

**RELATIONSHIP BETWEEN SOCIO ECONOMIC FACTORS AND USE OF
INFORMATION AND COMMUNICATION TECHNOLOGIES IN
MARKETING OF FARM PRODUCE BY FARMERS IN MANGA
SUB-COUNTY, NYAMIRA COUNTY, KENYA**

DENNIS NYABOCHWA MORWANI

**A Thesis Submitted to Board of Post Graduate Studies in Partial Fulfillment of the
Requirements for the Award of the Degree of Master of Science in Agricultural
Education of Egerton University**

EGERTON UNIVERSITY

NOVEMBER, 2017

DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been presented for the award of a degree in any other university.

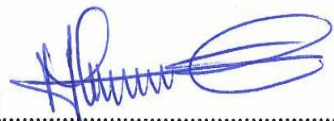
Signed.......... Date..........

Dennis Nyabochwa Morwani

EM11/2318/09

Recommendation

This thesis has been presented for examination with our approval as university supervisors.

Signed.......... Date..........

Dr. Justus Moturi Ombati,

Department of Agricultural Education and Extension,

Egerton University

Signed.......... Date..........

Prof. Fredrick Ugwe Ngesa,

Department of Agricultural Education and Extension,

Egerton University

COPYRIGHT

© 2017 Dennis Nyabochwa Morwani

No whole or part of this thesis may be reproduced, transmitted or stored in any form or means such as electronic; mechanical or photocopying including recording or any information storage and retrieval systems without prior written permission of the author or Egerton University on behalf of the author.

All rights reserved

DEDICATION

This Thesis is dedicated to my loving parents, Samuel Morwani and the late Grace Nyamoita, my beloved wife Damaris Nyagoti and my sons, Eugene Nyabochwa and Raphael Nyabochwa. They all have been my pillars.

ACKNOWLEDGEMENT

My gratitude goes to Almighty God who has given me the strength to complete this work. I also owe my gratitude to Egerton University for giving me a rare opportunity to study. This work was not an event, but a process into which a number of people made inputs both directly and indirectly. I would like to express my gratitude to my supervisors: Dr. Justus Moturi Ombati and Prof. Fredrick Ugwe Ngesa whose invaluable input informed this work. It is a reflection of their patience and professional inputs. I would like to appreciate my lecturers in the Department of Agricultural Education and Extension. They played a big role in imparting knowledge and ideas that were to evolve into this work. I would want to say a big thank you to my farmers who were sampled to take part in this study for their valuable time that was dedicated for provision of genuine responses on the questionnaire items. My gratitude further goes to the National Commission for Science, Technology and Innovation (NACOSTI) who gave me permission to conduct the study. Lastly, I would like to appreciate the support and encouragement from members of my family, colleagues and all people of goodwill whose direct or indirect contribution enabled me to accomplish this task. May God bless them!

ABSTRACT

Limited access to accurate and timely market information continues to be a major impediment in the marketing of farm produce by farmers in Manga Sub-County, Nyamira County, Kenya. This limited access to market information has led to high cost of marketing and emergence of middlemen. Information and Communication Technologies (ICTs) have the potential to assist in addressing this problem by creating awareness, linking and distributing information on marketing. It is evident that farmers in Kenya have focused their attention in acquisition of ICT resources because of widespread coverage of mobile telephony, low call rates, affordable data bundles, increasing internet connectivity and other forms of ICTs applications for example the M-pesa services and use of ICTs in marketing farm produce. This study aimed to determine the relationship between socio economic factors and the use of ICTs in marketing of farm produce by farmers in Manga Sub-County in Nyamira County, Kenya. The purpose of the study was to examine the relationship between socio economic factors and the use of ICTs in marketing farm produce by farmers in Manga Sub-County. Descriptive research design was adopted in the study. The target population of the study was 11,040 farmers in Manga Sub-County, from whom a sample size of 109 farmers was selected using stratified random sampling technique. A questionnaire administered to farmers in the Sub-County was used to collect data. Validity of the instrument was enhanced by subjecting the instrument to examination by three experts in the Department of Agricultural Education and Extension of Egerton University. Analysis of piloting results using Cronbach's coefficient alpha method yielded a reliability index of 0.896, indicating the instrument was reliable. The collected data were analysed using both descriptive and inferential statistics. The descriptive statistics used were the frequency and percentages. Pearson's correlation coefficient was used to test the hypotheses. Statistical Package for the Social Sciences was used in data analysis. The hypotheses were tested at a significance level of 0.05. Findings of the study identified that the farmer's level of education influences the use of ICTs in marketing farm produce, training of farmers in ICTs increases the use of ICTs in marketing of farm produce, access to ICT resources had a significant influence on the use of ICTs in marketing of farm produce and access to extension services had a significant influence on the use of ICTs in marketing of farm produce by farmers in Manga Sub-County. This study recommends that The County Directorate of Agriculture should organise training programmes on use of ICTs in marketing. It, also, recommends that The county Government should set up tele-centres with information on agricultural marketing.

TABLE OF CONTENTS

DECLARATION AND RECOMMENDATION	ii
COPYRIGHT	iii
DEDICATION	iv
ACKNOWLEDGEMENT	v
ABSTRACT	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS AND ACRYNOMS	xi
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background of the Study.....	1
1.2 Statement of the Problem.....	4
1.3 Purpose of the Study	5
1.4 Objectives of the Study.....	5
1.5 Hypotheses of the study.....	5
1.6 Significance of the Study	5
1.7 Scope of the Study	6
1.8 Limitations of the Study.....	6
1.9 Assumptions of the Study	6
1.10 Definitions of Terms	7
CHAPTER TWO	9
LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Value of Agriculture	9
2.3 Marketing of Farm Produce in Kenya	10
2.4 Level of Education and Use of ICTs in Marketing of Farm Produce.....	12
2.5 Training of Farmers in ICTs and use of ICTs in Marketing of Farm Produce	12
2.6 Access to ICT Resources and use of ICTs in Marketing of Farm Produce	13
2.7 Access to Extension Services and use of ICTs in Marketing Farm Produce	16
2.8 Theoretical Framework.....	18
2.9 Conceptual Framework.....	19

CHAPTER THREE	21
RESEARCH METHODOLOGY	21
3.1 Introduction	21
3.2 Research Design	21
3.3 Location of the Study.....	21
3.4 Population of the Study.....	21
3.5 Sampling Procedure and Sample Size	22
3.6 Instrumentation.....	23
3.7 Data Collection.....	24
3.8 Data Analysis	24
CHAPTER FOUR	27
RESULTS AND DISCUSSION	27
4.1 Introduction	27
4.2 Socio-economic Characteristics of Farmers.....	27
4.3 Level of Education of Farmers and use of ICTs in Marketing Farm Produce.....	40
4.4 Training Farmers in ICTs and use of ICTs in Marketing Farm Produce.....	42
4.5 Access to ICT Resources and use of ICTs in Marketing Farm Produce	44
4.6 Access to Extension Services and use of ICTs in Marketing Farm Produce	45
CHAPTER FIVE	48
SUMMARY, CONCLUSIONS AND RECOMMENDATION	48
5.1 Introduction	48
5.2 Summary of Study	48
5.3 Conclusionsa	48
5.4 Recommendations	49
REFERENCES	50
APPENDICES	58
APPENDIX A Letter of Transmittal.....	58
APPENDIX B Farmer’s Questionnaire.....	59
APPENDIX C Research Permit.....	64
APPENDIX D Research Authorization Letter	65

LIST OF TABLES

Table 1 Small Scale Farmer Population and Sample Size	23
Table 2 Summary of Data Analysis	26
Table 3 Age of the Farmers in Years	29
Table 4 Farmers' Primary Occupation	30
Table 5 Types of Crops Grown by Farmers in the Study Area	31
Table 6 Livestock Enterprises Reared by Farmers in the Study Area	32
Table 7 Experience in Marketing of Farm Produce in Years	34
Table 8 Access to ICT Resources for Marketing Farm Produce by Farmers.....	35
Table 9 Ways ICTs used in Marketing Farm Produce	36
Table 10 Access to ICT-Based Services from Service Providers to Farmers	36
Table 11 Frequency of Use of ICTs in Marketing Farm Produce	37
Table 12 Reasons for Not Using ICTs	38
Table 13 Challenges in Using ICTs in Marketing Farm Produce.....	38
Table 14 Suggested Solutions for Improving Farmers' use of ICTs in Marketing	39
Table 15 Farmers' Level of Education.....	40
Table 16 Relationship between Level of Education of Farmers and use of ICTs in Marketing of Farm Produce by Farmers.	41
Table 17 Effects of Level of Education on the use of ICTs in Marketing Farm Produce	42
Table 18 Training of farmers in ICTs.	42
Table 19 Relationship between Training Farmers in ICTs and use of ICTs in Marketing of Farm Produce by Farmers.	43
Table 20 Relationship between Access to ICT Resources and use of ICTs in Marketing of Farm Produce by Farmers	45
Table 21 Farmers Receipt of Extension Services in Relation to ICT Marketing	46
Table 22 Relationship between Access to Extension Services and use of ICTs in Marketing Farm Produce	47

LIST OF FIGURES

Figure 1: Conceptual Framework showing the relationship between the dependent variables, the independent variables, and the intervening variables in the study.	20
Figure 2: Gender of the Farmers.	28
Figure 3: Farmers' Involvement in Marketing of Farm Produce	33
Figure 4: Access to ICT resources.	34
Figure 5: ICT resources used by the farmers.....	44

LIST OF ABBREVIATIONS AND ACRYNOMS

3G	Third-Generation Mobile Communication System.
CAK	Communication Authority of Kenya
GDP	Gross Domestic Product
ICTs	Information Communication Technologies
IFAD	International Fund for Agricultural Development
IT	Information Technology
ITC	Information Technology Centre
KACE	Kenya Agricultural Commodity Exchange
MIS	Market Information Systems
MMS	Multimedia Messaging Service
NACOSTI	National Commission for Science, Technology and Innovations
SME	Small and Medium-sized Enterprises
SMS	Short Messaging Service
SRA	Strategy for Revitalizing Agriculture
TAM	Technology Acceptance Model
WAP	Wireless Application Protocol
WWW	World Wide Web

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agriculture plays an important role in the world economy (FAO, 2010). It provides sixty per cent of all employment in Africa, with seventy to eighty per cent of the total population living in rural areas and being dependent mainly on crop and livestock farming for livelihood. In Kenya, agriculture contributes twenty six per cent of the country's Gross Domestic Product (GDP) (GoK, 2010a). For decades, agriculture has been associated with the production of essential food crops.

Marketing of farm produce in western countries has broadly evolved from traditional street markets to the modern hypermarket or out-of-town shopping center. Rural assembly markets are located in production areas and primarily serve as places where farmers can meet with traders to sell their products. These may be occasional (perhaps weekly) markets, such as haat bazaars in India and Nepal, or permanent (Tracey & White, 2003). Marketing of farm produce differ worldwide due to the level of development in the particular country, economically and technologically (Kaynak, 1999). Further Kaynak, (1999) noted that understanding and interpreting a particular countries food marketing techniques also requires taking into account the socio-economic, cultural, legal-political and technological environment of that country.

In Africa, marketing of farm produce is personalized in farms or village markets. Such village markets, however, tend to offer low prices and are characterized by significant price variation (Aker, 2008; Fafchamps & Gabre-Madhin, 2006). Linking farmers to markets remains a major challenge in Africa, and is associated with the lack of commercialization in the continent (Barrett, 2008; Poulton, Doward & Kydd, (2006). According to Poulton et al., (2008), farmer's sell their produce in local markets usually in small volumes. This has given rise to thriving business for intermediaries. The intermediaries collect and bulk produce from farmers and sell them to urban brokers. The urban broker then sells to urban traders, which could be wholesalers or retailers. This has led to limited access to accurate market information. Marketing of farm produce in many developing countries remains severely constrained by poor access to agricultural/market information (Shephard, 1997; Barrett & Carter, 2013). This limited access to market information limit farmers to subsistence farming and prevent them from adopting profitable production alternatives and keeps them supplying

low-paying marketing outlets (Ashraf, Gine & Karlan, 2006). Most small scale farmers are engaged in subsistence and semi-subsistence agriculture with low productivity, low marketable surplus (hence low returns) and low investment, a situation described as low equilibrium poverty trap (Barrett & Swallow, 2006; Barrett, 2008).

In Kenya, marketing chains for different farm produce are long, not transparent and consist of many players making them inefficient and unresponsive to farmer's needs (GoK, 2010a). Information search increases the transaction costs, making the cost of doing marketing unaffordable to majority of farmers (Shiferaw, Obare & Muricho, 2007). Farmers respond to the high cost of marketing by selling their farm produce at the farm gates, rather than travelling to the market where they could get better prices (Fafchamps & Hill, 2005). Most buyers physically inspect the produce when buying because there are no well-defined quality grades and standards in such markets. In the absence of market information, opportunistic behaviour by traders and other market actors tends to develop. Such behaviour encompasses cheating on quality and quantity which in turn results into the failure of traders to establish long-term business relations with farmers (Fafchamps & Gabre-Madhin, 2006). The right of access to markets or factories presents complexities in marketing of farm produce. One approach to improve marketing of farm produce and to curb information poverty is use of Information and Communication Technologies (ICTs) in marketing of farm produce, (Shepherd, 2007).

Modern communications technologies open up the possibility for market information services to improve information delivery through short message service (SMS) on cell phones and the rapid growth of FM radio stations in many developing countries offers the possibility of more localised information services, (Andrew & Shepherd, 1997). In the longer run, the internet may become an effective way of delivering information to farmers. According to DeMaagd and Moore 2006; Shivakumar, (2007) noted that E-Choupal and its rural Internet kiosks, between 2000 and 2007, the agribusiness division of Innovative Technology Centres (ITC) Limited set up 6,400 Internet kiosks called e-Choupals in nine Indian states, reaching about 38,000 villages and 4 million farmers. ITC establishes an Internet facility in a village and appoints and trains an operator (sanchalak) from among the farmers in the village. The sanchalak operates the computer to enable farmers to get free information on local and global market prices, weather, and farming practices. It also improves price transparency.

According to Kofi, (2007) Trade Net, a Ghana-based trading platform, allows users to sign up for SMS alerts for commodities and markets of their choice and receive instant alerts for

offers to buy or sell as soon as anyone else on the network has submitted an offer on their mobile phone. Users can also request and receive real-time prices for more than 80 commodities from 400 markets across West Africa. Farmers can advertise their farm produce and offers on free Web sites with their own Internet addresses.

According to Payne (2011), a private for-profit company called, (Manobi, Inc), has developed a range of mobile and web-based applications focused on improving weaknesses in agricultural value chains in Senegal, Mali, Ivory Coast and Niger. Time to Market (T2M) application enables farmers to check market prices on their mobile phones via Short Messaging Service (SMS), Wireless Application Protocol (WAP), Multimedia Messaging Service (MMS) or mobile internet. International Telecommunication Union (2010) mid-term review reported that Manobi provides access to price data on various crops collected from different markets across the country. Manobi personnel use mobile phones to send the price data to the Manobi database using (WAP). In Zambia, widespread adoption of ICTs has been particularly slow in development (Nchimunya, 2012). Mwenechanya (2007) argued that lack of adoption and usage of ICTs can make the economy less competitive and lose out on the potential profit margins and recommended the need for country's promotion of use of ICTs.

In Kenya, ICTs like e-mails, World Wide Web (WWW) and cellular telephony have been used by rural farmers alongside radios and Televisions (Farrell, 2007). Use of ICTs encompasses innovative ways of capturing, processing, storing, and displaying information and is capable of increasing productivity and marketing through information provision (Mangesi, 2010). ICTs can improve market access by facilitating communication with customers, competitive positioning, enable information acquisition and production of quality products, generation of market information, reduction in logistic costs, facilitating access to global markets, facilitating market research, networking, market transactions and market identification (Kiveu & Ofafa, 2013). Among the ICTs used by farmers the mobile phones emerge as the preferred ICT tool due to affordability, ease of use, and a reliable network. According to the quarterly sector statistics report by the Communication Authority of Kenya (CAK), at the end of the first quarter of the year 2016, mobile penetration stood at 88.1% with 37.8 million subscribers up from 36.1 million in the previous quarter (Communication Authority of Kenya, 2016).

Farming is the main occupation in Manga Sub-County and is the major source of income. The major enterprises in the Sub-County include tea, coffee, maize, dairy, horticulture and poultry. Most farm produce are sold in the local market or to the middle men who sell the

produce to markets outside the Sub-County (Agribusiness Annual Report, 2014). The area is characterized by limited factories for farm produce. In Manga Sub-County, available ICTs already in use to improve marketing of farm produce include the use of popular social sites such as face-book, twitter and WhatsApp. Some farmers are already using mobile phones, FM radio stations, internet among other ICTs to access market information and advertise their produce. Use of such ICTs can address the constraint of market spaces, high marketing costs, and use of intermediaries to reach more potential customers as they have done in other parts of the country.

Rathgeber and Adera (2000) and Bartholomew, Wainwright & Green, (2009) noted that although ICTs have enhanced information exchange amongst farmers and improved farmers' ability to make decisions, develop ideas and consequently improve their livelihoods through better marketing, its use in agricultural marketing still poses serious challenges and low adoption. The use of ICTs in marketing farm produce could be influenced by various socio-economic factors, cultural, technological factors and access to extension services. Socio economic factors being; level of education of farmers, training farmers in ICTs and access to ICT resources. Little is known about the influence of socio-economic factors and access to extension services on use of ICTs in marketing farm produce. The present study aimed to fill this gap by examining the relationship between socio-economic factors and use of ICTs in marketing farm produce by farmers in Manga Sub County.

1.2 Statement of the Problem

Farmers in Manga Sub-County have experienced problems in marketing their farm produce due to limited access to accurate and timely market information. One strategy of improving farmers' access to market information is integration of Information and Communication Technologies (ICTs) in marketing of farm produce. Use of ICTs in marketing of farm produce could be influenced by many factors such as socio-economic, cultural, technological factors and access to extension services. The study singled out the level of education of farmers, training farmers in ICTs, access to ICT resources and access to extension services. There is limited information on the relationship between socio-economic factors and the use of ICTs in marketing farm produce in the study area. This study sought to fill this gap by investigating on the relationship between socio-economic factors and use of ICTs in marketing of farm produce by farmers in Manga Sub-County.

1.3 Purpose of the Study

The purpose of the study was to examine the relationship between socio economic factors and access to extension services on the use of ICTs in marketing farm produce by farmers in Manga Sub-County.

1.4 Objectives of the Study

The following were the objectives of study:

- i. To document the socio-economic characteristics of farmers in Manga Sub-County.
- ii. To determine the relationship between level of education of farmers and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- iii. To establish the relationship between training of farmers in ICTs and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- iv. To establish the relationship between access to ICT resources and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- v. To determine the relationship between access to extension services and use of ICTs in marketing farm produce by farmers in Manga Sub-County.

1.5 Hypotheses of the study

The following null hypotheses were tested in the study:

- H0₁: There is no statistically significant relationship between level of education of farmers and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- H0₂: There is no statistically significant relationship between training of farmers in ICTs and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- H0₃: There is no statistically significant relationship between access to ICT resources and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- H0₄: There is no statistically significant relationship between access to extension services and use of ICTs in marketing farm produce by farmers in Manga Sub-County.

1.6 Significance of the Study

The findings of this study may be of interest to stakeholders in the incorporation of ICTs in marketing. The research results emanating from this study leads to better understanding and awareness that education is an important determinant of intensity of adoption of ICTs in marketing of farm produces as they have the ability to search for new markets locally and globally. The study also being based in a rural community, generated research information on the potential of ICTs in marketing for wider sharing of the knowledge with similar communities in the country and sub-Saharan Africa. The findings of this study is useful in

influencing policy decisions in providing insight and identifying key areas of strategic intervention. The study yielded information that help extension officers to train farmers to fully adopt ICTs as a marketing strategy for farm produce. The findings of this research contributes to future knowledge as a reference material. The findings of the study is useful to other researchers in that recommendations for further research was made on the basis of the findings.

1.7 Scope of the Study

The study was confined to socio-economic factors and the use of ICTs in marketing of farm produce by farmers in Manga Sub-county, namely: the level of education of farmers, training of farmers in ICTs, access to ICT resources and access to extension services. There were other factors that could influence the use of ICTs in marketing of farm produce by farmers, these were: age, gender and cultural factors.

1.8 Limitations of the Study

The following limitations were made during the study:

- i) Time consuming when collecting data from illiterate farmers. The researcher was forced to interpret and guide the farmer to fill the questionnaire.
- ii) Absence of some farmers when collecting data. Call backs were made and the researcher revisited the farmer to collect data when they were available.

1.9 Assumptions of the Study

The following assumptions guided the study:

- i) The study assumed that farmers in Manga Sub-County had access to ICT resources for marketing farm produce.
- ii) The farmers' responses reflected their true understanding of the questions posed to them and that they were representative of the wider community.

1.10 Definitions of Terms

The following terms used in the study have the following meaning.

Agricultural marketing is inferred to cover the services involved in moving an agricultural product from the farm to the consumer (Wikipedia). In this study it refers to the selling of farm produce by small scale farmers.

Digital Divide: The Digital Divide, or the digital split, is a social issue referring to the differing amount of information between those who have access to the Internet (especially broadband access) and those who do not have access. It means the gap in technological developments. In this study it refers to differing amount of information between those who have access to ICTs and those who do not have access

Extension Services: mean ‘advisory and other services’ that help rural families to make the best possible use of the productive resources at their disposal (Katz 2002). In this study it refers to the provision of important and relevant information and services concerning use of ICTs in marketing to small scale farmers by extension officers.

Information and Communication Technologies (ICTs): Information and Communication Technologies are technologies used to generate, process, store and disseminate information. Dzidou, (2010) defines Information and Communications Technologies (ICTs) as a term that cuts across a variety of technologies including computer, microelectronics and related technologies such as microchip and microprocessor-based technologies, multimedia and other information processing technologies and systems; telecommunications technologies and infrastructure; and communication network technologies and infrastructure including local and wide area communications and computer networks for voice, data and video. In this study ICTs refers to the various ICT resources used to manage or handle marketing information.

ICT Marketing: ICT encompasses innovative ways of capturing, processing, storing, and displaying information and increasing productivity and marketing through information provision (Mangesi, 2010). In this study it means deliberate use of ICTs in order to gather accurate and timely market information on prices and markets of farm produce, advertisement of farm produce to facilitating payments and to communicate with potential customers while marketing farm produce.

ICT Skills: Describe the set of skills one requires to become digitally included/ a set of basic ICT skills an individual requires to use a computer to safely enter access and communicate information online (Benavent, 2002). In this study it describe the set of skills a farmer requires to use ICTs in marketing farm produce.

Information poverty: Any deficiency of knowledge about something (Dictionary.com). In this study it refers to the lack of accurate market information for marketing farm produce by farmers.

IT Proficiency: refers to the knowledge of computer systems and the ability to work with Word processing, data management, and spreadsheet and data analysis programs (Dictionary.com). ICT literacy proficiency is the ability to use digital technology, communication tools, and/or networks appropriately to solve information problems in order to function in an information society (Rockman, 2005). In this study it refers to the possession of ICT skills required to operate various ICTs in marketing.

Level of Education: is the stage of learning that occurs in primary, secondary and college institutions. In this study it refers to the 3 stages the farmer attended while pursuing education that is primary school, secondary school and tertiary colleges.

Marketing: Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large such as American Marketing Association. In this study it refers to communication between the farmer and customers, gathering of market information and markets, advertisement and sale of farm produce.

M-Pesa: (M-for mobile, pesa is Swahili for money) is a mobile phone –based money transfer, financing and micro financing service launched in 2007 by Vodafone for safaricom (Wikipedia). In this study it refers to the platform through which farmers receive their payment after sell of produce.

Relationship: it is the state of being related or interrelated (Merriam-Webster’s Learners Dictionary). In this study it refers to the relation connecting or binding socio-economic factors and use of ICTs in marketing farm produce.

Small Scale Farmers: Farmers with little land operating less than 2 hectares of cropland (World Bank, 2003). Farmers with limited resource endowments relative to the other farmers in the sector (Dixon & Ralf, 2010; Tanguchi & Wattenbach, 2003). In this study, it refers to farmers who have 2 acres of land and practice farming.

Socio economic factors: Are the social and economic experiences and realities that help Mold one’s personality, attitudes and lifestyle (Merriam-Webster online Dictionary). In this study it refers to age, gender, primary occupation, the level of education of farmers, training of farmers in ICTs, access to ICT resources, income and access to extension services and how they relate and contribute to the use of ICTs in marketing farm produce.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, literature review focuses on the issues related to the relationship between socio-economic factors and the use of ICTs in marketing of farm produce. It dealt with identifying and describing the relationship between socio-economic factors and use of ICTs in marketing farm produce. The chapter was organized into sections. They include value of agriculture, marketing farm produce in Kenya and relationship between socio-economic factors and the use of ICTs in marketing farm produce.

2.2 Value of Agriculture

Agriculture plays an important role in the world economy (FAO, 2010a). For decades, agriculture has been associated with the production of essential food crops. Agriculture entails farming like forestry, dairy, fruit cultivation, poultry, bee keeping, processing, marketing and distribution of crops and livestock products. Agriculture plays a critical role in a given economy. Agriculture is the backbone of the economic system in a given country in addition to providing food and raw materials, it also provides employment opportunities to large population (agric.goods.com, 2017). It provides sixty per cent of all employment in Africa with seventy to eighty per cent of the total population living in rural areas and being dependent mainly on crop and livestock farming for livelihood. Millions of livelihoods in most of the developing world depend heavily on agriculture and small to medium businesses (Dey, Bidit, Prendergast, Renee & Newman, 2008).

In Kenya agriculture remains the backbone of the Kenyan economy. It is the single most important sector in the economy, contributing twenty six percent of the GDP, and employing seventy five percent of the national labour force (Government of Kenya, 2010a). Over eighty percent of the Kenyan population live in the rural areas and derive their livelihoods, directly or indirectly from agriculture. The importance of agriculture to alleviate poverty and stimulate economic growth and development to farmers in Kenya cannot be over emphasized. Available evidence reveals that sustainable poverty reduction can only be possible through economic growth and development strategies (Nyoro, 2002). This will have to be done through agriculture because it is the backbone of economic growth, employment creation and generation of foreign exchange. Agriculture has been a major source of the country's food security and a stimulant to off-farm employment.

Farming is the main occupation in Manga Sub-County and is the major source of income. The major enterprises in the Sub-county include tea, coffee, maize, dairy, horticulture and poultry. Most farm produce are sold in the local market or to the middle men who sell the produce to markets outside the Sub-County (Agribusiness Annual Report, 2014).

2.3 Marketing of Farm Produce in Kenya

Marketing in many developing countries remains severely constrained by poor access to agricultural/market information (Shephard, 1997; Barrett & Carter, 2013). Marketing of farm produce by farmers in Kenya is done in farms or village markets. Such village markets however tend to offer low prices and are characterized by significant price variation (Aker, 2008; Fafchamps & Gabre-Madhin, 2006). The farmer's role would be over after the transfer of products to intermediaries, who bear the responsibilities of transporting, storing, processing and selling products. Intermediaries who purchase products at the farm-gate, provide important marketing services to farmers in developing countries. These farmers would incur high marketing costs if they had to transport small amounts of their produce market centres, thereby constraining the adoption of suitable and economically attractive land use systems (Bingen, Serrano & Howard 2003).

Patrick and Rosemary (2006) noted that, poor marketing facilities and institutions are some of the constraints to increased agricultural production in Kenya. The major marketing constraints comprise high transportation costs due to dilapidated roads, improper handling, poor storage facilities and wastage. In the small farm situation, asymmetric information arises when either the farmer or the buyer lacks essential information relating to the exchange. The more informed of parties therefore takes advantage of the market information to benefit themselves, a situation referred to as opportunism (Miller, 2005 & Williamson, 1985). In agricultural marketing in Kenya, farmers tend to be less informed than the buyers who use the exclusively available information to their benefit thus causing information poverty traps.

Information poverty traps limit farmers to subsistence farming, thereby preventing them from adopting profitable production alternatives and keeps them supplying low-paying marketing outlets (Ashraf, Gine & Karlan, 2006). This information-poverty has in turn led to low levels of agricultural commercialization among the small scale farmers (Barrett, 2008; Poulton et al., 2006). Information poverty increases the transaction costs making the cost of marketing unaffordable to majority of small scale farmers (Shiferaw, Obare & Muricho, 2007). Farmers respond to the high cost of marketing by selling their produce at the farm gate at low prices or

sell to buyers who come to their farms at reasonable prices rather than travelling to the market where they could get better prices (Fafchamps & Hill, 2005).

Buyers and middlemen sometimes take unfair advantage of farmers' lack of knowledge of market prices, poverty and weak bargaining power arising from illiteracy and low social status, on one side, or oligopoly types of marketing system, on the other side. These combined with seasonal shortfalls of cash, lack of storage facilities in villages and little awareness of market prices have further weakened farmers' bargaining power (Government of Kenya, 2010b). In the absence of market information, opportunistic behaviours by traders tends to develop. Such behaviours encompasses cheating on quality and quantity especially scale which in turn results into the failure of traders to establish long-term business relations with farmers and other traders (Fafchamps & Gabre-Madhin, 2006). Opportunistic behaviours between buyers and farmers cause actors to prefer selling only to those previously known and hence trusted. Such exchange tends to involve small volumes and is based on visual inspection.

Marketing chains for different farm produce are long, not transparent and consist of many players making them inefficient and unresponsive to farmer's needs (GoK, 2010b). Uncertainty of future outcomes means that the buyers, even with a priori agreement on terms of exchange can take advantage of farmers by engaging in actions that are contrary to the specifications of the agreement such as abuse the spirit of the contract, a condition known as moral hazard. These conditions prevail in many rural farming environments in which agricultural information is generally unavailable and has been one of the factors behind the push for ICT integration in marketing of agricultural products (Mangisoni, 2006).

Farmers need accurate information on marketing opportunities to be able to minimize some of the post-harvest losses. Similarly, they also require market related information to make appropriate marketing decisions. Decisions of farmers whether to sell the farm produce at the farm gate or travel to far away markets depends on many factors such as farm size, wealth level, level of surplus, connectivity and transportation facilities, proper market information, and reach to formal market institutions (Fafchamps & Hill, 2005). This calls for an approach to address the marketing problems of the farmers. One strategy to improve marketing of farm produce and to curb information poverty traps is integration of Information and Communication Technologies (ICTs) in marketing of farm produce, (Shepherd, 2007). According Rathgeber and Adera (2000) and Bartholomew et al, (2009) noted that although ICTs have enhanced information exchange amongst farmers and improved farmers' ability to

make decisions, develop ideas and consequently improve their livelihoods through better marketing, its use in agricultural marketing still poses serious challenges and low adoption. Thus the study set out to determine and document the relationship between access to ICTs and the use of ICTs in marketing of farm produce by farmers in Manga Sub-County.

2.4 Level of Education and Use of ICTs in Marketing of Farm Produce

With regard to education, Norris and Batie (1987) argue that farmers with more education are more likely to have enhanced access to technological information than farmers with less education. Education generates a better receptivity to change, the extent of use of ICTs needs the users to have a positive effect on initiation and adoption behaviour. Igoden, Ohoji, and Ekpare, (1990) and Lin (1991) observed a positive influence between the education level of the household head and the adoption level of improved technologies. Olwande, Sikei, and Mathenge, (2009) who carried out a study on agricultural technology adoption including modern marketing, observed that the farmers' level of education was one of the strongest determinants of intensity of adoption. Likewise, Mburu, (2007) noted that education level of the farmers was a significant factor that influences the farmers' adoption of various milk marketing methods in Kenya Highlands. In addition, a better educated employee tends to create the flexibility needed to ICT adoption and innovation (Roffe, 2007; Mohamad & Ismail, 2009). Galloway and Mochrie, (2005) noted that usage of ICTs by farmers that inhabit mainly rural areas is constrained by limited education. Thus the study sought to determine the relationship between level of education of farmers and use of ICTs in marketing farm produce in Manga Sub-County in Nyamira County.

2.5 Training of Farmers in ICTs and Use of ICTs in Marketing of Farm Produce

Farmers' training to effectively integrate ICTs in the marketing of farm produce as well as awareness of opportunities to exploit ICTs is an aspect that is determined by an interplay of several factors. According to Kiveu, (2008) high ICT literacy levels among employees and owners translates to higher degree of ICT use in enterprises. One barrier that prevents farmers from using ICTs in their marketing is lack of ICT skills. A lack of knowledge of best practices in ICTs usage as well as ICT-related skill deficiencies in the workforce will constrain the benefits from ICTs (Kaushik & Singh, 2004) based on case studies of two projects in North India. In Kenya the Sessional Paper No. 1 of 2005 captures ICT as chapter VIII. The Government recognizes that an ICT literate workforce is the foundation on which Kenya can acquire the status of a knowledge economy (Government of Kenya, 2005a).

In a study carried in out in Sri Lanka to investigate the effect of the ICT training programme on Export Agriculture Extension Officers (EAEOs) conducted by the Open University of Sri Lanka (OUSL)-L3F project, results revealed that many of the EAEOs were not computer literate/users before the training, and therefore they lacked the functional computer literacy foundation upon which to build new technology and skills. However, after the training, they significantly improved their ICT skills on computer. As identified by Gelb & Voet, (2010), this kind of ICT training serves as a dominant and a common factor in ICT adoption in agriculture. It is well recognized that a trained, skilled, and well educated workforce is critical in enhancing work and economic performance and sustaining competitiveness (Zainol, 1999). Thus the study set out to establish and document the relationship between training of farmers in ICTs and use of ICTs in marketing of farm produce in Manga Sub-County.

2.6 Access to ICT Resources and Use of ICTs in Marketing of Farm Produce

ICTs include cellular telephony, internet, World Wide Web, Print media, and digital radio receivers. These new ICTs complement older ICTs that include radios and Television sets (TVs) that were earlier mostly used by farmers to access information about agricultural commodities (Singh, 2006). In most African countries, ICTs like e-mails, World Wide Web (www) and cellular telephony have been used by rural farmers alongside radios and TVs (Farrell, 2007). Ogotu, Okello, and Jakinda, (2012) points out that some of the sources of market information in the agricultural sector in Kenya include ICT projects and Market Information Systems such as M-Farm, Kenya Agricultural Commodity Exchange (KACE), National Livestock Marketing Information System (NLMIS), Regional Agricultural Trade Intelligence Network (RATIN) and Drumnet.

Situma, (2016) indicates that M-Farm is a web based market information system enabled by a mobile handset which allows farmers to get information on retail prices of their products, buy their farm inputs directly from manufacturers and find market for their produce by SMS. Smartphone Applications developed locally by University students have come up with innovative ways of tackling farmers' problems (Sandra 2013). *Mkulimaleo* addresses challenges that small and medium scale farmers face in accessing information that influences their food production and market access. The application also provides a forum for farmers to interact and share information.

Munyua, (2008) documented widespread application of ICT tools in agriculture, such as the internet, mobile phones and interactive video/CD-ROMs. According to Munyua, (2008) in

Kenya mobile phones services are provided for by mobile service providers like *Safaricom*. According to the quarterly sector statistics report by the Communication Authority of Kenya (CAK), at the end of the first quarter of the year 2016, more than 95% of farmers in Kenya owned mobile phones and mobile penetration stood at 88.1% with 37.8 million subscribers up from 36.1 million in the previous quarter (Communication Authority of Kenya, 2016).

On the 28th August, 2009 the country's leading mobile operators launched the 3G technology that will allow subscribers to access internet on their mobile phones. This technology, has since gone to 4G, it will enable farmers to engage in e-marketing and e-agriculture. Currently a national fibre-optic ring has gone online and has provided a solution to transform Kenya's economy from poor agriculture to high-tech economic innovator in sub-Saharan Africa and a major hub for ICT's in sub-Saharan Africa. Mobile phone ownership has increased rapidly, and far more people own phones than have computers. Kenya is a notable exception. Its good regulatory environment has led to competition and reduced the cost of mobile phone tariffs (Kimura, Omole, & Williams, M. 2010).

Ilahiane (2007) noted that mobile phones have revolutionised the way in which farmers' access, exchange and manipulate information. They have changed the way farmers interact with markets and cities because they enable farmers to extract current and relevant information critical for decision making. In a study carried out in Laikipia West, farmers found out that ICTs have the opportunity to access market information like prices of different items to enable them make informed decisions before venturing into the market. If farmers want to sell a product, such as beans, they can access the market prices in major towns using their mobile phones at the comfort of their homes. Kenya Agricultural Commodity Exchange (KACE) has developed a short messaging service- *SMS SOKONI* in partnership with mobile phone providers. Any farmer anywhere in the country can access updated and reliable market information on prices and commodity offers at an affordable rate using their mobile phones.

ICTs have changed the way people communicate and do business (Alonge, 2005; Hussein & Safa 2009). Lio and Liu (2006) and Rao (2008) noted that ICTs offer promising opportunities for dissemination of appropriate information and provision of services to the farmers. The accessibility of market and market information offered by ICTs leads to reduction in marketing costs, access to better markets and finally increase in income. Huyer and Sikoska, (2003) note that ICTs have potential to reshape, reorganize, and restructure working methods because of their inclusive advantages of efficiency, information sharing, storage, faster knowledge accumulation, dissemination which permit new and collaborative work methods.

Indeed, without local market information, farmers might be reluctant to take the costly trip to markets to sell their goods (Patel et al., 2010). In remote areas, farmers could gain rapid access to market and get information about prices and commodity availability. It also makes it possible to reach markets or buyers who would not be contacted without mobile phones (Wald & Koblo, 2008).

ICTs make it possible for convenient payment because services for receiving cash via mobile phone, such as M-PESA, which has more than 13 million users in Kenya make it easier for farmers to provide other services such as selling produce and arranging more convenient payments for produce. ICTs offer a possible solution by promoting an online market access portal known as *Sokopepe* which means the virtual marketplace (Muriithi, Eric, & Sarah, 2009), which can link farmers with the national market via mobile phones and the internet. This can help to better inform farmers about where and when to sell their produce. ICTs can aid in the advertisement of farm produce on online thus elimination of middlemen. Instead of product passing through the hands of multiple small traders, resulting in high unit transport cost, significant postharvest losses, and a high overall aggregate margin, the transaction costs is reduced (Dixie, 2007).

Using media such as the internet allows businesses to break through geographical barriers and promote products and services faster. Advertising a product on a website can extend an offer to potential customers in any part of the world (Hartline et al., 2012). Advertising products on a website could allow consumers to comment and offer valuable reviews of products and services. Additionally, emails, SMS and MMS allow businesses to send out custom-made multimedia messages or alerts to a target audience that can facilitate direct responses. In addition it exercises temporal and spatial arbitrage (Payne & McCarthy 2010). ICTs have bettered information exchange amongst farmers and improved farmers' ability to make decisions, develop ideas and consequently improve their livelihoods (Rathgeber & Adera, 2000; Bartholomew et al., 2009). However a great impediment to the use of ICTs such as computer by SMEs is the high cost of computer hardware and connectivity, unreliable network, lack of awareness and limited computer knowledge and skills (Minges, 2003; Kiveu, 2008). Rathgeber and Adera (2000) and Bartholomew et al., (2009) noted that although modern ICTs have enhanced information exchange amongst farmers and improved farmers' ability to make decisions, develop ideas and consequently improve their livelihoods through better marketing, its use in agricultural marketing still poses serious challenges and

low adoption. Thus there is urgency to establish the relationship between access to ICT resources and use of ICTs in marketing of farm produce by farmers in Manga the Sub-county.

In a study carried out in Zimbabwe, Gudza, (2010) notes that podcasting has been adopted as a media to disseminate agricultural information amongst rural farmers. This is an innovative way of using ICTs in disseminating information within areas that have limited road networks and poor communication infrastructure as the case in Kenyan rural areas. Podcasts are being used to distribute audio and video content particularly on the internet. In Kenya, the popular weekly program *Mali Shambani* (“wealth on the farm”) offers advice on various technical and financial issues. Listeners are invited to call or text the program with specific questions. Mbogo (2008) suggest that 80 percent of listeners claim to have learned something new from the program, and half said they had put advice into practice. A typical hour-long programme can attract up to 200 SMS messages, including contributions from neighboring Uganda and Tanzania. Local radio stations in Kenya are particularly well placed to develop programming to suit their audiences. When radio operates as a source of reliable information that works at the local level, it gives farmers an alternative to limited public agricultural extension services.

The use of ICT-based MIS facilitate the linkage of farmers to input and commodity markets (Aker, 2008; Chigona, Beukes, Vally & Tanner. 2009). The use of mobile phones and internet-based platform to improve small scale farmers’ access to input and output markets have been done in Kenya (Mbogo, 2008). The use of mobile phones has been found to reduce information asymmetries, enabling users to access arbitrage, marketing, or trade opportunities (Jensen, 2007). Bhavnani, Won-Wai-Chiu, Janakiram & Silarszky, (2008) attributed multiple benefits to the mobile phone. ICTs transforms traditional marketing and creates new markets in time, new products and services and information that did not previously exist (Hanna, 2010). ICTs can improve market access, communication with customers, competitive positioning, enable information acquisition and production of quality products, generation of market information, reduction in logistic costs, facilitating access to global markets, facilitating market research, networking, market transactions and market identification (Kiveu & Ofafa, 2013). Literature reviewed reveals that little has been done to determine the relationship between access to ICT resources and use of ICTs in marketing of farm produce by farmers.

2.7 Access to Extension Services and Use of ICTs in Marketing Farm Produce

As witnessed from different extension approaches, such as whole farm extension, integrated agricultural development and Training and Visit (T&V) approaches (GoK, 2007), there is a

gap in market information generation and dissemination. Enhancing communication and networking between farmers, agricultural extension agents and other stakeholders in agriculture can minimize this gap. Extension service play a key role in disseminating knowledge, technologies and agricultural information and in linking farmers to markets (GoK, 2010b). Use of ICTs in agricultural extension services especially mobile phone services in the agricultural sector has provided information on market, weather, transport and agricultural techniques to contact with concerned agencies and departments (Aker, 2011).

According to Muriithi, Eric, and Sarah, (2009), use of mobile phones is currently widespread in the rural areas of Kenya. Extension service providers have harnessed this technology by putting it into profitable use in rural Kenya. Zhou (2014) who noted that extension services from agricultural extension officers who provide need and demand based knowledge does not only impact positively on farmers' agronomic techniques and skills but also in dissemination of important technologies like ICT marketing.

Other socio-economic factors determining use of ICTs in marketing of farm produce include: age, attitudes, cultural beliefs, digital divide and farm size. The use of ICTs for agricultural marketing is greater among the younger farmers as this category of farmers are more literate and better able to use ICT (Okello, Ofwona-Adera & Mbatia, 2010). Attitude determines consumers' likelihood to adopt a particular product. Bauer, Barnes, Reinhardt and Neumann (2005) noted that the rural farmer's attitude toward adopting the ICTs depended on the acceptance toward technological application, mobile marketing in particular. A consumer is normally uncertain about the outcome of any action. This uncertainty causes perceived risks. The beliefs, attitude, and intention to use come in place when a user is presented with a new technology. These influence the user's decision regarding how and when they will use it (Davis, Foxall & Pallister, 2002).

According to Parayil (2005), the world today is divided not only by ideology, but also by technology. However, the reality of the Digital Divide, the gap between those who have access to and control of technology and those who do not means that the introduction and integration of ICTs at different levels and in marketing will be a most challenging undertaking. The digital divide is not merely a problem of access to ICTs, 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. Balanced growth is needed and deep structural problems must be solved to make ICT induced development more inclusive.

2.8 Theoretical Framework

The study employed the following theories: Technology acceptance model (TAM) and Diffusion innovation theory. The Technology Acceptance Model (TAM) is a theoretical model that explains how users come to accept/adopt and use a technology. Original TAM was proposed by Davis in 1989. The model suggests that when a user is presented with a new technology, a number of factors determine their decision regarding how and when they will use it. This includes its perceived usefulness and its perceived ease of use. However, the TAM does not account for the influence and personal control factors on behavior. Other factors such as economic factors, outside influences from suppliers, customers and competitors are also not considered by the TAM (Van Akkeren & Cavaye, 1999). This model adopts well established causal chain of “beliefs, attitude, intention, actual behavior”, which was developed from the theory of reasoned action by social psychologists. In Davis’s study, two important constructs are identified; perceived usefulness and perceived ease of use (Davis, Foxall and Pallister, 2002). These perceptions predict attitudes toward the system adoption. Then the attitude develops the intentions to use and the intentions cause actual system usage.

TAM was adopted and showed that it contributes to the prediction of individual usage of technology (Fishbein & Ajzen, 1989). TAM assumes that perceived usefulness the degree to which a farmer believes that using a particular ICTs would enhance his or her marketing and perceived ease of use the degree to which a farmer believes that using a particular ICTs would be free of effort with the influence of pre-existing external variables being the primary determinants for adoption of a new technology. Perceived ease of use has a direct effect on perceived usefulness and both determine the consumer's attitude toward use, which leads to behavioral intention to use the system and actual use of the system (Davis, Foxall, & Pallister, 2002).

According to Rogers (1995), the adopter’s experience with one innovation influences the individual’s perception of the next innovation in a technology cluster to diffuse through the individual’s system. Therefore, if an adopter has a negative first experience with one ICT application, he or she may regard all ICT applications through that perspective. The diffusion theory provided a framework that helped to understand why ICTs are adopted for marketing by some small scale farmers and not by others. Brychan (2003) observed that the diffusion theory can explain, predict, and account for the factors that increase or impede the diffusion of innovations.

2.9 Conceptual Framework

The conceptual framework depicts relationships among the variables in the study. On the basis of the technology acceptance theory, a farmer's attitude towards technology and actual use was determined by: external variables, perceived usefulness, and perceived ease of use. In this conceptual framework, the level of education of farmers, training of farmers in ICTs and the availability of ICT resources had a direct relationship with the use of ICTs in marketing farm produce. Availability of ICTs determined what the farmer chose from to use in marketing farm produce. Training of farmers determined the farmers' attitude towards use of ICTs and the ease with which he or she applied them in actual marketing. The level of education of the farmer determined an individual's perception of usefulness and the ease with which they used ICTs in marketing.

The conceptual framework in this study was based on the relationship between socio-economic factors and the use of ICTs in marketing of farm produce. The independent variables that determine the use of ICTs in marketing farm produce included: level of education of farmers, training of farmers in ICTs, access to ICT resources and access to extension services. The decision of farmers' to invest in ICT resources would lead to use of ICTs in marketing of farm produce which would consequently lead to access to markets and market information. The extraneous variables such as age, cultural beliefs and attitudes towards ICTs were controlled in the study. The researcher ensured that the sampled farmers were homogenous with respect to the extraneous variables in order to control their influence (Kothari, 2008).

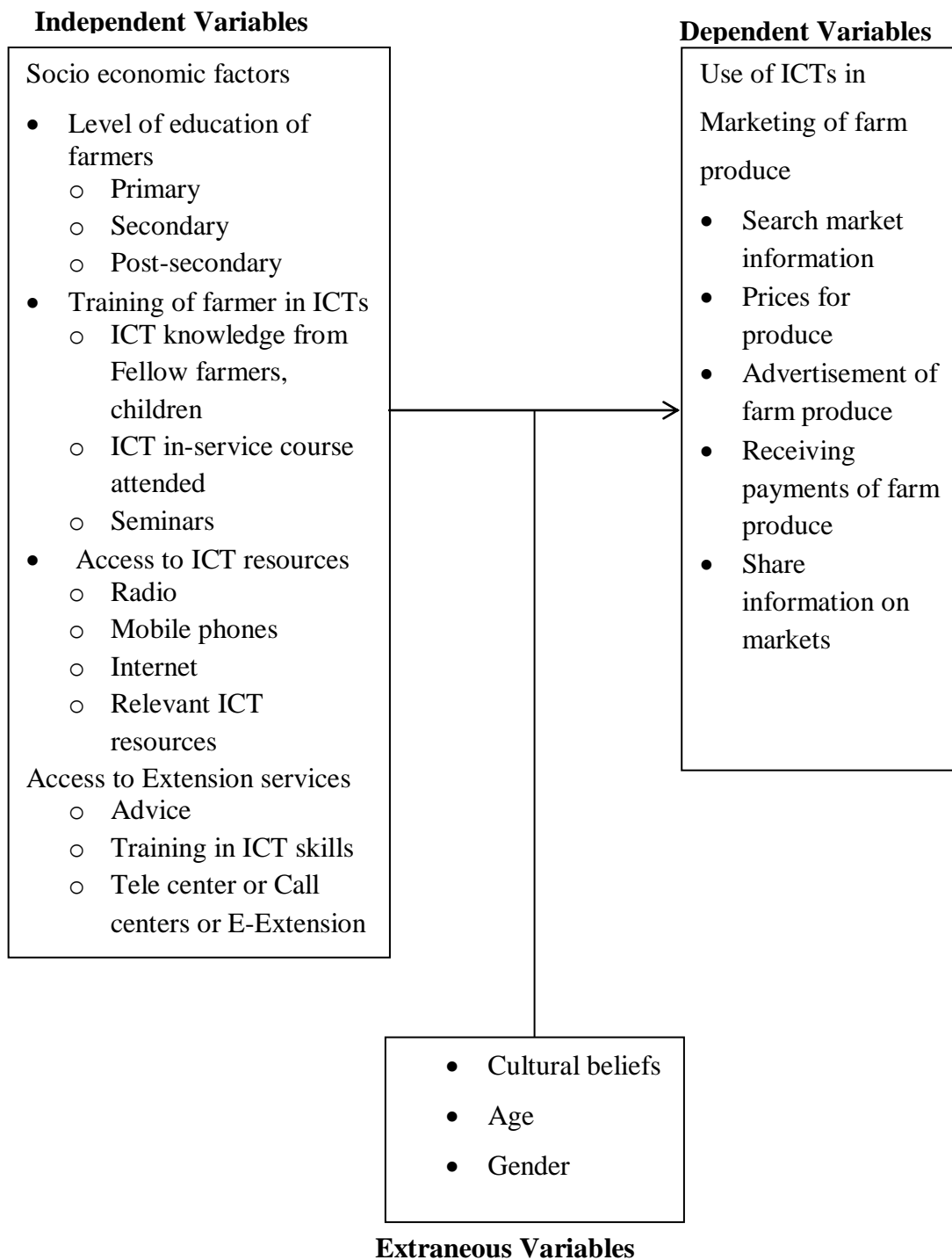


Figure 1: Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section outlines the methodology that was used to attain the objectives of the study. It presents the research design, the location of the study, the population of the study, sampling procedures, instrumentation, validity, and reliability of the instrument, data collection, and analysis.

3.2 Research Design

The study used a descriptive survey research design. It was considered appropriate because it facilitates the collection of data through direct enquiries and observations. It allows researchers to gather information, summarize, present, and interpret for purposes of clarification (Orodho, 2005). Descriptive survey is suitable for collecting data that describes specific characteristics of a phenomenon for the purpose of reporting things the way they are (Ogula, 1998). The study used this design to elicit information on the relationship between socio-economic factors and the use of ICTs in marketing of farm produce by farmers in Manga Sub-County.

3.3 Location of the Study

The study was conducted in Manga Sub-County which is one of the Sub-Counties in Nyamira County. The Sub-County was established in 2007 and it has three administrative wards namely: Manga, Kemera and Magombo. It was demarcated from the now Masaba South Sub-County. The Sub-County has one constituency; Kitutu Masaba which extends into the neighbouring Masaba Sub-County. The major enterprises in the Sub-County include tea, coffee, maize, dairy, and horticulture. According to the Manga Sub-County Ministry of Agriculture statistics, (2014), the Sub-County has 11,040 households taken as farmers involved in agricultural production and marketing. The Sub-County was chosen for this study because it has a large number of farmers deriving their livelihood from all types' agricultural production and in each household there is at least one ICT resource such as the radio, mobile phones and Television.

3.4 Population of the Study

The target population for this study consisted of all farmers in Manga Sub-County, which comprised of 11,040 farmers (Manga Sub-County Ministry of Agriculture Agribusiness Annual Report, 2014). Farmers are sellers of their produce thus can be involved in the use of

ICTs marketing of farm produce. Their attitudes and perceptions influence the use of ICTs in marketing.

3.5 Sampling Procedure and Sample Size

A sampling design is a definite plan for obtaining a sample from a given population. The preliminary stage of the study was identification of 11,040 farmers in Manga Sub-County who are involved in farming with at least one ICT resource was used to develop a sampling frame. Manga Sub-County is divided into three main administrative wards. Being a descriptive survey all the three wards were included in the study. The sampling distribution formula as proposed in Nassiuma, (2000) was used to come up with a sample size of 109 for the study.

$$n = \frac{NC^2}{C^2 + (N - 1) e^2}$$

Where: n = Sample size,

N = Population,

C = Coefficient of variation,

e = Standard error.

The sample was obtained using coefficient of variation. Nassiuma, (2000) asserts that in most surveys or experiments, a coefficient of variation in the range of $21\% \leq C \leq 30\%$ and a standard error in the range $2\% \leq e \leq 5\%$ is usually acceptable. Therefore a coefficient variation of 21% and a standard error of 2% were preferred for this study. The lower limit for coefficient of variation and standard error was selected so as to ensure low variability in the sample and minimize the degree of error.

$$n = \frac{11,040 \times (0.21)^2}{(0.21)^2 + (11,040 - 1) (0.02)^2} = 109$$

For this study N = 11,040 farmers in the Sub-county, C = 21% and e = 0.02.

A proportionate stratified random sampling was used to obtain the sample from different wards (strata) in the sub-county. The method was used to ensure each ward and thus agro ecological zones were represented. The subject of analysis was the household head. A list of farmers was developed from the three wards which formed the respective sampling frames.

Table 1 shows the target population and the percentage proportion for each ward in Manga Sub-County. It also shows the calculated sample size for each ward and the total sample size for the study.

Table 1
Small Scale Farmer Population and Sample Size

Ward	Population	Sample size
Manga	3950	39
Kemera	3687	37
Magombo	3403	33
Total	11,040	109

Source: Ministry of Agriculture Manga Sub-county Agribusiness Annual Report, 2014 P.2

3.6 Instrumentation

The instrument used in this study was a questionnaire containing structured and closed ended questions (Appendix C). The questionnaire was developed so as to contain all the items that helped in achieving the objectives of the research. The questionnaire was used to collect information about the farmer's gender, level of education, farmers training to use ICTs, availability of ICT resources and extension services in relation to use of ICTs in marketing of farm produce.

3.6.1 Validity

During the study, correct sampling was done to allow generalization of other people, times and contexts and hence give it external validity. The instrument was validated in consultation with the professionals in the Department of Agricultural Education of Egerton University to assess the content and face validity. Content validity, measures the degree to which the instrument items represent the domain (Mugenda & Mugenda, 2003). In order to determine the content validity of a measuring instrument, items were chosen from the content that accurately represented the information in all areas. Comments and suggestions from peers and experts were incorporated to improve the quality of the instruments to ensure the results and inferences of the study are accurate and meaningful. Face validity was enhanced by subjecting the instrument and objectives of the study to scrutiny by two professionals and

their comments incorporated into the instrument before being used in the field. This ensured that the items were clear, concise, complete, comprehensive and unambiguous.

3.6.2 Reliability

According to Mugenda and Mugenda, (2003), reliability is the measure to which an instrument yields consistent results over repeated trials. Reliability of the questionnaire used in this study was determined by pre-testing 30 farmers in the neighbouring Kiogoro Ward with similar characteristics as the study area. The instrument used in this study was considered reliable and acceptable as it achieved a reliability co-efficiency of 0.896 using Cronbach alpha scale (Kothari, 2004). The purpose of piloting was to detect possible flaws in the measurement procedure, to identify ambiguously formulated items and to identify non-verbal behaviour in the subjects that may signify discomfort about the wordings of the questions. According to Fraenkel and Wallen (2000), a reliability of 0.70 or higher is preferable for research purposes. Also a reliability coefficient of 0.7 or above as suggested by (Nunnally, 1978) would make the instrument reliable and acceptable for a study in Social sciences.

3.7 Data Collection

Once the research proposal was approved, a letter of authorization (Appendix E) to conduct research was obtained from Board of Post Graduate Studies to facilitate the acquisition of a research permit from the National Commission for Science, Research, Technology and Innovations (NACOSTI) (Appendix D). Once permit to conduct research was granted, permission to carry out research was sought from Manga Sub-county Agricultural Officer. Primary data were collected through questionnaire. Information on socio-economic characteristics of farmers, training of farmers to use ICTs, access to ICT resources and access to extension services in relation to use of ICTs in marketing farm produce was collected using questionnaires. The farmers involved in the study were visited in their farms and given the questionnaire to respond to. Once the farmer completed the questionnaire, it was collected on the spot to ensure high response rate. In an event that the farmer was illiterate and failed to respond to the questionnaire the researcher interpreted and guided the farmer to fill it.

3.8 Data Analysis

Once the measuring instrument was administered, the raw data was systematically organized through coding to facilitate analysis. Quantitative methods of data analysis were used with both descriptive as well as inferential statistics being used to analyse the results of the study. Descriptive statistics helped the researcher to meaningfully describe the population of study

and enable the categorization of the farmers based on socio-economic characteristics, while inferential statistics were deemed appropriate, because they enabled the researcher to make inferences about a population based on the results of a representative sample (Mugenda & Mugenda, 2003). This helped the researcher to generalize the findings of a study to the population. The descriptive statistics used were the frequency and percentages while and inferential statistics was the Pearson's correlation coefficient. Pearson's correlation coefficient is deemed appropriate in this case because it is a technique for investigating the relationship between two quantitative, continuous variables. It is a measure of the type and strength of the association between the two variables. All tests of significance were computed at $\alpha = 0.05$. The statistical package for social science version 22.0 was used to aid in data analysis.

Table 2**Summary of Data Analysis**

Hypotheses	Independent Variable	Dependent Variable	Statistical Procedures
H0 ₁ : There is no statistically significant relationship between the level of education of farmers and use of ICTs in marketing of farm produce.	Level of education of farmers <ul style="list-style-type: none"> • Primary • Secondary • Post-secondary 	Use of ICT Marketing <ul style="list-style-type: none"> • Search markets • Price information • Advertisement • Receiving payments 	Percentages Frequency Pearson's correlation coefficient
H0 ₂ : There is no statistically significant relationship between training of farmers in ICTs and use of ICTs in marketing of farm produce.	Training of farmers on use of ICTs <ul style="list-style-type: none"> • Fellow farmer • ICT in-service course • Children 	Use of ICT Marketing <ul style="list-style-type: none"> • Search markets • Price information • Advertisement • Receiving payments 	Percentages Frequency Pearson's correlation coefficient
H0 ₃ : There is no statistically significant relationship between access to ICT resources and use of ICTs in marketing of farm produce.	Access to ICT Resources <ul style="list-style-type: none"> • Radio • Mobile phone • Internet 	Use of ICT Marketing <ul style="list-style-type: none"> • Search markets • Price information • Advertisement • Receiving payments 	Percentages Frequency Pearson's correlation coefficient
H0 ₄ : There is no statistically significant relationship between access to extension services and use of ICTs in marketing of farm produce.	Access to Extension services <ul style="list-style-type: none"> • Advice • Training in ICTs • Tele center or Call centers. 	Use of ICT Marketing <ul style="list-style-type: none"> • Search market information • Price information • Advertisement • Receiving payments 	Percentages Frequency Pearson's correlation coefficient

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussion on the socio economic characteristics of farmers, level of education of farmers and use of ICTs in marketing farm produce, training farmers in ICTs and use of ICTs in marketing farm produce, access to ICT resources and use of ICTs in marketing farm produce and access to extension services and use of ICTs in marketing farm produce.

The responses from the farmers were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0 for Windows. The study was guided by the following objectives:

- i. To document the socio economic characteristics of farmers in Manga Sub County.
- ii. To determine the relationship between level of education of farmers and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- iii. To establish the relationship between training farmers in ICTs and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- iv. To establish the relationship between access to ICT resources and use of ICTs in marketing farm produce by farmers in Manga Sub-County.
- v. To determine the relationship between access to extension services and the use of ICTs in marketing farm produce by farmers in Manga Sub-County.

A total of 109 questionnaires were distributed as per the sampling techniques used in the study. All 109 questionnaires were collected from the farmers making return rate of 100.0% which the study found to be significant enough in achieving its objectives.

4.2 Socio-economic Characteristics of Farmers

The first objective was:

To document socio economic characteristics of farmers in Manga Sub County

The study gathered information on a variety of farmers' attributes. These attributes encompassed the gender, age, primary occupation, level of education, main crop grown, types of livestock, involvement in marketing and experience in the marketing of farm produce. These characteristics are crucial in understanding the nature of farming in the area as well as the use of ICTs in marketing of farm produce.

4.2.1 Gender of the Farmers

The study was interested in gender as farming presents equal opportunities to both male and female farmers in marketing farm produce by use of ICTs. Likewise, gender represents differences in market orientation between male and female heads of households. The results of gender is shown in figure 2.

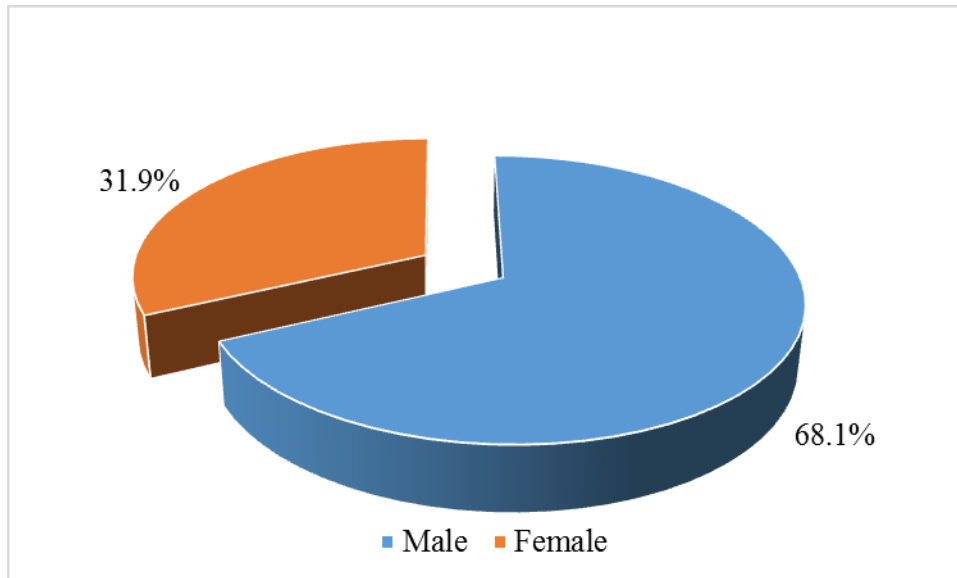


Figure 2: Gender of the Farmers

The study established that 68.1% of the farmers were male as compared to 31.9% female. This implies that most farming related decisions such as what to produce, how to produce and how to market the surplus produce could be dominated by male. These results agree with World Bank Report (1996) that noted that although women play a crucial productive role, their involvement in decision making within the agricultural sector is often low. Equal opportunities should be opened up for women to make decisions in farming and marketing. The findings are in line with Quisumbing, (2003), who noted that in most African societies men make decisions as women's voices are often muted in family or community decision making. The results also agree with Reyes, Donovan, Bernsten and Maredia, (2012) whose study revealed that male-headed households were richer than their counterparts and more likely to sell farm produce, owning productive assets and have access to extension services. Females become household heads in the absence of an adult male considered capable of being the household head (Abatania, Gyasi, Terbobri & Salifu, 1999). This explains the large representation of male heads in the sample.

4.2.2 Age of the Farmers

The study was interested in the age distribution of the farmers in the study area, as it is the primary latent characteristic in the adoption decision. The age of the farmer is crucial for his or her decision making in determining what to farm as well as how to market the surplus produce. Hemmer and Heinzl, (2012) established that the information seeker's dispositional personality traits such as age and gender have an influence on the selection and use of appropriate information channel. The age brackets of farmers that were sampled are shown in Table 3.

Table 3
Age of the Farmers in Years

Age Bracket	Frequency	Percentage
20-29 years	23	21.2%
30-39 years	38	34.8%
40-49 years	16	14.7%
50-59 years	16	14.7%
60-69 years	8	7.3%
70 years and above	8	7.3%
Total	109	100.0%

The findings in table 3 indicate that 34.8% of the farmers were aged between 30 and 39 years. This was closely followed by 21.2% of the farmers aged between 20 and 29 years. Of 14.7% of the farmers were aged 40 and 49 years with a similar proportion aged 50 – 59 years. And 7.3% of farmers were in the 60 and 69 years and a similar proportion in the 70 years and above bracket. The fact that farmers are in their middle ages implies not only a possibility of better farming with a better impact on the economy of the Manga Sub-county but also a possibility of better adoption of ICTs in marketing of farm produce. In the analysis of the determinants of intensity of participation in ICT marketing of banana among smallholder farmers in Kenya, Fischer and Qaim (2014) noted that the quantity sold was significantly influenced by age. The finding indicates that the use of ICTs in marketing farm produce is greater among the younger farmers which corroborates the findings of past studies suggesting that this category of farmers are more literate and better able to use ICT (Okello, Ofwona-Adera & Mbatia, 2010).

4.2.3 Primary Occupation

The study was interested in the farmers' primary occupation because the likelihood of using ICTs in marketing farm produce is higher among farmers that practice farming as a primary occupation than their counterparts probably because farmers who engage in farming full time are more likely to produce more and hence will need to seek input and output information from multiple sources using multiple strategies including ICTs. Table 4 provides this information.

Table 4
Farmers' Primary Occupation

Occupation	Frequency	Percentage
Farming	59	54.1 %
Public Service	15	13.8 %
Business	33	30.3 %
Student	2	1.8 %
Total	109	100%

These results in table 4 imply that 54.1% of farmers in the study area had farming as their primary occupation. The results are consistent with Jari and Fraser (2009), GoK (2010), Salami, Brioxiova, and Kamara, (2010) and Methenge, Place, Olwande and Mithoefer, (2010) who noted the immense popularity of farming occupation by Kenyans with majority of them living in the rural areas and deriving their livelihoods from agricultural activities. Hence making the development of the agricultural sector to be crucial to the sub county's overall economic performance. Other farmers were diversified and this decision may have been influenced by the need to reduce the risks inherent in agriculture. Ellis (2000), and Kimura, Omole, and Williams, (2010) noted that the need to reduce agricultural risks often result to coping strategies that incorporates diversification.

4.2.4 Types of Crops Grown by Farmers in the Study Area

The study was also interested in crops grown by farmers as this forms the bulk of the farm produce that can be marketed using ICTs by farmers in Manga Sub-County besides livestock production. The different types of crops grown in the study area as shown in Table 5.

Table 5
Types of Crops Grown by Farmers in the Study Area

Types of Crops	Frequency	Percentage
Tea	25	22.9 %
Bananas	21	19.2 %
Maize	15	13.8 %
Sugarcane	12	11.0%
Trees	9	8.3 %
Coffee	8	7.4 %
Passion	3	2.8 %
Beans	3	2.8 %
Avocadoes	3	2.8 %
Nappier grass	2	1.8 %
Wheat	2	1.8 %
Pineapple	1	0.9 %
Kales	1	0.9 %
Tomatoes	1	0.9 %
Millet	1	0.9 %
Carrots	1	0.9 %
Cabbages	1	0.9 %
Total	109	100 %

These findings agree with Obasi, (2007), who noted that small land holdings invariably lead to more intensive land use systems. As a result, several types of crops are grown in the study area as food and/or cash crops. Marketing of most crops is personalized except tea and coffee sold through factories. The implication that ICT marketing may be adequately exploited by the farmers in the study area.

4.2.5 Types of Livestock Enterprises by Farmers in the Study Area

The study was interested in livestock enterprises, this offer significant avenue for marketing a number of livestock produce using ICTs in Manga Sub-County besides crop production. This is shown in table 6.

Table 6**Livestock Enterprises Reared by Farmers in the Study Area**

Types of Livestock	Frequency	Percentage
Poultry	49	44.9 %
Cattle	41	37.6 %
Bees	8	7.3 %
Sheep	4	3.7 %
Goats	3	2.8 %
Fish	3	2.8 %
Rabbit	1	0.9 %
Total	109	100%

The findings agrees with Barrett, (2007) who noted that the value of most livestock and associated products is often high and present a better chance of marketing as compared to crop commodities and products in most rural areas in Eastern and Southern Africa. This therefore means that, if adopted, use of ICTs marketing strategy could benefit farmers in the study area from higher value of livestock commodities.

4.2.6 Involvement in Marketing of Farm Produce

Involvement of farmers in marketing of farm produce is critical, it requires successful marketing, up-to-date information on prices, and advertisement of farm produce thus opening up possibility for use of ICTs in marketing farm produce. This is as shown in Figure 3.

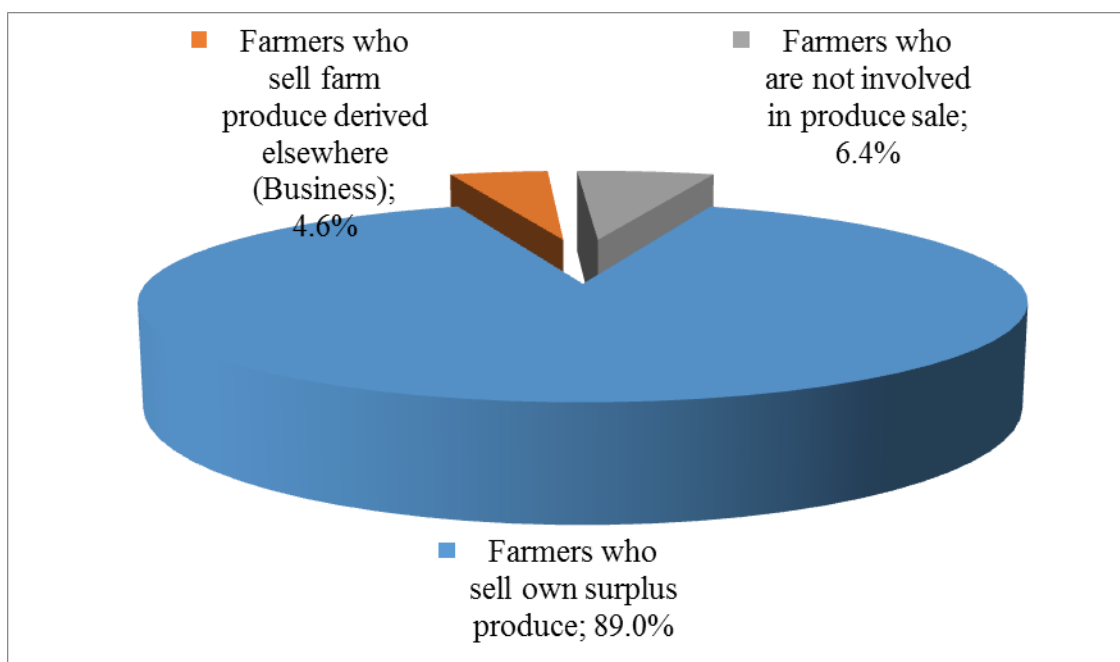


Figure 3: Farmers’ Involvement in Marketing of Farm Produce

The results are in line with Munyua and Stilwell, (2009) who established that of the farmers in Kenya, 80% are small holders, who produce for subsistence and for sale. The results also agree with Ngqangweni, (2000) who showed that participation of farmers in agricultural marketing is very important because they derive income and rural employment from farming. Producers’ participation in marketing helps in transition from subsistence farming to commercial farming. This means that farmers that participate more in selling their produce are more likely to advance from lower scale of production to larger scale of production (Makhura, 2001). Commercialization provides an incentive for increased production and thus improves the welfare of farmers. Jari (2009) noted that farmer market participation is very important for sustainable economic growth and poverty alleviation.

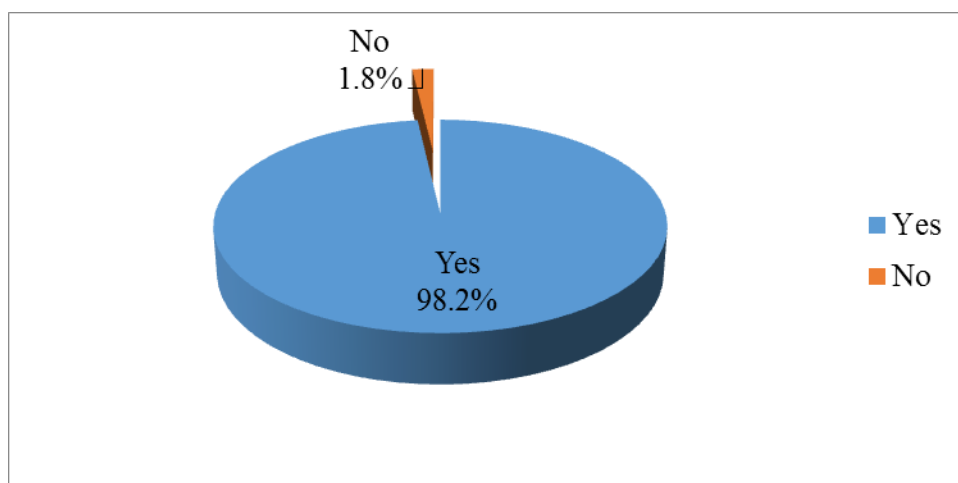
The study was interested in experience in marketing of farm produce since it had an implication of farmer’s knowledge on matters related integration of ICTs in marketing of farm produce. The results are summarized in Table 7.

Table 7**Experience in Marketing of Farm Produce in Years**

Experience	Frequency	Percentage
1-4 years	33	30.3%
5-9 years	22	20.2%
10-14 years	19	17.4%
15-19 years	18	16.5%
20 years and above	17	15.6%
Total	109	100.0%

4.2.7 Access to ICT Resources

The study was interested in the access of ICT resources because they make it easy and convenient for farmers to use ICTs in marketing farm produce in Manga Sub-county. Accessibility of ICT resources was determined and presented in Figure 4.

**Figure 4: Access to ICT resources.**

The high percentage of ICT resources could be attributed to affordability, ease of use, a reliable network and the recent advancement of IT infrastructure in the Sub-county. According to the quarterly sector statistics report by the Communication Authority of Kenya (CAK), at the end of the first quarter of the year 2016, mobile penetration in Kenya stood at 88.1% with 37.8 million subscribers up from 36.1 million in the previous quarter (Communication Authority of Kenya, 2016).

The study was interested in the accessibility to ICT resources used in marketing farm produce. This is because they were used to obtain accurate and timely market information in ICT marketing. This is shown in Table 8.

Table 8

Access to ICT Resources for Marketing Farm Produce by Farmers

ICTs	Percentage Accessibility	Percentage Inaccessibility	Totals
Radio	88.1%	11.9%	100.0
Mobile Phone	86.2%	13.8%	100.0
TV	46.8%	53.2%	100.0
Internet Services	23.9%	76.1%	100.0
Computer	15.6%	84.4%	100.0

The high representation of farmers using radios could be attributed to their relative lower cost of purchase and maintenance. The results are consistent with Ilahiane, (2007), who noted that the popularity of use of mobile phones could be attributed to their relative convenience and importance in the relaying of verbal information. The results also agree with Munyua, (2007), who observed that the conventional ICT-based technologies, namely radio and television are also being used. Likewise the results agree with Andrew & Shepherd, (1997), who noted that modern communications technologies open up the possibility for market information services to improve information delivery through SMS on cell phones and the rapid growth of FM radio stations in many developing countries offers the possibility of more localised information services. There are relatively few internet resource centres and cyber cafés in the study area and this may contribute to the low use of internet services by the farmers. In the longer run, the internet may become an effective way of delivering information to farmers. On the other hand, computers are not only expensive to purchase and maintain, but require electricity for their running which could be a great challenge to the farmers in the study area.

4.2.8 Ways ICTs are used in Marketing Farm Produce

The study was interested in ways in which ICTs were used in marketing of farm produce because ICTs offer promising opportunities for dissemination of appropriate market information and provision of services to the farmers. This shown in Table 9.

Table 9**Ways ICTs used in Marketing Farm Produce**

ICTs use in marketing	Not				Very		Total	Mean	Std. Dev
	at all	Low	Moderate	High	high	high			
Search for markets	9.0%	23.0%	63.0%	5.0%	0.0%	100.0	3.84	1.03	
Receiving payments	11.0%	23.0%	58.0%	6.0%	2.0%	100.0	3.77	1.91	
Inquiry of prices	4.0%	27.0%	49.0%	19.0%	1.0%	100.0	2.96	1.20	
Advertising produces	31.0%	69.0%	0.0%	0.0%	0.0%	100.0	1.32	0.48	

The results in Table 9 shows that farmers were using ICTs in marketing farm produce. The results agree with Kiveu and Ofafa, 2013 who noted that ICTs can improve market access by facilitating communication with customers, competitive positioning, enable information acquisition and production of quality products, generation of market information, reduction in logistic costs, facilitating access to global markets, facilitating market research, networking, market transactions and market identification.

The study was interested in ICT-based marketing services from service providers in the study area. This provide an opportunity for marketing farm produce. This is revealed in Table 10.

Table 10**Access to ICT-Based Services from Service Providers to Farmers**

ICT-Based marketing services	Not				Very		Total	Mean	Std. Dev
	at all	Low	Moderate	High	high	high			
<i>M-Pesa</i> services	10.1%	6.4%	19.3%	36.7%	27.5%	100	3.651	1.235	
Mobile banking	65.1%	18.3%	15.6%	0.9%	0%	100	1.523	0.789	
Use OLX services	92.7%	1.8%	2.8%	2.8%	0%	100	1.156	0.596	
Use Mkesho	89.9%	7.3%	1.8%	0.9%	0%	100	1.138	0.461	
Texting(sms)	25.7%	10.1%	29.4%	18.3%	16.5%	100	2.899	1.407	
Extension services	71.6%	9.2%	12.8%	1.8%	4.6%	100	1.587	1.082	

According to Munyua (2008), *Safaricom* dominates the Kenya's mobile phones services with notable monopoly in *MPESA*, texting and voice services. *MPESA* has transformed lives in Kenya, socio-economically, especially to the rural poor who can receive small amounts of money from their relatives working in urban areas to invest in their farms. This flow of

financing makes a huge difference since the farmer can liaise with market operators' kilometers away making business flow much faster and smoother.

4.2.9 Frequency of Use of ICTs in Marketing Farm Produce

The study was interested in the frequency of use of ICTs in marketing of farm produce in the study area as this increases the potential of incorporating ICTs in marketing farm produce. This is summarized in Table 11.

Table 11
Frequency of Use of ICTs in Marketing Farm Produce

Responses	Frequency	Percent	Cumulative Percent
Not at all	20	18.3%	18.3%
Low	23	21.1%	39.4%
Moderate	45	41.3%	80.7%
High	20	18.3%	99.1%
Very high	1	0.9%	100.0
Total	109	100.0%	

The results agree with Adhiguru and Mruthyunjaya, (2004), who noted that in the recent years it has become clear that ICTs can play a great role in agriculture production and marketing system and consequently, emphasis is being laid for rapid adoption of these technologies both by public sector and private sector extension agencies, at various levels. Likewise, these results are consistent with Rathgeber and Adera (2000) and Bartholomew et al., (2009) who noted that although modern ICTs have enhanced information exchange amongst farmers and improved farmers' ability to make decisions, develop ideas and hence improve their livelihoods through better marketing, its use in agricultural marketing still poses serious challenges and low adoption. Those farmers who were not using ICTs in marketing of farm produce provided a number of reasons as shown in Table12.

Table 12
Reasons for Not Using ICTs

Reason	Frequency	Percentage
Never heard about it	2	10%
ICTs expensive	7	35%
Lack of exposure	6	30%
Lack of interest	2	10%
Old age	3	15%
Totals	20	100.0%

The results in table 12 are consistent with Patrick and Rosemary (2006) who noted that lack of exposure to ICT gadgets contributes to lack of use and eventually poor utilization of the gadgets in marketing in Kenya. The findings also agree with Chowdhury (2006), who noted that the high cost of ICT gadgets significantly reduce the ability of farmers to access their services and impairs the economic performance of small and medium scale enterprises in East Africa. The results are consistent with Huyer and Sikoska, (2003) who noted that although ICTs have the immense potential to reshape, reorganize, and restructure marketing of farm produce in Kenya, its potential has not been adequately utilized.

The study was also interested in some of the challenges that farmers encountered in their use of ICTs in marketing farm produce in the study area as addressing them would facilitate use of ICTs in marketing. The challenges are shown in Table 13.

Table 13
Challenges in Using ICTs in Marketing Farm Produce

	Not at all	Low	Moderate	High	Very high	Total	Mean	Std. Dev
Lack of electricity	2.8%	3.7%	15.6%	19.3%	58.7%	100	4.275	1.035
Problematic internet	2.8%	10.1%	12.8%	25.7%	48.6%	100	4.073	1.128
Inadequate extension	1.8%	10.1%	20.2%	14.7%	53.2%	100	4.073	1.144
Lack of ICT resources	7.3%	19.3%	32.1%	14.7%	26.6%	100	3.339	1.264
Lack of motivation	7.3%	17.4%	39.4%	17.4%	18.3%	100	3.220	1.158
Lack of awareness	15.6%	15.6%	26.6%	24.8%	17.4%	100	3.128	1.313
Negative attitude	13.8%	17.4%	30.3%	21.1%	17.4%	100	3.110	1.279

The results in Table 13 agree with the Government of Kenya, (2014) that indicated in its 2013 Economic Survey that most Kenyans still do not have access to electricity; a reason that significantly affect the use of ICTs such as mobile phones and computers that could play a great role in marketing of farm produce in rural areas. The inability of investor to establish ICT resource centres due to lack of electricity and consequently inaccessible internet/connectivity to most Kenyans also significantly impairs the likelihood of use of ICTs in marketing of farm produce; especially in rural areas. In addition, the study agrees with Omiti, Nyanamba and McCullouh, (2009) who indicated that inadequate services from extension officers negatively affect the use of ICTs in marketing of agricultural produce. The results also agree with Rathgeber and Adera (2000) and Bartholomew et al, (2009) who noted that although ICTs have enhanced information exchange amongst farmers and improved farmers' ability to make decisions, develop ideas and consequently improve their livelihoods through better marketing, its use in agricultural marketing still poses serious challenges.

The study also had an interest in suggested solutions to challenges that hinder farmers from using ICTs in marketing of farm produce in the study area in order to improve the farmers' use of ICTs in marketing. The proposed solutions by the farmers are shown in Table 14.

Table 14
Suggested Solutions for Improving Farmers' Use of ICTs in Marketing

Solutions	Frequency	Percentage
More awareness	47	43.2 %
Provision of electricity	20	18.4 %
Subsidize ICT resources	17	15.6%
Improved extension services	13	11.9%
Financial incentives	4	3.7%
Inexpensive internet connectivity	2	1.8%
Improved extension farmer ratio	2	1.8%
Provision of ICT resources to farmers	2	1.8%
More training centres	1	0.9 %
Community ICT resource by CDF funds	1	0.9%
Total	109	100%

4.3 Level of Education of Farmers and the Use of ICTs in Marketing Farm Produce

The second objective of the study was:

To determine the relationship between the level of education of farmers and the use of ICTs in marketing farm produce in Manga Sub-County

Levels of education of farmers were determined and the results are presented in Table 15.

Table 15

Farmers' Level of Education

Highest Level of Education	Frequency	Percentage
No formal education	10	9.2%
Primary	25	22.9%
Secondary	34	31.2%
Post-Secondary Education	40	36.7%
Total	109	100.0%

The results in Table 15 shows that 67.9% of farmers had secondary and post-secondary level of education. The high representation of farmers with secondary and post-secondary education could be attributed to farming being a lucrative business and these farmers have the skills required to integrate ICTs in marketing. It could, also, be high due to the majority of the youths in the Sub-County having tertiary education (Government of Kenya, 2010a). These results are consistent with Norris and Batie, (1987), who argued that farmers with more education are more likely to have enhanced access to technological information than less educated farmers. Likewise Igoden *et al.*, (1990) and Lin, (1991) too observed a positive relationship between the education level of the household head and the adoption level of improved technologies. The result, also, agree with Litondo and Ntale (2013) who noted that education level is the main determinant of mobile phone usage for business and also influences strategic choices.

4.3.1 Test of Hypothesis $H0_1$

Based on objective two of the study, the following hypothesis was generated:

$H0_1$: There is no statistically significant relationship between the level of education of farmers and the use of ICTs in marketing of farm produce by farmers in Manga Sub-County

The hypothesis was tested using Pearson’s correlation coefficient. The results of Pearson’s correlation coefficient analysis of the relationship between level of education of farmers and use of ICTs in marketing of farm produce are shown in Table 16.

Table 16
Relationship between Level of Education of Farmers and use of ICTs in Marketing of Farm Produce by Farmers

		Use of ICTs in marketing	Highest Level of Education
Use of ICTs in marketing	Pearson Correlation	1	.256**
	Sig. (2-tailed)		.007
	n	109	109
Highest Level of Education	Pearson Correlation	.256**	1
	Sig. (2-tailed)	.007	
	n	109	109

** . Correlation is significant at the 0.01 level (2-tailed).

On testing the relationship between the level of education of farmers and the use of ICTs in marketing farm produce by farmers, a Pearson’s Correlation coefficient of 0.256 with a P-value of 0.007 was obtained. Since a level of $P \leq 0.05$ significance level was adopted, the results of the study indicate that there is significant relationship between level of education of farmers and use of ICTs in marketing farm produce by farmers. The null hypothesis was rejected. Thus the level of education has a strong relationship with the use of ICTs in marketing farm produce by farmers in Manga Sub-County.

The study also made effort to determine the farmers’ perception on the influence of education on the use of ICTs in marketing of farm produce. The results are summarized in Table 17.

Table 17**Effects of Level of Education on the use of ICTs in Marketing Farm Produce**

Level of education on use of ICTs	SD	D	U	A	SA	Totals
Search for markets of farm produce	2	8	5	62	23	100
Receiving payments on sale of produce	5	13	13	54	15	100
Inquiry of prices for farm produce	8	16	22	45	9	100
Advertisement of farm produce	8	15	27	42	8	100

The results in Table 17 agree with Olwande et al., (2009) who carried out a study on agricultural technology adoption (including modern marketing) and observed that the farmers' level of education was one of the strongest determinants of intensity of adoption. The results also agrees with, Mburu et al., (2007) who noted that education level of the farmers was a significant factor that influences the farmers' adoption of various milk marketing methods in Kenya Highlands.

4.4 Training Farmers in ICTs and use of ICTs in Marketing Farm Produce

The third objective of the study was:

To establish the relationship between training of farmers in ICTs and use of ICTs in marketing farm produce by farmers in Manga Sub-County

How farmers got training in ICTs in marketing, was determined and the results are presented in Table 18.

Table 18**Training of farmers in ICTs**

Training	Frequency	Percentage
Fellow farmer	56	51.4%
Children	25	22.9%
Seminars	13	11.9%
Chiefs baraza	6	5.5%
Extension officers	4	3.7%
Magazines and news papers	3	2.8%
Higher learning institution	2	1.8%
Total	109	100%

The results are consistent with Kindness and Gordon, (2001), who noted that rural farmers mainly get market information from their fellow farmers via word of mouth, the radio and through occasional meetings with extension agents and village leaders; they sometimes get information from magazines and newspapers (Manda, 2002). The results are also in line with Litondo and Ntale, (2013) who stipulated that the neighbours' education level has a significant effect on the mobile usage in business. The findings agree with Aina, (2007) who observed that farmers don't interact with extension workers very much as there are few of them and they are mainly concentrated in urban areas.

4.4.1 Test of Hypothesis H0₂

Based on objective three of the study, the following hypothesis was generated:

H0₂: There is no statistically significant relationship between training farmers in ICTs and use of ICTs in marketing of farm produce by farmers in Manga Sub-County

Table 19
Relationship between Training Farmers in ICTs and use of ICTs in Marketing of Farm Produce by Farmers

		Use of ICTs in marketing	Training farmers in ICTs
Use of ICTs in marketing	Pearson Correlation	1	.250**
	Sig. (2-tailed)		.006
	n	109	109
Training farmers in ICTs	Pearson Correlation	.250**	1
	Sig. (2-tailed)	.006	
	n	109	109

** . Correlation is significant at the 0.01 level (2-tailed).

On testing the relationship between training farmers in ICTs and the use of ICTs in marketing farm produce by farmers, a Pearson's Correlation coefficient of 0.250 with a P-value of 0.006 was obtained. Since a level of $P \leq 0.05$ significance level was adopted, the results of the study indicate that there is significant relationship between training farmers in ICTs and use of ICTs in marketing farm produce. The null hypothesis was rejected. Thus training farmers in ICTs has a strong relationship with the use of ICTs in marketing farm produce in Manga Sub-county.

4.5 Access to ICT Resources and Use of ICTs in Marketing Farm Produce

The fourth objective of the study was:

To establish the relationship between access to ICT resources and use of ICTs in marketing farm produce by farmers in Manga Sub-county

Access to ICT Resources was determined the results are presented Figure 5

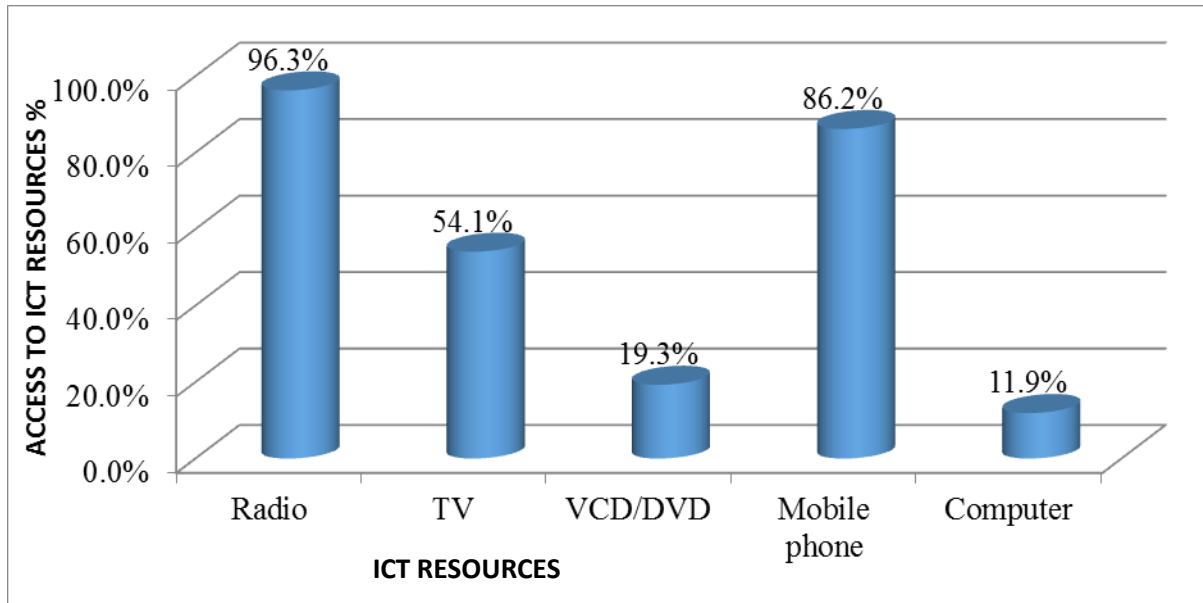


Figure 5: ICT resources used by the farmers

The high popularity of the radios could be attributed to their ability to use alternative power (battery cells) instead of electricity considering that most of the areas in the study location had inadequate infrastructure. The results agree with Aker and Mbiti, (2010), Nakasone, Torero and Minten, (2013) who observed that Mobile phone technology has achieved high penetration very rapidly in much of the developing world.

4.5.1 Test of Hypothesis H0₃

Based on objective four of the study, the following hypothesis was generated:

H0₃: There is no statistically significant relationship between access to ICT resources and use of ICTs in marketing of farm produce by farmers in Manga Sub-County

The hypothesis was tested using Pearson's correlation coefficient. Table 20 shows the relationship between the access to ICT resources and use of ICTs in marketing of farm produce by farmers in Manga Sub-County.

Table 20
Relationship between Access to ICT Resources and use of ICTs in Marketing of Farm Produce by Farmers

		Use of ICTs in marketing	Access to ICT resources
Use of ICTs in marketing	Pearson Correlation	1	.383**
	Sig. (2-tailed)		.000
	n	109	109
Access to ICT resources	Pearson Correlation	.383**	1
	Sig. (2-tailed)	.000	
	n	109	109

** . Correlation is significant at the 0.01 level (2-tailed).

Table 15 above shows that access to ICT resources has a direct correlation to the use of ICTs in marketing of farm produce ($P=0.000$, $r =+ 0.383$). Hence the null hypothesis was rejected. Thus there is statistically significant relationship between access to ICT resources and the use of ICTs in marketing of farm produce by farmers in Manga Sub-county.

The results agree with Farrell (2007) who in his survey of ICT and Education in most African countries, availability of modern ICTs (e-mails, World Wide Web (www), cellular telephony) and traditional ICTs (radio and TVs) significantly influences their use and consequent application in agriculture, marketing and education.

4.6 Access to Extension Services and the use of ICTs in Marketing Farm Produce

The fifth objective of the study was:

To determine the relationship between Access to extension services and the use of ICTs in marketing farm produce by farmers in Manga Sub-county

Extension services are a form of public sector support on knowledge dissemination and capacity building. Extension services were determined and the results are presented Table 21.

Table 21
Farmers Receipt of Extension Services for use in ICT Marketing

Extension services	Not at all	Low	Moderate	High	Very High	Total	Mean	Std. Dev.
Aid use of internet	40.5%	21.6%	29.7%	8.1	0.0	100.0	2.459	0.989
Tele-centres	24.3%	13.5%	56.8%	2.7	2.7	100.0	2.162	1.214
Train farmers in ICTs	43.2%	16.2%	24.3%	13.5	2.7	100.0	1.919	1.090
Mobile banking	51.4%	16.2%	21.6%	10.8	0.0	100.0	2.027	1.040
E-Extension	40.5%	24.3%	29.7	2.7	2.7	100.0	2.054	1.026

The results in Table 21 show that farmers were benefitting from being assisted/guided by extension officers on use of internet services in marketing as represented with a mean of 2.459 with a standard deviation of 0.989. The results agree with Gautam (2000) who noted that extension services have a potential on adoption of technologies that results to improved agricultural marketing and better agricultural incomes. The results agree with Zhou (2014) who noted that support services from agricultural extension officers who provide need and demand based knowledge does not only impact positively on farmers' agronomic techniques and skills but also in dissemination of important technologies like ICT marketing.

4.6.1 Test of Hypothesis H0₄

Based on objective five of the study, the following hypothesis was generated:

H0₄: There is no statistically significant relationship between access to extension services and use of ICTs in marketing of farm produce by farmers in Manga Sub-County

The hypothesis was tested using Pearson's correlation coefficient correction coefficient.

Table 22 shows how extension services correlate with the use of ICT in marketing of farm produce.

Table 22
Relationship between Access to Extension Services and Use of ICTs in Marketing Farm Produce

		Use of ICTs in marketing	Extension services
Use of ICTs in marketing	Pearson Correlation	1	.281**
	Sig. (2-tailed)		.003
	n	109	109
Extension services	Pearson Correlation	.281**	1
	Sig. (2-tailed)	.003	
	n	109	109

** . Correlation is significant at the 0.01 level (2-tailed).

On testing the relationship between access to extension services and use the of ICTs in marketing of farm produce by farmers, a Pearson’s Correlation coefficient of +0.281 with a P-value of 0.003 was obtained. This implies that access to extension services has a significant relationship with the use of ICTs in marketing of farm produce by farmers in Manga Sub-county. The null hypothesis was rejected.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

This study set out to determine the relationship between socio-economic factors and the use of ICTs in marketing of farm produce by farmers in Manga Sub-county, Nyamira County, Kenya. The summary of study, conclusions and recommendations are presented in this chapter. Suggestions for further studies are also presented.

5.2 Summary of Study

Based on the analysis of the research hypotheses in this study, the following summary was established:

Farmers in Manga Sub-County have experienced problems in marketing their farm produce due to limited access to accurate and timely market information. The study found out that use of ICTs in marketing farm produce in general, can help resolve the market challenges that small scale farmers face due to lack of access to market information. Use of ICTs in marketing of farm produce is influenced by socio-economic factors and access to extension services. This study examined the relationship between socio economic factors and use of ICTs in marketing farm produce.

The study finds that use of ICTs in marketing farm produce is driven by level of education of farmers, training of farmers in ICTs, access to ICT resources and access to extension services. The collected data were analysed using both descriptive and inferential statistics. The descriptive statistics used were the frequency and percentages. Pearson's correlation coefficient was used to test the hypotheses.

Pearson's correlation coefficient showed that all the socio economic factors and access to extension services had a positive relationship with the use of ICTs in marketing farm produce by farmers in Manga, Sub County. It, also, showed that their relationships were statistically significant.

5.3 Conclusions

Based on the study findings, the following conclusions were made:

- i) The farmers' level of education influences the use of ICTs in marketing of farm produce by farmers in Manga Sub-county.
- ii) Training farmers in ICTs increases the use of ICTs in the marketing of farm produce by farmers in Manga Sub-county. A Pearson's Correlation coefficient of 0.250 with a P-

value of 0.006 was obtained. Since a level of $P \leq 0.05$ significance level was adopted, the results of the study indicate that there is significant relationship between training farmers in ICTs and use of ICTs in marketing farm produce.

- iii) Access to Extension services increases use of ICTs in marketing of farm produce by farmers in Manga Sub-county.

5.4 Recommendations

5.4.1 Recommendations for policy

Based on the findings of this study, the following recommendations for policies were made:

- i) The County Directorate of Agriculture should organise training programmes on use of ICTs in marketing.
- ii) The county Government should set up tele centres with information on agricultural marketing.

5.4.2 Recommendation

More research needs to be done on factors promoting the use of ICT resources in marketing in agricultural produce in Manga Sub-county, Nyamira County, Kenya.

REFERENCES

- Abatania L, Gyasi, K.O., Terbobri P. B. & Salifu, A.B., (2010). Factors affecting the adoption of improved sorghum varieties among farm households in Northwest Ghana: A probit analysis. *Ghana Journal of Development Studies*, 2(1),37-50
- Adhiguru, P. & Mruthyunjaya, M.M. (2004). *Institutional innovations for using information and communication technology in agriculture*. New Delhi: National Centre for Agricultural Economics and Policy Research.
- Aina, L.O. (2007). *Globalisation and small-scale farming in Africa: What roles for information centres?* Durban, South Africa. 19–23. <http://www.ifla.org/iv/ifla73/index.htm> retrieved on 15, November,2017.
- Aker, J.C. (2011). Dial A for agriculture: a review of information and communication technologies for agricultural extension in developing countries. *Journal of Agricultural Economics*, 42 (6), 631-647.
- Aker, J.C., & Mbiti, I. (2010). Mobile phones and economic development in Africa. *Journal of economic perspectives*. 24 (3), 207-32.
- Alonge, J.A. (2005). *Beyond technology determinism, Applying technology triangle model to assess the integration of technology by Florida's secondary Agric-Science Teachers*. Proceedings of the 21st Century. San Antonio, Texas. Association of American Agricultural Educators Annual conference.
- Andrew W. & Shepherd, (1997). *Market information services .Theory and Practice*. Rome: Food and Agriculture Organisation.
- Ashraf, N., Gine, X. & Karlan, D. (2006). *Finding missing markets and a disturbing epilogue: Evidence from an export crop adoption and marketing intervention in Kenya, Nairobi*. <https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-4477>. Retrieved on 16th November,2017.
- Barrett, B.C. (2007). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Journal of Food Policy*, 33 (4), 299 -317.
- Barrett, C. (2008). Small scale market participation: Concepts and evidence from eastern and southern Africa. *Journal of Food Policy*, 34 (2), 299-317.
- Barrett, C., & Swallow, B. (2006). An ordered Tobit model of market participation: Evidence from Kenya and Ethiopia. *American Journal of Agricultural Economic*, 88(2), 324-337
- Bartholomew, A., Wainwright, D. & Green, G. (2009). Policy issues of e-commerce technology diffusion in Southeast Nigeria. *Journal of Small Scale Agribusiness*, 2 (1), 39-48.
- Bauer, H., Barnes, S.J., Reichardt, T. & Neumann, M. (2005). Driving consumer acceptance of mobile marketing: a theoretical framework and empirical study. *Journal of Electronic Commerce Research*, 6 (2), 181-192.
- Bhavnani, A., Won-Wai-Chiu, R., Janakiram, S. & Silarszky, P., (2008). *The role of mobile phones in sustainable rural poverty reduction*. Washington, D.C.: ICT Policy Division Global Information and Communications Department (GICT), World Bank.

- Bingen, J., Serrano, A. & Howard, J. (2003). Linking farmers to markets: Different approaches to human capital development. *Journal of Food Policy*, 28 (4), 405–419.
- Brychan, T. (2003). *A model of diffusion of technology into SME's*. Retrieved from <http://www.sbaer.uca.edu/Research/1999/ICSB/99ics224.htm>. Retrieved on 16th November, 2017.
- Chigona, W., Beukes, J., Vally, D. & Tanner, M. (2009). Can mobile internet help alleviate social exclusion in developing countries? *The Electronic Journal of Information Systems in Developing Countries*, 36 (2), 1–16.
- Chowdhury, S.K. (2006). Investments in ICT-capital and economic performance of small and medium scale enterprises in East Africa. *Journal of International Development*, 18 (1) 533-552.
- Chukwunonso, F. & Aisha, T. (2012). Problems and prospects of adopting ICT in agriculture: some comments. *African Journal of Agricultural Research and Development*, 5 (3), 41-97.
- Communication Authority of Kenya (2016). *Mobile penetration in Kenya: Quarterly sector statistics report (2016)*. Retrieved from <http://www.ca.go.ke/index.php/what-we.../366-kenya-s-mobile-penetration-hits-88-per-cent> on 16th November, 2017.
- DeMaagd, K. & Moore, S. (2006). *Using IT to open previously unprofitable markets*. Paper presented at the Annual Hawaii International Conference on System Sciences (HICSS'06). January 4, 2006 Hawaii: Doi.10.1109/HICSS.2006.524. Retrieved on 16th November, 2017.
- Davis, J., Foxall, G. & Pallister, J. (2002). Beyond the intention-behavior mythology: An integrated model of recycling. *Journal of Marketing Theory*, 2 (1), 29-113.
- Dey, Bidit L., Prendergast, Renee & Newman, D., (2008). *How can ICTs be used and appropriated to address agricultural information needs of Bangladeshi farmers?* GlobDev 2008. Paper 21. Retrieved from <http://www.aisel.aisnet.org/globdev2008/21>, on 16th November, 2017.
- Dzidonu, C.K. (2010). *An analysis of the role of ICTs to achieving the MDGs*. Paper presented during the division for public administration and development management of the United Nations department of economic affairs (UNDESA). Accra, Ghana. Retrieved on 16th November, 2017.
- Ellis, F. (1996). *Agricultural policies in developing countries*. Cambridge: Cambridge University Press.
- Ellis, F. (2000). *Rural livelihoods and diversity in developing countries*. Oxford: Oxford University Press.
- Eraut, M. (2007). Learning from other people in the workplace. *Journal of Oxford Review of Education*, 33 (4), 403-422.
- Fafchamps, M. & Gabre, M.E. (2006). Agricultural markets in Benin and Malawi. *African Journal of Agricultural and Resource Economics*, 34 (1), 67 – 94.
- Fafchamps, M., & Hill, R.V. (2005). Selling at the farm gate or travelling to the market. *American Journal of Agricultural Economics*, 87 (3), 717-734.

- FAO (2010). *Climate-smart agriculture policies, practices and financing for food security, Adaptation and mitigation*. Rome: Food and Agriculture Organization of the United Nations.
- Farrell, G. (2007). *Survey of ICT and education in Africa : Uganda country report*. Washington, D.C.: World Bank.
- Feder, G. & O'Mara, G.T. (1982). On information and innovation diffusion: A Bayesian approach. *American Journal of Agricultural Economics*, 64, (2)141–145.
- Fischer, E. & Qaim, M. (2011a). Linking smallholders to markets: determinants and impacts of farmer collective action in Kenya. *World Development Journal*, 10 (2), 10-16.
- Fischer, E. & Qaim, M. (2014). Smallholder Farmers and Collective Action: What Determines the Intensity of Participation? *Journal of Agricultural Economics*, 65(3), 683–702.
- Fishbein, M. & Ajzen, I. (1989). The theory of reasoned action. A test of Towriss's amended procedure for measuring beliefs. *Journal of Reasoned Theory*, 28 (1), 39-46.
- Galloway, L. & Mochrie, R. (2005). Use of ICT in rural firms: A Policy oriented literature review. *Journal of Information*, 7 (3), 33-46.
- Gautam, M. (2000). *Agricultural extension the Kenya experiences an impact evaluation*. Washington, D.C.: The World Bank.
- Government of Kenya (2005a). *Sessional paper No.1 of 2005*. Nairobi, Kenya: Government Printer.
- Government of Kenya (2005b). *Economic survey 2005*. Nairobi, Kenya: Government Printer.
- Government of Kenya (2007). *Ministry of education science and technology report*. Nairobi, Kenya: Government Printer.
- Government of Kenya (2010a). *Agricultural sector development strategy 2010 – 2020*. Nairobi, Kenya: Government Printer.
- Government of Kenya (2010b). *Economic review of agriculture 2010*. Nairobi, Kenya: Government Printer.
- Government of Kenya (2014). *Economic survey 2013*. Nairobi, Kenya: Government Printer.
- Gudza, L.D. (2010). *Podcasts can inform poor farmers*. Retrieved from <http://www.scidev.net/en/agricultureandenvironment/farmingpractices/opinions/podcasts-can-inform-poor-farmers.html> on 16th November, 2017
- Hanna, N.K. (2010). *Enabling enterprise transformation. Business and grassroots innovation for the knowledge economy*. New York: Springer.
- Hartline, J., Mirrokni, V. & Sundararajan, M. (2008). *Optimal marketing strategies over social networks*. Proceedings of the 17th international conference on World Wide Web, 2008. Retrieved from <http://www.ait.edu.gh> on 16th November, 2017

- Hemmer, E. & Heinzl, A. (2012). *Determinants of information channel choice: The impact of task complexity and dispositional character traits*. 45th Hawaii International Conference on System Sciences. Maui, Hawaii: <http://doi.ieeecomputersociety.org/10.1109/HICSS.2012.201> retrieved on 16th November, 2017.
- Hussein, M.S. & Safa, L. (2009). Factors affecting use of information and communication technologies (ICTs) by Iranian agricultural faculty members. *World of Applied Science Journal*, 6 (8), 212-250.
- Huyer, S. & Sikoska, T. (2003). *Overcoming the gender digital divide: Understanding the ICTs and their potential for the empowerment of women*. In straw research paper series No. 1, Retrieved from [http://www.uninstraw.org/en/research/gender and ict/virtual seminars](http://www.uninstraw.org/en/research/gender_and_ict/virtual_seminars) on 16th November, 2017.
- Igoden, C., Ohoji, P. and Ekpere, J. (1990). Factors associated with the adoption of recommended practices for maize production in the Lake Basin of Nigeria. *Journal of Agricultural Administration and Extension*, 29 (2), 149–156.
- Ilahiane, H. (2007). Impacts of ICT's on agriculture: Farmers and mobile phones. Integrated model of recycling. *Journal of Marketing Theory*, 2 (1), 29-113.
- International Telecommunication Union (2010). *World telecommunication/ICT development report 2010*. Monitoring the WSIS targets. A mid-term review. Geneva: International Telecommunication Union.
- Jari, B. & Fraser, G. (2009). An analysis of institutional and technical factors influencing agricultural marketing amongst smallholder farmers in the Kat River Valley, Eastern Cape Province, South Africa. *African Journal of Agricultural Research*, 4 (11), 1129-1137.
- Jari, B. (2009). Institutional and technical factors influencing agricultural marketing channel choices amongst smallholder and emerging farmers in the Kat river valley. *African Journal of Agricultural Marketing*, 1 (1), 016-023.
- Jensen, R. (2007). The digital divide: Information (technology), market performance, and welfare in the South Indian fisheries sector. *Quarterly Journal of Economics*, 122 (3), 879-924.
- Katz, E. (2002). *Innovative approaches to financing extension for agriculture and natural: conceptual consideration and analysis of experience*. Lindau, Switzerland: LBL, Swiss Centre for Agricultural Extension.
- Kaushik, P.D. & Singh, N. (2004). Information technology and broad-based development: preliminary lessons from North India. *Journal of World Development*, 32(6), 591-607.
- Kaynak, E. (1999). *Cross-national and cross-cultural issues in food marketing*. New York: International Business Press.
- Kerlinger, F.N. (1973). *Foundation of behavioural research, administration today* Columbus. New York: Charles Merrill Co.

- Kimaru, P. K., Nafula, N.N., Manda, D.K., Bedi, A.S. Mwabu, G. & Kimenyi, M.S. (2001). *Education indicators in Kenya*. Nairobi: Kenya Institute for Public Policy Research and Analysis.
- Kimura, K., Omole, D.W. & Williams, M. (2010). *Engaging the private sector to upgrade infrastructure: ICT in Sub-Saharan Africa: Success stories*. Washington, D.C. Retrieved from <http://www.siteresources.worldbank.org/AFRICAEXT/Resources/.../ICT-19.pdf> on 16th November, 2017.
- Kindness, H. & Gordon, A. (2001). *Agricultural marketing in developing countries: The role of NGOs and CBOs*, London: Natural Resources Institute, University of Greenwich.
- Kiveu, M. & Ofafa, G. (2013). Enhancing market access in Kenyan SMEs using ICT. *Global Business and Economics Research Journal*, 2 (9), 29-46.
- Kiveu, M. (2008). *Factors influencing ICT adoption by small and medium enterprises: A case of Thika Municipality* (Unpublished Thesis) Nairobi: Kenyatta University.
- Kofi, D. (2007). *Gender, food security and livelihoods: The Case of Plan Ghana and Sissala* No 52180, 2007 Second International Conference, August 20-22, 2007, Accra, Ghana: African Association of Agricultural Economists (AAAE). Retrieved from <http://www.econpaper.repec.org/paper/ags.aaae07/> on 16th November, 2017.
- Lio, M., & Liu, M.C. (2006). ICT and agricultural productivity: Evidence from cross country data. *Journal of Agricultural Economics*, 34 (3), 221–228.
- Litondo, K. O. & Ntale, J. F. (2013). Determinants of mobile phone usage for E-commerce among micro and small enterprises in the informal sector of Kenya. *International Journal of Applied Science and Technology*, 3 (6), 23-30.
- Makhura, M.T. (2001). *Overcoming transaction costs barriers to market participation of smallholder farmers in the Northern Province of South Africa*. (Unpublished Ph.D Thesis). Pretoria: University of Pretoria.
- Manda, P.A. (2002). Information and agricultural development in Tanzania: A critique. *Journal of Information Development*, 18 (3), 181–190.
- Mangesi, K. (2010). *A comparative study of approaches to ICT policy formulation and implementation in Ghana and South Africa* (Unpublished Master Thesis). Natal: University of Kwa Zulu.
- Mangisoni, J. (2006). *Markets, institutions and agricultural performance in Africa*. Nairobi: The African Technology Policy Studies Network.
- Mbogo, S. (2008). *Found in translation: Farm radio goes local*. Retrieved from <http://www.new-ag.info/en/focus/focusItem.php?a=484> on 16th November, 2017.
- Mburu, L.M. (2007). Determinants of smallholder dairy farmers' adoption of various milk marketing channels in Kenya highlands. *Livestock Research for Rural Development* 19 (9), Article #134. Retrieved November 17, 2017, from <http://www.lrrd.org/lrrd19/9/mbur19134.htm>

- Mathenge M., Place F., Olwande J. & Mithoefer D., (2010). *Participation in agricultural markets among the poor and marginalized: Analysis of factors influencing participation and impacts on income and poverty in Kenya*. Nairobi: Tegemeo Institute
- Minges, M. (2003). *Measuring business access to Information Communication Technologies*. Geneva: Information Telecommunication Union.
- Mugenda, O.M. & Mugenda, A.G. (2003). *Research methods: quantitative and qualitative approaches*. Nairobi: African Centre for Technology Studies.
- Munyua, H. (2007). *ICTs and small-scale agriculture in Africa: A scoping study*. Rome: Food and Agriculture Organisation.
- Muriithi, A.G, Eric, B. & Sarah, A.O. (2009). *Information technology for agriculture and rural development in Africa: Experiences from Kenya*. Nairobi: Ministry of Agriculture.
- Mwenechanya, S.K. (2007). *Legal empowerment of the poor: Empowering Informal Businesses in Zambia*. <http://www.essaytag.com/yp/5x38g3yp.html> retrieved on 16th November, 2017.
- Nakasone, E., Torero, M. & Minten, B. (2013). The Power of information: The ICT revolution in agricultural development. *Journal of Annual Review of Resource Economics*, 6 (1), 533-550.
- Nassiuma, D.K. (2000). *Survey sampling: Theory and methods*. Nairobi: University of Nairobi.
- Nchimunya, M. (2012). *The adoption and use of ICTs by SMEs in the road passenger transport sector in Lusaka: A case of bus operators at intercity bus terminal* (Unpublished Master's Thesis). Lusaka: University of Zambia.
- Ngqangweni, S.S. (2000). *Promoting income and employment growth in the rural economy of the Eastern Cape through smallholder agriculture* (Unpublished PhD Thesis). Pretoria: University of Pretoria.
- Norris, P.E, & Batie, S.S, (1987). Virginia's farmers' soil conservation decisions: An application of Tobit analysis. *Southern Journal of Agricultural Economics*, 10 (19), 79-90.
- Nunnally, J.C. (1978). *Psychometric theory*. New York: McGraw-Hil.
- Ogula, A. (1998). *A Handbook on educational research*. Nairobi: New Permit Publishers.
- Ogutu S.O., Okello J.J., & Jakinda D.O. (2012). *Impact of ICT-based market information service projects on farm input use and productivity in Kenya*. Nairobi: University of Nairobi.
- Okello, J.J. & Swinton, S.M. (2007). Compliance with international food safety standards in Kenya's green bean industry: A paired case study of small and large family farms. *Journal of Review of Agricultural Economics*, 20 (29), 269-285.

- Okello, J.J., Ofwona-Adera, E., Mbatia, O.L.E., & Okello, R.M. (2010). Using ICT to integrate smallholder farmers into agricultural value chain: The case of Drum Net project in Kenya. *International Journal of ICT and Research Development*, 10 (1), 23-37.
- Olwande, J., Sikei, G., & Mathenge, M. (2009). *Agricultural technology adoption: A panel analysis of smallholder farmers' fertilizer use in Kenya*. Berkeley: Center for Effective Global Action.
- Omiti, J.M., Otieno, D.J., Nyanamba, T.O. & McCullough, E. (2009). Factors influencing the intensity of market participation by smallholder farmers. A case study of rural and peri-urban areas of Kenya. *African Journal on Agriculture Resource Economics*, 3 (1), 57-82.
- Orodho, A.J. (2005). *Statistics made user friendly for education and social science research*. Nairobi: Masola Publishers.
- Parayil, G. (2005). Introduction: Information capitalism. In G. Parayil (Ed.), *Political Economy and Information Capitalism in India: Digital Divide, Development and Equity* (pp. 1-2). London: Palgrave Macmillan.
- Patrick O.A. & Rosemary, A. (2006). *Agricultural policy in Kenya: Issues and processes*. Nairobi: Institute for Development Studies, University of Nairobi.
- Payne, J. (2011). *Using ICT to provide agriculture market price information in Africa*. Briefing Paper. SAID. Retrieved from <http://www.bit.ly/1RB6Zso>.on 17th November, 2017.
- Poulton, C., Kydd, J. & Doward, A. (2006). Overcoming market constraints on pro-poor agricultural growth in Sub-Saharan Africa. *Journal of Development Policy Review*, 24 (3), 243-277.
- Hoddinott, J., Haddad, L. & Christopher R. U. (2003). Gender Differentials in Farm Productivity: Implications for Household Efficiency and Agricultural Policy Harold Alderman. In A. Quisumbing (Ed.), *Household Decisions, Gender and Development: A Synthesis of Recent Research* (pp. 61-66). Washington D.C.: International Food Policy Research Institute,
- Rao, S.S. (2004). Role of ICTs in India's rural community information systems. *Journal of Conceptual Paper*, 6 (4), 261-269.
- Rathgeber, E.M. & Adera, E.O. (2000). *Gender and the information revolution in Africa*. Ottawa: International Development Research Centre.
- Reyes, B., Donovan, C., Bernsten, R. & Maredia, M. (2012). *Market participation and sale of potatoes by smallholder farmers in the central highlands of Angola: A double hurdle approach*. http://ageconsearch.umn.edu/bitstream/126655/2/reyes_et_al_double_hurdle_market_participation_in_Angola_IAAE_2012_final_revised.pdf. Retrieved on 17th November, 2017
- Ritchie, B. & Bridley, C. (2005). ICT adoption by SMEs: Implications for relationships and management. *New Technology, Work and Employment*, 20(3), 184–267.

- Rockman, I.F. (2005). ICT Literacy. *Reference Services Review Journal*, 33 (2), 141-143.
- Rodgers, E.M. (1995). *Diffusion of innovations*. New York: Free Press.
- Roffie, I., (2007). Competitive strategy and influences on E-learning in entrepreneur-led SMEs. *Journal of European Industrial Training*, 31 (6), 416-434.
- Salami, O.A., Brioxiova, Z. & Kamara, A.B. (2010). *Smallholder agriculture in East Africa: Trends, constraints and opportunities*. Tunis, Tunisia: African Development Bank.
- Shepherd, W. (2007). *Approaches to linking producers to markets: A review of experience to date*. Rome: Food and Agriculture Organisation.
- Shiferaw, B, Obare, G. & Muricho, G. (2007). Rural market imperfections and the role of institutions of collective action to improve markets for the poor. *Journal of Natural Resources Forum*, 32 (1), 25-38.
- Singh, S. (2006). *Selected success stories on agricultural information systems*. Bangkok, Thailand: Asia-Pacific Association of Agricultural Research Institutions FAO Regional Office for Asia and the Pacific.
- Situma, S., N. (2016). Information communication technologies and marketing decisions among small scale farmers in Kenya. *International Journal of Economics, Commerce and Management United Kingdom*, 4 (4), 1167-1180
- Syng'enta Foundation for Sustainable Agriculture (2014). *Syng'enta foundation for sustainable agriculture, review 2014-2015*. Basel, Switzerland: Syngenta Foundation for Sustainable Agriculture
- Tracey & White, J. (2003) *Planning and designing rural markets*. Rome: Food and Agriculture Organisation.
- VanAkkeren, J.K. & Cavaye, A. (1999). Factors affecting entry-level internet technology adoption by small business in Australia - evidence from three cases. *Journal of Systems and Information Technology*, 3 (2), 33-48.
- Wald, A. & Koblo, R. (2008). ICT and poverty reduction: Mobile telecommunications advancing fast. *International Journal for Rural Development*, 42 (6), 11-13.
- World Bank (2008). *Gender in agriculture sourcebook*. Washington, D.C.: The World Bank.
- World Bank (2011). *Gender in agriculture sourcebook*. Washington, D.C: The World Bank.

APPENDICES

APPENDIX A: Letter of Transmittal

Dear farmer,

RE: REQUEST TO FILL A QUESTIONNAIRE.

Please spare a few minutes of your busy schedule to respond to the items in this questionnaire. The purpose is to conduct research on the relationship between Socio-economic factors and the use of Information and Communication Technologies-ICTs (use of Resources like Radio, Mobile phones, Television, DVDs, computers and internet) in marketing farm produce by farmers in Manga Sub-county.

The findings of the study may be valuable to small scale farmers, extension officers and other stakeholders as it will unearth the constraints faced in integrating of ICTs in marketing of farm produce and other products. Once the study is over the results will be shared with you. Any sensitive information that you may reveal will be treated with utmost confidentiality and will not be divulged to a third party.

Yours faithfully,

Dennis N. Morwani.

APPENDIX B: Farmer's Questionnaire

The purpose of the study was to examine the relationship between socio economic factors and the use of ICTs in marketing farm produce by farmers in Manga Sub-county. You have been identified as a useful informant to assist us (Egerton University) to achieve this mission. Your participation is voluntary and you are assured that the information you provide will be treated with confidentiality and used for the sole purpose of research. Kindly respond to the queries below. If you need more writing space you can attach more paper.

Instructions

- i) Please answer all the questions as fully as possible and to the best of your knowledge.
- ii) Where a particular question is not applicable to the household, please mark 'N/A' (not applicable) and proceed to the next question.

Section A: Socio economic characteristics

This section will gather information on farmers' attributes such as gender, age, level of education primary occupation, crop grown, types of livestock, involvement in marketing and experience in the marketing of farm produce.

Q1. Please provide the following information about yourself.

- a) Indicate your gender Male Female
- b) Tick your age bracket (20-29) years (30-39) years
 (40-49) years (50-59) years
 (60-69)years (70 and above) years
- c) Tick your highest level of education attained
 1. No formal education
 2. Primary level
 3. Secondary level
 4. Post-secondary education
 5. Any other specify

d) State whether the level of education attained assists you to use the listed ICTs marketing services (Please tick appropriately)

ICTs Marketing Services	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Moderate</i>	<i>Agree</i>	<i>Strongly Agree</i>
Inquiry of prices for farm produce					
Search for markets of farm produce					
Advertisement of farm produce					
Receiving payments after sale					

e) Indicate your primary occupation (circle appropriately)

1. Farming
2. Public service
3. Business
4. Any other specify

Section B: Marketing Experience

This section will gather information on marketing experience by the farmer

Q2. Indicate the main enterprises in crop and livestock farming on your farm.

- 1 2.....
 3 4.....
 5 6.....

Q3. Are you involved in marketing/selling of farm produces YES NO

Q4. Do you sell surplus farm produces YES NO

Q5. How long have you been involved in marketing of farm produce? (Tick appropriately)

- (1-4) years (5-9) years
 (10-14) years (15-19) years (20 years and above)

Section C: Training in ICTs

Q6. Have you ever been trained in the use of ICTs resources? YES NO

Q7. If yes, which among these? (Tick appropriately)

Radio	TV	Mobile Phone	Computer	Internet services

Q8. How did you learn about the use of the ICTs (gadget or service)? (Circle appropriately)

1. Fellow farmer
2. Extension officers
3. Children
4. Seminars
5. Religious meetings
6. Chiefs baraza
7. Any other specify.....

Q9. If you have never used any ICTs. Please give reasons why? Circle appropriately

1. Never heard about it
2. ICTs too expensive/their costs don't justify the use
3. No interest/poor attitude
4. Lack of awareness
5. Old age
6. Any other specify.....

Q10. Listed below are ICT-based services from service providers (e.g. *safaricom*). Indicate whether you have ever been trained in any of them. (Please tick appropriately)

ICT-based services	<i>Not at all</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Very High</i>
Mpesa-services					
Mobile banking					
OLX –services					
Mkesho					
Texting (sms)					
Extension services					

Section D: Access to ICT resources

This section will gather information on the availability and access to ICT resources used by the farmer

Q11. a) Which of the following ICTs do you have in your household? Tick (✓) appropriately)

- Radio TV VCD/DVDs
 Mobile phone Computer

b) How often do you use the ICT resources you have identified in 11(a) above in marketing farm produce (Circle appropriately)

1. Not at all
2. Low
3. Moderate
4. High
5. Very High

c) What ways is the ICTs used in marketing farm produce? (Tick appropriately)

ICT deployment in marketing	<i>Not at all</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Very High</i>
Inquiry of prices for farm produce					
Search for markets of farm produce					
Advertisement of farm produce					
Receiving payments on sale of produce					

Section D: Access to Extension Services.

This section will gather information on how farmers access extension services related to marketing of their farm produce.

Q12. Are you in contact with extension services? YES NO

If yes, what services do you receive from extension officers in relation to ICT marketing? (Tick appropriately)

Access to extension services	<i>Not at all</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Very High</i>
Assist farmers use internet					
Tele centres					
Exposing farmers to ICTs					
Mobile banking					
E-Extension services					

Section E: Challenges of using ICTs in Marketing Farm Produce

Q13. a) What do you consider as the serious problem in the use of ICTs in marketing of farm produce?

Challenges	<i>Not at all</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Very High</i>
Lack of ICT resources					
Lack of awareness					
Inaccessible internet					
Lack of motivation					
Negative attitude					
Lack of electricity					
Inadequate extension services					

Q14. What could be done to improve your ability to use ICTs to market your farm products? (List as many as possible)

- i.
- ii.
- iii.

Thank you for your thought, time and effort in answering these questions.

APPENDIX C: Research Permit

THIS IS TO CERTIFY THAT:
MR. DENNIS NYABOCHWA MORWANI
of EGERTON UNIVERSITY, 0-40200
Kisii, has been permitted to conduct
research in Nyamira County

on the topic: INFLUENCE OF SELECTED
FACTORS ON THE USE OF INFORMATION
AND COMMUNICATION TECHNOLOGY IN
MARKETING OF FARM PRODUCE AMONG
SMALL SCALE FARMERS IN MANGA
DISTRICT IN NYAMIRA COUNTY, KENYA

for the period ending:
31st December, 2014

Applicant's
Signature

Permit No : NACOSTI/P/14/6447/3158
Date Of Issue : 29th September, 2014
Fee Received :Ksh 1,000




Secretary
National Commission for Science,
Technology & Innovation

CONDITIONS

- 1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
- 2. Government Officers will not be interviewed without prior appointment.**
- 3. No questionnaire will be used unless it has been approved.**
- 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
- 5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
- 6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.**



REPUBLIC OF KENYA



National Commission for Science,
Technology and Innovation

RESEARCH CLEARANCE
PERMIT

Serial No. A 3368

CONDITIONS: see back page

APPENDIX D: Research Authorization Letter



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:

29th September, 2014

NACOSTI/P/14/6447/3158

Dennis Nyabochwa Morwani
Egerton University
P.O. Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"Influence of selected factors on the use of Information And Communication Technology in marketing of farm produce among small scale farmers in Manga District in Nyamira County, Kenya,"* I am pleased to inform you that you have been authorized to undertake research in **Nyamira County** for a period ending **31st December, 2014.**

You are advised to report to **the County Commissioner and the County Director of Education, Nyamira County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


DR. M. K. RUGUTT, PhD, HSC.
Ag. SECRETARY/CEO

Copy to:

The County Commissioner
The County Director of Education
Nyamira County.