited basis and Observability of the results of an innovation as specifically discussed by Rogers and Shoemaker (1995):

The innovation decision process is characterized by five stages namely; Knowledge, Persuasion, Decision, Implementation and Confirmation. In the knowledge stage the individual or household is exposed to the innovation's existence and gains understanding of how it functions. However, even after acquiring information on an innovation, individuals may need to be persuaded to use it because they do not regard it as relevant to their situation. The implementation stage is when an individual puts an innovation into use. The final stage is confirmation during which the individual seeks reinforcement for the decision made (Nguthi, 2007). Leeuwis (2006) further

explains that an innovation diffuses within a social system through its adoption by individuals and groups. The adoption process involves an interrelated series of personal, cultural, social, and situational factors. This includes the five distinguishable stages of awareness, further information and knowledge, evaluation, trial, and adoption. Characteristics of a technology, such as simplicity, visibility of results, usefulness towards meeting an existing need, and low capital investment promote its eventual adoption and should be considered when trying to transfer any technology. Particular innovations are used quickly by some and only taken up later by others, while others never adopt them, (ibid).

2.5 Conceptual framework

The study is limited to the following independent variables, sources of agriculture information, channels of agricultural information access and smallholder farmers' socio-economic characteristics and providers of agricultural information as illustrated in Figure 1. According to (Mugenda and Mugenda 2003), conceptual framework is when a researcher conceptualizes the relationship between variables in the study and shows the relationship graphically or diagrammatically.

Independent variables

Dependent variable

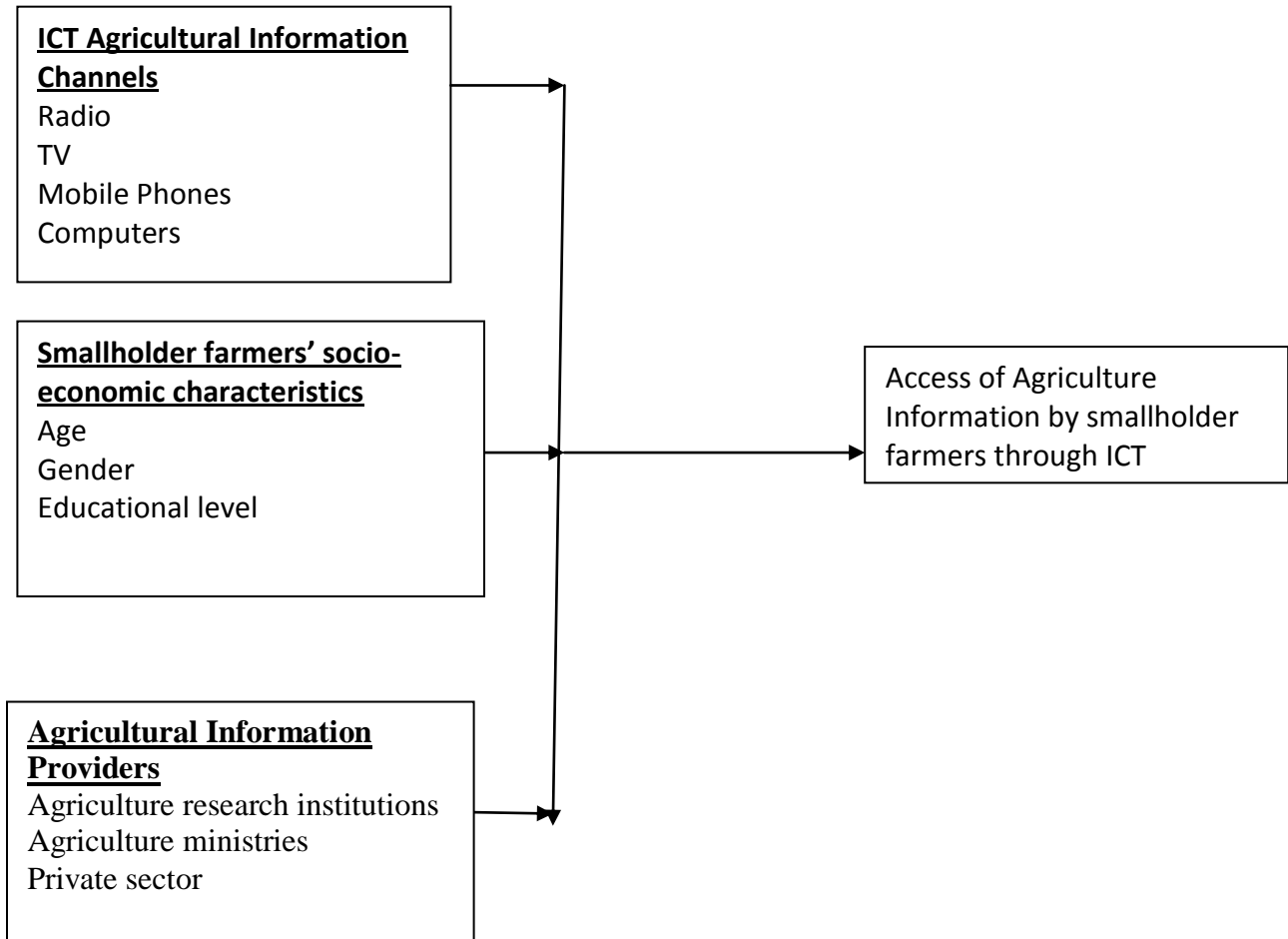


Fig 1: Conceptual framework

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology that was used to carry out the study. This included the study design, target population, sampling procedure, research instruments, data analysis and presentation. This research methodology was aimed at enabling the researcher obtain and process the data.

3.2 Area of study

Ndeiya is one of seven administrative locations of Limuru division of Kiambu county (GOK 2002-2008). The other six divisions are Kiambaa, Limuru, Githunguri, Kikuyu and Lari with a total of thirty-seven locations and one hundred and twelve sub locations. Kiambu County lies between latitudes 00 75, and 10 20' south of the Equator and longitudes 360 54' 360 54 and 360 85 east with a total area of 1,323.9 km². . Ndeiya location is in the lower midland comprising of dry plains with poor ground water potential. Boreholes in Ndeiya have an average yield of 3m² per hour at depths of 250-300m. Soils of plateaus are found on the western part of the district, in Ndeiya and Karai. The soils are of variable fertility and are either sandy or clay loams which are poorly drained. Kiambu County is quite densely populated except Ndeiya and Karai Location. These locations also have the highest poverty levels in the district (GOK, 2002-2008).

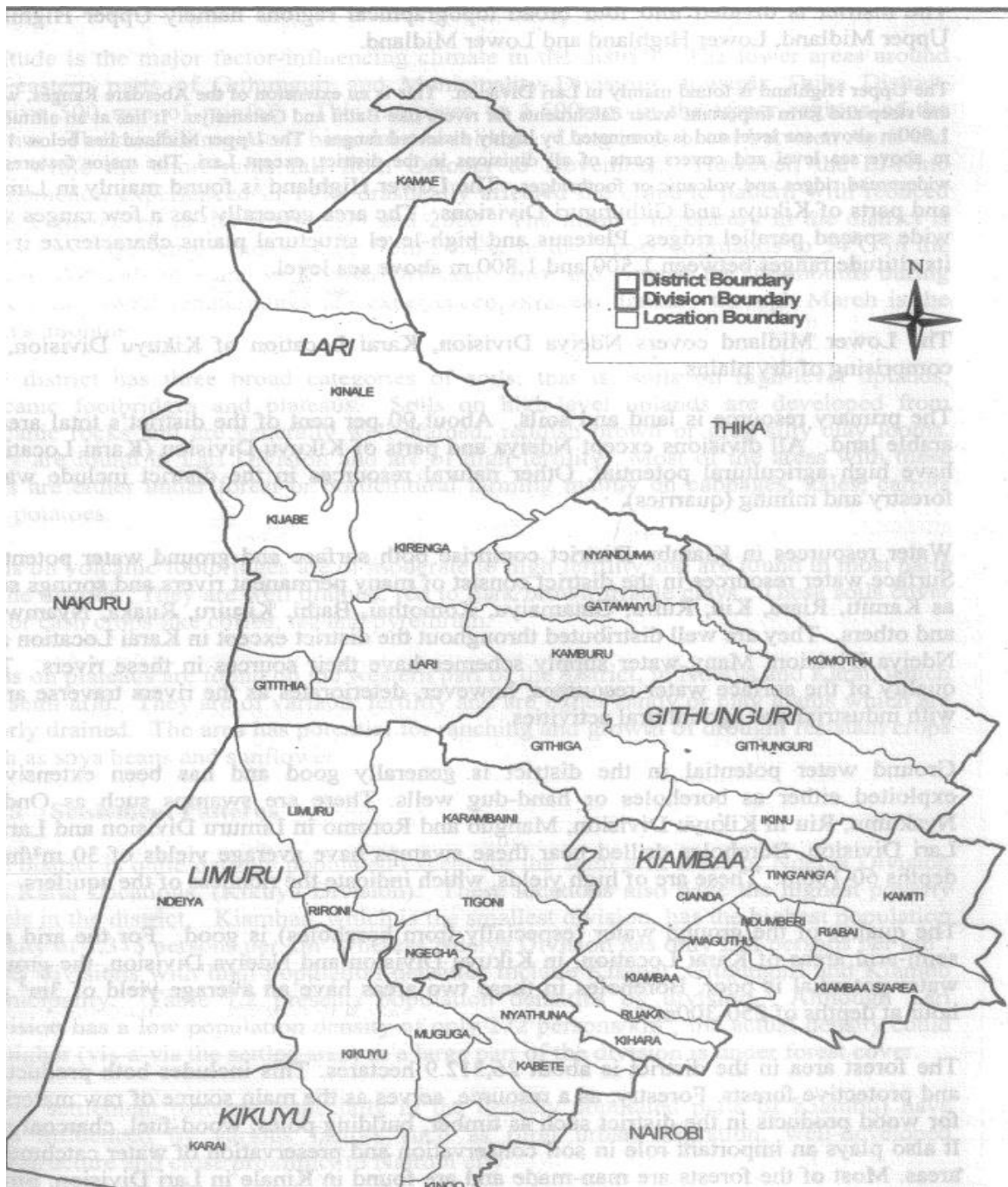


Figure 1: Map of Kiambu showing Limuru Division Area of study

Source: Kiambu District Development Plan 2002-2008

3.3 Target Population

Mugenda and Mugenda (2003) defines target population as the population to which a researcher wants to generalize the results of the study. In the study, the target population was the population of smallholder farmers in Ndeiya location within Kiambu County. Ndeiya location with a household total of 5,374 was purposively selected. The selection was based on the researcher's knowledge of the area having worked at KARI Muguga in the adjacent Kikuyu County and thus observed the location's poverty levels despite its' potential in agriculture and its proximity to the city centre. Ndeiya is comprised of four sub-locations namely Ndiuni with a population household total of 504, Nderu 1,759, Thigio 2,321 and Tiekunu 790, (Farm Management Handbook, Central Kenya 2007). For the purpose of this study, the term 'farmer' is taken to be synonymous the 'household'. The term was used depending on the local settings where household refer to the head of the household (man or woman).

3.4 Sampling Procedure

Sampling allows the researcher to study a relatively small number of units representing the whole population (Sarantakos, 1998). A sample should be large enough to serve as adequate representation of the population about which the researcher wishes to generalise and small enough to be selected economically in terms of subjects (Herman, 2009). In the study area, data was collected through face-to-face interviewing of the sample household heads using a structured questionnaire. The questions were administered by the researcher and five enumerators who were familiar with the study area and subject matter. The interviews were done in English, Kiswahili and the local language Kikuyu.

To determine the sample size, a table designed by Krejcie and Morgan (1998) as quoted in Wachira, (2012) was used. The table gave the required sample size for various population sizes and Ndiuni with a population of 504 households fell under a sample size of 217 households.

Systematic sampling method was used to select samples from Ndiuni sub-location which was picked at random from amongst the other sub-locations forming Ndeiya location. To illustrate the selection of a sample, the following formula was used:-

$$f = \frac{N}{sn}$$

Where f = frequency interval;

N = the total number of the wider population;

sn = the required number in the sample.

Therefore, $\frac{504}{217} = 2.3$

This round to 2, i.e. every 2nd households

Therefore, every 2nd household in Ndiuni sub-location on both sides of the three feeder roads starting from AIC Ndiuni was interviewed. Farms where the household heads was absent were skipped.

3.5 Research Instruments

The questionnaires were used in the study to collect primary data. The questionnaires save time and expense and are used for coverage of a wide population as stated by Orodho and Kombo (2003). Each item in the questionnaire was developed to address a specific objective, research question or hypothesis of the study (Orodho, 2010). Orodho further explains that the questionnaire be pre-tested to a selected sample for meaningful observation.

3.5.1 Instrument validity

Mugenda and Mugenda (2003) asserted that, the accuracy of data to be collected largely depend on the data collection instruments in terms of validity and reliability. Essentially, validity should be concerned with establishing whether the questionnaire content is measuring what it is supposed to measure (Orodho, 2010). Validity is noted by Robinson (2002) as the degree to which result obtained from the analysis of the data actually represents the phenomenon under study. In this study, validity was ensured by having objective questions included in the questionnaire.

3.5.2 Instrument Reliability

Reliability refers to a measure of the degree to which research instruments yield consistent results (Mugenda & Mugenda, 2003). In this study, reliability was ensured by pre-testing the questionnaire with a selected sample from Thigio sub-location which neighbours Ndiuni sub-location and has similar characteristics. Ten respondents were issued with the questionnaire and the data obtained was evaluated to ensure that questions were properly answered. The pilot study familiarised the researcher with the research administrative procedure and identified items that required modification. The result enabled the researcher to correct inconsistencies arising from the instruments, which ensured that they measured what was intended.

3.6 Data Analysis and Presentation

Quantitative data collected was analyzed by use of descriptive statistics using SPSS and presented using percentages and frequencies. The information was displayed by use of statistical techniques such as bar charts, graphs and pie charts. This was done by tallying up responses,

computing percentages of variations in response as well as describing and interpreting the data in line with the study objectives.

CHAPTER FOUR

4.0 DATA ANALYSIS AND INTERPRETATION

4.1 Assessment of Information Communication Technology channels used in accessing Agriculture information by smallholder farmers

Table 1: Information Communication Technology Channels used by smallholder farmers to access agricultural information

ICT Channel	Number of users	Percentage (out of 217 respondents)
Radio	143	66
TV	96	44
Computer	8	4
Mobile Phone	31	14

Table 1 above is on assessment of ICT channels used by smallholder farmers in Ndiuni sub-location. Majority of the respondents 143(66%) listen to the radio, 96(44%) watch TV, 8(4%) surf the internet and 31(14%) use the mobile phone to access agricultural information.

Table 2: Frequency of access of Agricultural Information through ICT channels

ICT Channel	Regular Access	Occasional Access	Rarely Access	Never Access
Radio	121	19	3	74
TV	88	6	2	121
Mobile Phone	27	4	0	186
Computer	6	1	1	201

Table 2 above on frequency of access to agricultural information through selected ICT channels reveals that respondents access the radio more regularly than the other channels of information. Though there were some respondents who used more than one channel, majority reported to use only one channel though there were still a few who used none of the channels to access agricultural information. Results showed that those farmers who access agricultural information through the selected ICT channels access the channels regularly followed by those who occasionally access. Those who do not access the channels for agricultural information or those who rarely does gave reasons that hinders them.

4.2 The influence of socio-economic characteristics of smallholder farmers on the access to ICT disseminated agricultural information

Farmers were targeted irrespective of gender through a systematic sampling procedure in a bid to make some comparative conclusions on specific emerging issues. The researcher had no intention of testing hypotheses regarding differences between male and female respondents. Respondents interviewed were 102 (47%) male and 115(53%) female.

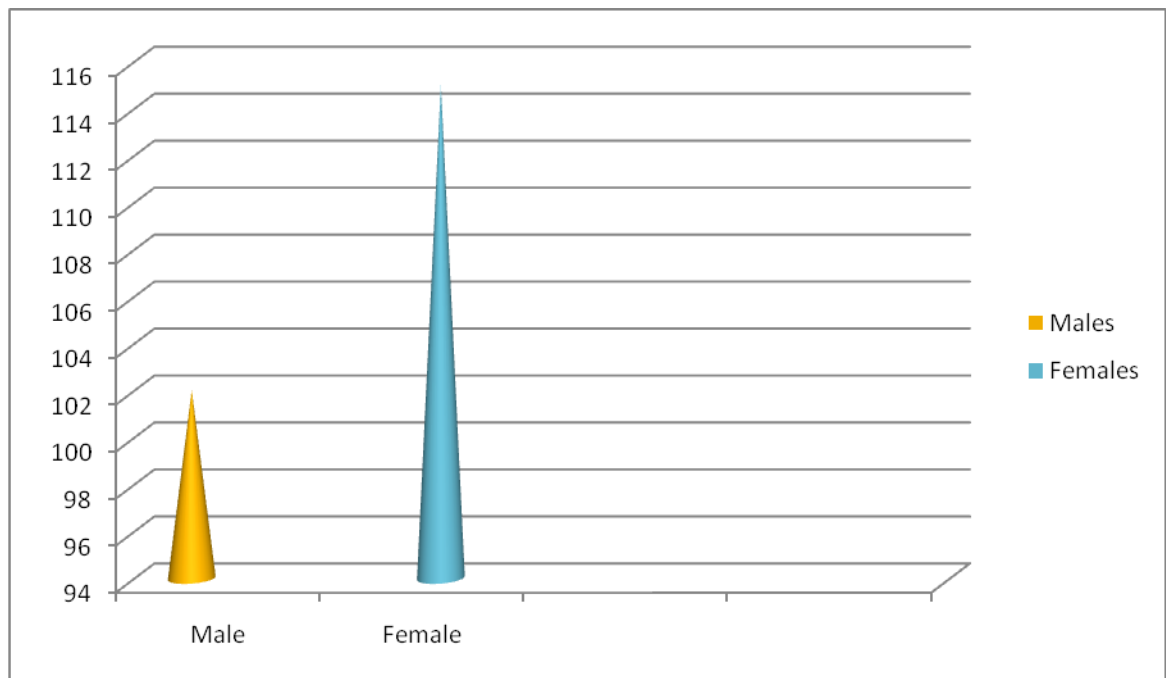


Figure 3: Sample Population by Gender of the respondents (n=217)

Table 3: Influence of smallholder farmers' age on the access of ICT channels of agricultural information access

Channel	Responses		
	Age	No.	Percentage
Radio	20-30	7	5
	31-40	27	19
	41-50	38	26
	51-60	38	26
	60<	33	23
		143	100
TV	20-30	12	13
	31-40	28	29
	41-50	22	23
	51-60	23	24
	60<	20	21
		96	100
Mobile Phone	20-30	3	30
	31-40	21	30
	41-50	5	20
	51-60	2	10
	60<	0	10
		31	100
Computer	20-30	4	50
	31-40	2	25
	41-50	1	13
	51-60	1	13
	60<	0	0
		8	100

Table 1 shows that majority 109(75%) of the respondents aged over 40 years and above preferred to listen to the radio. The researcher found out that farmers listened to the radio due to presentations of the programmes in Kiswahili and the local language. They also gave portability, elaboration of technical terms and affordability as some of the reasons why they preferred to listen to the radio. Young farmers 34(24%) aged 40 years and below do not prefer the radio. They cited unfavorable air time which does not coincide with their free time. Lack of control over the selection of their area of interest was a hindrance in listening to radio agricultural programmes. The TV is a favourite to all farmers 85(85%) above the age of 30 years. The

younger farmers 20(21%) below 30 years of age watch TV but not programmes on agriculture. The mobile phone was preferred by young farmers aged 40 years and below for access to agricultural information who also use it for chatting and communicating with their friends and family. Farmers above the age of 40 years do not prefer the mobile phone as a source of agricultural information. They use their phones for business transactions communicating with their friends and family and for money transactions. Like the mobile phone, the computer is preferred by majority young farmers below the age of 40 years. Most of the respondents reported that they surf the internet at the cyber café. They said the cost of surfing the internet as high but said it was however convenient for them because they could surf for information and download it into other devices for future reference. Farmers above the age of 40 years do not prefer the internet as a source of agriculture information. This is due to the fact that they were not exposed to computers while they were in school unlike the younger farmers.

Table 4: Influence of smallholder farmers’ education level on the access of ICT channels of information

Channel	Responses		
	Education	No.	Percentage
Radio	No formal education	27	19
	Primary school education	56	39
	Secondary school education	46	32
	College education	9	6
	University education	5	3
			143
TV	No formal education	5	5
	Primary school education	7	7
	Secondary school education	36	38
	College education	34	35
	University education	14	15
			96
Mobile phone	No formal education	0	0
	Primary school education	0	0
	Secondary school education	2	7
	College education	13	45
	University education	14	48
			29
Computer	No formal education	0	0
	Primary school education	0	0
	Secondary school education	1	13
	College education	3	37.5
	University education	4	50
			8

Table 3 shows that majority of the respondents with no formal education, primary and secondary school education 129(90%), listened to the radio agricultural programmes more than those with college and university education 14(10%).The TV is a preference by farmers 70(73%) with college and Secondary and education as compared to farmers in other categories. The mobile phone is preferred most by farmers with secondary and college education 15(52%), followed by those with those with university education 14(48%) respectively. Like the mobile phone, the

computer was preferred more by farmers with college and university education with a total of 7 (88%) respondents. This is an indication of strong connection of farmer's level of education and the use of modern technology in search of information.

Table 5: Chi-Square Test for Testing the Influence of Socio-Economic Factors on Access to ICT Disseminated Agricultural Information

Socio-Economic Factor	Access to ICT Disseminated Agricultural Information		Total	Chi-square Test
	Yes	No		
Age				
20-30	9 (7%)	25 (33.3%)	34	Pearson chi-square = 31.09 P-value = 0.0001
31-40	22 (17.1%)	19 (25.3%)	41	
41-50	33 (25.6%)	9 (12.0%)	42	
51-60	36 (27.9%)	10 (13.3%)	46	
60 and Above	29 (22.5%)	12 (16.0%)	41	
Total	129 (100%)	75 (100%)	204	
Education				
No formal	13 (13.3%)	20 (36.4%)	33	Pearson chi-square = 18.54 P-value = 0.00017
Primary	40 (40.8%)	9 (16.4%)	49	
Secondary	27 (27.6%)	10 (18.2%)	37	
College	9 (9.2%)	13 (16.4%)	18	
University	9 (9.2%)	9 (12.7%)	16	
Total	98 (100%)	55 (100%)	153	

Table 5 shows that socio-economic characteristics (Age and Education) has an influence on access to ICT disseminated Agricultural Information by small holder farmers (p-value <0.05) for both age and education.

4.3 Factors that limits smallholder farmers to access agricultural information through ICT channels

Table 6: Limitations associated with the access of agricultural information through ICT channels

ICT channels	Problems associated with the access of information through ICT channels									
	Unfavorable airtime schedule	Use of difficulty terms	Lack of transfer to other storage devices for referen ce	No control over the programme during access	Not audio visual	Lack of training in usage	Battery charging of device	Informati on results explosion	Power blackout while in use	Cost
Radio	60	10	133	30	25	-	10	-	15	-
TV	53	48	20	16	-	-	-	-	58	89
Computer	-	2	-	-	-	150	-	6	4	201
Mobile phone	-	5	26	-	19	-	26	11	-	12

Smallholder farmers cited various factors they encounter which are associated with hindrance to the access of information through ICT information channels. Unfavorable airtime was reported as a major setback by 60 and 53 respondents who listen to the radio and those who watch the TV respectively. Respondents (2) reported use of difficult terminologies as a hindrance especially where the computer and the mobile phone (5) are used to access information. Only 10 and 48 respondents who access radio and TV reported the use of difficulty terminologies respectively. The

radio and the TV were channels where 133 and 20 respondents respectively reported to lack facilitation in

transfer of information to other storage devices for future reference. These were followed by the mobile phone with 26 respondents reporting to encounter this hindrance. None of the respondents who use the computer as a channel for information access had this problem. Respondents (30) who listen to the radio and (16) who watch TV were hindered by lack of control over the programmes. They could not replay, rewind or print the programmes during and after they were presented. This problem was not encountered by respondents who access agricultural information by use of the computer and the mobile phone. Respondents (25) who listen to radio reported they were hindered by the channel not being visual. None of the respondents reported the computer reported as not being visual. Respondents who access agriculture information by use of the computer reported the problem of lack of training as a hindrance. Some of the respondents (10 and 26) respectively encountered the problem of time consumed by charging the battery for use in the radio and mobile phone. Information explosion was a problem faced by respondents who surf the internet through the computer and the mobile phone. All the respondents accessing information through radio, TV and the Computer reported power blackout as a hindrance. The cost to buy and to surf the internet was reported by a majority (201) respondents followed by purchase of the TV (89). The mobile phone was reported by 12 respondents as being costly to run due to the high cost of credit. All the respondents felt radio was the cheapest in its operations as compared to the other channels.

4.4 Types of agricultural practices

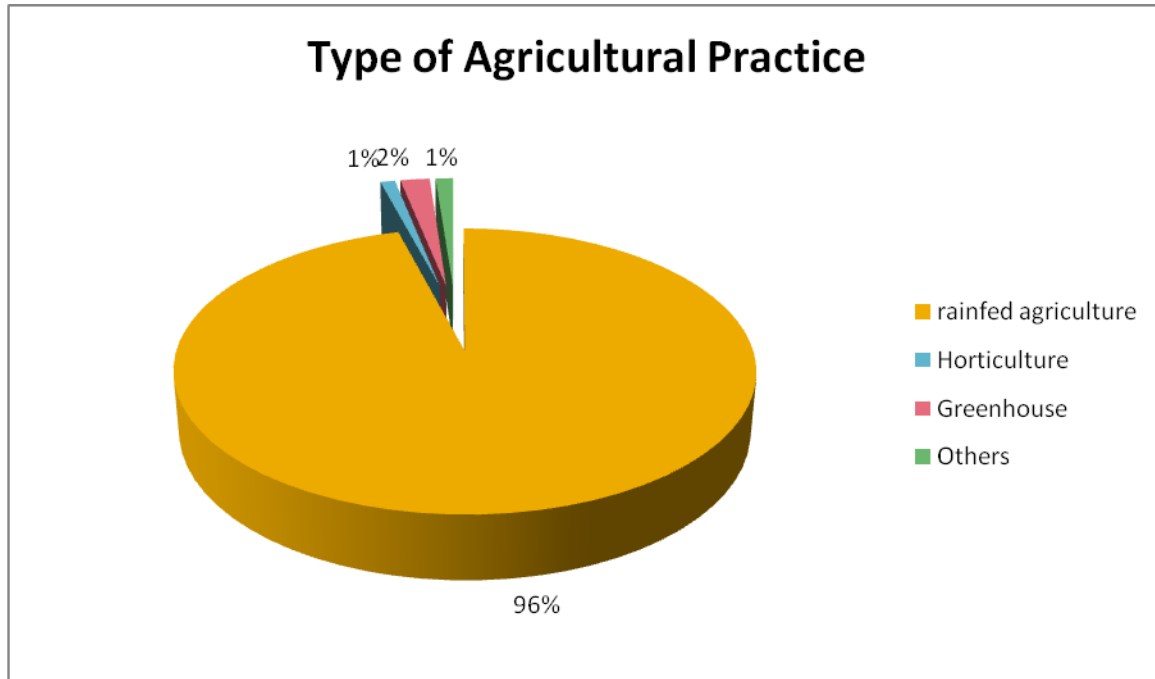


Fig. 4: Types of agricultural practice

Most farmers 208(96%) practice rain fed agriculture as shown in figure 5 above. Few farmers 9 (4%) practice horticulture and greenhouse farming. Some of the farmers reported to be practicing both. Greenhouse farmers seek information from all the sources being investigated. These farmers have put the information they got into practice and they reported to have an increase in yields after application of the information.

4.5 Crops and livestock

Table: 7: Crops and livestock

23123	No	Percentage
Maize	189	87
Beans	178	82
Potatoes	98	45
Cabbages	36	17
Carrots	14	6
Onions	57	26
Avocadoes	4	2
Mangoes	2	1
Bananas	61	28
Others	6	3
Cattle	194	89
Goats	185	85
Sheep	42	19
Poultry	182	84
Pigs	31	42
Rabbits	29	13
Others	2	1
Total		

Most farmers 189 (87%) grow maize while 178 (82%) farmers grow beans. This is also an indication that these are the main staple food for households in Ndeiya. Cattle and goats are the animals kept by majority of the farmers at 194 (89%) and 185 (85%) farmers respectively. There was an indication that the same farmers kept more than one different kind of animals.

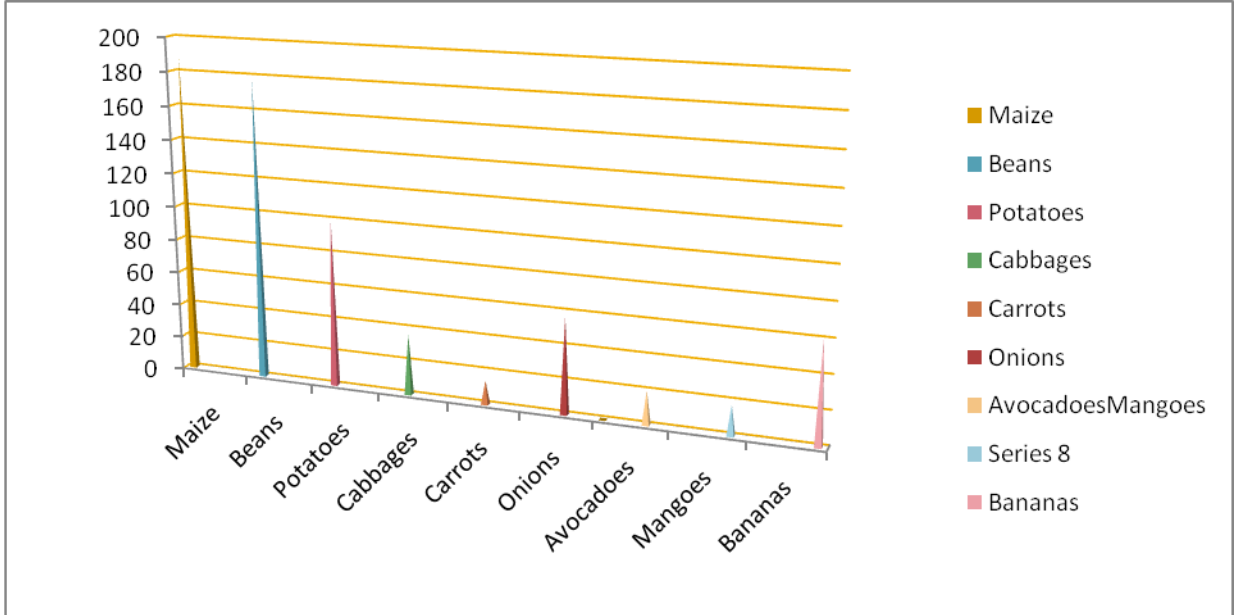


Fig.5: Crops grown by smallholder farmers

Greenhouse farmers who were interviewed grow tomatoes in addition to other horticultural crops. Some of the farmers who practice horticulture have dug wells as a source of water. They are growing horticultural produce like cabbages, carrots, spring onions and tomatoes. Bananas are planted at a very minimal level while of those who have planted mangoes have only one tree of the breeds which have not been improved.

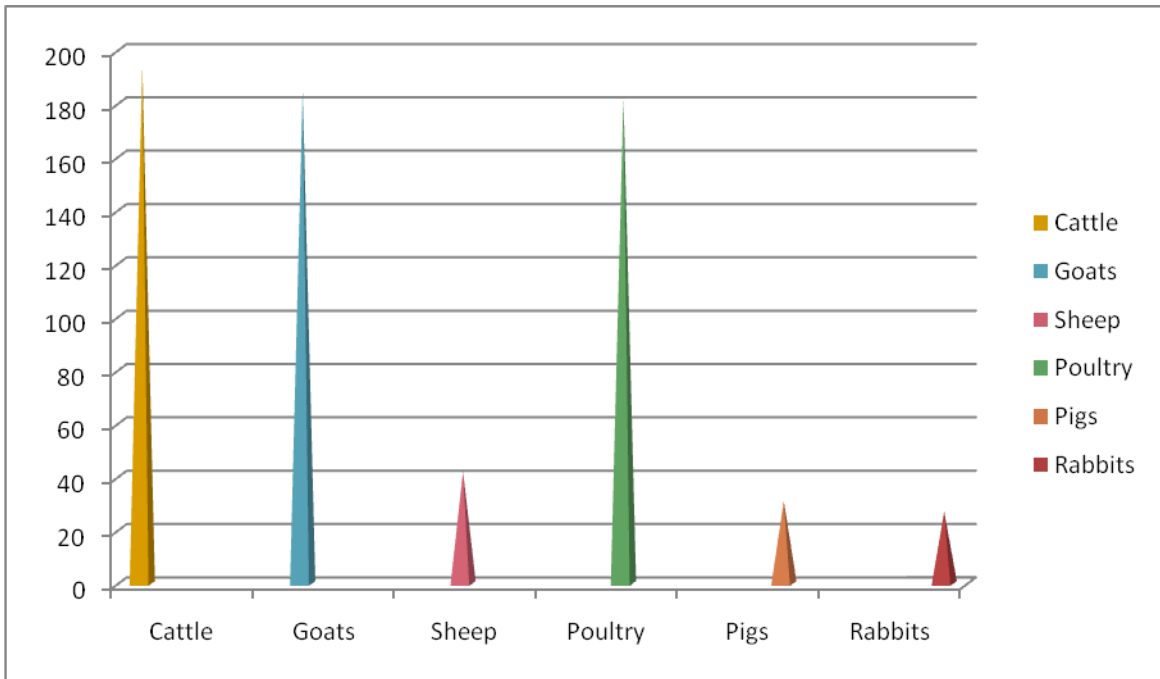


Fig.6: Livestock kept by smallholder farmers

Farmers keep cattle, goats and poultry. Few farmers 102(74%) keeps sheep, pigs and rabbits. Farmers interviewed said they rear the animals on small scale due to their land being small. Zero grazing method to use to rear cattle. Most of the farmers who rear chicken rear the local indigenous breed on small scale. Rabbits and pigs are kept by younger farmers below the age of 30 years. All the farmers who rear animals were eager to source for information as compared to those who only grow crops.

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

Farmers reported that the radio was a cheap means to use in the access of information and many of them own a radio. Many farmers did not own a TV as compared to the radio due to its high purchase cost. Farmers above the age of 40 years preferred to listen to the radio for agricultural information unlike those below 40 years of age. Majority of the farmers even those without power owned a radio and use batteries as a source of power. They said the radio use terms which are simple and easy to understand unlike the TV. More than 90% of the farmers who own a mobile phone use it as a means to communicate with friends, sending and receiving money but not as a means of acquiring information on agriculture. Some farmers with college and university education and those below the age of 40 years surf the internet for agricultural information from their mobile phones and from the internet in cyber café because it was expensive to buy and maintain their own computers. They however, complained of power blackouts as hindrances to accessing information using computers. At the same time, they preferred the computer because they could download information into other devices, surf the internet at their own time and have control of their information requirements and selection. Older farmers are at a disadvantage because while growing up they had less exposure to ICT. Small holder farmers who reported to have adopted the technologies they accessed through the channels said there was an improvement in the end results.

5.2 Conclusions

There was an indication during assessment of Information Communication Technology channels in the access of agricultural information by smallholder farmers that some of the farmers access more than one channel. Based on the findings of the study, it was revealed that socio-economic characteristics of smallholder farmers influence their access to ICT disseminated agricultural information. Farmers with no formal education and those with primary education listened to the radio more than other channels of communication due presentation of agricultural programmes in both Kiswahili and the local language. The TV was preferred because it was audio visual. Farmers found it more interesting due to demonstrations on farming methods. Farmers with university education did not prefer the TV as a means of information access but prefer to use the computer. They however cited surfing the internet for information to be expensive as compared to access through other channels of communication. Older farmers above the age of 40 years do not prefer to use computers because they lack skills in computer operation

5.3 Recommendations

The government and information providers should come up with measures to overcome the existing challenges facing farmers in accessing agriculture information. There is need to scale up the use of ICTs in access to agricultural information especially radio since it is the most preferred and accessible media by farmers. There is need for the government to educate small scale farmers on ICTs to enable them to acquire agricultural information that can develop skills to improve and hence increase their farm output. These can be done through organizing workshops and short courses for the farmers. The government can also work towards ensuring that there is power connection in all the rural areas in order to encourage the use of ICT channels.

Agricultural information and research centres ought to create more awareness of the availability of CDs and DVDs they produce for the farmers to access information contained in them.

5.4 Further Research

Further research on ICT information channels which the researcher did not include in the study will be vital. There is need for further research on government policies on information dissemination to farmers and cost implication on adoption of ICT technologies.

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APPENDICES

Appendix I: Questionnaire for the farmers

Access to Agricultural Information by Smallholder farmers through ICT channels in Ndeiya Location, Kiambu County

Date ___/___/___/ (Day/Month/Year)

Questionnaire Code

Enumerator's name

INTERVIEW QUESTIONNAIRE

GENERAL INFORMATION

COUNTY _____

LOCATION _____

SUB-LOCATION _____

VILLAGE _____

HOUSEHOLD NUMBER _____

INSTRUCTIONS

Please tick in the box and give comments where applicable.

SECTION A: FARMER SOCIO-ECONOMIC PROFILE

1. Gender

Male

Female

Age

20-30 Years

31-40 Years

41-50 Years

51-60 Years

Above 60 Years

2. Level of education?

- No formal education
- Primary
- Secondary
- College
- University
- Agricultural training
- Others

3. Which type of agriculture do you practice?

- Rain fed agriculture
- Horticulture
- Greenhouse irrigation
- Others specify-----

4. Which of the following crops do you grow? (Select more than one if necessary).

- Maize
- Beans
- Potatoes
- Cabbages
- Carrots
- Onions
- Avocadoes
- Mangoes
- Bananas
- Others specify

5. What livestock species do you keep on the farm?

- Cattle
- Goats
- Sheep
- Poultry
- Pigs
- Rabbits
- Others specify

SECTION B: ASSESSMENT OF ICT CHANNELS USED IN ACCESSING AGRICULTURAL INFORMATION BY SMALLHOLDER FARMERS

6. What information on food crops are you interested in? (Select more than one if necessary).

- Maize/beans intercrop
- Potatoes
- Cabbages
- Carrots
- Onions
- Avocadoes
- Mangoes
- Bananas
- Others specify -----

7. What information on livestock are you mostly interested in? (Select more than one if necessary).

- Cattle
- Goats
- Sheep
- Poultry
- Pigs
- Rabbits
- Others specify

8. Do you have access to a radio?

- Yes
- No

9. Do you listen to information on agriculture from the radio?

- Yes
- No

If yes, in which language does the channel you listen to disseminate the information?
.....

10. Why do you prefer to listen to the radio? (Select more than one if necessary).

- Vernacular Language
- Portability
- Affordable/cost
- Effective Interact with programme' presenters through phone
- Can perform other duties while I listen to programs
- No training is required in accessing
- Others specify

11. How often does the radio present programs on agriculture that you listen to?

Regularly

Occasionally

Rarely

Never

12. Do you think the air time for agricultural information programmes is convenient?

Yes

No

If not what suggestion can you make for adequate time?
.....

13. Do you have access to a TV?

Yes

No

14. Do you watch agricultural programmes on TV?

Yes

No

If yes, how often do you watch agricultural programmes?

Regularly

Occasionally

Rarely

Never

15. Why do you prefer to watch agricultural programmes on TV

TV is Audio visual

TV is Interesting to watch

Due to the languages TV present information

Demonstration

Others specify

16. Do you use the TV to access agricultural information in CD/DVDs?

Yes

No

If not why?

I am not aware of CD/DVDs that contain agricultural information

I cannot afford to buy CDs or DVDs

I do not have a DVD Player

There are no CDs/DVDs in the market with agricultural information

Others specify

17. Do you use the computer to access agricultural information?

Yes

No

If yes how often?

Regularly

Occasionally

Rarely

Never

18 What is the average number of hours per week do you spend surfing the internet.....

19 Why do you prefer information from the internet?

I can download

I can print

I can repeat to understand

I can access information from the internet any time I want

There is vast information from the internet

I can select information that is relevant

Others specify

20. Do you use the computer to access agricultural information in CD/DVDs?

Yes

No

If not why?

I am not aware of CD/DVDs contain agricultural information

I cannot afford to buy CDs or DVDs

Others specify

21. Do you own a mobile phone?

Yes

No

22 Do you access agricultural information from your mobile phone?

Yes

No

If yes, how often?

Regularly

Occasionally

Rarely

Never

If not, what do you use your mobile phone for?

Communicating with friends

Charting

Surfing information other than agricultural information

Money transactions

Others specify

23 Have you put the agricultural information you get into practice?

Yes

No

If not why?

.....

If yes, what changes have occurred in your output and income since you started applying the agricultural information?

Increased

No change

Decreased

SECTION C: LIMITATIONS ASSOCIATED WITH THE ACCESS OF INFORMATION THROUGH ICT CHANNELS

24 What problems do you encounter in accessing radio agricultural programs? (pick more than one where necessary).

Unfavourable airtime schedule

Use of difficult terms

Lack of transfer to other devices for reference

I have no control over the program during its presentation

The channel is not audio visual

Lack of training in usage of the channel

Battery needs constant charging

Information explosion

Power blackouts

Others specify

24. What problems do you encounter in watching TV agricultural programs (pick more than one where necessary).

Unfavourable airtime schedule

Use of difficult terms

Lack of transfer to other devices for reference

I have no control over the program during its presentation

The channel is not audio visual

Lack of training in usage of the channel

Battery needs constant charging

Information explosion
Power blackouts
Others specify

25. What problems do you encounter in surfing the internet for agriculture related information? (Pick more than one where necessary).

Unfavourable airtime schedule
Use of difficult terms
Lack of transfer to other devices for reference
I have no control over the program during its presentation
The channel is not audio visual
Lack of training in usage of the channel
Battery needs constant charging
Information explosion
Power blackouts
Others specify

26. What problems do you find in accessing information from the mobile phone? (pick more than one where necessary).

Unfavourable airtime schedule
Use of difficult terms
Lack of transfer to other devices for reference
I have no control over the program during its presentation
The channel is not audio visual
Lack of training in usage of the channel
Battery needs constant charging
Information explosion
Power blackouts
Others specify

APPENDIX II: MAP OF KIAMBU COUNTY



Source: Kiambu District Development plan 2002-2008