ADOPTION OF MOBILE PHONE BASED LIVESTOCK MANAGEMENT SERVICES FOR PASTORAL USE IN KARAMOJA: A CASE STUDY OF THE PIAN AND MATHENIKO ETHNIC GROUP

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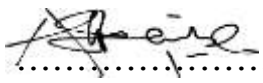
DECLARATION

I, Acheke Rigan Mark, declare that this is my original research Dissertation and has not been presented in any Institution of higher learning for any academic award.

Signature:  Date: 15/02/2023

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APPROVAL

This is to certify that this research dissertation titled ADOPTION OF MOBILE PHONE BASED LIVESTOCK MANAGEMENT SERVICES FOR PASTORAL USE IN KARAMOJA, UGANDA by Acheke Rigan Mark has been conducted under my supervision and is nowready for submission.

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LIST OF ACRONYMS

ICT	Information Communication Technology
FGD	Focus Group Discussion
CAADP	Comprehensive African Agricultural Development program
OCHA	Office of the Coordination of Humanitarian Affairs
USD	United States Dollar
TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and Use of Technology
USAID	United States Agency for International Development
GDP	Gross Domestic Product
ASAL	Arid and Semi-Arid Land
AU	African Union
FAO	Food and Agricultural Organization
UBOS	Uganda Bureau of Statistics
CELEP	Coalition of European Lobbies for Eastern African Pastoralism
ICT4D	Information Communication Technology for Development
MDG's	Millennium Development Goals
EMA-I	Event Mobile Application
NADDEC	National African-Australian Diaspora Engagement Conference
UNHS	Uganda National Household Survey
UNFPA	United Nations Population Fund
KRSU	Karamoja Resilience Support Unit

ABSTRACT

In the semi-arid pastoral region of Karamoja in Uganda, foot and mouth disease, and tick infestations remain the leading course of livestock losses and lower milk yield. This costs the regional economy over USD 92 million each year. This study investigates the challenges of mobile phone-based livestock management services adoption, and also explores factors for the successful adoption of mobile phone-based livestock management services among pastoralists in the semi-arid region of Karamoja in Uganda. The research instruments used were FGD and interviews. A total of 11 extension workers were interviewed, and 29 pastoralists were convened in 2 FGD groups. The study found out a few mobile-based livestock management services such as EMA-i (Event Mobile Application) and Pictorial Event (PET) were deployed by the government to address the animal health challenge. However, the study reveals that there were a number of challenges encountered during the deployment such as, lack of awareness, high cost of mobile phones, language barrier, complex applications, and poor network signals among others.

This paper, therefore, provides a Unified Theory of Acceptance and Use of Technology (UTAUT) model for the successful adoption of mobile phone-based livestock management services in Karamoja. It is hoped that this model may be of use to NGOs providing livelihood services to the pastoralists in Karamoja, the government and especially the Ministry of Agriculture, Animal Industry and Fisheries, policymakers and ICT implementers seeking to deploy mobile phone-based livestock management services among the pastoral communities in the semi-arid region of Karamoja.

Keywords: Mobile Phones; Livestock; Semi-Arid; Pastoralists

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter covers the overview of the study, outlines the background information to the problem, problem statement, objectives, significance of study and research questions that were guidance in this research.

1.1 Background

Sub-Saharan Africa constitutes of more than 25 million pastoralists (people whose livelihood is based on mobile livestock-keeping) and over 200 million agro-pastoralists (people combining mobile livestock-keeping with agriculture (SNV, 2012; Rota 2009). Pastoralists represent over a quarter of the total population in Africa and occupy 43% of the continent's total land mass. FAC CAADP (2012) estimates 30 million pastoralists and agro-pastoralists in the Greater Horn of Africa (Somalia, Ethiopia, Kenya, South Sudan, Eritrea, Djibouti, Sudan, Tanzania, and Uganda). In 2018, Byakagaba et al. observed that Pastoral areas in Uganda constitute around 44% (approx. 84,000 km^2) of Uganda's total land mass, and estimated around 10% of Uganda's population (3–3.5 million people) to be pastoralists.

Pastoralists in rural parts of developing countries have been constrained by a number of factors including limited access to market information and many more other factors (Aker et al., 2016). However, the low adoption and underuse of mobile phone services for pastoral use has been attributed to low uptake of existing mobile based technologies services in the rural context of developing countries in case of advice regarding management of Livestock (Lwoga, 2010; Mtega et al., 2013) thus due to the limited literature that expounds on factors associated with the adoption and use mobile phone services for pastoral use thus defining the baseline of this research

Pastoralists own up to 90% of the national herd, providing meat, hides, skins, and milk for domestic and international markets (Opolo, 2019). One of the regions in Uganda where pastoralism is practiced mostly is Karamoja sub region. The

Karamoja sub region is situated in north-eastern Uganda and it's bordered by Sudan in the North, Kenya in the East, Tanzania in the South and Democratic Republic of Congo in the West. Karamoja is a semi-arid region of Uganda and consists of seven districts in northeastern Uganda (Kaabong, Kotido, Abim, Moroto, Napak, Amudat, Nabilatuk and Nakapiripirit). With an estimated population of just over 1.1 million people (UBOS), the majority of the population subsists through agro-pastoral or purely pastoral livelihoods. The poverty in Karamoja region has already weakened

The capacity of the people to cope with the effects of the droughts. An estimated 82% of Karamoja population live in poverty compared to 32% of the national average (UNPF, 2018; Hussein, 2015). In the Karamoja cluster, the three principal ethnic pastoralism groups are the Dodoth in the north, the Jie in the central region, and the Karimojong (subdivided into the Bokora, Matheniko, and Pian groups) in the south (Waiswa et al. 2019) and livestock being a significant livelihood factor in these pastoral communities (Special Focus on Karamoja, 2008).

Karamoja Sub-Region contains about 3% of the population of Uganda and about 80% ofthe households in this sub-region own livestock (2002 population census; UBOS 2009). The livestock owners of Karamoja therefore constitute about 2.4% of the national population, but they are said to own about 20% of the nation's cattle, 16% of its goats, nearly half of all sheep, over 90% of the donkeys and virtually all camels (UBOS 2009).

The Karamoja livestock cluster consists of cattle, goats, sheep, donkeys, camels, pigs, chicken and turkeys of which the cattle cluster is primarily used in the ploughing of agricultural fields. Livestock in Karamoja produce three main products - milk, live and dead animal offtake, and blood. Proponents of the first view argue that "pastoralism feeds Africa." For instance, OCHA (2008) clearly stated that Ugandan pastoralists own 55% of the country's livestock and provide meat, milk, milk products, hides, and skins to local markets and for export.

These statistics show the very high value of livestock products and services in the sub- region both in absolute terms, and in terms of contributing to Uganda's national livestock economic value (KRSU, 2020).

In 2018–19, coalition of European lobbies for eastern African pastoralism (CELEP) estimated the total imputed monetary value of Karamoja livestock products and ploughing services to be Ugandan shilling (UGX) 1,161,660 million or United States dollar (USD) 323 million.

It was also observed that Karamoja farmers also directly benefited financially from theirown by selling their livestock, including the provision of credit, asset-based insurance, and the pooling of risk through the sharing of live animals, livestock products and services. Similarly, in 2018–19, it was stated that the total value of the financially derived benefits from cattle, goats and sheep was UGX 437,409 million or USD 122 million. Combining physical outputs and financial services, in 2018–19 Karamoja cattle, goats and sheep provided their owners with benefits valued at UGX 1,599,069 million or USD 444 million.

Livestock has a significant contribution to Uganda's economy. Recent statistics show that Uganda's livestock sector contributes 4.3% to agricultural gross domestic product (GDP), which is estimated at 23% of the national GDP (UBOS 2015). The sector, boosted by high demand for animal protein-based products, was growing fast at 3% per year by then. This demand is likely believed to double in the next 20 years because of urbanization and economic growth (Mugerwa et al. 2013; CIWF 2009). Karamoja makes very substantial economic contributions to Uganda's national livestock economy, and accounts for 39% of national cow milk value, 28% of national goat milk value, 47% of national sheep offtake value and 27% of national cattle offtake value (KRSU, 2020).

A key question is how to protect and develop Karamoja's livestock resources. Critical issues include the need to improve livestock management and general livelihood of pastoral communities in Karamoja region and to recognize the need to use technology to improve pastoralist systems, access to markets, secure access to productive rangeland and water for mobile herds, develop effective disease control strategies that limit disease- related economic losses (KRSU, 2020).

The use of ICT could help improve livestock management and general livelihood of pastoral communities in Karamoja region. Parlasca et al. (2021) observed that mobile phones, for examples, have the potential to shape and influence numerous aspects of pastoralists' daily lives. These aspects are diverse and include amongst others

herd management, nutrition, security, human wildlife conflict, access to markets and more. In the rural areas of Tanzania, there has been a remarkable progress in the use of ICTs for improving agro-pastoral livelihood; especially in the area of access to market information (Sife et al. 2010). Telecentres have been created to develop appropriate strategies for the application of ICTs among pastoralists in the rural areas of Tanzania (Lwoga, 2010; Mtega et al. 2013). Pastoralists are constantly innovating, modernizing, and working with technology. Mobile phones are commonly used by pastoralists across sub-Saharan Africa to check on pasture and water conditions, to compare market prices, to monitor livestock health, to avoid wildlife areas, and to recover stolen or raided cattle (Butt, 2015; KDF, 2016).

Concepts in Mobile Phone Technology

Mobile phone technology is one form of Information Communication Technologies used for cellular communication. It has evolved from the simple pager with two-way communication and PDAs and hand-held devices to the CDMA technology, GSM, 3G and 4G networks along with Internet-enabled phones and devices fitted with Wi-Fi and GPRS features. Currently mobile technology is revolving around smartphones and tablets each with features to enhance communication and use of technology in different sectors of the world economy (Information Office, UK, 2012). Feature phones are the most preferred by pastoralists and majority of the both rural and urban populace in Uganda. However, this trend is changing the country as well as the rest of Sub-Saharan Africa. This can be attributed to affordable entry-level smartphones, desire for use of these devices, at some point the affordability of Internet and data plans as well as deployment of the 3G mobile network technology. The mobile phone has the fastest penetration among Information Communication Technologies. In developing countries, mobile-cellular penetration leveled up to 90% by end of 2014, compared with 121% in developed countries. (ITU, 2014). Mobile telephony has made it possible for citizenry in the continent to connect among themselves; individuals, information, markets and services. In Ghana, farmers can send a text message to learn the prices of corn and tomatoes in Accra, which is 400 kilometers away (Mbiti et al. 2010). The regulatory design has improved in recent decades helping boost competition among the telecommunications companies, which in turn has made it possible for innovation in business models in mobile telephony

(Bonner et al 2009). The mobile phone has been identified as the first form of telephony for many of the world's poor including those in Sub-Saharan Africa and Uganda.

For the purposes of this study, the mobile phone technologies to be considered include mobile applications for both hardware and software. The hardware includes mobile gadgets, PDAs, smartphones and tablets. Software that sits on top of the operating system or on top of a platform, for example, served-based applications such as Airtel, MTN, and Mobile Money that provide services to mobile users are considered too as part of the study (InfoDev, 2012). The Mobile Money service is an example of USSD platform, which runs on the GSM cellular phones and more recent mobile networks.

1.1.0 Unified Theory of Acceptance and Use of Technology (UTAUT)

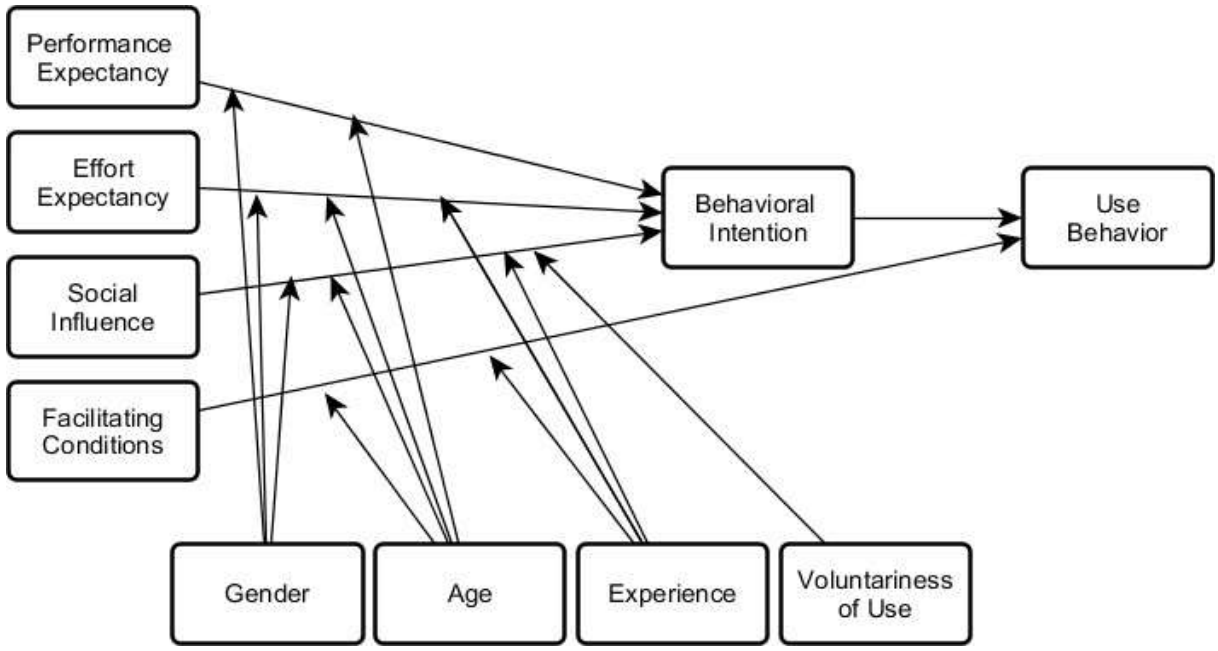
Several theories have been forwarded for the adoption and acceptance of technology in different settings. The most common of these theories is the Technology Acceptance Model (TAM), first advanced by Davis, 1986 then modified by Taylor and Todd, 1995 and then further extended by Venkatesh and Davis, 2000. Then there is the Diffusion of Innovations (DOI), first advanced by Rogers in 1983 and then later extended by Moore and Benbasat in 1991. The other is the Theory of Planned Behavior (TPB), first forwarded by Ajzen in 1985, and later many more modifications were done. Venkatesh et al., 2003 also forwarded the Unified Theory of Acceptance and Use of Technology (UTAUT) which was later modified. These theories, and many more not cited here have made vital contributions to ICT research, and to a large extent influenced technology adoption studies for decades. These theories have their strengths and weaknesses depending on the kind of environment one wishes to apply them. These theories may not be able to account for all of the dynamics of the adoption of new technology in a certain setting, because different dynamics are playing out in different settings or environments such as social, cultural, political and economic dynamics. This literary means no theory can fit all settings or environments. In an attempt to use a particular technology adoption theory to guide a study in a given environment, one has to consider the dynamics of the proposed study environment before choosing an appropriate theory to guide the study. The reason for choosing UTAUT as indicated earlier was that the model is a good

assessment toolfor measuring the likelihood of success of the use of mobile phones for livestock-based management services. It also provides possible drivers of acceptance of mobile phones for livestock-based management services.

The model considers four constructs as direct determinants of user acceptance and usage behavior which forms the basis of the study of this paper, namely

- **Performance expectancy** is defined as "*the degree to which an individual believes that using the system will help him or her to attain gains in job performance*".
- Then Effort expectancy which is defined as "*the degree of ease associated with the use of the system*".
- **Social Influence** is defined as "*the degree to which an individual perceives that important others believe he or she should use the new system*".
- **Facilitating conditions** is defined as "*the degree to which an individual believes that an organizations and technical infrastructure exists to support the use of the system*". There are four key moderating variables: gender, age, experience, and voluntariness of use.

Figure 1.1: Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003*)*



The study majorly investigated how the four contracts in UTAUT (performance expectancy, effort expectancy, social influence and facilitating conditions) facilitate a successful adoption of mobile phone-based livestock management services in Karamoja

1.2 Problem Statement

While the use of ICT and especially mobile phones would have a great potential to shape and influence numerous aspects of pastoralists' daily lives and especially livestock management in Karamoja, such as to determine pasture and water conditions, to compare market prices, to monitor livestock health, to avoid wildlife areas, and to recover stolen or raided cattle, the adoption of such technology has been a great challenge because of the high literacy levels, which estimate about 80 percent of the young population in Karamoja have never been to school, High poverty levels of about 80 percent of the total population, poor telecommunication network coverage, high prices for internet services and the nomadic life style of moving from one place to another are some of the challenges hampering the use of mobile technologies to shape and influence numerous aspects of pastoralists' daily lives in Karamoja (UNPF, 2018; Hussein, 2015). This study, therefore, seeks to assess the technological challenges associated with mobile phone-based livestock management services within the pastoral communities in Karamoja and there after provide recommendations for implementing mobile based livestock services in Karamoja region

1.3 Objectives

1.3.1 Main Objective

This study assesses the adoption of mobile phone-based livestock management service pastoral services in Karamoja region.

1.3.2 Specific Objectives

1) To study the state of mobile phone-based livestock management services among pastoralists in Karamoja
2) To assess the technological challenges associated with mobile phone-based livestock management services in Karamoja.

3) To determine the necessary factors for the successful adoption of mobile phone-based livestock management services in Karamoja.
4) To draw up conclusions and recommendations for implementing mobile based livestock services in Karamoja region.

1.4 The research questions

Accordingly, the four overarching research questions are as follows:

1) What is the state of mobile phone-based livestock management services among pastoralists in Karamoja?
2) What have been the technological challenges associated towards the adoption of mobile phone-based livestock management services for pastoral use in Karamoja?
3) What are some of the necessary factors that will lead to the successful adoption of mobile phone-based livestock management services among the pastoral communities in Karamoja
4) What are some of the recommendations for implementing mobile based livestock services in Karamoja region?

1.5 Significant of the Study

This research was aimed at pointing out the challenges and the ways forward towards the adoption of mobile phone-based livestock management services for pastoral use in Karamoja. Through this research, the pastoral community will further realize the use of mobile based livestock management services as a preventive measure against various challenges faced in these pastoral communities. Specifically, this research will benefit most pastoral communities in Karamoja region in identifications of Markets, Weather forecasts, and many more.

Therefore, the analysis that is presented in this study was to convey valuable information for future research that will explore the various benefits of use of mobile phone-based livestock management services by pastoral communities in Karamoja.

1.6 Scope of your study

The main purpose of the study was to identify and discuss the challenges being faced by the pastoral communities in Karamoja region towards the adoption of mobile phone-based livestock management services.

This study therefore was conducted in Karamoja Sub region and particularly two districts. That is Nabilatuk and Moroto. Furthermore, the study was narrowed down to at least two pastoral Tribes in these regions. The content of the study was confined to the state, the challenges, ways for improvement and to draw up conclusions and recommendations for implementing mobile based livestock services in Karamoja region.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the literature on the theoretical and conceptual review about the definition of pastoralism by the different researcher's, pastoralism in Africa and further more to the setting of Uganda, to study the state of mobile phone-based livestock management services among pastoralists in Karamoja, and to assess the major challenges associated with mobile phone-based livestock management services in Karamoja and the use of mobile based livestock management services to Improve Livestock Management.

2.1 Pastoralism

There are several definitions of pastoralism. Box 1.1 presents some of the common definitions that have been used in the past.

Pastoral production systems are those "in which at least 50% of the gross incomes from households (i.e., the value of market production and the estimated value of subsistence production consumed by households) comes from pastoralism or its related activities, or else, where more than 15% of household's food energy consumption involves the milk or dairy products they produce (Swift 1988). In comparison, agro-pastoralists are those who derive more than 25% but less than 50% of their incomes from livestock and most of the remaining income from cultivation.

African pastoralism is defined by a high reliance on livestock as a source of economic and social well-being, and various types of strategic mobility to access water and grazing resources in areas of high rainfall variability (African Union 2010).

Pastoralism refers to any predominantly livestock-based production system that is mainly extensive in nature and uses some form of mobility of livestock (Hatfield and Davies 2006).

Waiswa C.D continues to define pastoralism as a production system that is closely linked with cultural identity, relying on raising livestock on pastures that may be privately or commonly managed and accessed through agreements based on competition, reciprocity and negotiation. Livestock are social, cultural, and spiritual assets, as well as economic assets, providing food and income for the family within and between generations.

Livestock management strategies in a pastoralism system include herd mobility and diversification, with a high proportion of female livestock. Typically, pastoralism (as opposed to other livestock production systems) derives economic benefits from lands not suited to crop cultivation and is dependent upon periodic access to more productive pastures during regular dry seasons or drought. In agro-pastoral systems, in addition to livestock production, there is some form of crop cultivation. Pastoralists adopt several livelihood coping strategies in response to the difficult circumstances they are confronted with. Some of the key pastoralists' strategies include: (1) controlling access to water to ensure rational pasture management and peace; (2) using mobility not only to avoid risks such as disease but also and mainly to access nutritive pastures that are scattered and variable across the rangelands to enhance productivity; (3) maintaining pastoral resources under an overarching common property tenure regime, with nested rights of control and access to specific, high-value resources regulated by negotiation and reciprocity rather than fixed rules as a way to interface with variability.

FAO (2010) in their study on pastoralists lifestyle established that, over 40 million pastoralists and agro pastoralists in the Horn of Africa are perennially undernourished and food insecure. The study found out that in East Africa, pastoralism is still adopted as a way of life and source of livelihood, unfortunately policymakers do not realize the contribution pastoralists make to economic growth in those countries. They further indicated that climate change has an impact on the environmental, social and economic uncertainty and therefore requires pastoralists equipped with knowledge and experience on livestock management that can be utilized in the overall management of Africa's dry lands.

2.2 Pastoralists

Pastoralists are people who depend largely on livestock for their food and income; livestock are used for both subsistence and marketing, and pastoralists also look to livestock to define their cultural identity.

Pastoralists in Uganda and East Africa are a heterogeneous group characterized by varying aspects of ethnicity and sociocultural set-ups, production forms, and strategies (ODI 2010). The variations include the degree of mobility, key livestock types, engagement and dependence on pastoral activities (especially levels of dependence on livestock for food and income), management practices, geographical location, nature of engagement with the market, and numerous other factors, all of which contribute to the difficulty of constructing a versatile definition.

Kerkrade (2008) defines pastoralists as nomadic people who inhabit rangelands deriving their livelihood from extensive livestock keeping by moving from one place another. They depend on scarce natural resources with harsh unstable conditions which make them vulnerable to poor infrastructures, draughts, perennial cattle rustling and isolation from access to social services. It is essential for pastoralists to have knowledge on animal husbandry, sustainable rangeland management and informal livestock markets in order to survive (Kerkrade 2008).

2.3 Pastoralism in Africa

Sub-Saharan Africa constitutes of more than 25 million pastoralists (people whose livelihood is based on mobile livestock-keeping) and over 200 million agro-pastoralists (people combining mobile livestock-keeping with agriculture (SNV, Improved Livelihoods for Pastoralists; 2012). Pastoralists represent over a quarter of the total population in Africa and occupy 43% of the continent's total land mass. FAC CAADP (2012) estimates 30 million pastoralists and agro-pastoralists in the Greater Horn of Africa (Somalia, Ethiopia, Kenya, South Sudan, Eritrea, Djibouti, Sudan, Tanzania, and Uganda). In 2018, Furthermore, observed that Pastoral areas in Uganda constitute around 44% (approx. 84,000 km^2) of Uganda's total land mass, and estimated around 10% of Uganda's population (3–3.5 million people) to be pastoralists (Patrick Byakagaba, et al; 2018). Pastoralists

own up to 90% of the national herd, providing meat, hides, skins, and milk for domestic and international markets (C.D. Waiswa, et al; 2019).

Pastoralists' contribution to the agriculture GDP in Kenya, Tanzania, Uganda and Ethiopia is estimated at 50%, 30%, 12% and 19% respectively (World Bank, 2015). However, 75% of Kenya's population of 44.9 million people depend on agriculture, which contributes 26% to the nation's GDP and 60% of foreign exchange income (FAO, 2010). According to World Bank (2015), a third of the total land area of Kenya is agriculturally productive with only two thirds semi-arid to arid, characterized by low, unreliable and poorly distributed rainfall. These areas lie in the Northern and Southern regions and are a home to approximately four million pastoralists. They engage in livestock farming thus contributing 26% of the total national agriculture GDP (Kirk Bride and Grahn, 2008). Despite the economic potential of pastoralism, pastoralists worldwide are vulnerable to food insecurity and poverty (Clover, 2003; FAO 2010).

However, Kadimah and Susan Otete (2018) observed that in East Africa, pastoralists live in very different environments, like those associated with harsh climate conditions but usually in marginal areas, geographically close to national borders. Such areas can be wet, cool highlands; dry, hot lowlands; swampy wetlands or along riverine forests; and get their water from different sources. By our definition, however, all these environments share a common characteristic: unpredictable and highly variable access to pasture and water within and between years.

2.4 Pastoralism in Uganda

One of the regions in Uganda where pastoralism is practiced mostly is Karamoja sub region. The Karamoja sub region is situated in north-eastern Uganda and it's bordered by Sudan in the North, Kenya in the East, Tanzania in the South and Democratic Republic of Congo in the West. Karamoja is a semi-arid region of Uganda and consists of eight districts in northeastern Uganda (Kaabong, Kotido, Abim, Moroto, Napak, Amudat, Nabilatuk and Nakapiripirit). With an estimated population of about 1.2 million people (Obtained from the Uganda Bearau of Statistics, The Uganda National Household Survey Report. (2019/2020), the majority of the population subsists through agro-pastoral or purely pastoral livelihoods. The

poverty in Karamoja region has already weakened the capacity of the people to cope with the effects of the droughts. An estimate of 82% of Karamojong population are believed to live in poverty compared to 32% of the national average (report from the UNFPA, Population Matters (2018). S.J. Opolot 2019; defined that in the Karamoja cluster, the three principal ethnic pastoralism groups are the Dodoth in the north, the Jie in the central region, and the Karimojong (subdivided into the Bokora, Matheniko, and Pian groups) in the south and livestock being a significant livelihood factor in these pastoral communities.

The population census conducted in 2009 by UBOS Karamoja Sub-Region contains about 3% of the population of Uganda and about 80% of the households in this sub-region own livestock. The livestock owners of Karamoja, therefore, constitute about 2.4% of the national population, but they are said to own about 20% of the nation's cattle, 16% of its goats, nearly half of all sheep, over 90% of the donkeys and virtually all camels.

However, Karamoja livestock resources face a variety of challenges as discussed in the next section.

2.5 Challenges faced by Pastoralists in Karamoja

In the areas of Karamoja, over the past decade pressures on the current production system have increased significantly affecting the lives of these pastoral communities. These pressures primarily manifest through persistent drought, conflict insecurity, poverty, and shrinking amounts of rangelands. Many of these pressures have multiple effects on the lifestyle of pastoralist communities, resulting in positive and negative changes. These changes have been diverse and numerous, and have and will continue to spur reactions and adaptations amongst populations in these regions.

This section will focus on some thematic areas including agriculture, conflict, gender, land-rights, education and animal health in these pastoral communities.

2.5.1 Livestock Production and Health

Livestock production in Karamoja is a major factor to household and community resilience in Karamoja (Rockeman et al. 2016), particularly in the face of shocks such as drought and failed harvest. Access to markets facilitates successful livestock production through investments hence outlining the sale of animals to cover consumption shortfalls or households needs.

Among most pastoralists in Karamoja, Livestock production is mainly focused on their economic well-being well as in most developing countries people keep livestock for other off-farm expenses such as payment of lobola, school fees, insurance against emergencies, and purchase of food (Chiwawa, 2019; Cholo et al. 2017). The cattle-keeping communities living in the cluster have developed sophisticated strategies for livestock production and movement in order to cope with the high level of risks inherent to this marginal environment (Wantsusi et al. 2008).

2.5.2 Animal disease

This is currently the main challenge to livestock production in the areas of Karamoja. According to Stites et al. (2016), the drought that began in early 2015 weakened animals and left them more susceptible to disease. Mortality over the past year has been pronounced. Access to treatment is either limited or not effective, and animal owners complain that they lack adequate cash to purchase the required medicines.

2.5.3 Climatic changes

Much of the Karamojong Cluster, including Karamoja, is characterized by harsh arid and semi-arid land (ASAL) receiving 300 mm or less rainfall per annum. Precipitation is seasonal but highly variable in volume, distribution and timing (Wantsusi et al. 2008).

Climate change has rendered other channels to obtain such information-for example, traditional forecasting methods-less reliable (Rasmussen et al., 2014; Rasmussen et al., 2015). Some scholars suggest that mobile phones could be used to build an indigenous knowledge database, combining data from modern stations with the valuable indigenous knowledge that pastoralists have acquired over time (Balehegn et al., 2019). This combination has the potential to bridge the lack of trust among pastoral communities towards external knowledge producers (Rasmussen et al., 2015). However, because pastoralists require highly time specific and recent information on weather conditions, such

databases need to have a substantial resolution with very frequent updates. To the best of our knowledge, no platform of such kind is therefore currently under operation.

Moreover, the climate in Karamoja (and the surrounding regions) has been heavily affected by climate change, with the occurrence and severity of drought increasing significantly over the last 10 years (Akabwai et al. 2005).

2.5.4 Animal theft

Pastoralists' reliance on mobility makes them more vulnerable to theft. This can cut off access to key resources and block them from routes to markets. Insecurity and conflict is creating fear and loss of life and livestock, made worse by the spread of small arms and other weaponry into the region. In cases of animal theft, use of mobile phones has been purposively seen as one of the elements that could help in reducing its rampancy. This means that mobile phones will be used as the first-time alert mechanisms for such cases.

2.5.5 Market constrains

Access to markets is a central component of successful livestock production. It allows for investment in new animals, including "trading up" to improve the growth potential of herds. Markets also allow families to sell animals in the event of consumption shortfalls or to support household needs. Markets in Karamoja are also the main source of veterinary medicines and supplements.

Mobile phones can affect pastoralists' income through several channels. One of the channels is the acquisition of information on prices for livestock. This activity is widespread among pastoralists and frequently mentioned across several studies and contexts (Baird & Hartter, 2017; Karimuribo et al., 2016; Little et al., 2014; Mertz et al., 2016; Mtimet et al., 2018; Roba et al., 2018; Vidal-González & Nahhass, 2018). The pastoral meat supply chain is characterized by high price variability. Prices are usually not known until the market day and delayed payments occur frequently (Roba et al., 2017; Roba etal., 2018). This makes negotiations between traders and pastoralists on livestock purchases challenging. The mobile phone allows gathering reliable information on livestock prices quickly by calling contact.

However, because most herders are less market-oriented than traders (Djohy et al., 2017), herders may use and benefit from mobile phones less than traders (Debsu

et al., 2016). The information on livestock prices at different markets that traders acquire through their mobile phone might increase the price traders are willing to offer herders. Herders could therefore also indirectly benefit from traders' mobile phone use. So far, however, it is unclear whether such trickle-down effects actually occur.

2.5.6 Social change

Information and knowledge are key assets for members of pastoral communities. Having access to information resembles power (Nilsson & Salazar, 2017). In most pastoral communities, access to information and knowledge traditionally depends on a person's gender, age, and position within the society. The emergence of the mobile phone has stirred up this traditional information distribution because the mobile phone facilitates information access and sharing also for previously deprived social groups (Djohy et al., 2017). These changes in access to information and power relations affect the societies of pastoral communities along several dimensions.

2.5.7 Conflict

Pastoral communities are oftentimes exposed to different types of conflict including human–wildlife conflicts, conflicts between livestock herders and authorities of protected areas, conflicts between livestock herders and sedentary farmers, and conflicts between different tribes. Because the mobile phone allows fast and cheap exchanges of information, pastoralists use the technology to prevent conflicts before they occur, but they also use them strategically in ongoing conflicts. For example, mobile phones have shown to reduce conflicts between pastoralists and wildlife in East Africa, because herders use the phone to share information on sightings of dangerous species, their footprints or their dung, with other herders (Butt, 2015; Lewis et al., 2016).

2.5.8 Growing populations.

Pastoral towns and settlements are expanding, but while human populations are growing, livestock population numbers are remaining relatively stable. This is resulting in fewer livestock per capita. The increasing need to grow crops to feed the growing numbers of people makes it difficult to keep rangelands open for livestock. This is restricting mobility. It is also causing pastoral economies to be less self-sufficient.

2.5.9 Gender inequality.

Martin C. (2021), identified that in most pastoral communities, access to information and knowledge traditionally is dependent on a person's gender, age, and position within the society.

According to a demographic health survey conducted in 2006, 60% of Ugandan women have experienced physical violence since the age of fifteen, 39% of the women have experienced sexual violence and 41% of women have beaten or harmed by partners.

According to C.D. Waiswa et al. (2019), Pastoralists within a community are differentiated by gender. Gender division of labor on the other hand refers to the socially determined ideas and practices that define what roles and activities are deemed appropriate for women and men. Gender roles and relations are the focal point for the gender division of labor within pastoral communities; that is, who does what in the household. Gender roles here refer to the range of behaviors and attitudes that are generally considered acceptable, appropriate, or desirable for people based on their actual or perceived sex.

Family members are often involved in a number of different activities, depending on their age and gender:

2.5.10 Herd management

The emergence of mobile phones strongly influences herd management of pastoralists as well. Herders inquire and provide information on several important aspects including information on forage and water resources, on the location of rangers who might disrupt herding practices, on weather conditions, or on situations that require veterinary assistance (Baird & Hartter, 2017; Butt, 2015; Debsu et al., 2016; Djohy et al., 2017; Nilsson & Salazar, 2017; Rasmussen et al., 2014; Vidal-González & Nahhass, 2018).

2.5.11 Livestock diseases and their control

According to C.D Waiswa et al., 2019; livestock diseases were observed as a major constraint to livestock production in pastoral areas of Uganda and beyond. Even when livestock disease were not fatal, livestock diseases have always caused significant impact on productivity, fertility, and those of public health concern leading to quarantines. This then resulted to pastoralists using mobility to manage

pests and diseases, although access to veterinary services suited to the pastoral system was also very important.

2.5.12 Water Availability

Water is an essential natural resource not just for the herd but also for the family. Understanding the links between water, natural pastures, and the family is important for appreciating how the pastoral system works as a system (C.D Waiswa et al., 2019).

Worldwide, pastoralists now use mobile phones to obtain information about areas and conditions for water availability along trekking routes. They can stay in touch with family members and herders in their base and mobile camps, and can make herd management from a distance. Mobile phones have help pastoralists grasp new market opportunities, e.g. in camel meat and milk (Debsu et al 2016). In Kenya, a study last year found that 93% of Maasai herders rely on cellphones for some aspects of pastoral work (Butt 2015).

According to the KRSU 2020, a key question is how to protect and develop Karamoja's livestock resources. Critical issues include the need to improve livestock management and general livelihood of pastoral communities in Karamoja region and to recognize the need to use technology to improve pastoralist systems, access to markets, secure access to productive rangeland and water for mobile herds, develop effective disease control strategies that limit disease-related economic losses.

2.6 The Use of ICT to Improve Livestock Management

The use of ICT especially mobile phones could help improve livestock management and general livelihood of pastoral communities in Karamoja region. It was also observed that mobile phones, for examples, have the potential to shape and influence numerous aspects of pastoralists' daily lives. These aspects are diverse and include amongst others herd management, nutrition, security, human wildlife conflict, access to markets and more (Parlasca et al 2021).

In the rural areas of Tanzania, there has been a remarkable progress in the use of ICTs for improving agro-pastoral livelihood; especially in the area of access to market information (Mwamfupe, 2015; Sife et al., 2010;). Telecentres have been created to develop appropriate strategies for the application of ICTs among pastoralists in the rural areas of Tanzania. Pastoralists are constantly innovating, modernizing, and working with technology. Mobile phones are commonly used by pastoralists across

sub-Saharan Africa to check on pasture and water conditions, to compare market prices, to monitor livestock health, to avoid wildlife areas, and to recover stolen or raided cattle (Butt, 2014).

Ever since 2001 when telecentres became operational, Tanzania's mobile phone services have also experienced a tremendous growth. It is one of the fastest growing sectors in Tanzania with 20% growth per annum (TCRA and TTN, 2011) reaching all areas and sections of the society. Mobile phones have become popular for agro-pastoralists to communicate with the RISP operators in case of advice regarding farming activities (Lwoga, 2010). Increased growth rates of mobile phones have been attributed to many factors including the liberalization of telecommunication markets; user-friendliness of the mobile phones; prepayment modes; and usage of local languages in communication (Akpabio, 2007; Choudhary, 2012). For these reasons, the study focused on the mobile phone services in form of a telecentres alongside with community radios and mobile phones technology); since mobile phones are also becoming popular for agro-pastoralists to communicate with telecentres operators (Lwoga, 2010). The paper thrusts on the conviction that telecentres can efficiently address the concerns of the agro-pastoralists stationed even at remote locations of the country. The use of Mobile phones play an important role by promoting livelihoods and hence, fostering rural development between and among different actors in rural areas (agro-pastoralists, telecentres services providers and policy makers) to attain mutually acceptable development goals.

Mobile phones have presented great potential in shaping and influencing numerous aspects of pastoralists' daily lives and especially livestock management in Karamoja, such as to determine pasture and water conditions, to compare market prices, to monitor livestock health, to avoid wildlife areas, and to recover stolen or raided cattle, the adoption of such technology has been a great challenge because of the high illiteracy levels, which estimate about 80 percent of the young population in Karamoja have never been to school, High poverty levels of about 80 percent of the total population, poor telecommunication network coverage, high prices for internet services and low levels of ICT literacy are some of the challenges hampering the use of ICTs to shape and influence

numerous aspects of pastoralists' daily lives in Karamoja (C.D. Waiswa, et al,; 2019).

According to Chilimo (2008), Information Communication Technology for Development (ICT4D) is the use of ICTs in the social, cultural, economic and political development of individuals in providing essential information and knowledge that can improve the well- being of individuals and communities, particularly in developing countries. Notably, ICT has been recognized as a necessary tool for achieving the Millennium Development Goals (MDGs) such as, goal number eight engaging global partnerships in poverty reduction (Kuriyan et al., 2010). Similarly, Zheng et al., (2011) adds that, the purpose of emphasizing the use of ICTs is to produce socio-economic change, reduce poverty, and solve inequality problems and to reduce the gap between access to information between rich and poor populations of rural communities.

They further pointed out that, pastoralism as a sector is estimated to be worth US$800 million a year in Kenya alone, however in regard to nationally produced goods and services, there are no clear records showing the importance of pastoralism as an aspect of economic development in.

2.7 Factors for successful adoption of mobile phone-based livestock management services for pastoral.

2.7.1 Create awareness and sensitization

Obala (2021) stated that in Ethiopia, the University of Tufts have developed a pastoralism education curriculum, aimed at targeting Eastern Africa to build the capacities and increase understanding and awareness among Pastoralists across all faculties through inclusion of pastoralism as a cross cutting unit or a core course in identified Universities.

2.7.2 Toll free vet helpline

The Fisheries and Agricultural Organization in Uganda together with a number ofGovernment agencies are working towards this cause and have at least initially have developed an SMS structure where by pastoralists are provided with a specific Code for reporting cases of animal theft and Health.

Abakar et al. (2018) supported this by saying that communication between remote pastoralists and the extension support staff is a core factor to the success of

such programs and provision of such a communication medium would be of great advantage.

2.7.3 Stronger telephone network

A telephone network is a medium that connects telephones, which allows telephone calls between two or more parties. It was earlier on noted that most areas where pastoralists reside or take their animals in search for pastures and water within Karamoja region have poor network connectivity

Furthermore, it was also observed that due to the strong telephone network of mobile phones in the rural areas of Tanzania, pastoralists have adopted the use of mobile phones as a better way to communicate with the telecentres operators in case of advice related to management of their Livestock (Lwoga, 2010; Mtega et al., 2013).

2.7.4 Customized vet mobile application

FAO (2015) together with the government of Uganda introduced a Vet Mobile application (EMA-i) that was customized for reporting cases of animal health and this was deployed to the Veterinary doctors and Extension workers within the areas of Karamoja so as to enhance surveillance. However, the design of this application has not been customized in a way that fits the Lifestyle of the pastoralists. Furthermore, these applications are designed in a way that a user must be able to interpret the data being processed.

However, for a number of studies that have been directed towards phone use among pastoralists, most have understandably focused on information exchange (Muto and Yamano 2009, Aker 2011, Tadesse and Bahiigwa 2015). Akpabio & Inyang (2007); Choudhary (2012) backed this by noting that the customization of these applications in the local languages have presented a tremendous Increased growth rates of mobile phones among the pastoralists in Tanzania.

2.7.5 Social influence

It has been observed that the traditional settings of most pastoral communities, the access to knowledge and information usually depends on a person's gender, age, and position within the society. Hence the emergence of the mobile phone technology has stirred up this traditional information distribution because it facilitates information sharing and access also for previously deprived social groups (Djohy et al., 2017). These changes in access to information and power

relations have however been seen to affect the societies of pastoral communities along different dimensions.

Nilsson et al. (2017) further adds that knowledge and information is now observed as an asset for members in pastoral communities. This means that having access to information resembles power.

2.7.6 Trainings

USAID (2017), introduced a number of training initiatives directed to the pastoralists in Kenya and Namibia to enable them gather data and acquire knowledge so that they may be able to respond to climate change and other threats. In this case, a cloud-based Land potential Knowledge System (LandPKS) was designed by USAID and the United States Department of Agriculture (USDA) to address threats that pastoralists face. However, in Karamoja. This factor is observed to reduce on the dependency of pastoralists for mobile services in cases where specified extension support cannot be reached or is Unavailable.

2.8 Summary of literature review

Furthermore, despite all factors mentioned such as their contribution to economic growth and environmental change, pastoralist communities' worldwide face challenges of food insecurity and massive poverty. Zheng et al., (2011) posits that in regard to the findings from several authors mentioned it was clear that pastoral farmers require timely information on weather conditions, advice on maintaining healthy livestock under favorable conditions from relevant persons, and information on markets to empower them for sustainable livelihoods.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This section presents the research design that was used in this research. It also discussed the qualitative method being used, case study approach, sampling, data collection tools and the analysis techniques that were used for the study.

3.1 Research design

Saunders (2007) defines research design as the general plan of how one will go about answering the research question(s) and that it contains a clear objective, derived from your research question specifying the sources which you intend to collect data, and consider the constraints that will inevitably have an impact to the study being conducted.

This will lead to a well framed strategy that can be specified to integrate the different components of the study being developed in a coherent and logical way, thereby effectively addressing the research problem.

Accordingly, the four overarching objectives are as follows:

1) What is the state of mobile phone-based livestock management services among pastoralists in Karamoja?
2) What have been the technological challenges associated towards the adoption of mobile phone-based livestock management services for pastoral use in Karamoja?
3) What are some of the necessary factors that will lead to the successful adoption of mobile phone-based livestock management services among the pastoral communities in Karamoja
4) What are some of the recommendations for implementing mobile based livestock services in Karamoja region?

Based on the nature of the research questions of the study and especially the first 3 research questions, a qualitative study would appropriately address the research questions because the take of answers to these research questions are explanations and feelings of the respondents about ICT based livestock management service in Karamoja sub region

3.2 Qualitative Research Method

This type of research is quite contrary to quantitative research design because It is explanatory in nature and it always seeks answers to “What’s” and “How’s”. According to Wu and Volker (2009), it was observed that qualitative research approaches are used to understand everyday human experience in all its natural settings and in all its complexity. To do this, qualitative research conforms to notions that reality which cannot be measured directly is socially constructed and that inquiry is unavoidably value-laden (Denzin NK, Lincoln 1998). This approach will help the researcher to gain a rich, detailed understanding on the state of mobile phone-based livestock management services among pastoralists in Karamoja, the technological challenges associated with the adoption of mobile phone-based livestock management services for pastoral use in Karamoja and factors necessary for the successful adoption of mobile phone-based livestock management services among the pastoral communities in Karamoja. It will help the study to generate ideas and developing a theory or hypothesis, Summarizing, classifying, and analyzing of the data used to conduct the analysis, mostly represented with word, at least only a few people are required to answer and it involves open-ended inquiries or interview guide. Qualitative research allows you to ask questions that cannot be easily put into numbers to understand human experience. Case study is one of the main methods used in qualitative research which will also be used in this study.

3.3 Case Study

Gustafsson (2017) stated that a case study can be defined as an intensive study about a person, a group of people or a unit, which is aimed to generalize over several units. A case study has also been described as a systematic intensive investigation of a single individual, group, community or some other unit in which the researcher examines in- depth data relating to several variables (Calanzaro et al. 1980). Hamel J. (1993) and Yin (2003) made an observation and concluded that researchers describe how case studies examine complex phenomena in the natural setting so as to increase understanding of them. In this method of research, the researcher is allowed to take a complex and broad topic, or phenomenon, and narrow it down into a manageable research question(s). By collecting qualitative or quantitative datasets about the

phenomenon, the researcher gains a more in-depth understanding into the phenomenon than would be obtained using only one type of data. There are a number of pastoral communities in Karamoja region. Undertaking a study on all of them may be un achievable in a short time. This study therefore will undertake two case studies namely the Pian and the Matheniko pastoral communities. This will be representative on the entire pastoral communities in Karamoja. One of their key benefits of using case studies is their ability to capture what Hodkinson and Hodkinson (2001:3) call 'lived reality'. As they put it, case studies have the potential, when applied successfully, to 'retain more of the "noise" of real life than many other types of research' (Hodkinson and Hodkinson, 2001:3). The importance of 'noise' and its place in research is especially important in contexts such as in a pastoral community where background noise from cattle is unavoidable but also make it real. The most significant benefit of case studies is that they enable a holistic review. Unlike standalone research techniques which give more of a snapshot, eg surveys, a case study offers the opportunity for a researcher to use a range of tools on one subject. This gives time and space to build a detailed understanding of the topic, establishing a sound platform from which to explore the factors influencing the case study in greater detail.

3.4 Sampling

Sampling is referred to as the selection of a group that you will actually collect data from in your research. In statistics, this allows us to test a hypothesis about the characteristics of a population.

Sampling is important for researchers in a way that it provides a guide on the selection of a subset of the population of interest in a research study. In the vast majority of research endeavors, the participation of an entire population of interest is not possible, so a smaller group is relied upon for data collection. In other words, it also allows researchers to gather the same answers from a sample that they would receive from the whole population.

Basically, sampling is used to form conclusions about populations based on samples, and it allows us to identify the features of a population by directly seeing only a subset (or sample) of the population.

The beauty of this sampling attribute is that when it comes to choosing a sample, less time is spent than choosing every item in a population, Sample selection is

a low-cost strategy and a sample analysis is less time-consuming and more practical than a population analysis.

3.4.1 Sampling technique

There are a number of techniques which help us to gather sample depending upon the need and situation which are grouped into two categories as:

1) Probability Sampling
2) Non- Probability Sampling

The difference lies between the above two is whether the sample selection is based on randomization or not. With randomization, every element gets equal chance to be picked up and to be part of sample for study.

However, for this research, a non-probability sampling technique will be adopted.

3.4.1.1 Non-Probability Sampling

This sampling technique does not rely on randomization. This technique is more reliant on the researcher's ability to select elements for a sample. Outcome of sampling might be biased and makes difficult for all the elements of population to be part of the sample equally. This type of sampling is also known as non-random sampling.

3.4.1.2 Convenience Sampling

Here the samples are selected based on the availability. This method will be used when the availability of sample is rare and also costly. So based on the convenience samples are selected. For example: Researchers prefer this during the initial stages of survey research, as it's quick and easy to deliver results.

3.5 Sample size

Sample size is a research term used for defining the number of individuals included in a research study to represent a population. The sample size references the total number of respondents included in a study, and the number is often broken down into sub-groups by demographics such as age, gender, and location so that the total sample achieves represents the entire population.

In this case, we define the number of participants or observations included in a study. This number is usually represented by n.

The size of a sample influences two statistical properties:

1) The precision of our estimates
2) The power of the study to draw conclusions.

For this research, the sample size was 29 pastoralists, Basically, it has previously been recommended that qualitative studies require a minimum sample size of at least 12 to reach data saturation (Clarke & Braun, 2013; Fugard & Potts, 2014; Guest, Bunce, & Johnson, 2006) Therefore, a sample of at least 29 will be deemed sufficient for the qualitative analysis and scale of this study.

According to Seema (2018), **Sampling** helps a lot in research. It is one of the most important factors which determines the accuracy of your research/survey result. If anything goes wrong with your sample, then it will be directly reflected in the final result.

3.6 Data Collection tools

Data collection is a process of gathering and analyzing specific information to provide solutions to relevant questions and at the end of it evaluate the obtained results. It will help focus on finding out everything about a particular topic. The data collected will provide a hypothesis test that will seek to explain a phenomenon.

It is important to decide on data collection tools because research is carried out in different ways and for different purposes. For this study, the major purpose of data collection was to obtain quality evidence that allows for analysis leading to the formulation of convincing and credible answers to the questions posed.

3.6.1 Interviews

According to Kothari (2004), he defines interviews as a formal data collection method involving face to face conversation between the researcher and the respondent. In this case, Interviews are of necessity when there is need of face-to-face interaction to generate ideas in a discourse bordering mutual interest. Here I intend to investigate the current state of mobile phone-based livestock management services among pastoralists in Karamoja, assess the technological challenges associated with mobile phone-based livestock management services in Karamoja and lastly to determine the necessary factors for the successful adoption of mobile phone-based livestock management services in Karamoja

Interviews were used because they improve the understanding and the credibility of studies and there is more of understanding of the topic of discussion (Key 1997). In this study, interviews were used to help gather relevant information from pastoral communities on the use of mobile phones for managing their livestock guided by a questionnaire.

The participants that were involved in the interviews included clan chairpersons and vice chairpersons or any other person on the clan committee, pastoral community members and district extension staffs.

3.6.2 Focus Group Discussions (FGD)

A focus group discussion involves gathering people from similar backgrounds or experiences together to discuss a specific topic of interest. It is a form of qualitative research where questions are asked about their perceptions attitudes, beliefs, opinion or ideas. A total of 29 participants were involved in the 2 Focus Group Discussions. Some of who were the Area Local Chairpersons, Clan Leaders and the most powerful pastoral community members within the pastoralist's community.

3.7 Qualitative Data analysis

Qualitative data analysis is a process of gathering, structuring and interpreting qualitative data to understand what it represents. According to Brown and Lloyd, (2001), qualitative data from interviews is analyzed as the study progresses following a logical analysis, a method which is highly recommended for qualitative research.

3.8 Content Analysis and Thematic Analysis

This is a popular approach to qualitative data analysis. Other analysis techniques may fit within the broad scope of content analysis. According to GAO (1996), content analysis helps to Perouse through large volumes of data easily. Berelson (1952) defined content analysis as replicable technique for compressing words of texts into fewer content categories basing on explicit rules of coding Content analysis used to identify the patterns that emerge from text, by grouping content into words, concepts, and themes. Content analysis is useful to quantify the relationship between all of the grouped content.

3.9 Chapter summary

According to this chapter, the area of study has been pointed out and descriptive research design discussed. This chapter still figures out procedures that are adopted for sample selection and research instruments used for research study. The instrument used was the interviews. In summation, this chapter discusses the validation and limitation of instruments that will be used as well. The next chapter will give a presentation of data collected.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.0 Introduction

This section is organized in to major themes as follows; demographic of respondents, state of mobile based livestock management services among pastoralists in Karamoja, the technological challenges associated with the use of these mobile based livestock management services among pastoralists in Karamoja, and the factors for the successful adoption mobile based livestock management services among pastoralists in Karamoja.

4.1 Presentation of the Findings

There are two main approaches to writing up the findings of qualitative research. The first is to simply report key findings under each main theme or category, using appropriate verbatim quotes to illustrate those findings, this is then accompanied by a linking, separate discussion chapter in which the findings are discussed in relation to existing research (as in quantitative studies). The second is to do the same but to incorporate the discussion into the findings chapter. This study uses the first approach.

4.2 Demographics

About 40 participants were involved (11 extension workers including veterinary, agricultural, animal husbandry and production officers) and (29 pastoralists of which included clan leaders, and Local Area chairpersons and the pastoralists). However, much of the emphasis on the discussion in this chapter was mainly focusing on the outputs of the pastoral members.

Table 4.1: Representation of the Demographics

Respondents	**Frequency**	**Tool**
Pastoralists	29	**FGD**
Extension workers	11	**Interview**
TOTAL	**40**	

Figure 4.1: Showing pastoral participants during the FGD

Figure 4.2: An interview with Veterinary involvement in the data collection exercise Officer

Table 4.2: Representation of the nature of mobile devices used among the represented pastoralists for this research

Region	**Nature of the Mobile device**	**No. of respondents that own them**
NABILATUK (Pian Ethnic group)	Smart phone	**1**
	Basic phone	**13**
	None	**1**
MOROTO (Matheniko Ethnic group)	Smart phone	**3**
	Basic phone	**8**
	None	**3**
TOTAL		**29**

4.3 Types of mobile Based Livestock management services used among pastoralists

Mobile phones have presented a number of characteristics and features that comply with the lifestyle and situation of most pastoral communities in Karamoja.

The study investigated the types of mobile based livestock management services used in Karamoja (and for what purpose are they used for among these pastoral communities). The study came up with the following findings

From both these pastoral communities, a number of them(pastoralists) responded *"yes we use these services and they help us manage our livestock (ngibaren).* Some of these ICT based services included;

4.3.1 Making of phone calls

The use of a mobile phone for making of phone calls among pastoralists has been observed as the most used module among the pastoralists in Karamoja that drives them to purchasing one. The making of phone calls is always the first-time media for monitoring of their herd at all times. For example, in Karamoja, cattle raiding has been much reduced since a number of pastoralists got introduced to the use of mobile phones for making phone calls in such times.

One of the FG discussants noted that *"Making phone calls has helped us a lot in managing our livestock even when the herd's men are far away. This happens because we take our animals in long places for search of green pastures and in these moments of insecurity where your animals get raided, phone calls are the first-time alert means taken to alert the authorities on the incident".*

Another discussant on the same note added that *"using a mobile phone is good, for example when an animal is taken for grazing and it gets sick, the herds' men are able to easily reach you so that you can inform the respective veterinary doctors within so that you can administer the drugs".*

Still on the same note, concern was raised by the discussant that *"the beauty of phone calling is that if you want to sell your animal, you just have to call the person on the other side of the market so that you can identify the price of such an animal currently on the market".*

4.3.2 Text Messaging

Pastoral groups in Karamoja have embraced the use of text messaging as one of the modern technologies that improve their production systems and lives in managing their Livestock. The study found out that some of the pastoralists used Text messages through the help of their colleagues who can somehow read and write to communicate to extension staff or the authorities when matters of concern like Animal Health or raids happened.

During the study, one of the FG discussants said that *"in situations where you don't have airtime, the easiest medium you can use to communicate to an extension worker is by SMS. Even when issues regarding livestock arise when you are in far-grazing lands, you can be able to text a message by the help of a learnt colleague".* The discussant added on that *"we are however still having challenges with typing. At some point, I have to call someone that has known how to write SMS's so that they can interpret what I want to communicate".*

4.3.3 Mobile Money

Mobile money is one of the technologies that were used by pastoralists in their daily lives. The study found out that some of the pastoralists used mobile money transactions when selling their livestock. During this research, one of the FG discussants said, "*We use this service to make transactions when selling our Livestock within different markets. Suppose I want*

to by an animal and I don't have probably enough cash. In that case, it's easy for me to initiate the transaction from my savings at that very time though the steps for making the transactions seem to disturb us sometimes hence making us request extra help from the learnt ones".

4.3.4 Camera

The use of a Camera module is also one of the features on a smartphone widely used among Pastoralists in Karamoja region. During this study, it was observed that some of the pastoralists have taken the initiative of keeping records of their sales and loses inform of pictures.

During this research, one of the FG discussants said that *"The beauty of a phone is also the fact that it has a camera. We use this to take photos for reporting in case our animals get sick or get raided".* Another informant added on that *"for me, whenever I sell my animal, I use the camera on my ordinary phone to take a photo of*

the seller. I do this for purposes of any complains that may come up if the animal sold to me was stolen".

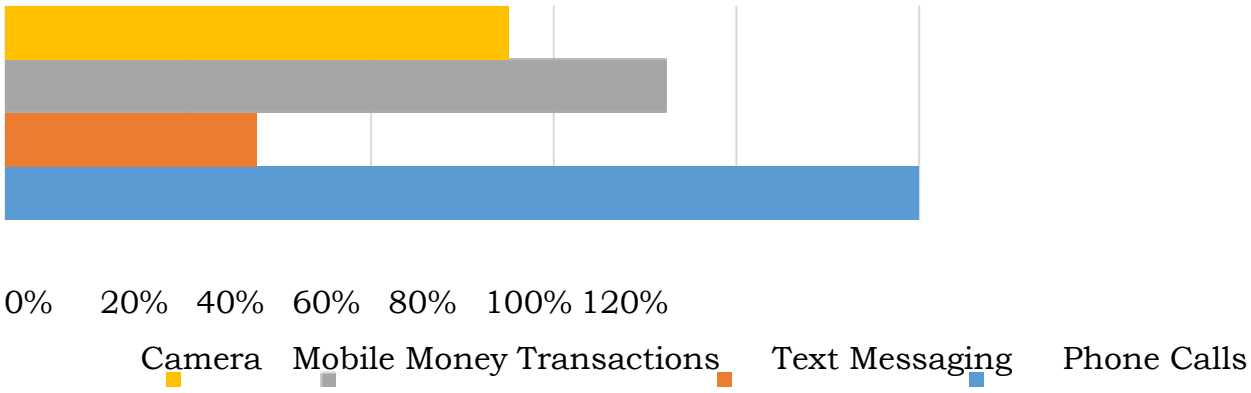
Table 4.3. Showing mobile phone-based livestock management services used by pastoralists

MOBILE PHONE-BASED LIVESTOCK MANAGEMENT SERVICES USED BY PASTORALISTS

	(N=29)		
SERVICE	**Moroto Region (Matheniko) - 14 Respondents**	**Nabilatuk Region (Pian) - 15 Respondents**	**TOTAL**
Phone Calls	48.3 % (14)	51.7% (15)	100% (29)
Text Messaging	10.3 % (3)	17.2% (5)	27.5% (8)
Mobile Money Transactions	31.0% (9)	41.4% (12)	72.4% (21)
Camera	24.1% (7)	31.0% (9)	55.1% (16)

Figure 4.3: Graphical representation of the findings in table 5

MOBILE PHONE-BASED LIVESTOCK MANAGEMENT SERVICES USED BY PASTORALISTS



4.4 Challenges associated with the use of mobile based Livestock management services among the pastoralists in Karamoja region

However, during this study, it was also observed that some pastoralists in Karamoja region were not using any form of mobile based livestock-based services. The study also assessed the technological challenges associated with the use of Mobile Based livestock management services among pastoralists in Karamoja and the finding are presented below

Under this section, some of the questions that were presented to the pastoralists duringthe FGD and to the extension workers during the interview were *"What have been the challenges of using Mobile based livestock management services for managing livestock?"* and *"Why do you think there is little adoption of Mobile based livestock management services in Karamoja Region".* A number of concerns were raised from the FGD and the interviews which included

4.4.1 Lack of Awareness

Several pastoralists have not yet realised the benefits of using existing technology to manage livestock. One extension worker said *''The government and other NGOs have introduced some ICT-based livestock management services such as Pictorial Event (PET) introduced by the Ministry of Agriculture Animal Industry and Fisheries (MAAIF). However, Pastoralists have not realized the real value of using ICT for managing livestock''* There is also a lack of information among these pastoral communities about the availability of ICT- based livestock management service. One of the FG discussants noted *"For us, we do not know these things, we are not informed at all about these mobile-based livestock management services. We just manage our livestock based on the knowledge obtained from our fathers and friends around us"*

4.4.2 Cost of a phone

One of the challenges discussed during the FGD was the high cost of mobile phones. Whereas mobile phones are now readily available for purchase, buying this technology has been a challenge. The poverty level in Karamoja is the highest in Uganda. During the FG discussions, one of the discussants said *"The cost of buying a mobile phone among us is high and not affordable. We have more important priorities like food, given the fact that we live in a semi-arid*

environment where drought and hunger are common. I cannot buy a phone and stay hungry".

4.4.3 Language Burrier

The inability to read and understand the functions of the livestock management application and interpret modules of a mobile phone has been one of the most challenging factors that have hindered the use of mobile phone-based livestock management services among pastoralists. The fact that 80 percent of the population in Karamoja is illiterate, indicates that they can hardly read and write. Those who can read can only read the local language "Ngakarimojong". One of the FG discussants said *"Today all things of technology are in English.For sure we cannot read and interpret nor write in English. Of course with this, we are left out. Otherwise, we would love to also have the ability to navigate through these mobile phones".*

4.4.4 Poor network Signals

Karamoja region is a region with very poor telecommunication network coverage. This is attributed to the numerous valleys and hills which disrupt network signals. However, the network is relatively good in urban areas and the surrounding areas. An extension worker noted that "*there is poor network coverage in some areas, especially in remote areas*. One of the FG discussants said, *"Our regions have poor signal networks. We cannot use a mobile phone in these areas. So if the government even brings these ICT services, it will be hard to access them without a network".*

4.4.5 Insecurity

Insecurity in Karamoja has increased and this is mostly attributed to the fact that locals around grazing areas have started communicating to the raiders (ngi`moe) through the use of mobile phones. During the FGDs, a number of pastoralists said that *"if one of the*
pastoral members hate you, he or she can use their mobile phone to communicate to people called
raiders. An arrangement can be made on phone on the ways your cattle can be raided".
However, this has made some heads of some pastoral communities to ban the use of mobile phones among the people around their communities. However, these decisions have made and have affected even some pastoralists who would

have embraced the use of these technologies in the management of their livestock.

4.4.6 Lack of support from Extension Workers

Pastoralists still face a number of challenges because of limited support from agricultural extension sector which is scientific and instructional. Agricultural extension has been well applauded for the crucial role it plays in the development of the agricultural sector through the promotion of a sustainable, inclusive and pro-poor economic development and poverty reduction but however, the pastoralists in Karamoja still identified a big gap arising from the lack of support.

A number of pastoral members during the FGD said that *"there are extension support staff per sub county that are supposed to regular provide us with support related to managing our livestock, but some of these workers have just ghosted among us"*

On the other hand, during the interviews, it was highly pointed out by the extension workers that *"about 75% of today's Karamojong pastoral communities have still not realized the real value of integrating mobile based livestock management services within their daily lives for*

managing livestock. However, there are initiatives being put in place to have them engaged in the

use of Technology for Livestock management"

4.4.7 Lack of Power

Mobile devices are machines that run on a power source like a chargeable battery. After a certain period of using a mobile phone, the battery at some point gets drained.

A number of areas in Karamoja are still facing a challenge of possessing power connectivity. However, this has been attributed to the high costs per unit of power which is seen as a high rate among a number of members in these pastoral communities.

During an interview with the extension worker, it was noted *that "in the process of queuing in information using a phone, device may turn off before even submitting the information. It even makes it worse when you are in an area that has no power or electricity".*

However, added to this is that charging points for these devices are distant. During an interview, it was noted that *"Sometimes when you are in the field, the phone may black out due to low battery and the nearby charging point could be 10KM. This really makes it difficult for us to use these phones at some point"*

Table 4.4. challenges associated with the use of mobile based Livestock management services among the pastoralists in Karamoja region

CHALLENGES ASSOCIATED WITH THE USE OF MOBILE BASED LIVESTOCK MANAGEMENT SERVICES AMONG THE PASTORALISTS IN KARAMOJA REGION

	(N=29)		
FACTOR	Moroto Region (Matheniko) - 14 Respondents	Nabilatuk Region (Pian) - 15 Respondents	**TOTAL**
Poor Network	48.3 % (14)	34.5% (10)	**82.8% (24)**
Insecurity	48.3 % (14)	44.7% (13)	**93.1% (27)**
Illiteracy/Lack of awareness	37.9% (11)	41.4% (12)	**79.3% (23)**
High costs of Mobile Phones	27.6% (8)	17.2% (5)	**44.7% (13)**
Language Burrier	41.3 % (12)	51.7% (15)	**93% (27)**
Lack of Vet. Support	10.3% (3)	48.3% (14)	**58.6% (17)**
Lack of Power	31.0% (9)	41.4% (12)	**72.4% (21)**

4.5 NGO Involvement in Promoting ICT Based Livestock Management Services

The study also investigated the level of Government/NGO involvement in promoting ICT based livestock management services to the pastoralist

In this aspect of political marginalization, the need to strengthen and support local institutions, pastoral communities, organizations, and civil society still remain one of the areas for government to intervene in. Most research has indicated that in Sub-Saharan Africa, there is a need to understand the dynamics and inner workings of pastoralist practices (traditionally) and for both the government and NGOs to partner with and strengthen them. In an article Pastoralism in Karamoja published by Relief Web in 2016 pointed out that this linking of civil society and state actors is believed that it can help to build the capacity of civil society groups which are focused on pastoralism and help to change the tide of the national policies that continue to keep pastoralist communities on the margin in many areas of the Sub-Saharan Africa.

In Uganda, FAO developed a mobile application EMA-i (Event Mobile Application) for data collection meant to facilitate real-time disease reporting to support veterinary services capacities in disease surveillance while in the field. Furthermore, the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) in collaboration with the AU- IBAR have been involved in the implementation of an initiative program by the AU called Reinforcing Veterinary Governance in Africa (VETGOV).

Table 4.5. ICT veterinary-based services provided by the government and NGO`s

Application	**Service**	**Implementing Agency**	**Users**
EMA-i (Event Mobile Application)	EMA is a web-based real-time technology that uses smartphones for making instant reporting on livestock disease	FAO	Veterinary extension workers
Veterinary Governance (VETGOV)	Create a new desk specifically tasked with supporting the coordination of veterinary services and disease	MAAIF	MAAIF

	control across Karamoja's seven districts		
Pictorial Event (PET)	Presents photo-indicators of cattle, goats, fat-tailed sheep and camels in a progressive series of body conditions, ranging from very thin to very fat for each species	MAAIF	Veterinary extension workers, Pastoralists

4.6 Mobile based Livestock Management Services Needed by the Pastoralists in Karamoja

One of the questions that was presented to the pastoralists during the FGD and to the extension workers during the interview was "*what key mobile based livestock management services would you recommend to be provided to the pastoralists for livestock management in Karamoja region?''*. During the FGD and Interview sessions, a number of services were suggested and they include the following

4.6.1 Use of Micro-chips

The use of microchips as an identification system will help reduce the level of animal theft among pastoralists in Karamoja. Not only can animals be traced when stolen or lost; the system also traces the provenance/origin of stock, which is useful for penetrating the EU market that requires such data.

One of the FG discussants noted that "*we follow footsteps of the stolen cattle, but once it rains, these tracks are lost and this makes it hard to continue with the search"*

4.6.2 Weather forecast Information systems

The use of geographic information systems has been observed as one of the ways that one can provide a hi-tech satellite-derived vegetation and weather data to help herders decide where to take their herds in different seasons

During the FGD, it was evident that the changes in weather pattern had made it difficult for pastoralist to locate for pastures elsewhere during dry season. Pastoralists end up moving around the region in search of pastures without knowledge of the exact place where pastures can be found.

During the FGD, one other participant observed that *"I mostly go to graze my livestock from long distant places, but I have no specific geographical location to go. How I wish it was possible to use this phone to detect that it will rain in such a place the next day so that it becomes easy forme to drive my cattle to places with water"*

4.6.3 Early warning systems

These are systems put in place by an organization or an individual to help provide timelyinformation or predictions on matters of security, disease outbreaks and weather situations.

During the FGD, one informant said that *"besides having systems that predict weather situations, we also need a central form of system that will probably send SMS's to us in situationsof cattle raiding's and new disease outbreaks within the lives of pour animals"*

Access to market information services e.g. market prices, newmarkets

From the study, it was quite evident that the pastoralists had no clue about market prices of animal until they reach the market on the market day. Sometimes, this would require them to walk very long distance to the market and only to find prices too low.

One participant during the FGD said that: *"I would at least love to have information of cattle within the different livestock markets in the district. This will make it easy for me know where theready market for my animal is and how much it will be sold at".*

One of the extension workers said "*If a web-based system is embedded in the app, this will help sensitize the farmer on readily available market and at what price the weight of cattle will cost"*

***4.6.4* The Use of Mobile Phones for Veterinary Service**

During the study, one notable challenge faced by the pastoralist and the extension workers was that there was no quick means of communication between the Extension workers at community level with government authorities in case there is an outbreak that needed emergency attention

During an interview, one extension worker said *'' phones should be provided to the community workers at lower level to give information passively. With phones, they can call the concerned authorities at district level''.*

However, majorly about the mobile based livestock management Services Needed by thePastoralists in Karamoja was a request for a toll-free veterinary call Centre for

the pastoral communities. One of the discussants during the FGD said that *"One of our biggest challenges*

is buying airtime and sometimes when you buy these minutes, they are too little for emergency

cases. The other thing would be that not all of us can poses phones. We would like to have a toll-free Centre for making calls on emergency cases like raiding of our cattle, and communication to theanimal doctors on the health of our livestock".

Table 4.5. Mobile phone-based livestock management services required by pastoralists

MOBILE PHONE-BASED LIVESTOCK MANAGEMENT SERVICES REQUIRED BY PASTORALISTS

	(N=29)		
SERVICE	Moroto Region (Matheniko) - 14 Respondents	Nabilatuk Region (Pian) - 15 Respondents	**TOTAL**
Access to weather information service	48.3 % (14)	51.7% (15)	**100% (29)**
Access to government services (extension services)	48.3 % (14)	44.7% (13)	**93.1% (27)**
Use of Micro-Chip Technology	37.9% (11)	41.4% (12)	**79.3% (23)**
Early warning systems	37.9% (11)	44.8% (13)	**82.8% (24)**
Access to market information services e.g. market prices, new markets	44.8% (13)	41.3 % (12)	**86.2% (25)**

4.7 The factors for successful adoption of mobile based livestock management services among pastoralists in Karamoja

The study further explored the factors for the successful adoption of mobile based livestock management services among pastoralists in Karamoja.

Some of the questions that were presented to the pastoralists during the FGD and to the extension workers during the interview were *"Suggest ways in which pastoralists in Karamoja can be encouraged to use mobile based livestock management services to manage*

livestock"

4.7.1 Create awareness and sensitization

Awareness is defined as the act of making the people informed about something. This sensitization is needed not only for bringing up awareness but also create a trust for using these mobile services amongst the pastoralists in Karamoja region.

One of the interviewees (extension worker) pointed out that *"government programs*

concerned with management of livestock have always been introduced, but however, the level of sensitization and the rate at which awareness is done is still demanding."

4.7.2 Toll free vet helpline

The ability for pastoralists to poses airtime on their mobile phones as a minimum requirement to make calls is still a challenge among the majority. This is because money has been prioritized as an asset for only buying of animals and some food at home. So, this puts a majority of the pastoral community members in a position of not possessing airtime or even credit on their mobile phones.

During the FGD, one of the members noted that *"usually when our animals get raided or fall sick, it becomes hard for me to communicate to the concerned authorities or extension workers. Thishappens because you have no airtime or minutes for making that phone call"*

4.7.3 Stronger telephone network

A number of regions in Karamoja that are populated by pastoralists have a relatively poor network connectivity. This is what has made communication among those pastoralists that poses mobile phones a challenge.

During an interview with the extension workers, one of the interviewees said that *"The network is not doing us any good here. In most areas of Karamoja region, network*

coverage is so low, sometimes weak or even poor. Some times when we want to submit data to the Ministry through the provided mobile applications, we are forced to move to town areas in search for stronggood networks"

4.7.4 Customized vet mobile application

A number of Veterinary applications that seem to exist like the EMA-i have been designed in a way that they require a lot of technicalities for one to read and interpret the results indicated within them. However, some of these applications are always designed in a way that does not suite certain environments and life styles of people like the pastoralists in Karamoja.

One of the extension workers aid that *"these applications developed by the different NGO's and the Government are not customized to suit the Life of pastoralists. For example, these applications need someone that can read, write and interpret information within the application."*

4.7.5 Social influence

This is defined as the ability to copy from other societies. In the Karamojong pastoral community, this is believed to be a positive factor for the adoption of mobile phones among the pastoralists in a way that clan leaders are seen as very influential people and are highly respected. This means that if a service through the use of mobile phones is being introduced, the first approach would be through reaching to these clan leaders first and in this, there is a high chance of the service being adopted.

One of the interviewees said that *"the Structure of leadership within these communities must be followed. The opinion leaders are always looked at as being influential in these communities. So, when any mobile service is to be implemented, we consider them first. This makes it easy for the rest to easily adopt to"*

4.7.6 Trainings

One of the most identified challenges in adopting the use of mobile phones among pastoralists, was lack of skills amongst themselves. Pastoralists need to be trained and be followed up with different refresher trainings specifically on how to use mobile based livestock management services for pastoral use in Karamoja.

One of the FGD members said that *"government has had a number of efforts to help us adopt*

to the use of mobile phones for managing our herds, but however, we do not receive enough trainings from government trainers. At the end, this affects our output and the results that they ought to obtain from us"

Table 4.6. Factors for successful adoption of mobile phone-based livestock management services among pastoralists in Karamoja region.

FACTORS FOR SUCCESSFUL ADOPTION OF MOBILE PHONE-BASED LIVESTOCK MANAGEMENT SERVICES AMONG PASTORALISTS IN KARAMOJA

	(N=29)		
FACTOR	**Moroto Region (Matheniko) - 14 Respondents**	**Nabilatuk Region (Pian) - 15 Respondents**	**TOTAL**
Awareness and sensitization	48.3 % (14)	34.5% (10)	**82.8% (24)**
Toll free vet helpline	48.3 % (14)	51.7% (15)	**100% (29)**
Stronger telephone network	37.9% (11)	44.7% (13)	**82.8% (24)**
Customized vet mobile application	27.6% (8)	27.6% (8)	**55.2% (16)**
Social influence	48.3 % (14)	48.3 % (14)	**96% (28)**
Trainings	44.7% (13)	41.3 % (12)	**86.2% (25)**

4.9 Conclusion

Pastoral communities in Sub-Saharan Africa have in the recent years long experienced a rapid diffusion of mobile phone technology. Today, it is represented that mobile phones act as an integral part of various activities and create an impact on the pastoralists' lives along several dimensions. There is a vital necessity for most members of pastoral communities to communicate and access information, mobile phone use is an area of research that has deserved particular attention. Therefore, because of the emerging body of academic research concerned with this topic, I have identified, summarized, and analyzed related literature in order to connect existing case studies and determine common or divergent themes as well as aspects that are still under researched. The findings of this body of research were categorized into a number of themes as reflected in this chapter.

Furthermore, the study sought to establish the role of mobile based livestock management services in improving livelihoods in Uganda as perceived by the pastoralists. Key themes that emerged from the research findings indicated that there is steady progress in the use of mobile based livestock management services for agriculture production in pastoral communities in Uganda but however, there are still gaps in the effective learning and utilization of these services for sustainable agro-pastoral livelihoods.

CHAPTER FIVE

DISCUSSIONS OF THE RESULTS

5.0 Introduction

This section resents a discussion of results organized in to major themes as follows; thetechnological challenges associated with the use of these mobile based livestock management services among pastoralists in Karamoja, and the factors for the successful adoption mobile basedlivestock management services among pastoralists in Karamoja.

5.1 Mobile based Livestock Management Services Needed by the Pastoralists in Karamoja.

A number of pastoralists however presented that Karamoja as a region is affiliated to a number of conflicts that are being caused through keeping Livestock. However, for this research, a question "*what key mobile based livestock management services would you recommend to be provided to the pastoralists for livestock management?*" was presented to the pastoralists during the FGD and to the extension workers during the interview. During the FGD and Interview sessions, a number of services were suggestedand.

However, the study further explored the factors for the successful adoption of mobile-based livestock management services among pastoralists in Karamoja. The study majorly focused on investigating how the UTAUT constructs (performance expectancy, effort expectancy, social influence, facilitating conditions) influence the successful adoption of live livestock management services among pastoralists in Karamoja

5.1.1 Performance expectancy

Performance expectancy is an individual's belief that technology will facilitate daily activities. It was very important to investigate mobile phone-based livestock management services that were of interest to the pastoralists. The major question asked during the FGDs and interview sessions was *"what mobile phone-based solutions would you need to manage your livestock effectively and increase your yield"*

A summary of both the FGDs and interview discussions ispresented in Table 5.1.

Table 5.1 Mobile phone-based livestock management services required by pastoralists

1.	Use of Micro-chips
2.	Weather forecast Information systems
3.	Early warning systems
4.	Access to market information services e.g. market prices, new markets
5.	Provide customized mobile phones to extension workers
6.	Veterinary Help desk with toll-free line
7.	Free internet connection for phone-based livestock management applications

5.1.1.1 Use of Microchips configured to mobile phones.

The use of microchips as an identification system will help reduce the level of animal theft among pastoralists in Karamoja. The animals can be traced when stolen or lost using a mobile phone; an extension worker noted that "*When cattle raiders steal animals from us, the only way of tracing the animals is to follow the hooves tracks on the ground. However, this method is not reliable once it rains, these tracks are lost and this makes it hard to continue with the search". The microchip which is configured to a mobile phone and then inserted under the skin of every animal would be of great help in tracking stolen animals"*

Finally, the use of microchips as a form of digital identification of livestock (Trevarthen et al. 2007) to curb cattle theft is becoming popular and is being tested a cross many nomadic communities in Africa (Dyllan et al. 2018). For example, in the Botswana province, cattle theft has been much reduced since the introduction of a digital livestock identification system, that applies the use of a microchip encased in a bolus in the rumen and radio frequency technology (Kelobang et al. 2019).

5.1.1.2 Weather forecast applications.

The use of geographic information systems has been observed as one of the ways that one can provide hi-tech satellite-derived vegetation and weather data to help herders decide where to take their herds in different seasons. During the FGD, it was evident that the changes in weather patterns had made it difficult for pastoralists to locate pastures elsewhere during the dry season. Pastoralists end up moving around the region in search of pastures without knowledge of the exact place where pastures can be found. One FGD participant observed that *"I mostly go to graze my livestock to*

long distant places, but I have no specific geographical location to go. How I wish it was possible to use this mobile phone to detect places of water and pasture for my animal

During the FGD, one other participant observed that *"I mostly go to graze my livestock from long distant places, but I have no specific geographical location to go. How I wish it was possible to use this phone to detect that it will rain in such a place the next day so that it becomes easy for me to drive my cattle to places with water".* In some cases, such as Kenya, herders collect information on the status of vegetation on the ground using a geo-localized app. Their reports make the satellite-based forage maps more precise (Gangale, 2017).

5.1.1.3 Early warning systems

In Kenya, Kadimah., et al 2018; observed that the use of timely warning systems has caused a positive impact on the livelihoods of these pastoral communities. These are systems put in place by an organization or an individual to help provide timely information or predictions on matters of security, disease outbreaks and weather situations. During the FGD, one informant said that *"besides having systems that predict weather situations, we also need a central system that will probably send SMS to us in situations of cattle raiding, new disease outbreaks, floods etc"*

However, as stated earlier, the information collected by herders on the state of vegetation on the ground using a geo-localized app in Kenya is fed in to a GIS and generates a precise satellite-based forage maps that can be used primarily by government and development agencies for early- warning and planning purposes (Erica and Nesoba, 2023). However, in Uganda today, the Strengthening Climate Information and Early Warning Systems (SCIEWS) project has replaced outdated and inadequate meteorological stations with updated systems, improving disaster risk reduction with more effective means of generating and disseminating information.

5.1.1.4 Access to market information

Pastoralists in Karamoja would love to use mobile phones to locate which of the markets is offering fair prices for their animals hence boosting their income and improving their livelihoods. However, in Africa, some projects have introduced computerized market information systems where market data is made available via cell phone and online and this can be downloaded and printed for herders

without Internet access and then posted at markets (Muto et al. 2009; Tollens et al.2006).

From the study, it was quite evident that the pastoralists had no clue about the market prices of the animals until they reached the market on the market day. Sometimes, this would require them to walk very long distances to the market and only to find prices too low. One participant during the FGD said: *"I would at least love to have information on cattle prices within the different livestock markets in the district. This will make it easy for me to know which market offers better prices.* One of the extension workers said "*We need a web-based system or SMS based alert-based system that informs the pastoralist about the different prices in the different cattle markets within Karamoja region.* However, one of the extension workers said "*If a web-based system is embedded in the app, this will help sensitize the farmer on readily available market and at what price the weight of cattle will cost"*

5.1.1.5 The Use of Mobile Phones for Veterinary Service

The wide popularity of mobile phones among pastoralists in Africa has made it possible to monitor health and demographic data for livestock and thus help control diseases. In Chad, for example, groups of pastoralists were contacted regularly by mobile phone to gather information on birth, death and health status of the herds. This surveillance can be combined with One Health services for pastoralists and their livestock (Schelling et al. 2014).

During the study, one notable challenge faced by the pastoralists and the extension workers was there was no quick means of communication between the extension workers at the community level with government authorities in case there was an outbreak that needed urgent attention (Sandford, 1981 and Nikolic et al. 2020). During an interview, one extension worker said *'' phones should be provided to the community workers at lower levels to give information passively. With phones, they can call the concerned authorities at the district level immediately whenever there is an outbreak in a certain community''.*

5.1.1.6 Toll-free line

As indicated before, the Karamoja region is one of the poorest regions in Uganda. Many pastoralists cannot afford to buy airtime to call the help desk centre. There was a call to set up a toll-free veterinary help desk that provides veterinary advice. One of the discussants during the FGD said *"One of our biggest challenges is buying*

airtime in times of an emergency, I am always caught off guard, with no money to buy airtime to callfor help. A toll-free line would be of great help".

5.1.1.7 Free Internet

There is also a need to provide free internet connection for specific mobile phone-based livestock management applications. The Internet providers should provide free Internet connection to selected applications. Using such an application does not need a pastoralist to have internet data. With or without internet data, the pastoralist should be able to use the application

5.1.2 Effort Expectancy

This is the degree of ease associated with the use of the system. It was important to understand ways in which the above proposed mobile phone-based livestock management services can be made convenience and easy to use by the pastoralist. The major question asked during the FGDs and interview sessions was *"How can these different mobile phone-based livestock management services you identified be made easier for you to use"*

5.1.2.1 Customized vet mobile application

Several veterinary applications such as EMA-i have been designed in a way that they require high ICT literacy to use. One of the extension workers said *"These applications developed by the different NGOs and the Government arenot customized to suit the Life of pastoralists. For example, these applications need someone that can read, write and interpret information within the application."*

5.1.2.2 Training

One of the most identified challenges in adopting the use of mobile phones among pastoralists, was a lack of skills amongst themselves. Pastoralists need to be trained and be followed up with different refresher training specifically on how to use mobile-based livestock management services for pastoral use. One of the FGD members said that *"government has had several efforts to help us adopt to the use of mobile phones for managing our herds, but we do not receive enough training from government trainers. In the end, this affects our output and the results that they ought to obtain from us"*

5.1.2.3 User-friendly service

There is a need to develop user-friendly mobile phone-based services. Easy to use with a few steps '*'I am not very familiar with my mobile phone; I majorly use it for calling and receiving calls yet I have several important applications on my phone. However, many of the applications on my phone are very complicated to use. So, if the veterinary application is also complicated to use, I will not be able to use it. That is why a toll-free line would be the most appropriate*"

5.1.2.4 Create awareness and sensitization

Awareness is defined as the act of making people informed about something. This sensitization is needed not only to create awareness but also to create trust for using these mobile services amongst the pastoralists in the Karamoja region.

One of the interviewees (extension worker) pointed out that *"government programs concerned with the management of livestock have always been introduced, but the level of sensitization and the rate at which awareness is done is still demanding."*

5.1.3 Social influence

This is defined as the ability to copy from other societies. It was paramount to investigate the role of the community leaders in influencing acceptance of mobile phone-based livestock management services among the pastoralists. The major question asked was '' *to what extent do you think your community leader may influence you to use mobile phone-based livestock management services?*''

5.1.3.1 Leadership role

In pastoral communities, clan leaders are very influential people and are highly respected. For any new service to be accepted by the community, clan leaders play a pivotal role. One of the interviewees (extension worker) said that *"the structure of leadership within these communities must be followed. The opinion leaders or clan leaders are always looked at as being influential in these communities. So when any mobile phone-based livestock management service is to be implemented, we consider hearing from them first. This makes it easy for the rest of the community members to join in.*

5.1.4 Facilitating conditions

Improving facilitating conditions involves ensuring that the necessary resources and support systems are in place. The study also investigated the kind of conditions that facilitate the successful use of mobile phone-based livestock management services among the pastoralists. The question asked was *'' what do you think should be in place to enable pastoralists to easily use mobile phone-based livestock management services?*

5.1.4.1 Stronger telephone network

Several regions in Karamoja have relatively poor network connectivity. This is what has made communication among those pastoralists challenging. During an interview with the extension workers, one of the interviewees said *"The network is not doing us any good here. In most areas of the Karamoja region, network coverage is so low, sometimes weak or even poor. Sometimes when we want to submit data to the Ministry through the provided mobile applications, we are forced to move to town areas in search of strong networks"*

5.2 Challenges affecting the adoption of mobile phone-based livestock management services in Karamoja

5.2.1 Cost of a phone

Access to mobile phones among pastoral communities in the areas of Karamoja has seemingly increased because centers for buying these devices have been set up. However, ownership of a mobile device among the pastoralists in Karamoja was found to be Minimal. However, from **Table 4.2**, it was observed that a majority of the respondents about 21 of them owned basic phones, 4 had none and 4 owned smart phones. The nature of these devices (basic and smart phones however vary differently when it comes to the costs associated with buying them.

One pastoralist said that *"most of us cannot afford to buy these smart mobile phones yet we have a number of demanding responsibilities like buying food for our families so that they don't starve".* Debsu et al., 2016 stated that the costs related to the acquisition and use of a mobile phone

are substantial for many pastoral households. Summers et al., 2020 went ahead to note that for remote pastoralists the costs are higher. Therefore, it is possible

that these costs crowd out other areas of household spending, such as for food which is a prior among the pastoralists.

5.2.2 Language Burrier

According to the UNFP (2018); it was stated that the ability to Understand and interpret modules of a mobile phone has been one of the most outstanding factors that has hindered the use of mobile phones among these pastoralists. However, from **Table 4.4, 93% (27 respondents)** acknowledged this as a challenge saying that *"Today all things of technology is in English. For sure we cannot read and interpret nor write in English. Of course,*
with this, we are left out. Otherwise, we would love to use smart phones also". However, one of the extension workers attributed this to the high illiteracy rates among the pastoral communities where he pointed out that "*the highest percentage of pastoral community cannot read and write. This makes it hard for them to operate these mobile phones".* Edwin Ngowi etal. (2015) supported this finding and stated that in Tanzania, most people in rural areas
cannot access and use ICTs services provided by the telecentre, simply because they do not understand the language the machine is using.
Hussein (2015) further added that 80% of the population in Karamoja is illiterate. That means they can hardly read and write. This observably means that even if Mobile phones were customized in the local Language "Ngakarimojong" that a few can understand, it would still stand as one of the reasons why they don't adopt the use of these mobile phones.

5.2.3 Poor network Signals

According to the UNPF (2018); and up to date, it is still observed that Karamoja region has Poor telecommunication network coverage. The network is observed to only be good in areas that are situated near the urban centers.
FAO during the launch of the EMA-I mobile application noted that *"the rationale for the app is that in some developing countries access to the Internet can be difficult, especially in areas away from urban centers and this was attributed to the poor network in some areas".*
From the findings, **82.8% (24 respondents)** noted this as one of the challenges towards the use of these mobile technologies. *"Our regions have poor signal networks and even lack masks to strengthen the available network. You find that*

you cannot even use a phone in these areas. So if government even brings these ICT services, it will be hard to maintain in such areas".

However, statistics in Kenya indicated that the mobile penetration being at 89. 1%, yet coverage is still at 4.1 % among the pastoral communities hence implying that there are many areas where access to network signals is not available *(from CCK Sector report, 2012).*

Additionally, Huggins & Izushi (2002); Friedlander (2002); Galloway & Mochrie (2005),

supported this cause by identifying that poor technological infrastructure is a major hindrance to implementation of ICT projects in rural areas, while small bone et al. (2002) observed that highlighted that the facilitating condition especially the poor telecommunication infrastructure in the rural areas as major impediment of ICT.

5.2.4 Lack of Power

A one uses a mobile device for a certain period of time, the battery gets drained hence need for a replacement or recharging. However, most areas where pastoralists do reside or take their animals for grazing have not obtained power connectivity hence when the battery is drained, one has to move long miles just in search for a point where he or she can have their mobile device charged. One of the pastoralists noted *that "in the process of*

making calls during raids or insecurity, making transactions or sending texts, device may turn off

before even submitting the information. It even makes it worse when you are in an area that has no power or electricity". Another respondent added that *"Sometimes when you are in the field, the phone may black out due to low battery and the nearby charging point could be 10KM. This really makes it difficult for us to use these phones at some point"*

Debsu et al (2014) and Summers, et al. (2020) stated that these costs are seen to be higher for remote pastoralists because mobile phone batteries have to be recharged with at least portable solar panels since most areas have no power connectivity.

5.2.5 Support from Extension Workers

According to the World Bank (2015), it was found out that, pastoralists face challenges because of limited support from agricultural extension services which is scientific and instructional. Although agricultural extension has been well

applauded for the crucial role it plays in the development of the agricultural sector through the promotion of a sustainable, inclusive and pro-poor economic development and poverty reduction, it is not realized by Kenyan pastoralists who are still isolated due to their nomadic way of life. **Table 4.4** indicated that a majority of the pastoralists of about **58.6% (17)** don't receive veterinary support from the extension staff. This has made a majority of them to rely on knowledge obtained from their fathers and friends regarding the management of Livestock health.

On the other hand, during the interviews, it was highly pointed out by the extension workers that *"the Karamojong pastoral communities have not acknowledged the use of mobile based livestock management services but the government has put in place a number of initiatives*

like support from extension workers at all levels of management to have them engaged in the use

of Technology for Livestock management"

Lwoga (2010), Mtega et al. (2013) point out that mobile phone creates a better mechanism or medium for pastoralists to communicate with the extension service providers for obtaining advice regarding activities related to pastoralism

5.2.6 Tiresome

The use of EMA-i app in Uganda has demonstrated major improvements in the increased the number of animal disease reports received from targeted districts and communication between districts and central level (i.e. from monthly to real-time). For example, in 2013, July to December, 126 livestock disease reports were submitted in real-time to NADDEC. This compares to 45 and 56 monthly reports NADDEC received through the regular reporting system in 2012 and 2011, respectively. In addition, a wider range of diseases is reported using EMA-i.

However, the users of this mobile application have appreciated the simplicity and feel that it is easy to navigate, but there are some who still face difficulties like when it comes to the time spent navigating through the system to ensure that information is captured. This point of view triggered most of the participants during the interview to note that, *"at some point, we find it tiresome while feeding all this information into the system manually"*.

During an interview with one of the extension workers, it was noted that *"there are a number of pages to be navigated through while carrying out disease reporting within the application and here you are having a line-up of many animals to be treated".*

5.2.7 Information captured is tentative and not confirmative

Surveillance and early warning of animal disease outbreaks, including zoonotic diseases, with potential public health impact enables national authorities to advise at-risk populations.

In Uganda, FAO developed a mobile application EMA-i (Event Mobile Application) for data collection meant to facilitate real-time disease reporting to support veterinary services capacities in disease surveillance while in the field. The rationale for the app was that in some developing countries like Uganda, the access to the Internet canbe difficult, especially away from urban centers, while telephone networks have good signal coverage over widerareas with rapid connection form the field.

For example, when a veterinary technician in the field examines an infected animal, theyuse the app to enter the epidemiological data, including photographs of the animal in question. The data, which is automatically geo- referenced, is collected in a report which is sent to the Global Animal Disease Information System (EMPRES-i). Once the report is received, the data is verified and validated, and it is either published on the EMPRES-i public website, or maintained in the internal database, depending on circumstances.

However, for this matter, during an interview with the DVO in Moroto district, it was noted that in most cases, the information sent to the ministry is tentative. This means that if we are to have confirmatory tests, it will require a certain process of drawing samples of blood from the infected animal, move probably back to the lab and again back.

He also added on that *"Everything is better confirmed in the laboratory*". This means whatever treatment administered is still tentative diagnosis. Through the EMA-i app, a rapid, real time, efficient and highly confidential communication channel is guaranteed, allowing for an effective and more immediate action during the occurrence of a disease

outbreak from detection, reporting and response by FAO in 2015.

5.2.8 Insecurity

According to a study "Identification of livestock investment opportunities in Uganda" undertaken by the Embassy of Netherlands in 2012, it was observed that for about two decades, the northern region of Uganda was ravaged by civil war caused by cattle raiders. This resulted to insecurity leading to a decimation of the herd, through abandonment, as pastoralist fled, and through feeding the rebel horde. Since 2007, the region is undergoing resettlement and livelihood development programs are still running to date.

On the other hand, insecurity in Karamoja has increased and this is mostly attributed to the fact that locals around grazing areas have started communicating to the raiders (ngi`moe) through the use of mobile phones. During the FGDs, a number of pastoralists said that *"if one of the pastoral members hates you, he or she can use their mobile phone to communicate to people called raiders. An arrangement can be made on phone on the ways your cattle can be raided".*

However, this has made some heads of some pastoral communities to ban the use of mobile phones among the people around their communities. However, these decisions have made and have affected even some pastoralists who would have embraced the use of these technologies in the management of their livestock.

In Uganda and specifically Karamoja region, there have been a number of projects through the State house and the UPDF that have been structured in place to ensure that there is peace and stability in Karamoja so that there is good service delivery. Furthermore, Baird et al. (2017) mentioned situations in which pastoralists were ambushed by robbers when they carried larger amounts of money. He further more added that this was because the robbers had received information from market snoops about persons that were carrying money via mobile phone communication.

5.2.9 Poverty

UNHS (2016) indicated that Karamoja remains as one of the least socially and economically developed regions, with approximately 61% of the total population of 1.2 million living in poverty. However, Consolata et al. (2016) stated that in Kenya,

a call costing 3 Kenya shillings per second during peak period is quite expensive for developing countries for a majority of who live below the poverty line. Because of this, it is then paramount to strengthen the human capital competitiveness of the region for sustainable wealth creation, inclusive growth and employment. In other words, development should be focused on redistributing wealth and creating opportunities across the regions of Karamoja.

Increasingly, because of poverty, pastoralists are looking after the animals of non- pastoralists, and this is bringing other problems, such as reduced mobility. However, still on the technological challenges associated ICT based livestock management services among pastoralists in Karamoja were other factors like Complexity during use; where a number of participants in the FGD said that *"these mobile phones,*

mostly these new smart phones are very complex to use. It is not easy for me who is still even

facing challenges with an ordinary phone to get adopted to it."

5.3 Factors for successful adoption of mobile phone-based livestock management services among pastoralists in Karamoja

The study further explored the factors for the successful adoption ICT based livestock management services among pastoralists in Karamoja Some of the questions that were presented to the pastoralists during the FGD and to the extension workers during the interview were *"Suggest ways in which pastoralists in Karamoja can be encouraged to use ICT based management services to manage livestock".*

5.3.1 Create awareness and sensitization

Awareness is defined as the quality or state of being informed. However, according to Obala (2021), it was pointed out that the University of Tufts in Ethiopia have developed a pastoralism education curriculum, aimed at targeting Eastern Africa to build capacities and increase understanding and awareness of Pastoralists among across all faculties through inclusion of pastoralism as a cross cutting unit or a core course in identified Universities.

Relatively, according to **Table 4.6, a Total of 24 pastoralists** representing over **82%** affiliated this aspect as very important as it makes them aware of such benefits that may arise from the use of Mobile technologies. If this could be done,

a number of the pastoralists will adopt to the use of these Mobile based livestock management services.

However, one of the interviewees (extension worker) pointed out that *"government programs concerned with management of livestock have always been introduced, but however, thelevel of sensitization and the rate at which awareness is still demanding."*

Furthermore, it was also noted that the internet and mobile technologies have gradually transformed the

ways in which the social network within the pastoralists is evolving because they are always informed (Horst and Miller 2006, Ling 2008, Castells et al. 2009).

5.3.2 Toll free vet helpline

According to **Table 4.6, a Total of 29 pastoralists** representing over **100%**, appreciated that the provision of a Toll-free vet helpline would really improve on their reporting ability in cases of insecurity and animal health. However, FAO together with a number of Government agencies in Uganda that are working towards this cause and have at least initially have developed an SMS structure where by pastoralists are provided with a specific Code for reporting cases of animal theft and Health.

During the FGD One of the members noted that *"usually when our animals get raided or fall sick, it becomes hard for me to communicate to the concerned authorities or extension workers. This happens because you have no airtime or minutes for making that phone call. With this kind of service in place, a number of hindrances like insecurity, animal theft will be overcome".* Abakar et al. (2018) supported this by saying that communication between remote pastoralists and the extension support staff is a core factor to the success of such programs.

5.3.3 Stronger telephone network

A telephone network is a medium that connects telephones, which allows telephone calls between two or more parties. It was earlier on noted that most areas where pastoralists reside or take their animals in search for pastures and water within Karamoja region have poor network connectivity. However, from the findings indicated in **Table 4.6,** it was acknowledged by **82.8% (24 pastoral community members)** that with a strong and steady network on their mobile phones, immediate cases of animal Health, and theft will be reduced because they

will be reported instantly. This will no longer require one to move again to another location in search for network connectivity.

During an interview with the extension workers, one of the interviewees said that *"The network is not doing any good here. In most areas of Karamoja region, network coverage is so low, sometimes weak or even poor. Some times when we want to submit data to the Ministry through the provided mobile applications, we are forced to move to town areas in search for strong good networks"* Furthermore, it was also observed that due to the strong telephone network of mobile phones in the rural areas of Tanzania, pastoralists have adopted the use of mobile

phones as a way to communicate with the telecentres operators in case of advice related to management of their Livestock (Lwoga, 2010; Mtega et al., 2013).

5.3.4 Customized vet mobile application

FAO (2015) together with the government of Uganda introduced a Vet Mobile application (EMA-i) that was customized for reporting cases of animal health and this was deployed to the Veterinary doctors and Extension workers within the areas of Karamoja so as to enhance surveillance. However, the design of this application has not been customized in a way that fits the Lifestyle of the pastoralists. Furthermore, these applications are designed in a way that a user must be able to interpret the data being processed.

The Findings in **Table 4.6** indicate that **55.2% (16 members)** acknowledged that these applications should also be designed to fit the Life of a pastoralist because there are a number of cases that are not recorded by the Extension staff and yet do exist within our pastoral communities. One of the extension workers aid that *"these applications developed by the different NGO's and the Government are not customized to suit the Life of pastoralists. For example, these applications need someone that can read, write and interpret information within*

the application."

However, for a number of studies that have been directed towards phone use among pastoralists, most have understandably focused on information exchange (Muto and Yamano 2009, Aker 2011, Tadesse and Bahiigwa 2015). Akpabio & Inyang (2007); Choudhary (2012) backed this by noting that the customization of these applications in the local languages have presented a tremendous Increased growth rates of mobile phones among the pastoralists in Tanzania.

5.3.5 Social influence

In most pastoral communities, the access to knowledge and information traditionally depends on a person's gender, age, and position within the society. Therefore, the emergence of the mobile phone technology has stirred up this traditional information distribution because it facilitates information sharing and access also for previously deprived social groups (Djohy et al., 2017). These changes in access to information and power relations have however been seen to affect the societies of pastoral communities along different dimensions.

However, knowledge and information have been observed as assets for members of pastoral communities. This means that having access to information resembles power (Nilsson et al. 2017). One of the respondents during the FGD noted that "t*he opinion leaders*

are always looked at as being influential in these communities. So, when a mobile based livestock

management service is to be implemented; we consider them first. This makes it easy for the rest to easily adopt to"

5.3.6 Trainings

USAID (2017), introduced a number of training initiatives directed to the pastoralists in Kenya and Namibia to enable them gather data and acquire knowledge so that they may be able to respond to climate change and other threats. In this case, a cloud-based Land Potential Knowledge System (LandPKS) was designed by USAID and the United States Department of Agriculture (USDA) to address threats that pastoralists face. However, in Karamoja, the findings in **Table 4.6** have indicated that **86.2% (25 pastoral community members)** adhered that a number of initiatives through the use of mobile phones are being introduced to us but we are still facing challenged towards these because we are not being trained enough. A number of pastoralists said that *"government has had a number*

of efforts to help us adopt to the use of mobile phones for managing our herds, but however, we do

not receive enough trainings from governmenttrainers. At the end, this affects our output and theresults". This will reduce on the dependency in cases where specified extension support cannot be reached or is Unavailable.

5.4 Summary

A number of factors for the Successful adoption of Mobile based Livestock management services for pastoral use in Karamoja have been discussed above and related literature indicated. But however, most outstanding has been the need of a toll-free vet helpline that will require no costs involved during use so that will make it is easy for the pastoralists to report cases of Animal theft and Animal Health. However, this was affiliated with the fact that even with the existence of such a service, training on how to use this service among them would also be required where by most of them said that they Lack the skills to use these mobile based livestock management services hence need for capacity building.

This represents that the Government; NGOs and the responsible allocated people (Extension and Veterinary officers) still have a big role to play as far as deploying the use of Mobile based Livestock Management Services for pastoral use in Karamoja is Concerned.

CHAPTER SIX

GENERAL CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

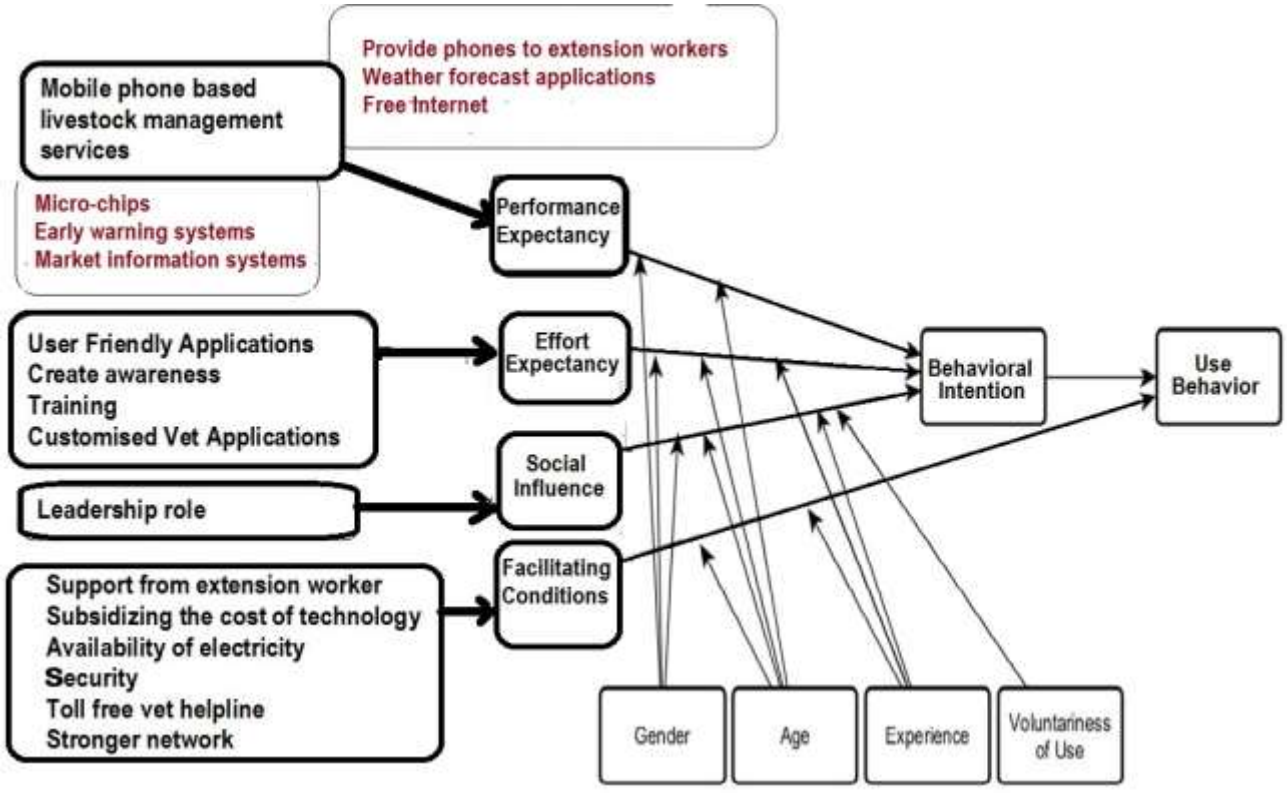
6.0 Introduction

This chapter presents the UTAUT model for successful adoption of mobile phone-based livestock management services among pastoralists in Karamoja region, general conclusions, Limitations and Recommendation related to the adoption of Mobile based Livestock management services for pastoral use in Karamoja.

6.1 UTAUT model for successful adoption, General Conclusions, Limitations and Recommendation

6.1.1 Discussion and presentation of UTAUT model for successful adoption of mobile phone-based livestock management services among pastoralists in the Karamoja region

Figure 6: UTAUT model for successful adoption of mobile phone-based livestock management services among pastoralists in Karamoja region



From the findings presented in Chapter 5, was observed that a number of mobile presentations of UTAUT model for successful adoption of mobile phone-based livestock management services among pastoralists in the Karamoja region Having established the challenges and successful factors for the adoption of mobile phone- based livestock management services among pastoralists in the Karamoja region. We used the UTAUT model to provide a general taxonomy for classifying the different factors for the successful adoption of mobile phone-based livestock management services among pastoralists in Karamoja as follows;

Performance expectancy: To enhance performance expectancy, we could introduce technology-driven solutions that directly address the challenges faced by pastoralists.

- *Mobile phone-based livestock management Service*
- *Use of Micro-chips*
- *Weather forecast systems*
- *Early warning systems*
- *Market information services*
- *Provide mobile phones to extension workers*
- *Free internet*

Implementing mobile phone-based livestock management service can empower pastoralists to respond promptly to livestock challenges, resulting in improved outcomes. Mobile phones have been used by pastoralists to check on pasture and water conditions, compare market prices, monitor livestock health, avoid wildlife areas, and recover stolen or raided cattle (Butt, 2015).

Effort Expectancy: This is the degree of ease associated with the use of the system.

- ***User-friendly interface***

  As indicated in the study, mobile phone-based livestock management services are complex to use by an ordinary pastoralist, even for a pastoralist who can read and write. Therefore, simplifying technology interfaces and providing user-friendly training materials can significantly reduce the perceived effort required for technology adoption. By ensuring that tools and applications are intuitive and easy to navigate, we could encourage wider acceptance and usage.

Poor usability can reduce productivity. Flawed interface design, for example, can make it difficult for users to perform tasks correctly and with confidence (Koskie, 2022).

- ***Create awareness and sensitization***

  Creating awareness amongst the pastoralists is important. Many pastoralists are not aware of the existing mobile-based livestock management solutions, nor are they aware that a mobile phone can be harnessed for livestock management. This sensitization about mobile-based livestock management solutions can be conducted by extension workers and community leaders. Quddus (2022) conducted a study on the dissemination of technological innovations of livestock in Bangladesh and recommended that, for the technology innovation to be adopted by livestock farmers, there is a need for massive sensitization. Government offices and research institutes should take the initiative by arranging frequent demonstration workshops among the farmers with newly developed technologies.

- ***Training***

  During the study, we found out that the government had put in a considerable effort to help pastoralists adopt and use mobile phones for managing their herds, however, the major challenge was that there was not enough training from governmenttrainers. Quddus (2022) recommends that extension visits to pastoralists, and intensified training programs on the use of available technology for livestock among the various livestock partners should be built up for better adoption.

- ***Customized vet mobile application***

  A customized application would facilitate the usage of vet mobile applications even amongst non-English speaking pastoralists. It is easier to adopt a technology that communicates with the pastoralist in their language. Eilu (2019) says that a product provides a better user experience if it is tailored to the individual's needs, interests, personality, usage context, or other factors relevant to the individual

Social influence: It refers to the degree to which the person who is deemed to be important to the individual believes that he/she should use the new system

- ***Leadership role***

  During the study, some respondents recommended that the structure of leadership within these communities must be followed. The opinion leaders are always looked at as being influential in these communities. The involvement of community leaders in the implementation of mobile- based livestock management services is important. An endorsement by community leaders to the use of the mobile application would foster acceptance and usage of the technology. Eilu (2019) asserts that the use of social validation may promote positive perceptions and responses towards a product or service. For example, an endorsement by Jessica Simpson and Aesthetician Nerida Joy helped Beauty Mint attract 500,000 visitors on day one of its launch (Feldman, 2014).

Facilitating conditions: Improving facilitating conditions involves ensuring that the necessary resources and support systems are in place. These support systems include

- ***Support from extension worker***

  The study revealed that there is little support from extension workers. The government needs to increase the number of extension veterinary workers to facilitate the creation of awareness about the available mobile phone-based livestock management services, and also train the pastoralists on how to use the services. Bugeza et al (2017) recommend that for the sustainability of animal health care services in the Karamoja region continuous training and strategic deployment of extension veterinary workers.

- ***Subsidizing the Cost of Technology***

  Karamoja region is the poorest region in Uganda, and technology affordability is a challenge. A special subsidy for technology-based livestock solutions will help many pastoralists acquire these technologies. Summers et al., 2020 agree and state that subsidizing the cost of technology in the pastoral community would foster the acquisition and usage of mobile phones for livestock management

- ***Availability of Electricity***

  The low power connectivity in Karamoja is a hindrance to technology adoption. Rural electrification will be a solution through the extension of the electricity grid or the provision of affordable solar power chargers. As a result of low power connectivity in pastoral communities in Kenya, many communities have invested in affordable small solar chargers, and through the rural electricity program, the government can extend power lines to pastoral communities (Debsu et al. 2014; Summers, et al. 2020)

- ***Security***

  There is a need to address the security situation in the Karamoja region. The insecurity in Karamoja has increased and this is mostly attributed to the fact that locals around grazing areas have started communicating with the raiders (ngi`moe) through the use of mobile phones. As a result, some heads of pastoral communities ban the use of mobile phones among the people around their communities. The government of Uganda has put in place several initiatives to bring peace and stability to Karamoja. Mobile phones have been known to aggravate conflicts in pastoral communities. This mainly happens when there is drought and water points have dried up. Due to mobile phone communication, more pastoralists are aware of the location of precious resources and direct their livestock to these places. The fierce competition for resources then provokes conflicts among pastoralists (Mertz et al., 2016).

- ***Toll-free vet helpline***

  The provision of a toll-free vet helpline would greatly improve on early reporting of animal infections and insecurity threats. Early or pre-diagnostic detection of emerging and endemic infectious diseases remains a vital aspect of health surveillance targeted at preventing further transmission and spread (Abakar et al. 2018). Easy communication between remote pastoralists and the extension support staff is a core factor in improved animal health (Abakar et al. 2018)

- ***Stronger telephone network***

  As reported earlier in the findings, the poor network is one of the challenges affecting effective communication between the pastoralists and the extension workers. It also greatly inhibits the use of mobile phone-based livestock

management services. There is a need to provide more network infrastructure in pastoral communities to enable the effective use of ICT-based veterinary services. The strong telephone network in rural pastoral areas in Tanzania has enabled the effective adoption of mobile phone-based livestock management services (Lwoga,2010; Mtega et al., 2013).

6.1.2 Conclusion

In line with the above findings obtained and the ensuing discussions, the following conclusions can be made:

1) The challenges affecting the adoption of mobile based livestock management services in Karamoja can be relatively eliminated provided that the success factors presented above is put into use.
2) The factors for successful implementation of adoption of mobile based livestock management services in Karamoja must be given consideration provided any mobile based service is to be implemented to the pastoralists as most of these factors were thoroughly presented in the findings.

6.1.3 Limitations

A number of limitations were encountered during this study. These included FGDs to be conducted had to first be approved by the Security Agencies.

The study interviewed only 29 pastoral members and 11 extension staff; this may not be representative. However, the researcher believes that the study reached data saturation

However, financial challenges in terms of SDA during FGDs may have contributed to some of the limitation of the study.

6.1.4 Recommendations for further research

- Martin C. Parlasca (2021) also recommended that pastoral communities have experienced a rapid diffusion of mobile phone technology in recent years. Today,mobile phones represent an integral part of various activities and impact pastoralists' lives along several dimensions. However, he added that some research gaps still exist when it comes to understanding the implications of mobile phone use for pastoralists' household income and expenditure. *"For example, it is unclear if and by how much households' incomes rise precisely because they use a mobile phone"* he added. Debsu et

al. (2016) and Roba et al. (2018) noted that the determinants depend on the types of income-generating activities performed at the household, and that because it is repeatedly mentioned that traders are likely to benefit more from the use of mobile phones than herders.

- Debsu et al. (2016) noted the influence of mobile phones on female empowerment as a research gap that needs to be addressed. Overall, literature proposes that mobile phones have helped rural populations in low-income settings more than they do harm. However, this narrative has recently been put into question that the benefits of mobile phone use are not equally distributed in the society, hence women in low-income countries often miss out. Porter et al., (2020); Summers et al. (2020); Wyche & Olson, (2018) further acknowledged that mobile phones can even weaken female empowerment if not addressed. While Summers et al. (2020) have recently provided a detailed assessment of mobile phone use among females within the context of Maasai pastoralists, more research also for other cultural environments is therefore still required.
- This research was conducted in two districts within Karamoja Region that included Nabilatuk District and Moroto District. The researcher therefore recommends that a similar study also be implemented out in other Karamoja districts so as to widely disclose more evidence in relation to the adoption of mobile based Livestock Management services for pastoral use in Karamoja as well as the challenges affiliated to this.
- However, this review also identified a few important research gaps still, as well as methodological shortcomings. *Mobile phones' effects on pastoralists' income and expenditure, potential environmental externalities, and the influence of phones on gender roles are not yet sufficiently understood.* More research on these topics is therefore encouraged.

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COMPLIANCE FORM

SCHOOL OF RESEARCH & POSTGRADUATE STUDIES

DISSERTATION CORRECTION COMPLIANCE FORM

Date: **24th - May - 2024**

Name of Candidate: **ACHEKE RIGAN MARK**

Reg.No: **J22/MUC/MIT/004**

Title of Dissertation: **ADOPTION OF MOBILE PHONE BASED LIVESTOCK MANAGEMENT SERVICES FOR PASTORAL USE IN KARAMOJA.**

S/N	COMMENTS BY EXTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	Global perspective: How is your problem area on a global scale?	Literature to this is defined in Chapter One of the introduction. Paragraph 2	Page 8
2	Regional perspective: How is it regionally speaking.	This is well defined in Chapter One "Introduction" as well as the problem statement with References provided	Page 9
3	National perspective: How is the situation from a national point of view?	This is best Explained in Chapter One (Background of the Study)	Page 9 and Page 10
4	The candidate needs to include justification of the study to strengthen his work.	This is Explained as indicated and the results obtained from the research justify the need for this research.	Page 14

S/N	COMMENTS BY INTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	In chapter 4; present the findings only! without any literature	Action was taken to this as indicated within the dissertation.	From Page 34
2	Secondly, Observe your referencing style. Kindly read how APA Citation and Referencing is done	This was taken into consideration. All referencing style changed.	Through Entire Dissertation

3	Kindly share your work ASAP. Locate for the relevant literature for those places that do not have literature	This was also worked on as in the previously sent work, most parts of the introduction were cited but not Referenced	Chapter 1 Mostly
4	Also remember to include the reference from the UTAUT literature on reference list	References to related literature added unto the reference list	Reference List
5	Then in chapter 6: present the model first and all its write up, the you can have the conclusions and future research. Also change the write up of the introduction to match the new changes	UTAUT model well explained and presented in Chapter Six as well as the introduction of to the chapter edited so as to define the flow of the work (Chapter)	Chapter 6, Page 61

S/N	**COMMENTS BY VIVA VOCE PANNEL**	**ACTION TAKEN**	**INDICATOR**
1	You need to clearly indicate the contribution of this study to the case study (how are the findings going to help in the effective use of technology in Karamoja).	This is best explained in the last chapter under *"Recommendation's".* Each Service that observed was explained in detail on how it contributed to the effective use of Technology for pastoral use in Karamoja.	Chapter Six, Page 61 -Page 65 under the Recommendation' s Section.
2	Findings do not clearly show how TAM was used.	The model was changed to UTAUT and the findings related to the Model.	Chapter 1, Page 12 Chapter 5, Page 47
3	Indicate statistics in the Technology Acceptance Model to show how you measured the variables that led to your conclusions/findings.	The model was changed to UTAUT and the findings related to the Model. Statistics measured in Chapter 5 together with the Findings and percentages.	Chapter 1, Page 12 Chapter 5, Page 47 and as well as Chapter 6
4	Have statistics to show why the people with mobile phones are not accessing services / the factors that are affecting/hindering adoption of mobile phone services and not just phones	This is explained in "*challenges associated with the use of mobile based Livestock management services among the pastoralists in Karamoja region"* varying to not just phones but also mobile phone services.	Chapter Four, Page 36 -page 39. Table 4.4
5	What services do you intend to add to the case study apart from those that they are already using.	These are defined in *"Mobile based Livestock Management Services Needed by the Pastoralists in*	Chapter Four, Page 40-42, indicated in Table 4.5

		Karamoja". These differ from what they are currently using.	

Candidate's Name **ACHEKE RIGAN MARK**

Signature 

Supervisor's Name **Dr. Emmanuel Eilu**

Signature 

NB: Post Viva compliance form is designed to capture all the corrections recommended by internal examiner (supervisor), external examiner and viva panel.