

**THE ROLE PLAYED BY MOBILE PHONE COMMUNICATION IN DIFFUSION OF  
DAIRY GOATS REARING IN MUTONGUNI DIVISION,  
KITUI COUNTY. KENYA.**

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**Dissertation Submitted to the Department of Agricultural Economics in partial fulfillment  
of the requirement for the award of a degree of Master of Science in Agricultural  
Information and Communication Management (AICM) of University of Nairobi.**

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## **DECLARATION**

This dissertation is my original work and has not been presented for a degree in any other university.

Sign

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### **Recommendation**

This dissertation is from the student's own work and effort, and where he has other sources of information it has been acknowledged in the reference section. The dissertation has been submitted with our recommendations as university supervisors.

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## **DEDICATION**

To my late grandfather Oliech Adongo (Ayombi wuod Ny'Asembo) who wished that I pursue my education to America. To him only those with American university degrees were academic giants in the land. He cited the likes of Oruko, D.O. Makasembo, Ochola Ogaye Makanyengo and Tom Okello Odongo.

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## **ABBREVIATIONS AND ACRONYMS**

ADP	-	Area Development Programme
ASAL	-	Arid and Semi Arid Lands
CAES	-	Caprine Arthritis Encephalitis Syndrome
CCPP	-	Contagious Caprine Pleuropneumonia
DAO	-	District Agricultural Officer
DC	-	District Commissioner
DGR	-	Dairy Goat Rearing
DLPO	-	District Livestock Production Officer
DO	-	District Officer
DVO	-	District Veterinary Officer
ECA	-	Economic Commission for Africa
FGD	-	Focused Group Discussion
GSM	-	Global System for Mobile communications
ITU	-	International Telecommunication Union
ICT	-	Information and Communication Technology
ICRIER	-	Indian Council for Research on International Economic Relations
KACE	-	Kenya Agricultural Commodity Exchange
KII	-	Key Informants Interview
KWDGA	-	Kitui West Dairy Goat Association
Mpesa	-	Mobile money transfer service by Safaricom
MPRP	-	Mutonguni Poverty Reduction Project

- OVC - Orphaned and Vulnerable Children
- PC - Personal Computer
- PLWAS - People Living With AIDS
- SMS - Short Message Service
- WHO - World Health Organization
- WV - World Vision

## **ABSTRACT**

The study investigated how dairy goat farmers used mobile phones in dairy goat rearing. The dairy goat farmers targeted were widows, caregivers and orphans in a World Vision project. Kenya is of concern because dairy goat rearing has reduced the perennial inflow of relief food into the area. Mobile phone technology has penetrated virtually all sectors of the economy. However, in agriculture, information repository is still lacking to inform integration of the technology into agricultural sector especially agricultural extension services. Little is known regarding use of mobile phone for the livelihoods of those within the resource-constrained environments. Several countries are exploiting mobile phone technology to develop their agriculture as it provides new opportunities for rural farmers to obtain access to information in agricultural technology. Such countries include India, Nigeria and Uganda where the use of mobile phone has increased agricultural productivity. In Kenya, the study found out that mobile phone communication among farmers helped in enhancing rate of diffusion of dairy goat rearing thus reducing the period required to build the critical mass necessary to sustain the project. Household survey collected information from 100 dairy goat farmers on heterogeneous variables around ownership and use of mobile phones in keeping of dairy goats. The household survey was enriched by Focus group discussions and Key informant interviews. 99% of farmers interviewed own or have access to mobile phones with a key significant fact that 95 % of these farmers use mobile phone money transfer services at least once in a month. I recommend that the government puts measures that will lower the cost of mobile phone calls as this will benefit the farmers to transact their businesses faster and cheaply.

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 Background of the Study

World Vision through Mutonguni Poverty Reduction Project (MPRP), introduced rearing of dairy goats to 300 farmers comprising of widows, caregivers and orphans in 2007. The aim of the project was to increase family food security through consumption of goat milk and also to boost family income through sale of surplus milk and sale of male off springs (bucks).

The project targeted widows and caregivers of orphaned and vulnerable children (OVC) in the community who were experienced a lot of difficulties getting food and had very little or no income. Every farm family was issued with one Toggenburg doe and two Galla does to start the dairy goat rearing enterprise. One breeding Toggenburg buck was stationed at one farm for use by 20 farmers in each group. A strict breeding programme ensured that this buck is rotated to a new station once its female offspring become mature and ready for service. Farmers also keep records of sales, feed supplements, treatment and other management practices carried out on the enterprise. Goats are marketed by Kitui West Dairy Goats Association (KWDGA) to avoid exploitation by buyers and also to guard against overselling by group members.

All families with dairy goats have had additional goats borne within their stock adding to the number that they were initially given. End of project evaluation report revealed that 31.4% of the farmers had 16 goats each, 19.6% had 10 goats each while 23.4% had only 2 goats. Of all the farmers rearing goats, more than half (51.9%) admitted selling part of their flock compared to who did not sell at all (48.1%). The quantities sold ranged between one and 15 with majority

either selling 14 or 15. The average price for each he-goat was Ksh.2500 while that of a doe went as high as Ksh 8,000.00 (World Vision (2011) Annual Report).

There has been increased interest from community members who were not targeted by the project. This is evident from the increased number of non-group members who have been taking their local breed of goats to be mated by the Toggenburg bucks at a fee of Ksh 50.00 per mating.

The diffusion of mobile phones into rural areas represents one of the most profound changes in rural Kenya and many other developing countries in the past decade (Global Satellite Messaging 2008).

Farmers, agricultural processors, and marketers have transitioned from a culture in which there was virtually no telephone service of any kind to one in which mobile phones are now widely utilized among farmers and at rural markets. Little is known regarding the use of the mobile phone for the livelihoods of those within resource-constrained environments.

Many digital platforms have been hosted that try to communicate to farmers agricultural information ranging from input advertisements, input-output price fluctuations, extension messages etc., however, there is little documented information on the efficiency and effectiveness of these e-services.

The information gathered in this study will help create knowledge which shall be shared to inform designs of community development projects.

## **1.2 Problem Statement**

The diffusion of mobile phones into rural areas represents one of the most profound changes in rural Kenya and many other developing countries in the past decade (GSM, 2008). Farmers, agricultural processors, and marketers have transitioned from a culture in which there was virtually no telephone service of any kind to one in which mobile phones are now widely utilized among farmers and at rural markets. Little is known regarding the utility of the mobile phone for the livelihoods of those within resource-constrained environments.

There is urgent need to document the contribution of mobile phones in the diffusion of innovations. The fact that mobile phones are useful in information sharing among the farmers themselves and with the various stakeholders involved in the project cannot be overemphasized. Efficient and effective dissemination of extension messages through use of mobile phone would bring a lot of difference to livelihood of the farmer and farm family, notwithstanding selective exposure and selective perception of the recipient farmers.

## **1.3 Specific Objectives**

1. To determine proportion of farmers who own/have access to mobile phones
2. To determine mobile phone applications (products) used by dairy goat farmers.
3. To determine constraints faced by dairy goat farmers using mobile phone communication.

## **1.4 Research questions**

1. What proportion of farmers own or have access to mobile phones?
2. What mobile phone products are used by dairy goat farmers?
3. What constraints do dairy goat farmers face in using mobile phone communication?



## **1.5 Scope of the Study**

The study targeted widows, caregivers and orphans in the various dairy goat rearing groups who had earlier been trained on the rearing of dairy goats and were provided with dairy goats by World Vision Mutonguni Poverty Reduction Project (MPRP). One hundred farmers were sampled at random but from different groups to give their views on the use of mobile phones on the diffusion of rearing of dairy goats.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter presents literature review related to dairy goats distribution, management and breeding. It also explores the contribution of Information and communication Technology (ICT), and more specifically mobile phone technology, in the rate of adoption of dairy goats in Mutonguni division of Kitui County.

The review has looked at the global distribution of dairy goats and their performances amid the various constraints e.g. disease vulnerabilities. It has also attempted to give the global picture of how ICT has influenced the rate of adoption of various agricultural technologies among them dairy goat rearing. It has explored the different research findings carried out by different researchers in Uganda, Nigeria and India. The experiences point out that there is a great contribution of mobile phones in information dissemination among the farmers and their stakeholders.

#### **2.2 Dairy goats**

Dairy goats are ruminants and as such, need deep wide bodies with wide open ribbing and lots of room for the rumen to expand and digest large amounts of high-fibre; lower protein feeds along with plenty of water to make lots of great tasting milk. In addition they have to have enough body to carry heavy loads of developing kids for part of the year and several pounds of milk each day. This requires a good size body for the size of the animal, that deep, wide body to be what is called a dairy wedge, being wider at the hips than the withers, wider still at the barrel behind the

ribs and having a level top line with a bottom line that drops from elbow to the udder giving a wedge shape to the body from top, rear and side views. A dairy goat reaches puberty at the age of 4 to 12 months depending on climate and nutrition. Estrus (heat) cycle is between 18 to 23 days and lasts between 12 to 36 hours. Average gestation period is 150 days, making normal for a doe to have two sets of kids every year. (Gillespie, 1992)

More of the world's people consume goat milk than cow milk. A dairy goat is much easier to raise and adapts to a wider variety of environments than a dairy cow. Goat milk is naturally homogenized. Goat milk contains a less lactose than cow's milk and is less likely to trigger lactose intolerance. Goat's milk is more easily digested and less likely to cause irritability. The digestibility of goat milk can be attributed to its casein curd, which is both softer and smaller than that in a cow's milk. Infants below the age of one year should not be fed on goat milk or cow milk. (Gillespie, 1992)

The states with the largest number of dairy goats are California and Texas, however dairy goats are found in every state in the United States where they are kept in small numbers on farms for family milk production. (Briggs, 1980))

Dairy goats require less space than dairy cows and are less expensive to rear. In addition they can be used for meat. Since very little space is required for dairy goats, they are sometimes kept by people who do not live on farms. Dairy goat enterprises are profitable and can contribute significantly to the improvement of livelihoods of the rural communities in medium to high potential areas of Eastern Kenya, and elsewhere with similar agro-ecological conditions. Goat rearing under the cut-and-carry system of feeding can be successful under smallholder production

systems, especially where farmers can grow improved tree fodders, often to mark boundaries and as live hedges (Farm Africa, 2011).

### **2.3 Opportunity for dairy goats**

There are many situations where it is possible to successfully crossbreed African goats with European dairy breeds or the South African Boer meat breed to produce a productive and hardy crossbred. This has been successfully achieved in Kenya, Tanzania, Uganda, Ethiopia, Rwanda and Burundi through community-managed breed improvement programmes.

There are no recorded cases of government-managed goat breed improvement programmes having any lasting impact, particularly when they rely on government breeding stations to multiply the improver breed or for the production of crossbreds for distribution to farmers. Generally they have been found to be an expensive and inefficient method of breed improvement in goats and should be avoided.

The most appropriate and cost-effective method of breed improvement has been found to involve farmer groups managing the multiplication of the improver breed, supplying males for crossbreeding in community-managed 'buck stations' to which females in heat are brought for mating. Bucks in buck stations can easily sire 100-200 kids per year. Buck keepers receive payment for each successful mating providing the incentive necessary for them to keep the buck healthy.

Coordination is required through, for example, a farmers' organisation to manage the rotation of the bucks and thereby avoid inbreeding. This same farmer organisation is also able to register new births and provide quality assurance of the breeding quality to future buyers. The Meru Goat Breeders Association plays this role successfully in Kenya where they register all

Toggenburg and crossbred goat births with the Kenya Stud Book. (Dr. Christie Peacock, Farm Africa)

## **2.4 Mobile phone and innovation diffusion**

The rapid spread of information and Communication Technologies (ICT) in developing countries over the past decade offers a unique opportunity to transfer knowledge via private and public information systems. Over the past decade, mobile phone coverage has spread rapidly in Africa, Asia and Latin America. As of 2009, over half of the populations in sub-Saharan Africa, Asia and Latin America had access to mobile phone coverage, representing 60, 67 and 77 percent, respectively. Mobile phone coverage has greatly exceeded investments in other infrastructures in these countries, namely, electricity, roads and landlines. Coinciding with this increase in mobile phone coverage has been an increase in mobile phone adoption, even in some of the world's poorest countries. As of 2008, there were about 4 billion mobile phone subscribers worldwide, with 374 million subscriptions in Africa, 1,791 in Asia and 460 million in Latin America (International Telecommunications Union, 2009). While initial adoption was primarily by the wealthy, urban and educated residents, mobile phones are currently being adopted by the rural poor in some of the world's poorest countries (Mbiti, 2010).

### **2.4.1 Reduction in cost of information**

Mobile phones significantly reduce communication and information costs for the rural poor in developing countries. This not only provides new opportunities for rural farmers to obtain access to information on agricultural technologies, but also to use ICTs in agricultural extension systems. Since 2007, there has been a proliferation of mobile phone-based applications and services in the agricultural sector, providing information on market prices, weather, transport

and agricultural techniques via voice, short message service(SMS) and internet. While such programs are innovative, they are not without challenges, and it is not yet clear that they will substitute for existing agricultural extension systems.

Furthermore, as many of these projects are fairly recent, empirical evidence on their success is still largely anecdotal. In order to measure the impact of such services on farmers' knowledge, adoption and welfare, as well as the cost-effectiveness of such services, rigorous impact evaluations are needed (Aker, 2010).

#### **2.4.2 Mobile phone and poverty reduction**

There are several reasons why the ECA believes that information technology is central to poverty reduction, which in turn is central to the empowerment of women: ICTs provide the most cost-effective way of serving remote, rural areas without the huge infrastructure costs of traditional landlines. The capacity to acquire and communicate knowledge is the foundation of development. If development depends on empowering people and communities to take control of their own lives, access to information through improved communications is an essential component of growth. The application of ICTs to improving social services is enormous. Basic education could be vastly improved (for example, through teacher training and reaching unserved populations). The World Health Organisation (WHO) claims "40% of health is exchanging information." Many of the problems of health prevention relate to poor communications and limited access to information. ICTs are of enormous value in the control of epidemics and contagious diseases. Other values of ICT can be illustrated as follows;

- Participation in the information economy and the development of e-businesses itself offers many possibilities for wealth creation particularly for small and microenterprises.

- ICTs have the potential to improve the ability of marginalized groups to participate in governance across the spectrum – from local, to national, to global where the voice of the South, and especially of women, is still far too weak.

The bottom line is that there is no longer a choice: we live in a global village. There are great risks associated with globalisation and information technology. But the greatest risk of all is to pretend they don't exist! (Economic Commission, 2000).

In Uganda regardless of farm group membership, male and female use of SMS focused on two categories: (1) greetings with family and friends and (2) agricultural consultation which included coordination for farm group meetings and access to agricultural inputs as well as market information from local businessmen and farm group members. Respondents did not indicate receiving or accessing market information from organizations, such as Foodnet, that distribute SMS market updates. Five recurring themes were identified for agricultural-based mobile phone use. Regardless of gender or farm-group membership status, use focused on: (1) coordination for access to agricultural inputs, (2) consultation with expert advice, (3) attainment of market information, (4) agriculture emergency security, and (5) monitoring of financial transactions.

### **2.4.3 Impact of mobile phones**

On perception of impact of the mobile phone, Uganda farmers were unanimously focused on: (1) transportation efficiency, (2) benefits of agriculture emergency security, (3) increase in contacts and opportunities, (4) increase in market access, and (5) increase in efficiency resulting in greater output (Brandie et al, 2008).

Mobile phones can improve access to and use of information about agricultural technologies, potentially improving farmers' learning. Farmers require information on a variety of topics at each stage of the agricultural production process. In many developing countries, such information has traditionally been provided via personal exchanges, radio and perhaps landlines and newspapers. Compared with these mechanisms, mobile phones can significantly reduce the costs of obtaining agricultural information. Mobile phones are significantly less expensive than the equivalent per-search cost of personal travel or a newspaper, yet more expensive than landlines or radio. Nevertheless, landlines are not readily available in most regions of the country, and radio only provides price information for specific products and markets on a weekly basis.

The reduction in search costs associated with mobile phones could increase farmers' access to information via their private sources, such as members of their social network. This could speed up or increase farmers' contact with other adopters in a social network, thereby allowing farmers to learn from more "neighbors'" trials of a new technology or observe those trials more frequently. While this could potentially increase the rate of technology adoption, it could also reduce the rate of adoption in the presence of learning externalities (Foster et al., 1995, 2010).

Reduced communication costs could not only increase farmers' access to information, but also to public information such as those provided via agricultural extension services. The marginal cost of providing market information via SMS is cheaper than providing the same information via an additional extension visit, and is equivalent to providing the same information via radio. Reducing the costs of disseminating information could increase the extension system's geographic scope and scale, as well as facilitate more frequent and timely communications between extension agents and farmers. This could, in turn, improve the quality (or value) of the



information services provided. Yet the impact of these reduced costs on farmers' adoption decisions will depend upon the ability of such information to serve as substitute for in-person mechanisms(Aker, 2011).

In Nigeria it was observed that farmers using cell phone made greater number of contact than those made by farmers who had physical contact with extension agents. It could be inferred from this finding that farmers using cell phone are more informed than farmers making contact with extension agents. Experts have also found out that cell phone, could be used as a tool to reduce extension farmers ratio of 1:2000 per farm families in Nigeria.The finding further revealed that majority (71.2%) of the farmers listened to agricultural news by making use of their handset radio. According to the findings, radio is still 'a means of disseminating agricultural information to farmers in developing countries because it is widely accessible to rural dwellers.

Production levels of Cell phone users was also found to be higher than those of non cell phone users on average.This was so in all the crops that were compared i.e maize, sorghum and yam, while livestock and fish productions followed the same trend. It could be deduced from this result why income per annum of cell phone users' farmers was higher than that non cell phone users. It was further deduced that income status of the households, affected the attainment of food and nutrition security. Hence living standard of the cell phone users cannot be compared with that of non phone users. (Bolarinwa et al., 2011).

In the year 2009 in Kerala state of India, it was found out that proactive usage of the service by the farmers was very low. None of the farmers had made a voice call or sent an SMS to the service providers to seek additional agricultural information. It was also realized that most of the

farmers who had purchased the mobile phone as a part of the initiative were using it for social networking (Kameswari, 2011).

Faced with sustainability issues, some of the Personal Computer (PC) based initiatives were redesigned into mobile phone based systems (Warana project), however, adoption of mobile phones by fishermen translated into direct economic benefits. (Jensen, 2007).

Use of mobile phone-based money transfer services can spur smallholder commercialization and improve welfare of such households. Consequently, there is need to expand the coverage of mobile phone-based money transfer services in rural areas. (Kirui et al, 2010 )

#### **2.4.4 Angaza Mkulima**

In 2010, Kenyan agricultural input company Farmchem launched Angaza Mkulima, a website and SMS system that can be accessed via computer or mobile phone, in order to target their existing and potential customers. Registration to the system only requires the farmer to submit their name and phone number through a simple form on the website or by sending an SMS with the same information. Once registered, farmers gain access (through the website or SMS menu system) to farming tips and strategies for helping them increase their yields and profits. The system also allows farmers to give feedback on products, identify farmer field days near them, locate their nearest authorized retailer, get updates on new products, and order products directly to their nearest dealer. Distributors are also able to access the system to place orders directly from Farmchem as needed.( Angaza Mkulima, 2012)

Kenya Agricultural Commodity Exchange (KACE) has developed a short messaging service- SMS SOKONI in partnership with Safaricom mobile phone provider. 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. So far, the service is easy to use, reliable, convenient and affordable. The average monthly usage of this service increased from 1,273 in 2006 to 24,716 in 2008, demonstrating its subsequent usefulness and eagerness of farmers to explore the market information and linkage systems. Farmers are also able to access information on the right Hybrid Maize seeds to plant in their respective agroecological zones by way of texting to Kenya Seed Company Ltd a major seed distributor in East African region. (Murithi et al 2009)

#### **2.4.5 iCow**

Launched in June 2011, iCow is enabling livestock farmers in Kenya to more accurately track their cows' gestation period via mobile phone. Farmers register their cows and their insemination date by SMS short code, and then receive periodic SMS prompts timed with vital days during the gestation period. The service also sends weekly SMS messages to subscribers with information and tips on breeding, nutrition, milk production efficiency, and other best dairy practices. The service also enables farmers to locate the nearest veterinarian or artificial insemination specialist via SMS or through the iCow website. In addition, iCow Soko, enables farmers to trade livestock and livestock byproducts (chicken, goats, sheep, and goat milk.) via mobile phone. (FACET, 2011)

#### **2.4.6 M-Kilimo (Kenya Farmers' Helpline)**

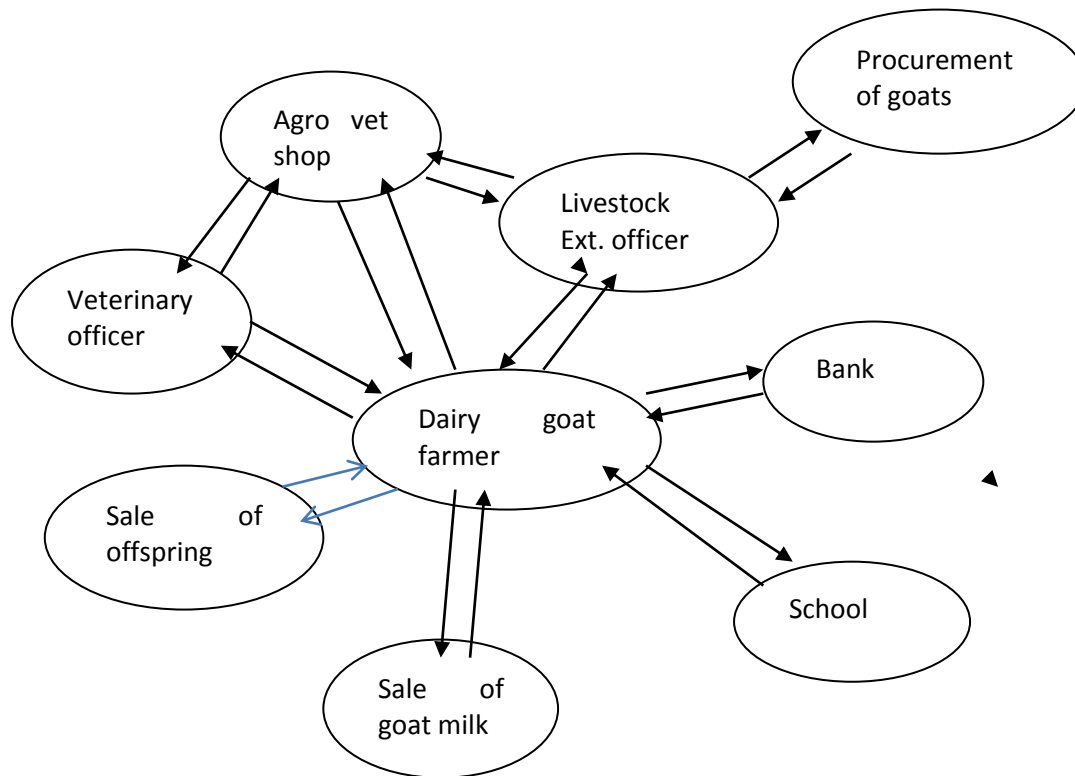
Mobile phones play a key role in providing smallholder farmers with information they need to improve their agricultural practice crops production, credits, input supply, pest and disease control, post-harvest techniques and improving market access. They can be used to

strengthen the capacities of rural development workers, extension workers, farmer organizations and rural communities as a whole. (Mwangi, 2012.Msc Thesis)

M-Kilimo platform exclusively uses mobile phone communication to enable farmers and extension agents to receive real-time answers to questions on agriculture related subjects, such as market price information, crop and livestock questions, weather forecasts, and agricultural products and services. The backbone of this service is a call center staffed by a team of trained agriculture experts that operates around the clock. Experts use a growing content management system to answer calls in real-time. If the live expert is unable to answer the question in real-time, they reach out to second-line, subject area specialists, and then return the call with an answer within 24 hours. Information is available in both English, Swahili, and other local languages.(Nyoro, Rockefeller foundation, 2011)

## 2.4 Conceptual Framework

### The roles of Mobile phone communication in diffusion of dairy goat rearing.



**Figure 1: Conceptual framework (Source; Adongo)**

The dairy goat farmer is at the Centre of the framework. The Livestock extension officer uses mobile phone to scout for the breeding stock and only take off with a sure destination in mind. This saves time and money and lowers the cost of scouting, thus saving the money for other uses. He uses mobile phone to mobilize dairy goat keepers to attend meetings, trainings and to prepare to receive their stock of goats. The feedback is instant as the farmers confirm that they have got the communication. He also gets reports on progress of the group and can make decisions without delay.

The farmers communicate to veterinary officer about sick animals and get assistance immediately. The time and money saved on transport to Veterinary office is spent somewhere else. Few animals die of disease attack. Buyers of milk and offspring easily contact the farmers for the commodities and get terms of sale at a much faster rate than through physical contact.

Farmers do mobile banking of their earnings through mobile phone money transfer services and pay for veterinary services and school levies. There is reduced risk of losing the money to thieves and robbers. Mobile phone communication between farmers and other stakeholders has facilitated a lot of information sharing which has enabled the group to move on as a team. All bucks born are disposed of at two years to avoid in breeding and the income earned is invested in the development of the family i.e. paying of school fees for children in school.

## **2.5 Theoretical framework**

According to Rogers (1962), there are four main elements that influence the spread of a new idea: These are; the innovation itself, communication channels, time, and a social system. Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Individuals progress through five stages: knowledge, persuasion, decision, implementation, and confirmation. If the innovation is adopted, it spreads via various communication channels. During communication, the idea is rarely evaluated from a scientific standpoint; rather, subjective perceptions of the innovation influence diffusion. The process occurs over time. Finally, social systems determine diffusion, norms on diffusion, roles of opinion leaders and change agents, types of innovation decisions, and innovation consequences. . In rearing of dairy goats, diffusion is about how, why and at what rate the technology of rearing of dairy goats has spread through the community of Mutonguni division from the first

beneficiaries of the dairy goats to those farmers who acquired their own stock after understanding the benefits of the enterprise.

Adoption as a process starts with innovators, people who are ready to take risks and try their hands on new technologies. Mobile owners are people who spared part of their resources to keep up with the technology. They are likely to be ahead of others and even influence them. Innovators are known for their willingness to share information and influence innovations. Rogers defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption"

Use of mobile phone reduces the length of channel of communication to a minimum. A communication channel is "the means by which messages get from one individual to another". Rogers defines several intrinsic characteristics of innovations that influence an individual's decision to adopt or reject an innovation. These are; relative advantage, compatibility, complexity (simplicity), triability and observability. Keeping of dairy goats is compatible to the area that is classified to be arid or semi-arid land (ASAL). The community keeps small and large stock in almost equal measure. Rearing of dairy goats under confined situation is alien but not very difficult to try. They tried it and adopted it. The obvious advantage is supply of goat milk that is not realized from the free-range local breeds. The animal's feed demand is low and therefore it can be fed from shrub and weed collections from the backyard.

## CHAPTER THREE

### 3.0 RESEARCH METHODOLOGY

#### 3.1 Introduction

This exercise was conducted using household survey, Key informant interviews (KII) and Focus Group Discussions (FGD) integrated with relevant data collection approaches such as literature review and observation among other methods. A questionnaire (Appendix 2) was administered to 100 farmers sampled from a frame of 300 farmers who benefited from dairy goats supplied by Mutonguni Poverty Reduction Project (MPRP) in the year 2007. The high percentage (30%) was decided since mobile phone is a new technology and the higher the number interviewed the higher the chances of interviewing farmers with access to mobile phones. As sample size increases, the ability to detect a real relationship increases and the possibility that it will not be detected decreases (Handwerker, 2005)

Household questionnaires, it is assumed, captured individual farmers responses at the comfort of their homes without due influence from their neighbours. Two focused group discussions were held at two different clusters. One FGD was attended by 12 women in Kaimu cluster and the other one was attended by 13 men in Kakeani cluster. Both discussions were facilitated by the researcher with help of a recorder and an observer. The survey clusters are equivalent of administrative locations. Three KIIs were held with Livestock Officer of Mutonguni ADP, District Veterinary Officer, District Livestock Officer and Chairman of Kitui West Dairy Goat Association who provided very key information to corroborate what was gathered through other methods of data collection.



### **3.2 Process**

The researcher met the District Officer 1, Kitui West, to introduce himself and seek permission to undertake the study in the district. Next stop was at the World Vision offices which acted as the base station for the rest of the week. Chiefs of different Locations were mobilized through mobile phone to prepare the community for the exercise. Chairman of KWDGA was informed that not all dairy goat farmers will be visited but only those who will be sampled in the various locations.

Five enumerators attended one day's training on data collection which included familiarization with the tool. Enumerators were selected from people with minimum education level of Form four and who have undertaken some form of survey.

Qualitative data was collected through two FGDs and 4 key informants' interviews. During the process of gathering the primary data, the researcher also studied and documented relevant secondary data obtained from the various organizations and institutions in order to validate the primary data.

### **3.3 Training of data collectors**

Five data collector were identified and trained for one day to undertake administration of the questionnaire to all the 100 dairy goat keepers. Training content included objective of the survey, sampling methodologies employed and discussion of the questionnaire to be used during the exercise. The enumerators translated the questions in their mother tongue, (Kikamba) so that they had a common understanding of the questions. Each enumerator administered 3 questionnaires each day and the filled questionnaires were forwarded to the researcher at the end

of each working day. The two data collectors who worked with the researcher were appreciated at the same rate. The work of data collection in the field took seven days.

### 3.4 Sample size and sample selection

The survey was designed to collect information from 100 farm families within the project area. The total number of farmers in the project is 300. The stratified random sampling technique was used in identifying the households to be interviewed from locations. Equal clusters were constituted out of the locations.

Sample size was calculated using the formulae:

$$n = \frac{z^2 p \cdot q \cdot N}{e^2 (N-1) + z^2 p \cdot q}$$

Where z (confidence interval) is at 90%

e (acceptable error ) is + (-)10

$$= \frac{1.96^2 (0.5) (0.5) (300)}{(0.1)^2 (299) + (1.96)^2 (0.5) (0.5)}$$

$$= 72.9$$

This was revised to 100 for ease of distribution in the clusters and work of enumerators to collect a sizeable data in view of the fact that the data being collected is largely heterogeneous i.e the variables being investigated included; mobile phone products mostly used by farmers, constraints they encounter as they use those products, production levels of the dairy goat enterprises etc. This is different from a homogeneous variable like the height of maize plant in the field after two weeks from time of planting.

### **3.4.1 Sampling**

List of all the farmers was retrieved from the files of World Vision Mutonguni Area Development Programme (ADP). With the help of data collectors who know the areas well, this list was scrutinized to delete names of those who have since died. The balance of the names was then compiled by clusters to form sample frame. Sampling was then done in two stages i.e. proportional (according to number of farmers in a given cluster) and random sampling within a cluster.

In proportional sampling, each administrative location was allocated a number according to that of its surviving farmers of dairy goats. Survey clusters were however formed depending on the proximity of the areas from one another and did not necessarily follow the administrative boundaries. A cluster consisted of an area to be visited by one enumerator who was expected to interview a total of 20 farmers there from. A case in point is Katheka and Mithini that are neighbouring one another and yet fall within two different administrative locations. Mutonguni location was split into two clusters because of its high number of allocated respondents.

While applying random sampling, a list of names of all farmers from every cluster were availed to form a sample frame. The 5 enumerators were allowed to pick one name in turns from their respective cluster until (s) he had picked the number of names required for interview in that cluster. The total of all the names picked by all the 5 enumerators formed the survey sample of 100 farmers for the study.

### **3.5 Data collection**

For household interviews, five enumerators moved from farmer to farmer administering a two-page questionnaire to capture the farmer responses to the items on the tool. The enumerators were posted back to work in their clusters where they will not require services of village elder to guide the tour since they come from those areas and know the farmers very well. Every enumerator was assigned 20 farmers to interview. It was agreed that only the researcher would replace the name of a farmer who could not be located after two attempts. This was intended to prevent a situation whereby an enumerator decides to concentrate on farmers whose homesteads are conveniently located along his/her route instead finding the sampled respondent. Airtime of Kshs. 200 was allocated to the data collectors to communicate to the researcher in case of need.

Enumerators were encouraged to cross an entry that is wrong and mark the correct one. The form of marking was a tick in the appropriate box. A cancelled response would have an X sign in the box and the correct response would show a tick under the same question. While in the field enumerators widely used their mobile phones to seek clarification on situations that they were not very clear with. Each enumerator administered 3 questionnaires each day and presented a total of 20 filled questionnaires at the end of seven working days.

FGDs were to help identify positive deviants and support the questionnaire responses by providing the qualitative data, as well as a means of triangulation. In special cases, when dealing with sensitive areas, a combination of approaches was applied to help get the response to sensitive questions, and strengthened the research ethics of the evaluation process

The researcher had a secretary to help in note taking as he facilitated the discussion using a discussion guide. The discussion groups were asked for permission to take photographs of the sittings. See the figure below.



**Figure 2: A photograph of women in an FGD in Kakeani (Source; Adongo)**

Key Informants Interviews (KIIs) were purposively sampled from people expected to have knowledge on the project or had perceived level of influence. Key Informants Interviews were conducted to World Vision Livestock Extension Officer, District Livestock Production Officer and District Veterinary Officer. Interview of World Vision Livestock officer was done through mobile phone because the officer has since been promoted and transferred to Ijara programme in Ijara district. The same channel of communication was used to interview District Livestock Officer who was on annual leave in Murang'a. World Vision Livestock officer pointed out that on several occasions he mobilized the dairy goat groups through mobile phone because this was faster and cheaper.

### **3.6 Data Processing**

**3.6.1 Editing:** this was in the form of central editing whereby the researcher went through the filled questionnaires, one cluster after another, pointing out to enumerators where they marked erroneously. Responses that did not tally were pointed out to enumerators who corrected them accordingly.

**3.6.2 Coding:** this consisted of assigning numerals from 0 to 7 to responses in the questionnaire. The predetermined codes were inserted in in red pen in the margins next to the responses. Items with multiple responses attracted up to 8 different code options between 0 and 7. It was decided that responses of “Never” and “Don’t know” be coded 0 to depict negative or inability. Every questionnaire was assigned a number at the top right corner that became reference of the respondent. This is the same number reflected in the first column of the data view window of the data base and runs from 001 to 100 as per the number of questionnaires administered.

### **3.7 Data Analysis**

This was both descriptive and inferential. Descriptive analysis provided profiles of dairy goat farmers on their ownership or access to mobile phones, frequency of use of those mobile phones to communicate to their customers, fellow group members and with the service providers. It also portrayed the rating of usefulness of mobile phone by different farmers and various challenges they face as they go about making calls and receiving and sending money through the mobile phone service. Analysis process started by developing the analysis tool to explain the variables, codes and the data items

## CHAPTER FOUR

### 4.0 RESEARCH FINDINGS

#### 4.1 Introduction

This research involved 100 of the 300 farmers who received goats, trainings and other capacity building components of the project. The District Commissioner Kitui West gave his blessing for the study expressed total support for the same.

#### 4.2 Farmers' demography

Most of the farmers under the project are women (71%) against men (29%) as illustrated in table 4. This is in line with the project's target of "widows, the elderly, Caregivers of OVC and People Living with HIV and AIDS". Women have found the project very useful and talk proudly of their increased income after introduction of the project. One lady confesses that her daughter has been retained in high school by the sales she makes of milk and male offspring from her dairy goats.

**Table 1: Goat farmers by gender**

<b>Gender</b>	<b>Percentage(%)</b>
Male	29
Female	71
<b>Total</b>	<b>100</b>

### 4.3 Farmers level of education

A good percentage of farmers (35 %) have not received formal education. A greater proportion (65%) however received either primary or secondary education, an improvement from the situation in 2009 when the same indicator was at 53% (MPRP Mid-term evaluation report, 2009). None of the farmers interviewed went beyond secondary school. The high illiteracy level (35%) has however not prevented majority of farmers (70%) from acquiring own mobile phone handsets, and even those who do not have their own usually rely on their family members or neighbors to communicate with fellow farmers and other stakeholders.

**Table 2: Level of education of goat farmers**

<b>Level of education of goat farmers</b>	<b>Percentage (%)</b>
Never gone to school	35
Primary Education	47
Secondary Education	18
Post Secondary Education	0
<b>Total</b>	<b>100</b>

### 4.4 Number of Dairy Goats per Farmer

The initial allocation of dairy goats per farmer was 2 galla does and 1 Toggenburg doe. A breeding buck is stationed at one farm and is shared by 20 farmers for 18 months before he is rotated to another group. 47% of farmers who have 3 goats and below report that they usually dispose of male offsprings to earn income and also to avoid inbreeding. Disposal of the animals



is coordinated by KWDGA, the group association to avoid exploitation by buyers. Rotation of the breeding buck and arranging for buyers is done by use of mobile phone.

Chairman of Kitui West Dairy Goats Association (KWDGA) is a very grateful man. He explains that mobile phone has made his work of coordination very easy. He does not have to traverse the expansive Mutonguni division to communicate with leaders of groups on important issues. He is also grateful for the umbrella group for facilitating him to execute his duties with ease while at the same time he is able do his own work at the farm. Conflicts that arise when people come together have also reduced. “Those who fail to come for the meetings no longer blame it on lack of communication since if I use Airtel it costs me only one shilling to send a message”. He concludes. He however points out one of the greatest benefits of his mobile phone is that he was also able to monitor the movement of the breeding buck (buck rotation) among groups to ensure that no buck stays in one station beyond 18 months which would lead to a buck mounting its own offspring and bringing about in breeding.



**Figure 3; A photograph of group breeding buck (Source; Adongo)**

Slightly over half of the farmers (53%) have 4 goats and above (Table 3). All the goats are either does or young males who have not matured. The high attention required by the dairy goat in terms of disease control requires that a farmer owns a mobile phone. It saves time and money to contact veterinary officer. Acquiring a mobile phone has not been a challenge for most people because a half- litre measure of goat milk sells at Ksh 70.00. Teachers in the area prefer goat milk to that of a cow because just 300ml of goat milk is sufficient to make enough tea for a family of four.

**Table 3: Number of Dairy goats per Farmer**

<b>Number of Dairy goats per Farmer</b>	<b>Percentage (%)</b>
Farmers having 1 – 3 goats	47
Farmers having 4 goats and above	53
<b>Total</b>	<b>100</b>

#### **4.5 Use of goat milk by farmers**

The few farmers (4%) who have not been able to milk their goats lost the original stock to diseases and had to look for replacement on their own. They are also to be found in the less potential part of the catchment. Almost half the farmers (42%) use milk from their dairy goats for home consumption to improve family nutrition. Mutonguni division is a food deficit area and this gesture was one of the objectives of the project at inception. The farmers who offer milk for sale make sure they satisfy their family demand first. It is no surprise that no farmer offers all his/her milk for sale before taking care of the family.

**Table 4: Use of goat milk by farmers**

<b>Use of Goat Milk</b>	<b>Percentage (%)</b>
Never milked	4
Family Consumption only	42
Sale only	0
Family Consumption and sale	54
<b>Total</b>	<b>100</b>

#### **4.6 Milk for sale outlets**

The farmers who do not offer any milk for sale (46%) are the same ones who consume all their milk in the family. Most farmers (96%) use milk within their families and also sell to their neighbours. A very small portion (4%) of milk reaches trading centre. The demand for goat milk within the farm and its neighbourhood is so high that nothing is sold to institutions, even though, Muthale Hospital, among other institutions, offers ready market for goat milk. Goat milk is popular for boosting immunity of people living with HIV and AIDS.

Esteemed buyers place their orders of milk by use of mobile phones. According to Mid-Term evaluation of MPRP in the year 2009, milk was sold to neighbours at an average price of Kshs. 60 per litre. The average litre per household was 0.62, while that sold to neighbours was 0.12. Average price (or mean) per litre was 8.97. Income from the sale of goat milk was Ksh 151 per household. 36 % of the 133 households indicated that they consumed 1 litre of milk per day while 10.5% consumed 2 litres per day on average. Those who consumed 3 litres were 1.5 %.

The nearest market to sell the milk produced was Kabati about 2-7 km from the member groups. This trend of selling milk to neighbours as a preferred outlet has therefore been sustained.

**Table 5: Milk for sale outlets**

<b>Sale out let/market of milk</b>	<b>Percent</b>
Dont sell milk	46
Sell milk to neighbours	50
Sell goat milk in trading center	4
Sell goat milk in institution	0
<b>Total</b>	<b>100</b>



**Figure 4: A photograph of farmer selling milk to her neighbour (Source; Adongo)**

#### 4.7 Mobile phone ownership or access

Almost all the farmers (99%) who were interviewed either own mobile phones or have access to one whenever they need to communicate, (Table 6). This high percentage shows the extent to which mobile phone technology has infiltrated the rearing of dairy goats in Mutonguni division. Even the single farmer who owns no phone has plans to acquire one before end of the year.

The spirit of sharing within the social fabric has enabled even those who do not have their own handsets to benefit from the technology. Some farmers report that a mobile phone owner can offer you service for as little as Ksh 2.00. The issue of non ownership of a phone is not an impediment to using a mobile phone.

**Table 6: Mobile phone ownership or access**

<b>Mobile phone ownership or access</b>	<b>Percent</b>
Own no mobile phone	1
Own mobile phone	70
Have access to mobile phone	29
<b>Total</b>	<b>100</b>

In a focused group discussion with women, participants were amused when one farmer said in Kikamba and I quote; “Matuku aa nituneenanasya na athooi kwa nzia ya simu niitumite uthukumi wakwa na mo withiwa wi muvuthu wikiitu kati waitu waingira”. This loosely translates as “Even orders of milk these days I receive through

mobile phone message and this has really enhanced communication between me and my customers and built trust.

#### 4.8 Farmers’ period of use of mobile phone

Most farmers (86%) have had their mobile phones long enough to influence their communication in the rearing of dairy goat, (Table 7). Those who have used mobile phones for between 1-2 years disclose that they were being left out whenever information was circulated by short message service (sms). This provoked them to acquire own handsets so as to be at par with the rest of the farmers. Since then they have never missed group meetings or failed to be considered as farmers to be visited when visitors come to tour the project.

**Table 7: Duration of mobile phone use**

<b>Duration of mobile phone use</b>	<b>Percent</b>
Has never used mobile phone	1
Used mobile phone for 3 years and above	51
Has used mobile phone for between 1-2 years	35
Has used mobile phone less than 1 year	13
<b>Total</b>	<b>100</b>

#### 4.9 Categories of people mostly called by dairy goat farmers

More than half (69%) of the farmers mostly called Livestock Extension officer and Veterinary officer, both of whom are instrumental in the general management and disease control of the dairy goats.(Table 8).This close communication between the farmers and the officers has resulted to the success of the project as reported by World Vision in their annual report of 2011.

A number of farmers (25%) called agroveter stores to inquire on drugs for controlling intestinal parasites and also to place orders for feed supplements for lactating goats. A smaller proportion of farmers called customers of milk because they are just neighbours who are close by. The airtime in most cases is saved to make distant calls.

**Table 8: People called by mobile phone**

<b>People called by mobile phone</b>	<b>Percent</b>
Has never called any one	1
Called extension officer	26
Called veterinary officer	43
Called agroveter stores	25
Called customers of milk or goat	5
<b>Total</b>	<b>100</b>

The District Veterinary Officer reported that on several occasions he was informed of goats that were sick through mobile phone and he responded promptly. In unfortunate situations when he received the information late, the animal succumbed but he still had to arrive and diagnose what

caused death of the animal. The post mortem reports generated helped to develop mitigation measures against the diseases. Records available in his office show the main killer diseases for the dairy goats as presented below.

**Table 9: Prevalence of goat diseases in Mutonguni division**

<b>Cause of death</b>	<b>No of deaths</b>	<b>Method of confirmation</b>
Anaplasmosis	7	Clinical symptoms, post mortem findings
Contagious Caprine Pleuropneumonia (CCPP)	25	Clinical symptoms, post mortem findings
Blindness	1	Clinical symptoms

Reasons for high mortality in 2008 were cited as; the animals were not vaccinated before they were relocated from Mwingi to Mutonguni division. Housing of the animals when they arrived was not up to required standard and this predisposed the young animals to attack by pneumonia. This situation improved in the later years when vaccination became mandatory before relocation. The Government also expanded surveillance to contain any disease out breaks. District Livestock officer reported that mobile phone communication enabled him to effectively coordinate routine deworming thus reducing worm loads in the animals and resulting into high milk yields. He divulges that a well- managed dairy goat in the area yields up to 2.5 litres per day ( KWDGA 2011) this means more income to the farmer and better nutrition to family members.





**Figure 5: Photograph of a well-managed dairy goat in Mutonguni (Source; Adongo)**

#### **4.10 Frequency of Mobile phone communication to dairy goat group members**

Slightly over half (57%) of the farmers communicate at least once every week over mobile phone, to members of dairy goat rearing group.(Table 9). This is beside the communication that they make to other targets in respect to rearing of dairy goats.The high monthly communication (42%), is when members are invited to monthly group meetings or when they inquire about the meetingsIt is also at the end of the month when farmers receive payments for their milk and also send their monthly dues to the group. This mode of communication saves time for travel and the saved time is spent in the farm to manage the dairy goats.

**Table 10; Frequency of mobile phone communication**

<b>Freq. of mobile phone communication</b>	<b>Percent</b>
No communication	1
Communicates daily	0
Communicates twice a week	11
Communicates weekly	46
Communicates monthly	42
<b>Total</b>	<b>100</b>

#### **4.11 Mobile Phone money transfer awareness**

Almost all the farmers (96%) who are rearing dairy goats are aware of mobile phone money transfer. Very few (4%) confess that they have not heard of the service. This level of awareness has enhanced the transfer of money between farmers as well as with those outside the dairy goat rearing project.

#### **4.12 Frequency of Mobile phone money transfer**

Upto 95% of these farmers use mobile phone money transfer service at least once in a month, to send or receive money from members of the family, members of dairy goat association or from other sources,(Table 11). They reveal that response from agrovets that demand payment before delivery of drugs has been instant once they receive their payment through Mpesa service. Misappropriation of group funds is reduced since the money is sent directly from a member to the treasurer without passing through other hands.

**Table11: Frequency of Mobile phone money transfer**

<b>Frequency of Mobile phone money transfer</b>	<b>Percent</b>
Never sent or recieved	5
Sent or recieved money daily	1
Sent or recieved money weekly	29
Sent or recieve money monthly	65
<b>Total</b>	<b>100</b>

#### **4.13 Mobile phone products transaction**

The most popular use of mobile money transfer service (65%) is when members make payments of the monies they owe to the group in terms of dues (Table 12). This has greatly reduced defaulting by members and improved the groups monthly collection of money. The financial strength of the group is translated into proper management of group activities like periodic meetings and organized capacity building sessions on the identified gaps.

The second most popular use of mobile money transfer service (20%) is when farmers receive payment for goat milk that has been supplied. Payment at the end of the month is preferred by the milk suppliers as the money received is substantial and can be spent on a much worthy cause. ‘Little money received every day immediately disappears into the kitchen’, laments one farmer.

**Table 12: Mobile phone products transaction**

<b>Mobile phone products transaction</b>	<b>Percent (%)</b>
Never use mobile money transfer	6
Used mobile money transfer for milk sale	20
Used mobile money transfer for goat sale	6
Used mobile money transfer to pay dues	65
Used for milk and goat sale	0
Used for goat sale and to pay dues	1
Used for milk sale and pay dues	1
All the above	1
<b>Total</b>	<b>100</b>

In an FGD with Kitheo Nzao group of Kakeani (See fig. 19), It was pointed out that on several occasions members paid their dues to the respective groups through Mpesa service. There are 15 groups in total with a membership of 300 farmers. Monthly meetings have since been reduced to take place after two months since members are now able to remit their subscription without physical contact with group officials.

One member of the group could not let the opportunity go because of language barrier and chose to express himself in the local language that

“Ni kukwataa athooi aingi ma mbui , mbaikana nthenge, nanituthing’isyaa kuivwa na nziaya simu mbee wa muthooi ata nesiambui’.

Loosely translated as; 'We receive a lot of orders for goats, whether does or bucks, and we insist on payment through mobile money transfer before the customer collects his goat'. Other team members added that mobile phone communication has also reduced the cost of following up on debts of milk sales.

Some secondary schools accepted payment through mobile money transfer which allowed the farmer to pay school fees without leaving his farm. While in the farm he continues to attend to the goats by fetching more feeds for the coming days. This arrangement has since been discontinued when some conman circulated fake mobile numbers purporting them to have originated from the school heads and coned many unsuspecting parents of lots of money, before the principals warned against sending money to such numbers.



**Figure 6: Photograph of Focused Group Discussion with men (Source; Adongo)**

#### 4.14 Rating of usefulness of mobile phone

A lot of farmers (69%) agreed that mobile phone is a very useful gadget and they have seen its fruits in their lives as farmers practicing dairy goats rearing (Table 13). About half of those in agreement (30%) described the technology as either useful or fairly useful whereas just one person had no idea as to the usefulness of mobile phone technology. Those who find it very useful have used it to communicate to members through voice call or by way of sms service and also to transact money to various destinations.

**Table 13: Rating of usefulness of mobile phone**

<b>Rating of usefulness of mobile phone</b>	<b>Percent</b>
No idea of usefulness	1
Mobile phone useful	22
Mobile phone fairly useful	8
Mobile phone very useful	69
<b>Total</b>	<b>100</b>

#### 4.15 Challenges encountered by dairy goat farmers in use of mobile phone

No innovation comes without its challenges. Many farmers (99%) were able to cite one or a combination of challenges that they face as they use mobile phone in carrying out their business of keeping of dairy goats, (Table 14). Ranking highest (32%) is high cost of airtime. This is followed closely (27%) by inadequate knowledge on use of mobile phones, which limits the number of features that a farmer can use on his/her mobile phone. Those who cite high cost of

airtime, inadequate knowledge on use of mobile phone or both form 79% of the farmers, confirming that there is a burning dsire among the farmers to exploit the technology for increased dairy goat production.

**Table 14: Challenges encountered by dairy goat farmers in use of mobile phone**

<b>Challenges encountered by dairy goat farmers in use of mobile phone</b>	<b>Percent (%)</b>
Lack or poor network	10
Inadequate knowlege on use of mobile phone	27
High cost of air time	32
Poor network and inadequate knowledge	2
Inadequate knowledge and high cost of air time	20
High cost and poor network	4
Poor network, inadequate knowledge and high cost of airtime	4
<b>Total</b>	<b>100</b>

## CHAPTER FIVE

### 5.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

#### 5.1 DISCUSSION

##### 5.1.1 Introduction

At a time when the government agricultural extension services are unable to adequately fulfill their responsibility of providing information on scientific modern technology for farming to all the farmers due to resource constraints and the operative inefficiencies, mobile phones along with the mobile-enabled services present us with a ray of hope for uplifting our agricultural extension system. Mobile phone has the potential to effectively supplement the efforts of existing extension services and synergize the whole process. The fast growth of mobile penetration and the rapid expansion in mobile communication network by the telecom players provide a fertile ground for looking at this medium seriously. (**Indian Council for Research on International Economic Relations (ICRIER) study, 2011**).

##### 5.1.2 Rate of diffusion of dairy goat rearing

The dairy goat farmers of Mutonguni Poverty Reduction Project were selected on the basis of need. Rich farmers were left out and they are now the ones who have come up to acquire the goat breeds through their own efforts, having appreciated the advantages of the project. They also do so with intention of supplying the Nairobi market where a litre of goat milk goes for about Ksh 300. Sharing of information among fellow goat keepers is much easier and encourages triability. When a farmer sees it being done by a neighbor he gets challenged. This fits very well with Rodger's principle of homophily. Rogers defines homophily as "the degree to which pairs of



individuals who interact are similar in certain attributes, such as beliefs, education, social status, and the like". When given the choice, individuals usually choose to interact with someone similar to him or herself. Furthermore, homophilous individuals engage in more effective communication because their similarities lead to greater knowledge gain as well as attitude or behavior change.

### **5.1.3 High speed of communication**

Mobile phone provides a faster means of consulting with peers on areas that do not appear to be clear. This rapid change of information enables the information seeker to take appropriate action and without delay that can prevent things from getting out of hand. Prompt communication with experts ensured high survival of dairy goats among Mutonguni dairy goat farmers.

Many dairy goat farmers (69%) consulted with experts on Livestock management practices. This is more than the proportion of Ugandan farmers (51%) who consult the experts on extension messages.

### **5.1.4 Use of various mobile phone products by farmers**

Unlike Mutonguni farmers Ugandan farmers are able to undertake such specialized tasks like, taking photos of agricultural demonstrations, using the loudspeaker function to permit a group of farmers to consult with an expert, recording group members pledging when they will repay loans, and storing data such as the date hens should start laying eggs. The low numerical literacy level among Uganda women that affects their use of calculator features of the mobile phone is not a serious problem in Mutonguni as only 27% of the farmers reported inadequate knowledge on use of mobile as a challenge.

In Madagascar, Okello et al, in their paper; '*Ownership and use of mobile phones for agricultural transactions by traders: The case of the Analanjirofo and Atsinanana Regions – Madagascar*;' observed that majority (94%) of traders tend to use call (voice) function while only a few (6%) make use of both text messaging and call functions.

Martin et al (2008) conducted research in Uganda to evaluate the relationship between level of education completed and length of time owning the mobile phone under the assumption that those who are higher in education level would have adopted the mobile phone earlier. In Mutonguni 86% of the farmers have interacted with mobile phone for one year and above despite the fact that 35% of the farmers have never been to school.

In Nigeria, studies showed that extension agencies can adequately serve the farmers with needed agricultural information in case ICT component such as mobile phone are employed alongside television and radio. The report concluded that there will be quick exchange of agricultural information between the extension agents and farmers if ICT components are integrated in delivery of agricultural information to farmers in Nigeria. In the same vein, extension agents will relay farmers' information needs to researchers and rapidly access large amount of information from the researchers through mobile phone for onward dissemination to farmers. (Bolarinwa et al, 2011).

This position has been corroborated by the high proportion of Mutonguni dairy goat farmers (69%), who engage the experts to exchange agricultural information on management of dairy goats and control of diseases. Better still a good proportion (25%), of farmers communicate with agrovet stores to procure feed supplements and to negotiate for market for their products..

### **5.1.5 Mobile phone communication and farm productivity**

In Nigeria it is reported that Cell phone user mean crops production for maize (41,240 tons), cassava (121,450 tons) and yam (98,000 tons) were greater than mean crops production maize (16,522 tons), Cassava (21,151 tons) and yam (35,120 tons) for non cell phone users. Livestock and fish productions follow the same trend . It could be deduced from this result why income per annual of cell phone users' was higher than that of non cell phone user. It was deduced from this finding that income status of the households, affected the attainment of food and nutrition security. Hence living standard of the cell phone users cannot be compared with that of non phone users. From Mutonguni also, it can be deduced that the 53% of farmers who have their own mobile phones are the same ones who own 4 goats and above and who are able to satisfy milk demands of their families and extra for sale (54%). Ownership of mobile phone has influenced the productivity of the farmer and his farm.

### **5.2 CONCLUSION**

Mobile phone communication played a significant role in rearing of dairy goats in Mutonguni division of Kitui county. More than two thirds (69%) of the farmers used mobile phones to call veterinary officer (43%) to attend to their sick animals and extension officer (23%) to give advice on dairy goat management practices. Still a substantial proportion (25%) of the farmers called agrovet stores to enquire about availability of dairy goat feed supplements and to place orders of the same.

### 5.3 RECOMMENDATIONS

1. Most farmers (99%) own or have access to mobile phones and yet no farmer communicates over mobile phones on a daily basis. The constraint cited is high cost of airtime (32%). Development agencies coming up with community-based projects should include allocation of airtime especially for leaders of the groups to ease communication to various members of the groups. This will shorten the chain of communication, reduce message distortion and facilitate response from the receiver of the message.
2. Unlike Ugandan farmers who are capable of using mobile phones to take photos of agricultural demonstrations, using the loudspeaker function to permit a group of farmers to consult with an expert, recording group members pledging when they will repay loans, and storing data such as the date hens should start laying eggs, Kenyan farmers only use voice calls and send SMS as the only means of communication through mobile phone. There is need to build capacity of Kenyan farmers in their respective farmers groups on how to use the other mobile phone applications to reduce the digital divide.
3. The government should support those firms that offer e-extension platforms by reducing taxes on their equipment and levies on their activities. This will enable such firms to diversify their products and also be able to carry out publicity on their products. This will help them to expand their audience and be able to benefit more framers to boost agricultural production.
4. Some research should be done among farmers in different parts of the country to bring out their views on the improvements that they think can enhance their use of mobile phones to improve agricultural productivity in their farms. This participation will spur adoption of mobile phone based innovations intended to improve agricultural production.

## REFERENCES

- Aker C. Jenny. (2010), Dial “A” for Agriculture: Using Information and Communication Technologies for Agricultural Extension in Developing Countries. Tufts University
- Angaza Mkulima: ‘Customer relationship management and agricultural information’. Farmchem Kenya, 2012. <http://www.angazamkulima.com>
- Beehive Kenya (2001). Opportunities for dairy goat farming. Nairobi, Kenya
- Bolarinwa, K. K., and Oyeyinka, R. A. (2011). Use of Cell Phone by Farmers and its Implication on Farmers’ Production Capacity in Oyo State Nigeria.
- Brandie Martin and Dr. Eric Abbott, (2008), Development Calling: The Use of Mobile Phones in Agriculture Development in Uganda.
- Briggs, Hilton M and D.M. Briggs. (1980). Modern Breeds of Lives. 4<sup>th</sup>ed, 2. 2. MacMillan Co.
- Peacock Christie (2006). Goats: Unlocking their potential for Africa’s farmers. Farm Africa, Kigali, Rwanda.
- Gillespie, James R (1992). Modern Livestock and Poultry Production, 4<sup>th</sup> edition. Irvine Mesa Charros 4-H Club, Irvine, California.
- Handbook of Australian Livestock, Australian Meat & Livestock Corp., 1989, 3rd Edition
- Handwerker, W. P. (2005), Sample Design, University of Connecticut, USA.
- Kameswari, V.L. (2011), ICTS for agricultural extension: a study in the Indian Himalayan region G. B. Pant University of Agriculture and Technology, India.
- Kathuri, N. and Pals, A. (1993): Introduction to Education Research, Egerton University Njoro, Kenya. Educational Media Centre.
- Kirui, Oliver, Kiptoo (2011). ‘An assessment of the use and impact of mobile phone-based money transfer services in Kenyan Agriculture’. Department of Agricultural Economics, UON, Nairobi, Kenya.
- <http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/14471>

- Kothari, C.R. (1990). Research Methodology methods and techniques (Second edition).New Delhi, India. New Age International (P) Limited, Publishers.
- Mathooko, J.M. (2004).Essentials of thesis writing, what students ought to know. EgertonUniversity,Njoro, Kenya. Educational Media Centre.
- Mathooko, J.M. (2004).Fundamentals of writing and publishing scientific papers. Egerton University Njoro, Kenya. Educational Media Centre.
- Ministry of Agriculture (2004), Strategic Plan 2005-2009. Ministry of Agriculture, Nairobi
- Mulwa, F.W (2008).Participatory Monitoring and Evaluation of Community Projects. Nairobi, Kenya. Paulines Publications Africa.
- Murithi A G et al.(2009) “Information Technology for Agriculture and Rural Development in Africa:Experiencesfrom Kenya ”. Tropentag 2009 University of Hamburg, a paper presnted during Conference on International Research on Food Security, Natural Resource Management and Rural Development
- Mwangi, J W. (2012) The potential of mobile phone usage in dissemination of Agricultural information: a case of Kikuyu District, Kenya. Agricultural Economics Department, University of Nairobi, Kenya. Msc Thesis.
- Mwangi, S.K. (2012). ‘The role of mobile phones as a tool for agricultural extension services among smallholder farmers in Kiambu County’. Agricultural Economics Department, University of Nairobi, Kenya.Msc Thesis.
- Nyoro James. ‘Agricultural information’. Rockefeller Foundation’s Africa, Presentation given at the ICT4D conference hosted in Lusaka, Zambia on March 29, 2011. <http://www.m-kilimo.com/>
- Okello, J.J. (2008) “Linking smallholder farmers input and output market through ICT-based Interventions: Results of a baseline survey”. Presented at Pride Africa’s Outcome Mapping Workshop held at Jacaranda Hotel, Nairobi, July 25, 2008
- Okello, J J (et al) (2012)“Ownership and use of mobile phones for agricultural transactions by traders: The case of the Analanjirofo and Atsinanana Regions – Madagascar”. Journal of Agricultural Extension and Rural Development Vol. 4(10), pp. 305-317, 6 June, 2012

Overholt (et al), (1991): Linking Human Nutritional Outcomes to Women's Participation in Dairy Goat Production. Farm Africa.

Surabhi, Mital (et al); (2010) "Socio-Economic Impact of mobile phones on Indian Agriculture".  
ICRIER, Working paper No.246, 2010.

Woodard Josh (2011) "Fostering Agriculture Competitiveness Employing Information Communication Technologies (FACET)": 'Livestock information' USAID.2011.  
([jwoodard@fhi360.org](mailto:jwoodard@fhi360.org)).

**APPENDICES**

**Appendix 1: University of Nairobi Letter of Transmittal**

**UNIVERSITY OF NAIROBI  
COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES  
FACULTY OF AGRICULTURE  
DEPARTMENT OF AGRICULTURAL ECONOMICS**

6 July 2012

Ref: uon/cavs/agec/7/4/2

To Whom It May Concern

Dear Sir/Madam

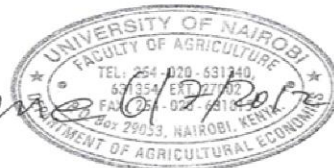
**RE: MAKODIAH JOHANNES ADONGO A56/66091/2010**

The above named person is a second year student in MSc. Agricultural Information and Communication Management. He is currently collecting data on his project titled "An Investigation of the Role Played by Mobile Phone in Diffusion of Dairy Goat Raring in Mutonguni Division, Kitui West District, Kitui County, Kenya"

Please accord him any necessary help that he may require during his data collection.

Yours faithfully

**DR. FRED I. MUGIVANE**  
CHAIRMAN  
DEPARTMENT OF AGRICULTURAL ECONOMICS



*The above mentioned  
M.Sc student has been granted  
authority to conduct research within  
Kitui west District.*

**DISTRICT COMMISSIONER  
KITUI WEST  
P. O. Box 21, KABATI**  
21/7/2012



## Appendix 2: Questionnaire

In view of the increasing desire to produce more food in situ and reduce reliance on Government handouts through famine relief supplies, the importance of Information and Communication Technology is thought to increase among the modern farmers. The aim of this survey is to estimate the importance of use of mobile phones and internet in keeping of dairy goats in Mutonguni division of Kitui West County. By filling this questionnaire you will be contributing to knowledge development and sharing.

(1) Name of farmer.....

Gender

1 Male

2 Female

General Production area (e.g. Kakumuti, Kangii).....

(2) Which is your highest level of formal education?

0. Never

1. Primary

2. Secondary

3. Post-secondary

(3) How many dairy goats do you have?

1. 1-3 goats

2. 4 goats and above

(4) How do you use milk from the goats? (Tick one)

0. Never milked

1. Family consumption

2. For sale

3. Both

(5) Where do you sell your milk?

0. Does not sell

1. Neighbour

2. Trading centre

3. Institution

4. Group cooperative

(6) Do you own a mobile phone or do you have access to one?

1. No

2. Own

3. Have access

(7) If owns or have access, for how long have you owned this phone or had access to it?

0. Never used a phone

1. 3 years and above

2. 1-2 years

3. Less than 1 year

(8) Which of these categories of people do you call more often in regard to keeping of dairy goats?

0. Never called using phone

1. Extension officer

2. Veterinary officer

3. Agro vet stores

4. Customers

(9) How often do you communicate to group members /KWDGA by mobile phone?

0. Never

1. Daily

2. Twice/week

3. Weekly

4. Monthly

(10) Are you aware of money transfer service through the use of mobile phone?

1. Yes

2. No

(11) If yes, how often do you use mobile phone money transfer service to send or to receive money?

0. Never

1. Daily

2. Weekly

3. Monthly

—

(12) Which of these have you transacted through mobile phone money transfer? (Multiple answers possible)

0. Never

1. Milk sales

2. Goat sale

3. Payment of dues

4. Milk and goat sale

—

—

5. Goat sale and payment of dues

6. Milk sale and payment of dues

7. All the above

(13) How do you rate benefits you get from mobile phone in supporting your business of dairy goat keeping?

0. No idea

1. Useful

2. Fairly useful

3. Very useful

(14) What challenges do you encounter in the use of mobile phone in your business of keeping of dairy goats? (Multiple answers possible)

0. No idea

1. Poor network

2. Inadequate knowledge

3. High cost of airtime

4. Poor network and  
inadequate knowledge

5. High cost and poor network

6. All three combined

(15) Any closing comments;

.....

.....

### Appendix 3: FGD guide

1. How many of you own mobile phones?
2. For how long have you had the mobile phone?
3. In your view how did mobile phone contribute to diffusion of keeping of dairy goats in Mutonguni division?
4. What do you consider to be celebrations in the use of mobile phones in keeping of dairy goats in Mutonguni division?

5. What were the limitations of the use of mobile phone by farmers in this project of keeping of dairy goats?
6. Give recommendation to improve use of mobile phones in keeping of dairy goats?

#### **Appendix 4: Key Informant's guide**

1. In your view how did mobile phone contribute to diffusion of keeping of dairy goats in Mutonguni division?
2. What do you consider to be celebrations in the use of mobile phones in keeping of dairy goats in Mutonguni division?
3. What were the limitations of the use of mobile phone by farmers in this project of keeping of dairy goats?
4. Give recommendation to improve use of mobile phones in keeping of dairy goats?

#### **Appendix 5: Activity schedule**

<b>No</b>	<b>Activity</b>	<b>No of days</b>	<b>Person responsible</b>
1	Farmers mobilization	2	Chiefs, Chairman KWDGBA
2	Training of enumerators	1	Researcher
3	Data collection	7	Enumerators, researcher
4	Data entry	5	Data entry clerk
5	Data analysis	4	Researcher
6	Report writing	4	Researcher



**Appendix 6: Sampling frames within locations;**

<b>No</b>	<b>Location</b>	<b>Number of farmers</b>	<b>Allocated respondents</b>	<b>Percentage</b>
<b>1</b>	Usiani	63	20	<b>21</b>
<b>2</b>	Mutonguni	119	40	<b>39.67</b>
<b>3</b>	Musengo	35	10	<b>11.67</b>
<b>4</b>	Kauwi	21	10	<b>7</b>
<b>5</b>	Takeani	62	20	<b>20.66</b>
	<b>Total</b>	<b>300</b>	<b>100</b>	100

**Appendix 7: Sampling within the clusters**

<b>No</b>	<b>Sub Location</b>	<b>Frequency</b>	<b>Per cent</b>	<b>Cumulative Percentage</b>
1	Kaimu	20	20	20
2	Musengo/Kauwi	20	20	40
3	Usiani	20	20	60
4	Mithini	20	20	80
5	Takeani	20	20	100
	<b>TOTAL</b>	<b>100</b>	<b>100</b>	

**Appendix 8: Details of reported cases of deaths of dairy goats at DVO's office.**

<b>Date</b>	<b>Goat details</b>	<b>Cause of death</b>	<b>Method of confirmation</b>
26-10-2008	Female Toggenburg	Anaplasmosis	Clinical symptoms Post mortem findings
23-5-2009	Female toggenburg 2 female gallas	Anaplasmosis	Clinical symptoms Post mortem findings
3-8-2009	Female galla less than 18 months	Pneumonia	Clinical symptoms Post mortem findings
13-7-2009	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
25-7-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
16-7-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
11-7-2008	2 Female gallas less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
18-7-2008	Female galla less than	Anaplasmosis	Post mortem findings

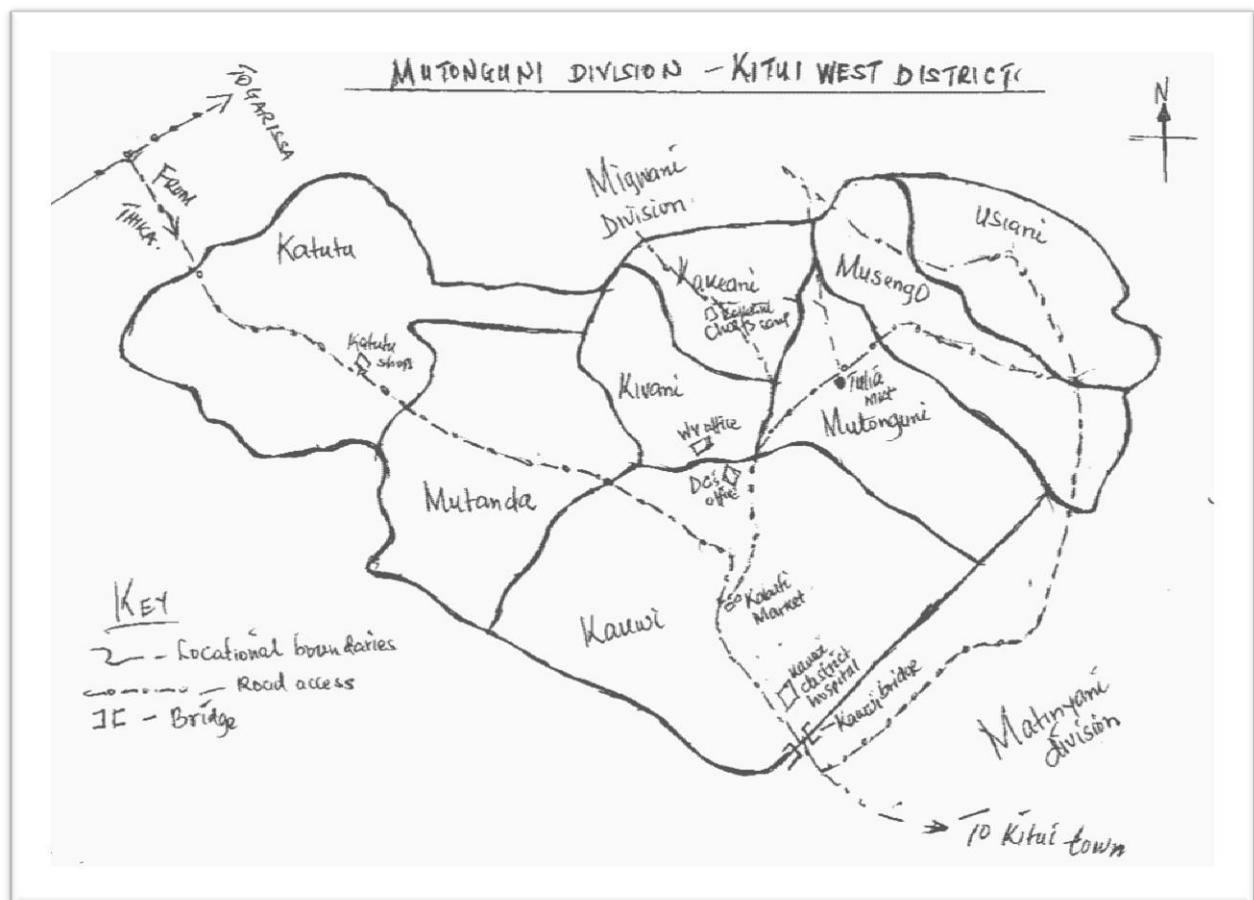
<b>Date</b>	<b>Goat details</b>	<b>Cause of death</b>	<b>Method of confirmation</b>
	18 months		
21-7-2008	Female galla less than 18 months	Pneumonia	Post mortem findings
30-7-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
7-8-2008	2 Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
8-8-2008	2 Female gallas less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
15-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
9-7-2008	3 Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
3-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings

<b>Date</b>	<b>Goat details</b>	<b>Cause of death</b>	<b>Method of confirmation</b>
5-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
11-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
14-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
15-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
18-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
20-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
24-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings

<b>Date</b>	<b>Goat details</b>	<b>Cause of death</b>	<b>Method of confirmation</b>
24-8-2008	Female toggenburg adult	Anaplasmosis	Post mortem findings
27-8-2008	Female galla less than 18 months	Anaplasmosis	Clinical symptoms Post mortem findings
28-8-2008	2 Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
30-8-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
1-9-2008	Female galla adult	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
3-9-2008	Adult toggenburg	Anaplasmosis	Clinical symptoms Post mortem findings
5-9-2008	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings
25-9-2008	Female galla less than 18 months	Pneumonia	Post mortem findings
26-9-2008	Female toggenburg	Anaplasmosis	Clinical symptoms

Date	Goat details	Cause of death	Method of confirmation
			Post mortem findings
20-11-2008	Female galla	blindness	Clinical symptoms
3-7-2009	Female galla less than 18 months	Contagious Caprine Pleuropneumonia (CCPP)	Clinical symptoms Post mortem findings

**Appendix 9: Map of Mutonguni division**



## Appendix 10: Respondents

### Kakumuti/Kangondi cluster

Cluster No/Name	Enumerator Name	Respondents
1. Kakumuti/Kangondi	Janet Mwendwa	1. Benedict Ndinda
		2. Kiteme Nzioki
		3. Damiris Makau
		4. Kalunda Kiilu
		5. Kavutha Mukamba
		6. Syoindo Lenda Nguli
		7. Jane K Mwatha
		8. Wangesi Nzomo
		9. Musyoli Masai
		10. Martha Mwanza
		11. Ngombalu Ngumbi
		12. Kitote Ngutho
		13. Kasyoka Nguu
		14. Kathanzu Suka
		15. Mawia Mwanza
		16. Makaa Mutui
		17. Mutongui Malingi
		18. Utee Ngata
		19. Mary Kimanzi
		20. Ngongoo Mutui

**Kaimu cluster**

<b>Cluster No/Name</b>	<b>Enumerator Name</b>	<b>Respondents</b>
2. Kaimu	Josephine Kasaa	1. Musyoka Kimama
		2. Vivi Kimanzi
		3. Ndulu Wambua
		4. Nzuna Nzuka
		5. Mary Musili
		6. Ndunga Mwango
		7. Losa Mulawa
		8. Mwatha Munyambo
		9. Ngwasi Ithuku
		10. Mwalili Kuyungi
		11. Rose Kyalo
		12. Elizabeth Mwendwa
		13. Alice Nzeva
		14. Musee Nzesi
		15. Ruth K Mbua
		16. Eunice Manzi
		17. Jane Mwanzia
		18. Ikuli Mbisu
		19. Mwende Muthengi
		20. Fidelix Kyalo



**Kauwi/Mithini cluster**

<b>Cluster No/Name</b>	<b>Enumerator Name</b>	<b>Respondents</b>
3. Kauwi/Mithini	PhyiasMusili	1. Nzisa Mbithi
		2. Domiana Kisavi
		3. Mutuku Musyoka
		4. Esther Muthiani
		5. Josephine Katumu
		6. Sabina Paul
		7. Ann Ngiku
		8. Nzula Munyasya
		9. Kavata Munyithia
		10. Damaris Kangangi
		11. Musyoka Ndemange
		12. Nzemba Nanga
		13. Mwendwa Kangwe
		14. Eunice Kasusya
		15. Kanini Kavili
		16. Kanyaa Mutemi
		17. Mwendu Mutemi
		18. Mawia Kawa
		19. Agnes Kimanzi
		20. Mwendu Nzelu

**Usiani cluster**

<b>Cluster No/Name</b>	<b>Enumerator Name</b>	<b>Respondents</b>
4. Usiani	Gabriel Mbalo	1. Mutanu Muthama
		2. Dalmas Muthama
		3. John Vingila
		4. Lisi Muli
		5. Nicodemus Kisata
		6. Maria Mutemi
		7. NdareNombwe
		8. Jemima Mulu
		9. David Musyoka
		10. Sila Kitau
		11. Kanyaa Nzioki
		12. Kilonzo Mwambi
		13. Musyoka Mwambi
		14. Muimi Mengi
		15. Musyoka Kiole
		16. Malia Mbiti
		17. Musee Ndabu
		18. Mukami Nzavi
		19. Muthui Musenya
		20. Mutemi Syanda

**Kakeani cluster**

<b>Cluster No/Name</b>	<b>Enumerator Name</b>	<b>Respondents</b>
5. Kakeani	Patrick Lonzo	1. Regina Kilile
		2. Muthunya Kithii
		3. Wamutwa Muthami
		4. Wayua Simon
		5. Musau Lyunga
		6. Kikava Kijumbi
		7. Felistes Ndovoi
		8. Makaa Kamba
		9. Kavengi Mbiti
		10. Kavavu Musyoki
		11. Nzau Kasenga
		12. Kavengi Kyenge
		13. Muimi Muli
		14. Mutuli Kisaki
		15. Musau Muli
		16. Ngivi Musumbi
		17. Kimuyu Munywoki
		18. Nzisa Nzeki
		19. Wamutwa Kasula
		20. Musau Kilonzi

## **Appendix 11: Steps involved in data analysis;**

### **Step 1:** Development of analysis tool;

The analysis tool was developed at the beginning of data analysis and was used to guide the analysis of the data.

### **Step 2:** Entry of data into data view

This was done by one person reading the codes and another person entering the codes in the respective columns. One questionnaire was entered at a time across all the variables that appear as consecutive columns in the data window.

### **Step 3:** Labeling of variables

This was done in the variable window by filling in the respective variables in the sixth column.

### **Step 4:** Data analysis;

This was accomplished through the following steps;

1. Go to variable view
2. Select analyze from the top bar menu
3. Select descriptive statistics
4. Select frequencies
5. Select the first variable i.e. gender
6. Click the feed arrow to transfer the variable gender into variable box
7. Click ok

## Appendix 12: Analysis tool

Question	Variable	Code	Data item
<u>1</u>	Gender	1	Male
		2	Female
<u>2</u>	Educational level	0	Never
		1	Primary
		2	Secondary
		3	Post-secondary
<u>3</u>	No of dairy goats	1	1-3 goats
		2	4 goats and above
<u>4</u>	Use of goat milk	0	Never milked
		1	Family consumption
		2	For sale
		3	Both
<u>5</u>	Sale of milk outlets	0	Does not sell
		1	Neighbours
		2	Trading centre
		3	Institution
		4	Group cooperative
<u>6</u>	Mobile phone ownership or access	1	No
		2	Own
		3	Have access

<b>Question</b>	<b>Variable</b>	<b>Code</b>	<b>Data item</b>
<b><u>7</u></b>	Period of use of mobile phone	0	Has never used phone
		1	3 years and above
		2	1-2 years
		3	Less than 1 year
<b><u>8</u></b>	People called	0	Has never called using a phone
		1	Extension officer
		2	Veterinary officer
		3	Agroveter stores
<b><u>9</u></b>	Frequency of mobile phone use to group members	0	No communication
		1	Daily
		2	Twice a week
		3	Weekly
		4	Monthly
<b><u>10</u></b>	Mobile money transfer awareness	1	Yes
		2	No
<b><u>11</u></b>	Frequency of mobile phone money transfer	0	Never sent or received money over the phone
		1	Daily
		2	Weekly
		3	Monthly
<b><u>12</u></b>	Mobile phone product transaction	0	Never
		1	Milk sale

Question	Variable	Code	Data item
		2	Goat sale
		3	Payment of dues
		4	Milk and goat sale
		5	Goat sale and payment of dues
		6	Milk sale and payment of dues
		7	All the above
<b><u>13</u></b>	Rating of usefulness of mobile phones	0	No idea
		1	Useful
		2	Fairly useful
		3	Very useful
<b><u>14</u></b>	Business challenges encountered in the use of mobile phone	0	No idea
		1	Poor network
		2	Inadequate knowledge
		3	High cost of airtime
		4	Poor network and inadequate knowledge
		5	Inadequate knowledge and high cost of air time
		6	High cost and poor network
		7	Poor network, inadequate knowledge and high cost of airtime

