

**AWARENESS AND USE OF NEW INFORMATION AND COMMUNICATION
TECHNOLOGIES IN DAIRY GOAT MARKETING: THE CASE OF MERU SOUTH
SUB-COUNTY, THARAKA NITHI COUNTY, KENYA.**

BY

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DECLARATION

I, Rwanda Christopher Bundi, declare that, this dissertation is my original idea and, to the best of my knowledge, has not been presented to any other institution for the award of a degree.

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APPROVAL

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DEDICATION

I dedicate this dissertation to my dear wife Bessy Kawira and my beloved son Levi Muthomi for the comfort they had to forgo while I pursued this study and, to the Almighty God who brings to fruition the desires of men.

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LIST OF ABBREVIATIONS

CCK	Communications Commission of Kenya
CAK	Communications Authority of Kenya
DGAK	Dairy Goat Association of Kenya
FA-GP	FARM-Africa-Goat Improvement Project
FARM-Africa	Food and Agricultural Research Management in Africa
GTZ	Germany Technical Co-operation
HEL-EUCDGP	Higher Education Links-Egerton University Community Dairy Goats Project
HPI	Heifer Project International
ICTs	Information and Communication Technologies
ITU	International Telecommunication Union
IVR	Interactive Voice Response
MoALF	Ministry of Agriculture, Livestock, Fisheries
MGBA	Meru Goat Breeders Association
MIS	Market Information Service
MoLFD	Ministry of Livestock and Fisheries Development
NAFIS	National Farmers' Information Service
KACE	Kenya Agricultural Commodity Exchange
KARI	Kenya Agricultural Research Institute
KNBS	Kenya National Bureau of Statistics
SMS	Short Message Service

ABSTRACT

Marketing of agricultural produce by the smallholder farmers has been evolving over time. In the past, smallholder farmers mostly relied on physical contacts to connect with potential buyers of their produce. This approach confines them mostly to customers who are within easy physical reach, probably hindering them from connecting to more competitive markets. The old Information and Communication Technologies (ICTs) have also been used but not with better success than the physical movement. They have often been faulted for not allowing much interaction between and among the users. This has therefore caused a shift in attention to the use of the new ICTs which seem to do better in linking smallholder farmers to better performing markets by enhancing access to relevant and timely market information. However, despite the undisputed contribution of the new ICTs in agricultural marketing, little information exists on the extent to which the smallholder farmers are aware of the use of these new ICTs in marketing among the smallholder farmers, more so the dairy goat farmers. This study was therefore designed to establish the awareness and use of the new ICTs in dairy goat marketing among the smallholder farmers. The study was carried out in Meru South sub-county. Chuka and Magumoni divisions were purposely selected. A sample of 97 dairy goat farmers obtained through a systematic random sampling from a population of 2800 smallholder farmers from two divisions. The study was cross-sectional in design and used a previously pre-tested questionnaire to collect the data. Three focus group discussions (FGDs) were also carried out with the officials of selected dairy goat keeping groups and officials of MGBA officials from the two divisions constituting the members of the FGDs. The study employed both descriptive and inferential statistics to analyze the data using the Statistical Package for Social Scientists (SPSS) software version 17. More so, chi-square test was carried out to test the three hypotheses of the study.

The findings revealed that firstly, the socio-demographics characteristics of the respondents have influence on the use of the new ICTs. Secondly, with regard to awareness levels of the new ICTs used in marketing of the dairy goats, mobile phones were the most popularly known types of new ICTs in marketing of the dairy goats. Thirdly, mobile phones were the most commonly owned and easily affordable new ICTs among the dairy goat farmers. And lastly, mobile phones were the most frequently used new ICTs in marketing of the dairy goats among the dairy goat farmers. The study concludes that generally, the awareness and use of the new ICTs in the marketing of the dairy goats was high, and that the mobile phone was the most commonly known and widely used ICT.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Dairy goat population in Kenya is about 175,000 according to the most recent estimates (Shivairo *et al.*, 2013). A majority of the farmers are found in the Kenyan highlands because they are more conducive for dairy goat farming. According to Mburu *et al.*, (2013), dairy goat farming was introduced in the Kenyan highlands in the 1990s by the German Technical Cooperation (GTZ), Food and Agricultural Research Management in Africa (FARM-Africa), in collaboration with local partners such as the Kenya Agricultural Research Institute (KARI), the then Ministry of Agriculture (MoA) and Ministry of Livestock and Fisheries Development (MoLFD). The main aim was to improve the poor farmers' livelihoods. Therefore, pure high yielding exotic dairy goat breeds and crosses of Toggenburg, German Alpine, Saanen, and Anglo-Nubian were introduced. According to FARM-Africa (n.d), the goat improvement project (FARM-Africa Goat Improvement Project) (FA-GP) was implemented in Meru South and Meru Central districts with great success. Mwingi and Kitui districts were also covered by the project according to (Peacock *et al.*, 2011). As at 2006, the dairy goat population in Kenya was reported to be 153, 200 out of which 6,900 were in the then Meru South district (currently split into Meru South and Maara Sub-counties) (ibid). According to Kiptarus *et al.*, (2002) and Ahuya *et al.*, (2005), the population of dairy goats in Kenya significantly increased during the FA-GP project period (1997-2008). It is reported that to-date the FA-GP farmers continue to supply dairy goat breeding stocks within the country and to the neighboring countries such as Rwanda, Uganda and Tanzania several years after the FARM Africa project (Peacock *et al.*, 2011).

Ahuya *et al.*, (2004), argues that dairy goats have become very popular in recent years as a pathway out of poverty. Dairy goat farming has several benefits among them, enhanced nutrition from the consumption of milk, Peacock (2008), creation of jobs through provision of animal health, breeding, and water management services Peacock *et al.*, (2011), and improved household income from the sale of weaners, culls and breeding stock, (Olubayo and Kairi 2004; Karanja-Lumumba *et al.*,2007). Furthermore, Maigua (n.d), observes that dairy goat enterprise has been shown to be profitable with annual gross margins of US dollars 259 being reported. Due to their small body size and fast maturity, dairy goats are frequently considered as the first line of action in the fight against poverty among the rural poor by most of the rural development organizations.

As with other agricultural enterprises, successful dairy goat farming requires that the farmers be adequately equipped with relevant and timely information. Asogwa *et al.*,(2012), observes that information is an indispensable factor in the practice of agriculture. Agricultural information according to Agbamu (2006),can be classified into legal, socio-cultural, technical and commercial. Marketing information according to Reddy *et al.*, (2004), is of great importance to governments, merchants and farmers. The price information is required by farmers to make decisions on their sales, while merchants (traders) require market information to carry out their regular transactions like buying, selling and storing. Governments also need this information to be able to keep track of price trends, for maintenance of buffer stocks and for market intervention (Reddy *et al.*, 2006). Thus, access to timely and relevant market information can greatly enhance market performance. In order to access dairy goat marketing information among other extension services, most of the dairy goat farmers in Meru South sub-county are organized into dairy goat farmers' groups which are then registered with the Meru Goat Breeders

Association (MGBA). However, this approach results in increased transaction costs in terms of time and money spent by individual farmers while making physical visits to stakeholders such as the neighbor farmers, group members, MGBA officials, agro-dealers, middle men or extension officers to obtain information on dairy goat demand and supply, selling prices, and availability and prices of inputs. Tollens (2006) and Aker (2008), observes that attempts to resolve the problem of poor access to better performing markets by smallholder farmers have thus focused on promoting information transfer through ICT-based innovations. These innovations according to Munyua (2007), includes but are not limited to new ICTs such as the mobile telephones, internet /web-based means, and interactive video and CD-ROM programs as well as older ICT-based technologies such as the radio and television. Okello *et al.*, (2010), observes that the ease of use of the new generation ICTs especially the mobile phones emanates from its expanded ownership and use by rural households.

It has been observed that the use of conventional channels of communication such as contact farmers, farm visits and personal letters in disseminating agricultural information has proved counterproductive (Arokoyo, 2005). The use of old ICTs though successful, has been monologic and has not allowed for much interaction among the users (Okwu and Iorkaa, 2011). Mukhebi (2004), argues that the use of low-cost ICTs (including new ICTs) to package and deliver relevant and timely market information “can improve the competitiveness of smallholder farmers in the market place”. Thus, the utilization of the new ICT such as the mobile phones and internet could substantially help smallholder farmers and dairy goat farmers in particular to improve access to marketing information, resulting to improved profits from their production. Furthermore, several researchers, Donner (2006) and Abraham (2007); Jensen (2007); Aker (2008) and De Silva and Ratnadiwakara (2008) have documented that mobile phones (and other

modern ICTs) can reduce information search costs, resulting to lower transaction costs. For the purposes of this study old ICTs will include traditional broadcast media such as the television, radio and video while the new ICTs will be confined to modern broadcast media such as mobile phones and internet (emails and websites).

1.2 Problem Statement

In the past, smallholder farmers mostly relied on physical contacts to connect with potential buyers of their produce. This approach confines them mostly to customers who are within easy physical reach, probably hindering them from connecting to more competitive markets. The old ICTs have also been used but not with better success than the physical movement. They have often been faulted for not allowing much interaction between and among the users. This has therefore caused a shift in attention to the use of the new ICTs which seem to do better in linking smallholder farmers to better performing markets by enhancing access to relevant and timely market information. However, despite the undisputed contribution of the new ICTs in agricultural marketing, little information exists on the awareness and use of these new ICTs in marketing among the smallholder farmers, more so the dairy goat farmers. This study was therefore designed to establish the awareness and usage of the new ICTs in dairy goat marketing among the smallholder farmers.

1.3 Justification of the Study

This study will contribute valuable knowledge on the use new of the ICTs in marketing in general and the use of new ICTs in dairy goat marketing in particular. It is the only study that has focused on the awareness and use of the new ICTs in marketing of dairy goats. It could provide the researchers and other scholars with useful reference material on the subject of the usage new

of ICTs in dairy goat marketing. The findings of this study may also be useful to the government and the stakeholders to formulate policy and strategy with regard to dairy goat production and marketing.

1.4 Main Objective

To assess the awareness and use of new information and communication technologies in dairy goat marketing among the smallholder farmers

1.5 Specific Objectives

1. To determine the socio-demographic characteristics influencing the use of new ICTs in dairy goat marketing among the smallholder farmers in Meru South sub-county.
2. To determine the level of awareness of new ICTs' use in marketing of dairy goats among the smallholder dairy goat farmers in Meru South sub-county.
3. To determine the access of the new ICTs among the smallholder dairy goat farmers in Meru South sub-county.
4. To establish the usage levels of the new ICTs among the smallholder dairy goat farmers in Meru South sub-county.

1.6 Hypotheses

1. There is no relationship between the socio-demographic characteristics of the dairy goat farmers and the use of new ICTs in dairy goat marketing.
2. There is no relationship between the level of awareness of the new ICTs and the use of the new ICTs in dairy goat marketing.

3. There is no relationship between access to new ICTs and the use of new ICTs in dairy goat marketing.

1.7 Definition of Key Terms

In the context of this study, the following key terms have the meaning as explained below.

Access (of new ICTs) : means ownership of new ICTs.

Awareness: the extent to which farmers have knowledge about the use of new ICTs available for use in marketing of dairy goats.

Marketing: means connecting to potential or actual buyers, and effecting transactions.

New ICTs: means mobile phones, internet (emails and websites), online discussion groups and interactive video.

Old ICTs: means television, radio and video.

Socio-demographic characteristics : refers to the composition of a population with regard to factors such as age, gender, education level, household income level and membership to a group.

Smallholder farmers: rural farmers who engage in crop and livestock production mainly for subsistence purpose.

Sub-county: a devolved unit equivalent to a district in the defunct provincial administration. In this study, the words district and sub-county have been used interchangeably.

Use (of new ICTs): means utilization of the new ICTs in marketing of dairy goats for instance, in sourcing for buyers or accessing market information.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Dairy Goat Farming and Marketing

Dairy goat population in Kenya is about 175,000 according to the most recent estimates (Shivairo *et al.*, 2013). A majority of these farmers are found in the Kenyan highlands which are more conducive for dairy goat farming. According to Mburu *et al.*, (2013), dairy goat farming was introduced in the Kenyan highlands in the 1990s by the German Technical Cooperation (GTZ), Food and Agricultural Research Management in Africa (FARM-Africa), in partnership with local partners such as the Kenya Agricultural Research Institute (KARI), the then Ministry of Agriculture (MoA) and Ministry of Livestock and Fisheries Development (MoLFD). The main aim, according to the authors, was to improve the poor famers' livelihoods in the region by introducing pure exotic dairy goat breeds and crosses of Toggenburg, German Alpine, Saanen, and Anglo-Nubian goat breeds. It is documented by FARM-Africa (n.d), that the goat improvement project (FARM-Africa Goat Improvement Project (FA-GP) was implemented in Meru South and Meru Central districts with great success. Mwingi and Kitui districts were also covered by the project according to (Peacock *et al.*, 2011). As at 2006, the dairy goat population in Kenya was reported to be 153, 200 out of which 6,900 were in Meru South district (ibid). According to Kiptarus *et al.*, (2002) and Ahuya *et al.*, (2005), the population of dairy goats in Kenya significantly increased during the FA-GP project period (1997-2008). It is reported that to-date the FA-GP farmers continue to supply dairy goat breeding stocks within the country and

to the neighboring countries (e.g Rwanda, Uganda, Tanzania and Southern Sudan) several years after the FARM Africa ended its support to the project area (Peacock *et al.*, 2011).

Ahuya *et al.*, (2004), argues that dairy goats have become very popular in recent years as a pathway out of poverty. Dairy goat farming has several benefits among them, enhanced nutrition from the consumption of milk, Peacock (2008), creation of jobs through provision of animal health, breeding, and water management services Peacock *et al.*, (2011), and improved household income from the sale of weaners, culls and breeding stock, (Olubayo and Kairi 2004; Karanja-Lumumba *et al.*,2007). Furthermore, Maigua (n.d), observes that dairy goat enterprise has been shown to be profitable with annual gross margins of US dollars 259 recorded indicating that dairy goat enterprises under smallholder production systems can be lucrative. Due to their small body size and fast maturity, dairy goats are frequently considered as the first line of action in the efforts to alleviate poverty among the rural poor by most of the rural development organizations.

As with other agricultural enterprises, successful dairy goat farming requires that the farmers be adequately equipped with relevant and timely information on production and marketing. Asogwa *et al.*,(2012), observes that information is an indispensable factor in the practice of agriculture. Agricultural information according to Agbamu (2006), can be classified into legal, social-cultural, technical and commercial information. Marketing information as argued by Reddy *et al.*, (2004) is of great importance to governments, merchants and farmers. The authors expound that price information (which is a component of market information) is required by farmers to make decisions on their sales, while merchants (traders) require market information to carry out their regular transactions like buying, selling and storing (Reddy *et al.*, 2004). Thus, in

order for farmers to have access to better performing markets, timely and relevant market information is imperative.

Prior to the advent of ICTs, efforts by the smallholder farmers to market their produce emphasized physical (face-to-face) meetings with the potential buyers in order to present the product, negotiate the prices and effect the transactions. Thus, the dairy goat farmers relied on their social networks to discover potential markets. The other option as observed by Nyaga (2012), was to seek information (physically) from the agricultural extension which is the main source of marketing information for the small scale farmers. These approaches to marketing limits the farmers' chances of connecting to better paying markets besides increasing the transaction costs in terms of the time and money incurred. However, with the new era of information and knowledge society, driven by modern ICTs especially the new ICTs, exchange of information from one location to another has drastically improved thereby creating new opportunities in various social and economic fronts. For instance, in agriculture, with the use of modern ICTs such as mobile phones, computers, internet, emails and websites farmers are able to easily link with potential buyers of their produce and negotiate the offers before deciding on whether to execute the transactions.

In summary this study sets out to firstly, identify the socio-demographic characteristics influencing the use of new ICTs in dairy goat marketing. Secondly, determine the new ICT's awareness levels among the dairy goat farmers and thirdly, determine the new ICTs' access levels. Finally, the study will determine the usage levels of the new ICTs by dairy goat farmers among the smallholder farmers in Meru South sub-county.

2.2 Socio-demographics and Use of ICTS

In assessing the use of ICTs, it is important to consider the socio-demographic composition (factors or characteristics) of a population. These factors are noteworthy since gender, Richardson *et al.*, (2000) and Colle and Roman (2002), age, Delgadillo *et al.*,(2002), level of income, Gomez and Casadiego (2002) and O' Farrell (2001), and level of education and skills, Mudhusudan (2002) and UNDP (2001), are some of the factors that are frequently cited as possibly affecting the ability to take advantage of (utilize) the ICTs. Furthermore, a study carried out by Olatokun (2009) to analyze the socio-demographic differences in access and use of ICTs in Nigeria sex (or gender), age, marital status, education, household income and type of work (occupation) were reviewed as some of the important socio-demographic factors. Other scholars such as Abulsalam *et al.*,(2008) and Okwu and Iorkaa (2011) in addition to examining the aforementioned factors in their studies, also considered the influence of an individual's membership to a cooperative/ an association (group), on the use of ICTs .

Education has been acknowledged as a very strong factor in differentiating the level of ICT use by farmers such that farmers who are poorly educated are less able to acquire information from the internet (Czapiewski et al., 2013). Furthermore, education level has been shown to improve the farmers' capacity to comprehend the benefits of new technologies such as ICTs (Okello *et al.*, 2009), hence promoting their use. Elsewhere, some scholars have argued that "literate individuals are keen to get information and use it" Henri-Ukoha *et al.*, (2012), implying the influence education has on the use of ICTs tools that facilitate access to information. Furthermore, a study carried out in Nigeria by Iorliam *et al.*, (2012) concluded that education was the most important factor influencing the choice of a wide range of ICTs by the respondents

for information on agricultural innovations. Studies by other researchers have established that the education level of an individual has influence on the adoption and usage of ICTs through influencing the capacity of an individual to use the technology (Piccoli *et al.*, 2001). A study carried out in Kiambu district of Kenya to determine the feasibility of ICTs in enhancing marketing of agricultural produce concluded that, farmers who were more educated were more likely to adopt the use of information and communication technologies (Nyaga, 2012). This emphasizes the significant influence education has on ICT usage in marketing of agricultural produce by the farmers.

It has been observed that men in Africa have greater access to productive resources (including ICTs) than women (Okello *et al.*, 2009). Research has shown that gender plays a significant role in the use of ICTs for agricultural transactions by both men and women. In a study conducted by Kirui and Njiraini (2013), male headed households (74%) dominated the female headed households (30%) in the use of ICT tools (mobile phones) for agricultural related transactions. Other scholars have argued that if the farmer is female the probability of ICT use is likely to increase (Sabuhoro & Wunsch, 2003) while in other studies it has been revealed that more women were likely to use shared phones than men (Blumenstock and Eagle, 2012).

Scholars have argued that improvements in farm income (or household income) could significantly increase the extent of modern ICT use (Iorliam *et al.*, 2012). This is perhaps due to the fact that increase in income levels promotes expenditure beyond the basic needs as corroborated by Kwapong (2008), in a study conducted in Ghana on policy implications for using ICTs for empowering of rural women. The author further observed that, families with higher incomes tend to spend less on food while poorer households spend higher amount of their

incomes on food. Moreover, Okello *et al.*, (2011), in a study conducted among the smallholder farmers to determine the factors influencing awareness and use of electronic- based market information services for farming business in Malawi reasoned that, households with more income are likely to have surplus to buy ICT tools such as radios, Televisions, mobile phones among others and thus be able to use them for marketing transactions. In this regard, one would expect income to have a strong influence on the use of ICTs among the households with high income levels hence its consideration for this study.

Age is an important variable which has a correlation with the use of ICTs. More so, age has been pointed out in the theory of technology use as a factor that influences how and when an individual uses technologies with some studies indicating that younger people tend to exhibit higher user levels (Chabossou *et al.*, 2008). A study conducted to assess the drivers of the use of ICTs by farm households among the smallholder farmers in Kenya found out that the decision to use ICTs such as mobile phones is driven by among other factors age, gender, household size and literacy levels (Okello *et al.*, 2012). With regard to age, it has been argued that young farmers are more likely to use ICT tools for agricultural transactions (including obtaining agricultural information) than their aged counterparts given that this category of farmers are more literate and better able to use ICTs (Okello *et al.*, 2010).

An important strategy of extending or introducing new technologies that has emerged in developing countries is the application of the group approach in technology uptake and transfer (Knowler and Brandshaw, 2007). In this regard, the group approach has been popularly used in the promotion of dairy goats through projects implemented by various development organizations.

Such projects include the FARM Africa's Dairy Goat Improvement Project (FA-GP), Dairy Goat Association of Kenya (DGAK), Higher Education Links-Egerton University Community Dairy Goats Project (HEL-EUCDGP) and Heifer Project International (HPI) as documented by (Mburu *et al.*, 2013; Peacock *et al.*, 2011; Bett *et al.*, 2009). Furthermore, Okello *et al.*, (2011), observes that membership to a group may entail more social influence and hence offer opportunities for the farmers to acquire accurate knowledge that is, become aware of innovations ICTs included. More so, membership to a group can increase an individual's awareness about new technologies and by extension promote the adoption of such technologies. In this regard, dairy goat farmers' membership to a group is expected to increase the awareness about new ICTs and consequently, the use of these ICTs in dairy goat marketing.

In summary, the specific objective of the study under this sub-topic, that is, the socio-demographic characteristics and use of ICTs) is to assess the socio-demographic characteristics and their influence on the use of new ICTs among dairy goat farmers in Meru South sub-county. Data on the socio-demographic characteristics of dairy goat farmers was gathered by collecting the responses on selected socio-demographic variables such as age, gender, level of education, household income and membership to a group.

2.3 Awareness of the Use ICTS in Agricultural Marketing

According to Abdulsalam *et al.*, (2008), awareness refers to the extent to which respondents have knowledge about ICTs (or other technologies) available to them. In the context of this study, awareness is defined as the degree to which farmers have knowledge about the ICTs available for use in agricultural produce marketing particularly dairy goat marketing.

Rogers (2003), observes that knowledge about the existence of an innovation for example new ICTs can create motivation for its adoption or use. Awareness has also been recognized as the first stage in the adoption process as observed by (Ani, 2007). This implies that the potential users of a technology will adopt it if first and the foremost, they know that it exists. Baumüller (2012), argued that information about the existence of agricultural technologies, including new ICTs, is a pre-requisite for their adoption. This information informs the potential user's decision to adopt the technologies. The information about a technology may be obtained from diverse sources such as friends, neighbors, agricultural extension agents or mass media. Additionally, farmers or other users of a technology may be motivated to adopt such technologies because of the benefits that accrue from their adoption. This is corroborated by Okello *et al.*, (2011), in their study on “factors influencing awareness and use of electronic-based market information services for farming business in Malawi” who observed that farmers who are aware of the existence of ICT-based market information services will adopt such services or technologies if they expect to benefit from doing so. In this regard, the adoption (use) of new ICTs such as mobile phones, computers, internet and e-mail by dairy goat farmers, may arise due to perceived benefits such as timely access to marketing information, reduction in information search costs, and/or improved bargaining power among others.

In summary, the specific objective of the study under this sub-topic that is, awareness of ICTs' use in agricultural marketing was to assess the level of awareness of new ICTs in dairy goat marketing by farmers in Meru South sub-county. Data on awareness levels among the dairy goat farmers was gathered by providing a list of new ICTs in a questionnaire from which the respondents choose the new ICTs they were aware of with regard to agricultural marketing.

2.4 Access to ICTS for Agricultural Marketing

According to Alampay (2006), access to ICTs can be defined in terms of physical access to an ICT device. Warschauer (2004), argues that, even though most limited, ownership of a device (ICT) is the simplest way of thinking about ICT access. However, further classification can be drawn such that among those who own the ICT devices, a distinction can be drawn between those who do not own the device (s) but can derive benefits from them (ICTs) when provided either commercially (i.e. buying the ICTs services) or at no cost to the beneficiaries as in the case with borrowing from relatives, friends or neighbors.

In an effort to improve access to better performing markets smallholder farmers have acquired various ICTs to enable them access market information and effect agricultural and other transactions in a more convenient, cost effective and efficient manner. Some of the ICTs commonly accessible to the rural folk in general and smallholder farmers in particular include old ICTs such as radios, television, telephone as well as new ICTs such as mobile phones, internet (emails and websites). Even though most of the rural households have access to at least one or more of the old ICTs, new ICTs particularly mobile phones and internet (emails and websites) have also been on the increase among the rural and urban populace prompting their use by farmers to market their produce. Indeed, a study conducted by Czapiewski *et al.*, (2013) in Mazovia region in Poland on diagnosis and evaluation of ICT use in farming revealed that the most common ICT device in the farms that were surveyed was the mobile phone, followed by the computer and lastly, the Internet. More so, the International Telecommunication Union (ITU) estimates that as at 2012, there were 6.8 billion mobile phone subscribers worldwide against a world population of 7.1 billion people (ITU, 2013). It is documented that, in Kenya a total of

30.7 million subscribers were registered on the mobile network translating to a mobile penetration rate of 78.0% as at the end of Quarter two of the 2012/13 financial year (Communications Commission of Kenya, (CCK), 2012). It is further documented that out the 93% Kenyans who use mobile phones for communication and mobile money transfer, 80% adults own their own personal mobile phones, while 10% use phones owned by other people in their households and a further 3 % use phones owned by people outside their household (e.g friends and neighbors) (Demombynes and Thegeya 2012). Some of the reasons that have been put forward to explain why mobile phones have been accepted and adapted much faster compared to other ICTs in rural areas are the ability of these ICTs to: (i) reduce the distance between individuals and institutions and (ii) make local content available in addition to making rural services more efficient in terms of coordination and logistics, and cost effectiveness (Michailidis *et al.*, 2010). Additionally, the money transfer services offered via the mobile phones have endeared many rural people to them. Furthermore, mobile phones are regarded as a less expensive and more accessible means to close the digital divide compared to other ICTs (Wade, 2004).Some scholars have argued that today the richest and the fastest source of information is internet (Czapiewski et al., 2013). Others have opined that “the search for an effective strategy for agricultural development calls for adequate use and application of ICTs, especially computers and the Internet, which are considered as among the principal drivers of economic growth and development worldwide” (Abubakar and Abdulahi, 2009).

It has also been recognized that improving market efficiency can be achieved by use of the powerful search engines available though the internet by bringing together a range of global buyers and sellers to organize exchanges for electronic trade (Chung *et al.*, 2010). Against this

background, the use of internet has attained some reasonable level of popularity even into the rural areas due to the realization that these ICTs can facilitate faster, convenient and cost effective means of communication in a variety of ways e. g through emails or online discussions between or among individuals who are geographically dispersed. Additionally, computers and internet allow the users unlimited access to online content available through various websites. Thus, traders including farmers have found in these new ICTs an opportunity to explore better paying markets.

In summary, the specific objective of the study under this sub-topic that is, access to ICTs for agricultural marketing) was to determine the access of the new ICTs among the smallholder dairy goat farmers in Meru South sub-county. Data on access levels was gathered by collecting information on the new ICTs owned by the farmers. The data collection also included establishing whether the ICTs actually belong to the farmer or whether it is borrowed or whether the farmers obtain the services by paying for them from ICT service vendors such as cyber café operators and telephone operators.

2.5 Use of ICTS in Agricultural Marketing

One of the most important factors influencing the performance of smallholder agriculture in developing countries and least developed countries in particular is market access (Barret, 2008). Mukhebi *et al.*,(2007) and Mukhebi (2004), observes that lack of market information represents a major hindrance to market access especially for smallholder poor farmers as it substantially increases transaction costs and reduces market efficiency. Additionally, poor market access (or lack of market access) by smallholder farmers has been attributed to lack of reliable and timely

agricultural market information on input and output quality and quantity (Okello *et al.*, 2011). This significantly affects the smallholder farmers' capacity to make timely marketing decisions such as the decision on the best time to: purchase the inputs, initiate production and deliver produce to the market. Tollens (2006) and Aker (2008), argue that in an endeavor to resolve the problem of poor access to better performing markets by smallholder farmers, recent attempts have focused on promoting information transfer through ICT-based innovations. These ICT-based innovations include new ICTs such as mobile telephony, and interactive video and CD-ROM programs, on-line discussion groups, internet, websites, and e-mails in addition to the conventional broadcast media (old ICTs) such as television, video and radio (Munyua, 2007; McBean, 2005). Computers and digital cameras also constitute the new ICTs. The use of conventional communication channels has been criticized for being monologic and not allowing for much interaction with the users (Okwu & Iarkaa, 2011). Thus more emphasis has been put in promoting the use of modern (new) ICTs due to the realization of the important role they can play in among others: communicating knowledge and information to farmers in the rural areas, delivering at low cost the training and education modules to farmers, improving access to markets and agricultural credit by smallholder farmers as well as empowering them (farmers) to negotiate for better prices (Okello *et al.*, 2012). In addition, the use of these new ICTs by the farmers has enabled them to connect to better paying markets, reduce information search costs, process payments efficiently, as well as minimize information asymmetry between the farmers and agricultural produce traders.

For a long time the public and private sector actors have been searching for effective solutions to tackle both the long term and short-term challenges in agriculture, including how to respond to

the abundant information needs of farmers (World Bank, 2011). In many countries, initiatives have been developed to enhance market transparency and improve smallholder farmers' bargaining power by ensuring that the farmers are supplied with up-to-date market information on prices of agricultural inputs and outputs. Some of these initiatives involve development of electronic systems such as websites and electronic-based Market Information Services (MISs) for dissemination of agricultural market information and for offering trading services. For instance, in Kenya, the government has developed an agricultural market information website- National Farmers Information Service (NAFIS)-(www.nafis.go.ke), which provides the farmers with agricultural commodity prices besides offering them with an opportunities to link up with the potential buyers of their commodities. The private sector equivalent of NAFIS is the Kenya Agricultural Commodity Exchange (KACE)-(www.kacekenya.com), which is an electronic-based Market Information Service (MIS) developed and operated by a private sector firm, KACE limited (Mukhebi,2004). The two electronic platforms (i.e NAFIS and KACE) allow the users (farmers and other agricultural traders) online access to marketing information besides offering Short Message Service (SMS) and Interactive Voice Response (IVR) services to the farmers and other agricultural produce traders on the available produce market opportunities via mobile phones. Furthermore, the entrepreneurs in the private sector have developed innovative applications such as I-cow and M-farm which provide agricultural market information over the internet and also provide a platform for sellers and buyers to link up and execute their transactions. Both applications can be accessed over the internet buy the users. This is in addition to the revolutionary money transfer services such as the M-pesa, AirtelMoney, MobiKash and Yucash which provide convenient and efficient means of settling transactions via the mobile phones.

In sum, the specific objective of the study under this sub-topic; use of ICTs in agricultural marketing, was to determine the usage levels of the new ICTs amongst the smallholder dairy goat farmers in Meru South sub-county. Data on new ICT usage levels was gathered by collecting information on the new ICTs actually used by the farmers in marketing of dairy goats and the frequency of their use.

In conclusion, the emergence of ICTs especially the new ICTs such as the mobile phones, computers, internet, websites and their use in delivery of agricultural information particularly the market information has improved access to better performing markets and thus promoted agricultural productivity among the smallholder farmers. This observation is corroborated by Wayne *et al.*, (2009), who observed that the new ICTs have been particularly useful due to their potential to facilitate information exchange between the extension (sources of agricultural information) and the clients (farmers and agri-traders) in a much faster and efficient manner. It is against this background that the proposed study seeks to assess the awareness and use of new Information Communication Technologies in marketing of dairy goats among the smallholder farmers.

2.6 Conceptual Framework

The conceptual framework illustrated in Figure 1 shows relationships between the independent variables; socio-demographic characteristics, awareness of the new ICTs and access of new ICTs, and the dependent variable; use of the new ICTs. The study conceptualizes that the socio-demographic characteristics of the respondents have influence on awareness of the new ICTs, which in turn influences the use of the new ICTs by the dairy goat farmers. The socio-demographic characteristics were measured using selected variables such as age, gender,

education level, household income level and membership to a dairy goat keeping group while awareness of new ICTs was measured by finding out from the respondents, the new ICTs they have ever heard about. Access to new ICTs was measured by identifying the new ICTs owned by the dairy goat farmers and the type of ownership of these new ICTs. The use of the new ICTs was measured by finding out from the respondents the ICTs they use and the frequency with which they use them.

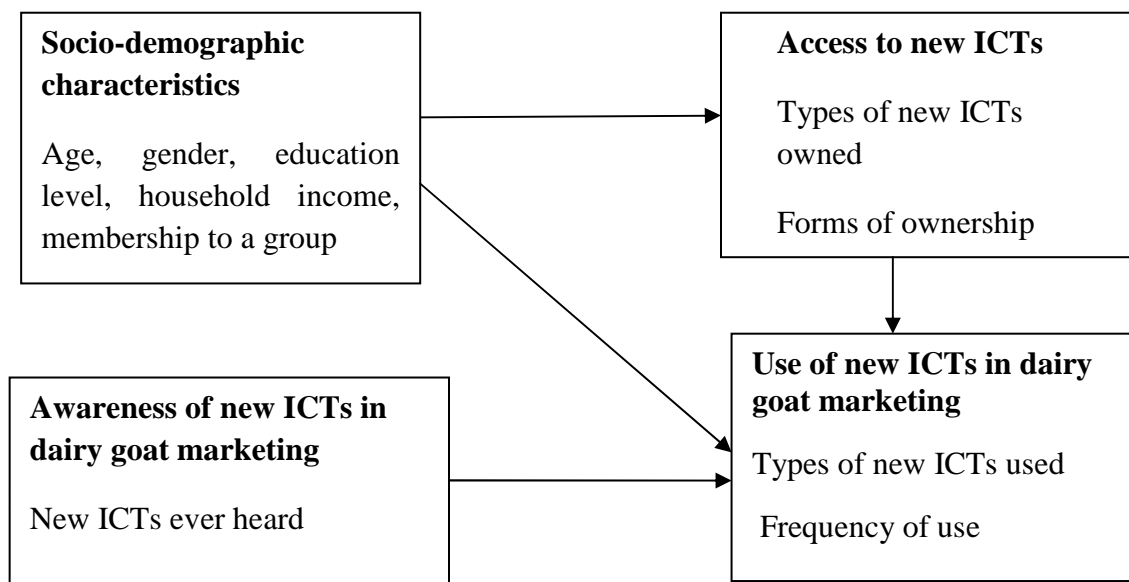


Figure 1: Conceptual framework

(Source: Author's Conceptualization)

CHAPTER THREE

STUDY DESIGN AND METHODOLOGY

Introduction

This chapter presents the study design and the methodology of the study. The chapter describes the study area, the population and sample frame, sample size determination, sampling procedure methods of data collection and analysis.

3.1 Study Design

The study adopted a cross-sectional research design. The design allows the researcher to measure the independent and dependent variables at the same point in time using research tools such as the questionnaire (Bhattacharjee, 2012). Thus, the design helps the researcher to collect the data within a short time hence cost effective.

3.2 Methodology

3.2.1 Study Area

The study was carried out in Chuka and Magumoni divisions of Meru South Sub-county in Tharaka Nithi County. The geographical location of the two divisions is shown in Figure 2. Chuka division has the highest population of 61, 449 persons constituting 16,869 households, followed by Magumoni with 36,498 persons constituting 9,251 households (KNBS, 2010). According to Republic of Kenya (2009), the altitude of Meru South district ranges from 5,200 metres above sea level at the tip of Mt. Kenya to 600 metres in the lower zones. The soils in the district are characterized by deep red loam soils in Chuka and Magumoni divisions, and are well drained and fairly fertile but due to over-cultivation they require fertilizers to improve their

fertility (ibid).The district has bi-modal rainfall pattern with the long rains falling in March to May and the short rains falling in October to December (Republic of Kenya, 2009). The rainfall ranges between 500mm to 2200mm (ibid). The temperatures in the district range between 14^oc to 17^oc in the highlands to 22^oc to 27^oc in the lowlands (Republic of Kenya, 2009).

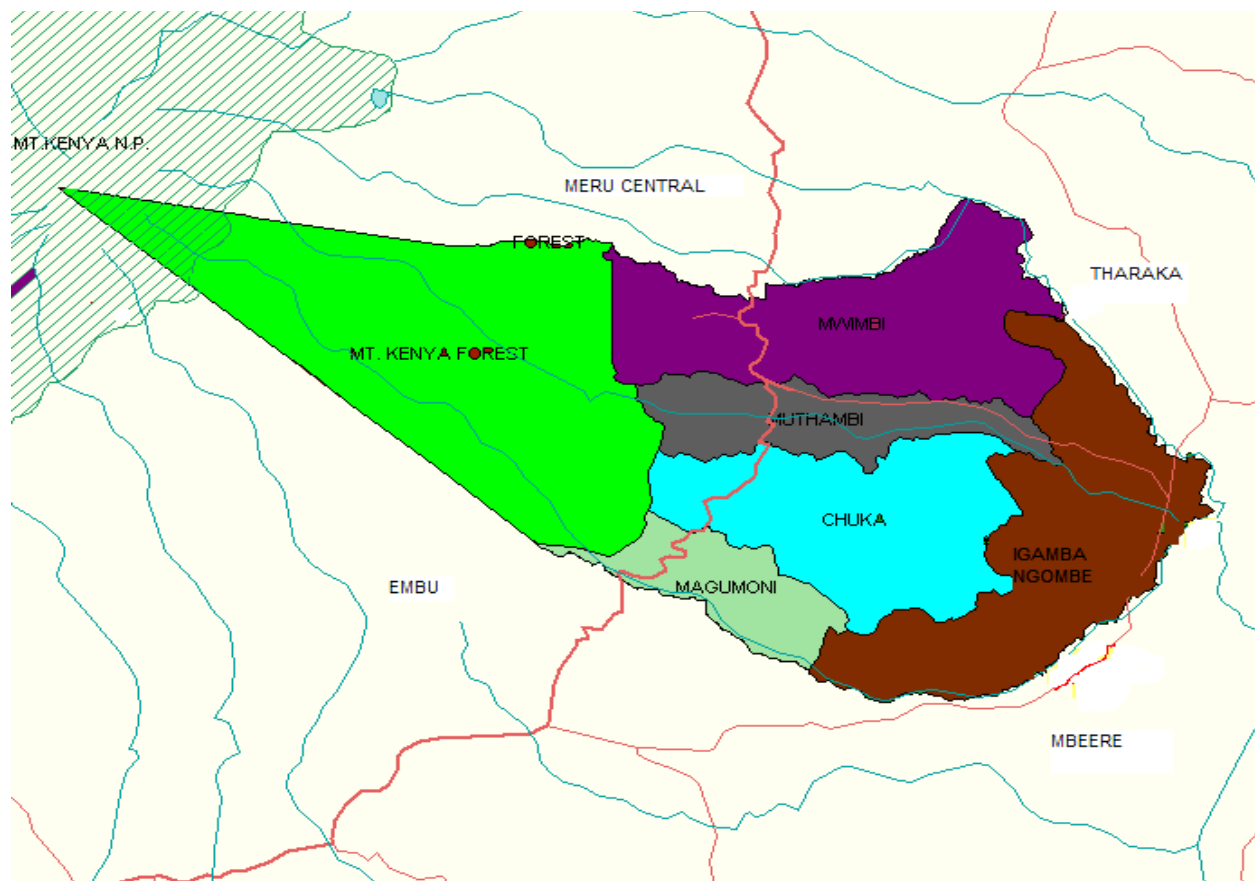


Figure 2: A Map of Meru South district showing the study divisions (Chuka and Magumoni)
(Source: District Environmental Plan (2006-2011, Meru South District)

The information obtained from Meru South district development plan 2008-2012 indicates that agriculture is the main occupation of the people in the district contributing about 45% of the household incomes (Republic of Kenya, 2009). The average farm size is two hectares among the

small-scale farmers and an average of ten hectares among the large scale farmers (ibid). The main food crops are maize, beans, sorghum, millet, green grams and cow peas while the major cash crops include tea, coffee and cotton (Republic of Kenya, 2009). The major livestock enterprises include dairy farming, beef production, goat and sheep keeping, rabbit production, pig production and bee keeping (Republic of Kenya, 2013).

3.2.2 Population and Sampling Frame

The study population comprised of all smallholder farmers in Chuka and Magumoni divisions of Meru South sub-county while the sampling frame comprised of all the dairy goat farmers in the study divisions. Meru South district has a total of 2,800 dairy goat farmers registered with the MGBA 1,570 of which are from Chuka division while 1,230 are from Magumoni division (Ministry of Agriculture, Livestock and Fisheries (MoALF, 2013).

3.2.3 Sample Size Determination

The desired sample size for the study was obtained the formula: $n=Z^2pq/d^2$ (Fisher *et al.*, 1991)

Where:-

n=sample size for an infinite population

Z= 1.96 (at 95% confidence interval)

p=proportion of the sample with the desired characteristics (50%)

q=1-p

d=acceptable degree of accuracy at 5% (0.05)

Thus, for a population more than 10,000,

the desired sample size $n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2} + 10\% \text{ attrition}$

$$= 422$$

For a finite population of 2800 dairy goat farmers, the minimum sample size for the study was determined using Yamane's (1967) formula: $n = N / (1 + N(e)^2)$

When the population is less than 10,000, the formula is modified as $nf = n(1+n)/N$

Where: -

nf= the desired sample size

n= sample size for an infinite population

N=estimate of the population

$$\begin{aligned} \text{Thus, the desired sample size, } nf &= 422 \frac{(1+422)}{2800} + 10\% \text{ attrition} \\ &= 70 \end{aligned}$$

Therefore, in order to obtain better results a sample of 97 dairy goat farmers was used.

3.2.4 Sampling Procedure

Meru South sub-county has three divisions; Chuka, Magumoni and Igamba Ng'ombe divisions. Chuka and Magumoni divisions were purposively selected for the study since they are the only divisions where dairy goat farming is mostly practiced in Meru South sub-county. A list of all the dairy goat farmers in the two divisions was obtained from the MGBA office at Chuka. The list constituted a sampling frame with 2,800 farmers from which a sample of 97 dairy goat farmers was drawn using a systematic sampling method in which every 29th name from the list was selected. The sampling procedure is as illustrated in Figure 3.

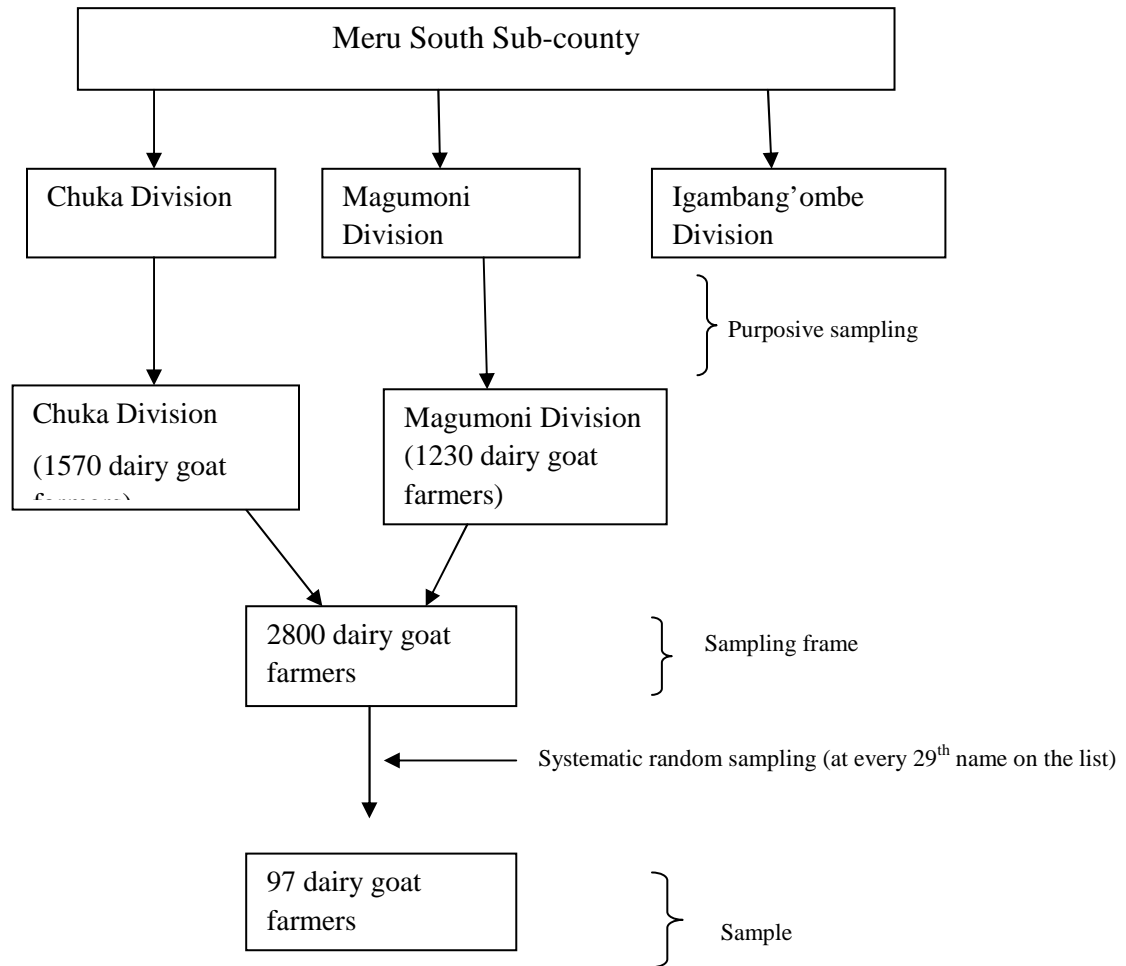


Figure 3: Diagrammatic representation of the sampling procedure

3.2.5 Data Collection

Three focus group discussions were carried out with key informants from Chuka and Magumoni divisions to gain insights on dairy goat marketing and the usage new ICTs in dairy goat marketing. The key informants consisted of the officials of dairy goat farmer groups from the two study divisions, and officials of Meru Goat Breeders Association (MGBA) from Meru South sub-county. In each of the two divisions one focus group discussion comprising of six officials of dairy goat groups was carried out. The third focus group discussion comprised of six officials of

MGBA drawn equally from the two the divisions. Additionally, a previously tested structured questionnaire was administered by the researcher and a trained research assistant to collect information on socio-demographic characteristics of the dairy goat farmers (age, gender, education level, household income levels, and membership to a group), the new ICTs owned and the forms of ownership, the new ICTs farmers have ever heard about, new ICTs actually used by the dairy goat farmers as well as the frequency of use of the new ICTs.

3.2.6 Data Analysis

The study used both descriptive and inferential statistics to analyze the data collected. Descriptive statistics such as frequency distribution and percentages were used to analyze the data on the four objectives of the study. A statistical package for social science (SPSS) software version 17 was used for statistical manipulation of the data. Microsoft Office Excel 2007 application was used to present the results in form of frequency tables, percentages, pie charts and bar graphs. More so, chi-square was used to test the three hypotheses of the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents the results of the study followed by a discussion in view of the objectives of the study.

4.1 Socio-demographic Characteristics Influencing the Use of New ICTS in Dairy Goat Marketing among the Smallholder Dairy Goat Farmers

4.1.1 Types of Dairy Goat Breeds kept

As indicated in Table 1, the most commonly kept breed of goat was Toggenburg with 80% of the respondents indicating that they kept this type of dairy goat breed. This could possibly be due to the fact that Toggenburg was the first breed of dairy goat to be introduced by FARM-Africa to the farmers in the Meru South, Meru Central, Mwingi and Kitui districts (Peacock *et al.*, 2011)

Table 1: Types of goat breeds kept by the farmers

Goat breeds kept by the farmers	Frequency	Percent
Saanen	3	3.20
Toggenburg	76	80.00
Germany Alpine	2	2.00
Kenya Alpine	3	3.20
Crosses	6	6.30
Others	5	5.30
Total	95	100.0

4.1.2 Age of the Respondents

The results of the analysis as indicated in the Figure 4 shows that 94.2% of the respondents who used the new ICTs, that is, mobile phones and internet, in marketing of the dairy goats were aged between 21-30 years, 92.0% were aged 31-40 years, and 89.5% were aged 41-50 years. Furthermore, the results indicate that 75.4.0% of the respondents were aged between 51-60 years while 68.6% had more than 61 years. The results reveal that an increase in the age of the respondents reduces their probability to use the new ICTs in marketing of the dairy goats.

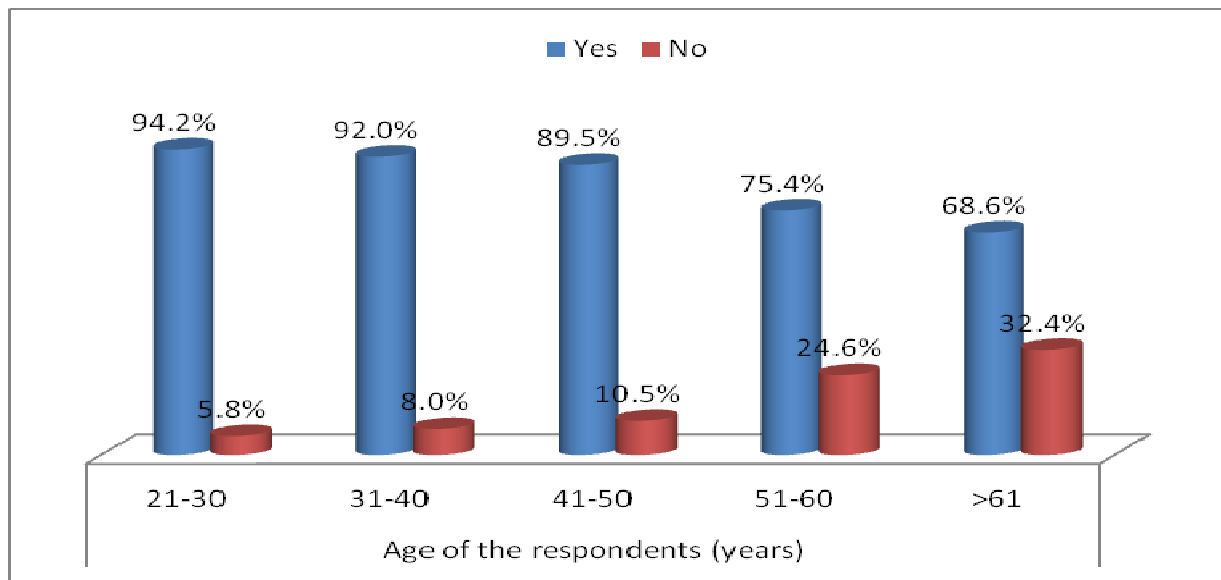


Figure 4: Age of the respondents and use of new ICTs

The phenomenal use of new ICTs among the respondents in the age brackets 21-40 years could be attributed to an observation that younger people tend to exhibit higher user levels (Chabossou *et al.*, 2008). More so, according to Okello *et al.*, (2010), young farmers (such as those in age

bracket 21-40 years), are more likely to use ICT tools for agricultural transactions than their aged counterparts given that this category of farmers are more literate and better able to use ICTs.

4.1.3 Gender

The results of data analysis as indicated in the Table 2 shows that the usage of new ICTs was highest among the females at 94.2% compared to usage levels of 90.7 % among the males. This suggests that more women than men use the new ICTs in marketing of dairy goats.

Table 2: Gender of the respondents

Response	Variable: Gender			
	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Yes	39	90.7%	49	94.2%
No	4	9.3%	3	5.8%
Total	43	100%	52	100%

The increased use of new ICTs by women as compared to men could be explained by the fact that women from the area covered by the study have a slightly upper hand in accessing the benefits accruing from dairy goat enterprises as compared to other enterprises such as dairy, coffee and tea whose benefits are exclusively controlled by men. The results compare favorably with the findings of (Sabuhoro and Wunsch, 2003) who found out that if the farmer is female the probability of ICT use is likely to increase. More so, studies by (Blumenstock and Eagle, 2012)

have revealed that more women are likely to use shared phones than men thus resulting to higher ICT usage levels among the females as compared to men.

4.1.4 Education Level

The results of data analysis as indicated in Table 3 indicate that the usage of new ICTs in dairy goat marketing was highest among respondents with higher education levels; post primary 88.2%, secondary 100 %, college 100% and university 100% and least among respondents with lower education levels; adult education 60% and Primary 71.4%. This implies that a higher education level has a positive influence on the use of new ICTs for dairy goat marketing.

Table 3: Education Levels of the respondents

Response	Variable : Education level											
	Adult Education		Primary		Post-primary (Vocational training)		Secondary		College (Middle level)		University	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Yes	3	60	15	71.4	15	88.2	29	100	20	100	3	100
No	2	40	6	28.6	2	11.8	0	0	0	0	0	0
Total	5	100	21	100	17	100	29		20	100	3	100

The positive relationship observed between the education level and use of new ICTs by the respondents could be explained by the reasoning that education has an influence on an individual's ability to acquire information, and also the individual's capacity to interpret and utilize the acquired information. In an argument that supports this view, some scholars have

argued that farmers who are poorly educated are less able to acquire information from the new ICTs such as internet Czapiewski *et al.*, (2013) while studies by Piccoli *et al.*,(2001) have established that the education level of an individual has an influence on the adoption and usage of ICTs through influencing the capacity of an individual to use the technology. Furthermore, studies have shown that education improves the farmers’ capacity to comprehend the benefits of new technologies including new ICTs (Okello *et al.*, 2009).

4.1.5 Household Income Level

As indicated in Table 4, the use of new ICTs in marketing of dairy goats was higher among the respondents from households with higher income levels, that is, households with income levels of Ksh.150,001 and above, while the use of new ICTs was lower among respondents from households with lower income levels, that is, households with income levels of between Ksh.50,000- 150,000. This shows that households with higher income levels have higher chances of using new ICTs since they can afford to buy them more easily than their counterparts.

Table 4: Household Income Levels

Response	Household income(Annual) (Ksh)							Total
	50,000-100,000	150,000-100,001	200,000-150,001	250,000-200,001	300,000-250,001	350,000-300,001	Above 350,000	
Yes	6 (40%)	10 (58.8%)	12 (75%)	15 (88.2%)	10 (76.9%)	7 (70%)	6 (85.7%)	66 (69.5%)
No	9 (60%)	7 (41.2%)	4 (25%)	2 (11.8%)	3 (23.1%)	3 (30%)	1 (14.3%)	29 (30.5%)
Total	15 (100%)	17 (100%)	16 (100%)	17 (100%)	13 (100%)	10 (100%)	7 (100%)	95 (100%)

The finding revealed by this study could be explained by an argument that households with higher income levels have a higher propensity to spend beyond their basic needs hence can afford to acquire ICTs and related services while household with lower income tend to spend most of their income on basic needs. This argument is corroborated by Kwapong (2008), who in a study conducted in Ghana on policy implications for using ICTs for empowering of rural women observed that, increase in income levels promotes expenditure beyond the basic needs. The study further observed that families with higher incomes tend to spend less on food while poorer households spend higher amount of their incomes on food. Moreover, research findings from other studies have revealed that households with more income are likely to have surplus to buy ICT tools such as radios, televisions, mobile phones among others and thus be able to use them for marketing transactions (Okello *et al.*, 2011).

4.1.6 Group Membership

The results of the analysis as indicated in the Table 5 shows that use of new ICTs was higher; 97.8 %, among the respondents who belonged to dairy goat keeping groups and lower; 96.0 % , among the respondents who did not belong to any dairy goat keeping group. This suggests that membership to a dairy goat keeping group increases the probability of an individual to use the new ICTs for dairy goat marketing purposes.

Table 5: Group membership of the respondents

Response	Variable: Group membership			
	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Yes	44	97.8%	48	96.0%
No	1	2.2%	2	4.0%
Total	45	100%	50	100%

The high usage of new ICTs in dairy goat marketing among respondents who belonged to dairy keeping groups could possibly be due to the constant exchange of information on the benefits of the use of these new ICTs among the group members which arouses the curiosity to use these new ICTs in dairy marketing. More so, members of a group are more likely to influence each other to adopt new innovations as observed by (Okello *et al.*, 2011).

4.2 Level of Awareness of New ICTS' Use in Marketing of Dairy Goats among the Smallholder Dairy Goat Farmers.

The researcher sought responses on the new ICTs the farmers have ever heard about with regard to dairy goat marketing. The results of the analysis were presented and discussed as follows.

4.2.1 New ICTS ever heard

As indicated in the results of the analysis in Figure 5, the majority of the respondents; 87.50%, reported to have been aware about the use of mobile phones in regard to marketing of the dairy goats while only 12.50 % of the respondents reported to have been aware about internet. This implies that the mobile phones were the most popular known new ICTs in dairy goat marketing in comparison with the internet.

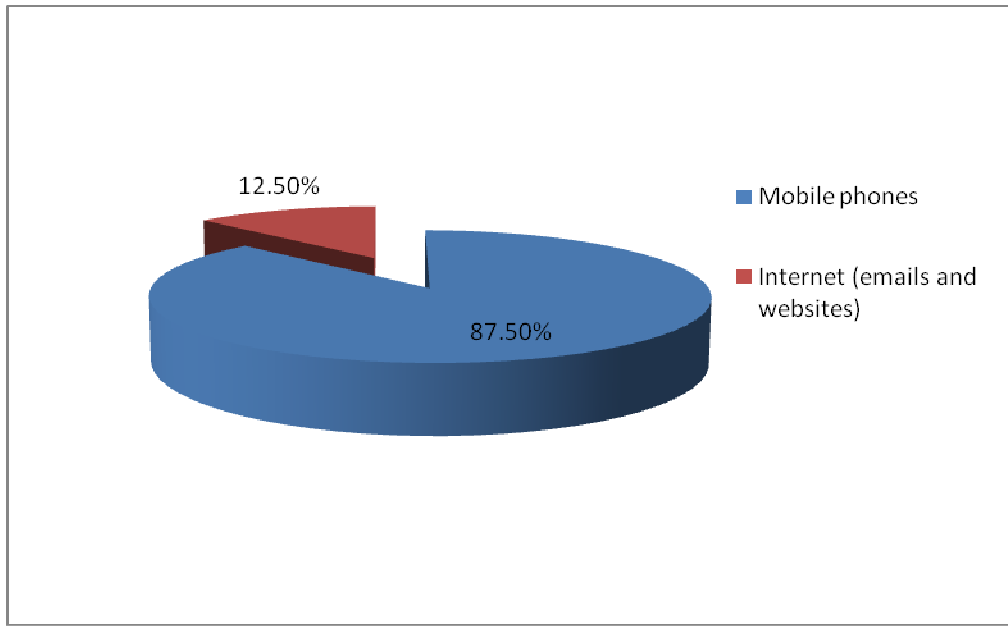


Figure 5: New ICTs ever heard

The observed popularity of the use of mobile phones among the dairy goat farmers could possibly be explained by the fact that mobile phones are more versatile than the internet (emails and websites) hence can be used to access several services such as telecommunication services (SMS, voice calls and interactive voice response), and money transfer services (Mpesa, AirtelMoney, MobiKash and YuCash). Furthermore, it is documented that there are more mobile phone subscribers than internet subscribers which stood at 32.2 million and 14.0 million respectively as at 30th June 2014 as documented by (Communications Authority of Kenya, CAK ,2014).

4.3 Access of the New ICTS among the Smallholder Dairy Goat Farmers

The study sought to determine the access of the new ICTs by obtaining responses on the new ICTs owned by the dairy goat farmers and the types of ownership; establishing whether the new

ICTs actually belong to the farmer or whether they are borrowed or whether the farmers obtain the services by paying for them from ICT service vendors such as cyber café operators and telephone operators. The results were presented and discussed as follows.

4.3.1 New ICTS owned

The results of the analysis as indicated in Figure 6 shows that most of the respondents; 87%, owned mobile phones while a small proportion; 13%, owned internet for use in the marketing of dairy goats. The results imply that mobile phones are the most widely owned new ICTs among the dairy goat farmers.

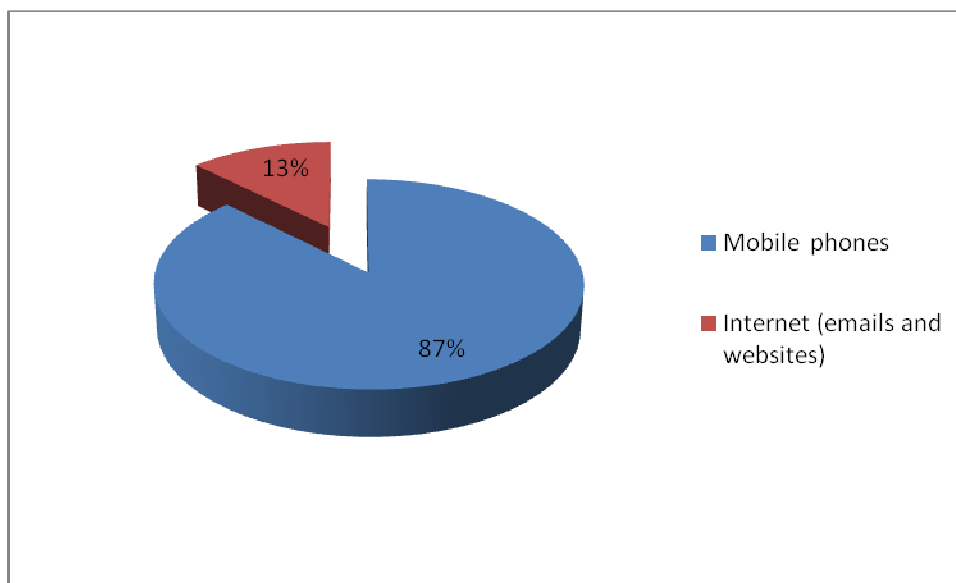


Figure 6: New ICTs owned by the dairy goat farmers

Mobile phones are more affordable than the internet services (emails and websites) especially among the rural populace. Furthermore, mobile phones are more easy to use by a majority of the people from a wide variety of demographics as compared to internet hence more people are bound to own mobile phones than internet.

4.3.2 Types of Ownership of the New ICTS

The results of data analysis indicated in Figure 7 reveals that 91% of the respondents had their own mobile phones, 6% borrowed the phones while 0% paid for the services from telephone vendors. More so, the results indicate that 1% of the respondents had their own internet services, 0% of the respondents accessed the service through borrowing while 22% of the respondents accessed internet services from the cyber cafes. The results imply that most of the dairy goat farmers can afford to own mobile phones more easily than internet services (emails and websites).

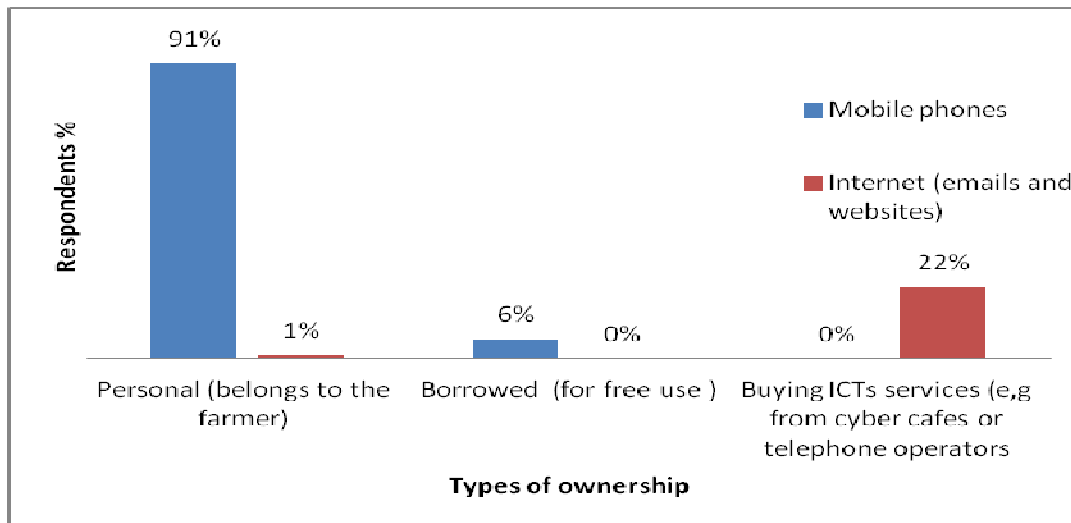


Figure 7: Types of ownership of new ICTs

These observed differences in the types of ownership of the new ICTs among the dairy goat farmers could perhaps be explained by differences in affordability levels. The majority of the dairy goat farmers who use mobile phones can afford to purchase these devices for their use while the majority of farmers who use internet pay for these services in the cyber cafes.

4.4 Usage Levels of the New ICTS among the Smallholder Dairy Goat Farmers

The researcher sought to obtain information on the usage levels of the new ICTs by collecting data on the new ICTs actually used by the farmers in marketing of dairy goats and the frequency of their use. The results of the analysis were presented and discussed as follows.

4.4.1 New ICTS used in Marketing of the Dairy Goats.

The results of the analysis in Figure 8 shows that the majority;86.70%, of the respondents use mobile phones in marketing of their dairy goats while only a small proportion of the respondents ;13.30%, use internet. The results imply that mobile phones are more widely used in dairy goat marketing than internet.

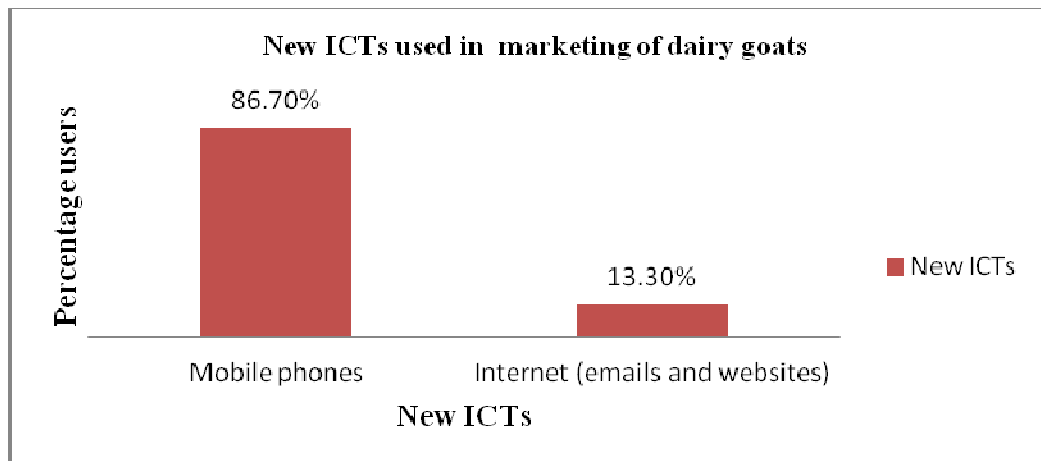


Figure 8: New ICTs used in marketing of dairy goats

Mobile phones provide the users with both telecommunication and money transfer services (Mpesa, AirtelMoney, Yucash, MobiKash) which endare them to the users more that the internet (emails and websites) which only provides communication services. Additionally, mobile phones

do not require much literacy skills to operate, are much more affordable and easily accessible to the rural folk, and besides. The results study are in line with the observations by Rashid & Elder (2009), who observed that the predominant mode of communication in developing world is mobile telephony.

4.4.2 Frequency of Use of the New ICTS

The results of data analysis as indicated in Figure 9 (a) shows that 87% “often” used mobile phones, 11% “rarely” used them, while 2% “never” used them. Furthermore, the results in figure 9 (b) indicate that 12% of the respondents “often” used internet, 88% “rarely” used them while 0% “never” used them. This suggests that the frequency of use of the mobile phones among the dairy goat farmers is much higher than that of the internet.

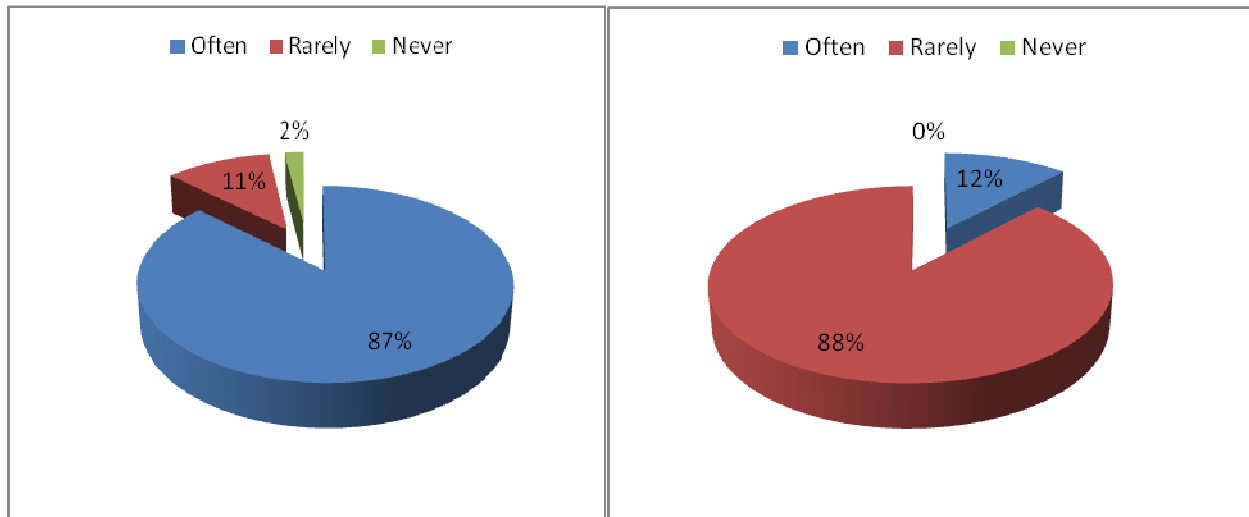


Figure 9(a): Frequency of the use of new ICTs
(Mobile phones)

Figure 9(b): Frequency of the use of new ICTs
(Internet-emails and websites)

The high frequency of the use of mobile phones compared to the internet could be attributed to the fact that mobile phones can be used to access a variety of services such as calls, SMS and

money transfer services. In addition, mobile phones do not require high literacy skills to operate as compared to internet services hence the most ideal for the rural populace.

The researcher also used chi-square to test the three hypotheses of the study; (i) there is no relationship between the socio-demographic characteristics of the dairy goat farmers and the use of new ICTs in dairy goat marketing, (ii) there is no relationship between the level of awareness of the new ICTs and the use of the new ICTs in dairy goat marketing and (iii), there is no relationship between access to new ICTs and the use of new ICTs in dairy goat marketing. The test results from all the three hypotheses revealed that there were relationships between the study variables and hence the null hypotheses were rejected.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study assessed the awareness and use of the new ICTs in dairy goat marketing among the dairy goat farmers in Meru South district. Based on the findings of this study, it was concluded that:

The socio-demographic characteristics of the respondents have influence on the use of the new ICTs in marketing of the dairy goats. In this regard, the study revealed a positive relationship between socio-demographics such as the respondents' age, education level, household income level and group membership, and the use of the new ICTs.

In regard to awareness of the new ICTs used in marketing of the dairy goats, mobile phones were the most commonly known of the new ICTs among the dairy goat farmers. However, the awareness levels on the use of the internet (emails and websites) were comparatively low.

In terms of accessibility of new ICTs identified by the study, mobile phones were the most commonly owned and easily affordable new ICTs among the dairy goat farmers and therefore, the most readily available for use in marketing of the dairy goats.

Mobile phones were the most widely used new ICTs in marketing of the dairy goats among the dairy goat farmers. In addition, they were the most frequently used types of the new ICTs.

5.2 Recommendations

This study recommends that:

Firstly, the institutions that promote the marketing of dairy goats such as the Meru Goat Breeders Association (MGBA), the dairy goat keeping groups and the Tharaka Nithi county government's department of livestock production should strongly put into consideration the socio-demographic characteristics of the dairy goat farmers when developing strategies and policies that incorporate the use of new ICTs in marketing of the dairy goats and other agricultural produce.

Secondly, the stakeholders involved in the marketing of the dairy goats should make efforts to promote the use of internet (emails and websites) as marketing platforms and hence avoid overreliance on mobile phones. This would ensure complementarities since different ICTs have varied strengths and weaknesses.

Thirdly, since mobile phones are most commonly owned and the most frequently used type of the new ICTs, collaborations should be explored with mobile phone software developers to develop customized software for dairy goat marketing in order to achieve greater success.

Fourthly, in view of the fact that the awareness and use of the new ICTs in marketing of the dairy goats was generally high, the national and the county governments should develop a policy to guide the promotion and use of the new ICTs in marketing of agricultural produce among the smallholder farmers.

Lastly, further research should be carried out to assess the impact of the use of new ICTs in marketing of the dairy goats among the smallholder farmers. This would provide useful information on the extent to which the new ICTs have succeeded in helping the smallholder

farmers connect to better performing markets as well as point out the gaps that needs to be addressed in order to make the use of new ICTs more advantageous to the smallholder farmers.

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APPENDICES

APPENDIX 1-QUESTIONNAIRE

Title of the Study: “An Assessment of Awareness and Use of New Information and Communication Technologies in Dairy Goat Marketing in Meru South Sub-county, Tharaka Nithi County, Kenya”

SECTION 1: IDENTIFICATION AND BACKGROUND INFORMATION

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

Questionnaire Code (Sub-county / Ward (Division) / Household)

Name of the Interviewer.....

Start time.....End time.....

GENERAL INFORMATION	
Respondent's Name:	
County:	
Sub- County	
Ward (Division):	
Location:	
Sub-Location:	
Village :	
Respondent's Mobile phone Number :	

General remarks:

SECTION2: INFORMATION ON DAIRY GOAT REARING AND MARKETING

1. Which breed (s) of dairy goats do you keep?

S/no	Breed	Tick as applicable	S/no	Breed	Tick as applicable
1.1	Toggenburg		1.4	Kenya Alpine	
1.2	Saanen		1.5	Crosses	

1.3	Germany Alpine		1.6	Others..... (specify)	
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2. For how long have you been keeping dairy goats? (**tick as applicable**)

(2.1) \leq 5 years [] (2.2) 6 -10 years [] (2.3) 11-15 years (2.4) $>$ 15 years

3. Have you ever sold dairy goats?

(3.1) Yes [] (3.2) No []

4. If yes in (3) above, where do you sell your goats?

4.1 Local market (Within the county) [] 4.2 Outside the county [] 4.3 Outside the **country** []

5. Kindly indicate your **total** sales from the dairy goats for the last 12 months.

S/no	Amount in Ksh.	Tick as applicable	S/no	Amount in Ksh.	Tick as applicable
5.1	\leq 10,000		5.4	30,001-40,000	
5.2	10,001-20,000		5.5	40,001-50,000	
5.3	20,001-30,000		5.6	\geq 50,001	

6. Indicate other dairy goat products you have sold in the last 12 months.

S/no	Product	Tick as applicable
6.1	Manure	
6.2	Milk	
6.3	Others (specify).....	

7. What is your **total** income from the product(s) indicated in (6) above in the last 12 months?

S/no	Amount in Ksh.	Tick as applicable	S/no	Amount in Ksh.	Tick as applicable
7.1	\leq 10,000		7.4	30,001-40,000	
7.2	10,001-20,000		7.5	40,001-50,000	
7.3	20,001-30,000		7.6	\geq 50,001	

8. What has been your **total** expenditure (costs) on your dairy goat enterprise for the last 12 months? (**tick the applicable box**).

(8.1) \leq Ksh.10, 000 []

(8.2). Ksh.10, 001 - Ksh.15, 000 []

(8.3). Ksh.15, 001- Ksh.20, 000 []

(8.4). Above Ksh.20, 001 []

SECTION 3: OBJECTIVE-BASED QUESTIONS

OBJECTIVE 1: To determine the socio-demographic characteristics of dairy goat farmers and establish their influence on the use of new ICTs in dairy goat marketing.

9. Kindly give the following information regarding yourself.

<p>9.1) <u>Age (years)</u></p> <ol style="list-style-type: none"> 1. \leq 20 2. 21-30 3. 31-40 4. 41-50 5. 51-60 6. \geq 61 <p>9.2) <u>Gender</u></p> <p>1. Male 2. Female</p>	<p>9.3) <u>Educational Level</u></p> <ol style="list-style-type: none"> 1. Primary 2. Post-primary-vocational 3. Secondary, A-level 4. College (middle level) 5. University 6. Adult education 7. No education 	<p>9.4) <u>Household Income</u> <u>(annual) (Ksh.)</u></p> <ol style="list-style-type: none"> 1. Less than 10,000 2. 10,000-50,000 3. 50,001-100,000 4. 100,001-150,000 5. 150,001-200,000 6. 200,001-250,000 7. 250,001-300,000 8. 300,001-350,000 9. above 350,000 	<p>9.5) <u>Group membership</u></p> <ol style="list-style-type: none"> 1. Yes 2. No
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OBJECTIVE 2: To assess the level of awareness of new ICTs in marketing of dairy goats by farmers in Meru South sub-county.

10. Do farmers in this sub-county use new ICTs in marketing of their farm produce?

10.1) yes [] 10.2) No []

11. Which of the following new ICTs have you ever heard about in regard to dairy goat marketing?

S/no	New ICT ever heard about	Tick as applicable
11.1	Mobile phones	

11.2	Internet (emails and websites)	
11.3	None	
11.4	Others (<i>specify</i>).....	

OBJECTIVE 3: To determine the access of the new ICTs amongst the smallholder dairy goat farmers in Meru South sub-county.

12. Which of the following new ICTs do you own?

S/no	New ICT	Tick as applicable
12.1	Mobile phones	
12.2	Internet (emails and websites)	
12.3	None	
12.4	Others (<i>specify</i>).....	

13. From the new ICTs identified in 12 above kindly indicate the type of ownership applicable to you. (*If none, move to the next question*).

S/no	New ICTs	Type of ownership of new ICTs
13.1	Mobile phones	(a) Personal (belongs to the farmer) (b) Borrowed (for free use) (c) Buying ICT services (e.g. from commercial telephone operators) (d) Others (<i>specify</i>).....
13.2	Internet (emails and websites)	(a) Personal (owned by the farmer) (b) Borrowed (for free use) (c) Buying ICT services (e.g. from cyber cafes) (d) Others (<i>specify</i>).....
13.4	Others (<i>specify</i>).....	a) Personal (owned by the farmer) (b) Borrowed (for free use) (c) Buying ICT services (e.g. from cyber cafes or commercial telephone operators)

		(d) Others (<i>specify</i>).....
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OBJECTIVE 4: To assess the level of usage of new ICTs in marketing of dairy goats by farmers in Meru South sub-county.

14. Have you ever used new ICTs in marketing of your dairy goats?

14.1 Yes [] 14.2 No []

15. If yes, from the list of the new ICTs indicated below, which one (s) have you ever used in marketing of your dairy goats?

S/no	New ICTs ever used in dairy goat marketing	Tick as applicable
15.1	Mobile phones	
15.2	Internet (emails and websites)	
15.3	None	
15.4	Others (<i>specify</i>).....	

16. How frequently do you use the new ICTs identified in question (15) above? (**Tick as applicable**).

S/no	New ICT	Mobile phones	Internet (emails and websites)	Others (<i>specify</i>).....
	Frequency			
16.1	Often			
16.2	Rarely			
16.3	Never			

XXXXXXXXXX

Thank you very much for your time.

APPENDIX 2: QUESTIONS FOR FOCUS GROUP DISCUSSIONS

Title of the study: An Assessment of Awareness and Use of New Information and Communication Technologies in Dairy Goat Marketing in Meru South Sub-county, Tharaka Nithi County

SECTION 1: IDENTIFICATION AND INTERVIEW BACKGROUND

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

Name of the Interviewer.....

Start time.....End time.....

GENERAL INFORMATION	
Name of the focus group	
County:	
Sub- County	
Division:	
Contact person:	

SECTION 2: FOCUS GROUP DISCUSSION QUESTIONS

1. Which dairy goat breeds are mainly kept by farmers in this sub-county?

2. Where do dairy goat farmers from this sub-county sell their dairy goats? **Probe:** Local market (within the county), outside the county and/or outside the country. (*Where possible try to find out the specific names of the markets (destinations) i.e. names of the local markets, counties or countries*).

3. What are the sources of dairy goat market information among farmers within this county?

4. Do dairy goat farmers in this sub-county use Information and Communication Technologies (ICTs) in marketing of their dairy goats? If yes, which types of ICTs are used **AND** in what ways are they used? *Probe: New ICTs such as mobile phones and internet (emails and websites) and old ICTs such as radio, television and videos used by the farmers.*
5. In your own opinion, out of 10 households where dairy goats are kept what is the access level of the new ICTs such as mobile phones and internet (emails and websites) and any other new ICTs.

S/no	Type of new ICT	No. of households with access to the new ICT
5.1	Mobile phones/ 10
5.2	internet (emails and websites/10
5.3	Others (specify)...../10

6. What do you consider to be the benefits of using new ICTs (mobile phones and internet) in marketing of dairy goats among the farmers in this sub-county?
7. What are the market-related challenges faced by the dairy goat farmers in this sub-county?

XXXXXXXXXXXXX

Thank you very much for your time.

**APPENDIX 3: LETTER OF INTRODUCTION TO THE SUB-COUNTY LIVESTOCK
PRODUCTION OFFICER**

Christopher Bundi Rwanda,

P.O Box 37-60403,

Magumoni.

8th August July, 2014.

Sub-county Livestock Production Officer,

Meru South Sub-county,

P.O. Box 15, Chuka

Dear sir/madam,

Re: Field study in Meru South Sub-county

My name is Christopher Bundi Rwanda, a Master of Science degree student in Agricultural Information and Communication Management (AICM) at the Department of agricultural Economics, University of Nairobi.

I would like to carry out the above mentioned exercise in Meru South Sub-county, in Chuka and Magumoni divisions in September 2014. The focus of my study is on **“awareness and Use of New Information and Communication Technologies in Dairy Goat Marketing in Meru South Sub-county, Tharaka Nithi County”**.

The purpose of this letter is to kindly request you to allow me to collect both primary and secondary data from your office and field. I also request that you allow me to use your staff in helping me identify the contact persons for dairy goat farmers i.e dairy goat group officials and Meru Goat Breeders Association (MGBA) officials.

Kind Regards,

Christopher Bundi Rwanda

Cell phone: 0724 4214 214

Email:chriswanda82@gmail.com

APPENDIX 4: LETTER OF INTRODUCTION TO DAIRY GOAT FARMERS, DAIRY GOAT GROUP OFFICIALS, AND MGBA OFFICIALS.

Christopher Bundi Rwanda,

P.O Box 37-60403,

Magumoni.

8th August July, 2014.

The dairy goat farmers/ dairy goat group officials/ MGBA officials,
Magumoni and Chuka Divisions,
C/o P.O. Box 15, Chuka.

Dear sir/madam,

Re: Field study in Meru South Sub-county

My name is Christopher Bundi Rwanda, a Master of Science degree student in Agricultural Information and Communication Management (AICM) at the Department of agricultural Economics, University of Nairobi.

I would like to carry out the above mentioned exercise in Meru South Sub-county, in Chuka and Magumoni divisions in September 2014. The focus of my study is on **“awareness and Use of New Information and Communication Technologies in Dairy Goat Marketing in Meru South Sub-county, Tharaka Nithi County”**.

I am happy to inform you that you have been identified as a farmer /official who will participate in this study. The study is purely for my education purpose and the outcome of the study can be availed to you on request. At the same time, wish to assure you that the information provided will be in confidence and will be used for the purposes of this study only. I request for your availability and co-operation.

Kind Regards,

Christopher Bundi Rwanda

Cell phone: 0724 4214 214

Email:chrisrwanda82@gmail.com