INFLUENCE OF COMMUNICATION FACTORS ON ADOPTION OF CONTAGIOUS BOVINE PLEUROPNEUMONIA VACCINE AMONG ARID AND SEMI-ARID LANDS PASTORALISTS IN KENYA

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Influence of Communication Factors on Adoption of Contagious Bovine Pleuropneumonia Vaccine among Arid and Semi-Arid Lands Pastoralists in Kenya

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DECLARATION

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

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DEDICATION

This thesis was made possible by the Almighty GOD who provided everything that I prayed for resources, time, and strength. May the knowledge gained from this academic journey be dedicated to His service.

I also dedicate this work posthumously to my late parents Stephen Ndungu Manyeki and Mwalimu Rosemary Mumbi Ndungu. To them I say, “Thank you for teaching me the values of hard work”. To my son, “Wa Manyeki”, and siblings Njeri, Wanjiku, Muchai and Njoroge who encouraged and believed in my ability to complete the work even when the journey seemed treacherous. To the little family munchkins, Izzy and Issa whose tiny fingers sometimes strayed onto my laptop keyboard. To them I say, “May GOD bless you in your chosen life paths”.

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ACRONYMS AND ABBREVIATIONS

APD	Academy for Peace and Development
ASAL	Arid and Semi-Arid Land
AU/IBAR	African Union/Interafrican Bureau for Animal Resources
CBPP	Contagious Bovine Pleuropneumonia
CA	Communications Authority of Kenya
DSNK&AL	Development Strategy for Northern Kenya & Other Arid lands
ECF	East Coast Fever
FGD	Focus Group Discussion
FMD	Foot and Mouth Disease
GOK	Government of Kenya
HS	Hemorrhagic Septicemia
IDRC	International Development Research Centre
IEC	Information, Education and Communication
ICT	Information Communication Technology
IFAD	International Fund for Agricultural Development
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KALRO	Kenya Agricultural and Livestock Research Organization
KNA	Kenya News Agency

KNLS	Kenya National Literacy Survey
KII	Key Informant Interview
KNBS	Kenya National Bureau of Statistics
LID	Livestock in Development
MOIC	Ministry of Information and Communication
NACOSTI	National Council for Science, Technology and Innovation
NCG	Narok County Government
NCD	New Castle Disease
NGO	Non-Governmental Organization
ODK	Open data tool kit
OIE	International Office of Epizootics
TV	Television
SAPs	Structural Adjustment Programmes
SLT	Social Learning Theory
SPSS	Statistical Package for Social Sciences
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VIDO	Vaccine and Infectious Disease Organization
WISP	World Initiative for Sustainable Pastoralism

DEFINITION OF OPERATIONAL TERMS

Adoption	A process of beginning to use something new or different
Agro pastoralism	A form of farming that combines growing crops and livestock
Baraza	Kiswahili word meaning a formal gathering used by Government officers to communicate to members of the public
CBPP	A contagious cattle lung disease that causes death to infected animals
Communication	A process in which information is shared another in order to reach a mutual understanding
Channel	A medium, through which a message is sent to an intended receiver
Communication factors	Essential components that facilitate exchange of ideas or information
Communication participants	These are senders and/or receivers of messages in a communication encounter
Demographic factors	Dynamics used to define the characteristics of a person or a population
Dependent variable	Is the factor that the research measured in research
Diffusion	A process in which an innovation is communicated thorough certain channels over time among the members of a social system
Messages	Exchange of verbal and non-verbal communication between senders and receivers
Moderating variable	Is a type of variable that affects the relationship between a dependent and an independent variable
Perceived characteristics	Apparent features of an idea, practice, or project that is perceived as new by an individual or other unit of adoption
Independent variable	A variable that stands alone and isn't changed by the other variables

Innovation	Is an idea, practice, or project that is perceived as new by an individual or other unit of adoption
Influence	The capacity or power of persons or things to be a compelling force on or produce effects on the actions, behavior, opinions etc. of others
Interpersonal communication	An exchange of messages, ideas, and information between individuals. Takes many forms, including face-to-face conversations and mobile phone calls
Mixed Farming	A practice of growing of food or cash crops, feed crops, and livestock on the same farm
Notifiable disease	Any disease required by law to be reported to government authorities
Pastoralism	The practice of herding as the primary economic activity of a society
Social Learning	An explanation of how people learn new behaviours
T1 44	A vaccine used to prevent cattle from contagious bovine pleuropneumonia infections
Vaccine	A preventive inoculation to confer immunity against a specific disease
Vernacular radio	Radio stations broadcast in local languages

ABSTRACT

This study sought to investigate the influence of communication factors on adoption of contagious bovine pleuropneumonia (CBPP) vaccine among Arid and Semi Arid Lands (ASAL) pastoralists in Kenya. The disease has a devastating effect on the livelihoods of 24 million people across 19 African countries who rely solely on livestock. It is estimated that the costs due to sickness and mortality from CBPP in Africa is US$41 million, of which US$6.4 million is attributed to Kenya. CBPP in Africa and Kenya is considered urgent because it threatens the establishment of disease free zones, envisaged in the economic pillar of the country's development blue print Vision 2030 (GoK, 2012) and livelihoods of people affected by it. CBPP is a highly contagious disease of cattle lung which spreads through direct contact with cough droplets facilitated by crowding of animals. Currently, it is controlled by restriction of infected herds and use of vaccines, although uptake by smallholder livestock farmers is estimated at 20- 60 %. CBPP is a notifiable disease, and infected countries are excluded from international trade of live animals. The focus on mass communication was informed by the slow pace of adoption of a vaccine being used, T144 to eradicate CBPP in Kenya. Elements of communication under investigation were independent variables; channels, participants, messages, perceived characteristics of CBPP vaccine and moderating demographic factors. The study was grounded on diffusion of innovation and social learning theories, but other relevant studies that had empirical evidence on communications factors influencing adoption of innovations were used. The study was conducted in Loita and Mara divisions in Narok South Sub County, because of the inherent prevalence of CBPP since independence. Descriptive research designed enabled data collection using mixed method research approach, for the broad purposes of breadth and depth of understanding and corroboration. Multi stage sampling techniques were used to select respondents who participated in the inquiry. A total sample of 468 respondents was studied where 440 participated in quantitative and in 28 qualitative surveys. Data was collected through a survey, focus group discussions and key information interviews and analyzed using Statistical Package for Social Scientists (SPSS) version 20.0. The study established that communication factors play complementary roles to enable CBPP vaccine adoption but some events contribute to non-adoption and disregard for expert advice to vaccinate annually. Some communication factors exercised influence but with differentiation in the degreewhile others did not. It was also apparent that literacy and income did not have an effect on adoption the vaccine while gender had a significant effect. An adoption graph following flow of CBPP information was also established. The study made recommendations for CBPP communications, and suggested areas of further research.

Key words: Influence, communication, adoption, innovation,

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

This study that sought to establish the influence of communication factors on adoption of contagious bovine pleuropneumonia (CBPP) vaccine among ASAL pastoralists of Kenya. CBPP is a highly contagious disease of cattle lung which spreads through direct contact with cough droplets, facilitated by crowding of animals (Provost et al., 1987). An outbreak of CBPP in one herd poses a threat to neighboring herds when movement and control is not enforced. The control of CBPP in Africa and Kenya is considered urgent because it threatens the establishment of disease free zones, envisaged in the economic pillar of the country's development blue print Vision 2030 (GoK, 2012). The disease has a devastating effect on the livelihoods of 24 million people across 19 African countries who rely solely on livestock (Thompson, 2005). Tambi et al., (2006) estimates that the costs due to sickness and mortality from CBPP in Africa is US$41 million, of which US$6.4 million is attributed to Kenya. The presence of this trans-boundary disease in Kenya is only a threat to improved quality and quantity of livestock production but also to international market standards of meat, hides and skins (Kuti, 2012). Currently, CBPP is controlled mainly by restriction of infected herds and use of vaccines, although uptake by smallholder livestock farmers is low, at 20- 60 % (Wanyoike, 2009). According to the World Organization for Animal Health (OIE 2016, OIE 2008), CBPP is a notifiable disease, and CBPP infected countries are excluded from international trade of live animals.

The pastoral systems where CBPP is prevalent are arid and semi-arid, makes up 89% of Kenya, and are home to 36% of the population. Pastoralism is the defining feature in all the arid counties and in some of the semi-arid, including the Southern Rangelands. The livestock subsector employs 90% of the people, and contributes 95% of the family income (Kilavi, 2008). The defining feature of the ASALs is aridity and rainfall ranging between

150mm and 550mm per year in arid, and between 550mm and 850mm per year in semi-arid counties. Elmi (2012) says that by 1990s the ASAL region had fallen far behind the rest of Kenya in levels of investment, communication, infrastructure, and human development. The report says that political, social and economic marginalization of the regions had taken place since the colonial era. In livestock sector, Young et al., (2003) confirms that health systems in the ASALs have been under-resourced since the cutbacks induced by structural adjustment programmes (SAPs) in the 1980s and the potential of livestock production. Since then, the ASALs has not been fully exploited because of a combination of challenges such as recurrent drought, climate change, diseases and insecurity (Young et al., 2003). Although not all pastoralists are nomadic, mobility is an inherent part of pastoralist existence, given that they move livestock depending on availability of resources including water and pasture (Oxfam international, 2008). Dissemination of information on CBPP vaccine to these pastoralists was considered a challenge since grazing areas were far from towns and villages, and frequent movement makes it difficult to plan outreach activities to reach them. In Kenya, adoption of CBPP vaccine continues to be low at 20-60% (Wanyoike, 2009), and 1.3 million people at risk of diminished livelihoods due to livestock losses caused by CBPP. This necessitated a focus on human problem, specifically on how communication factors influence adoption of CBPP vaccine.

CBPP Zonation map shows that CBPP is present in the Karamoja ecosystem bordering Uganda, South Sudan, the Somali ecosystem in the eastern part of Kenya, and the Maasai ecosystem in the South (Wanyoike, 2009). The country is divided into three zones namely clean zone (zone 1), protective zone (zone ii) and infected zone (zone iii) in accordance with international nomenclature based on Fig 1.1 below.

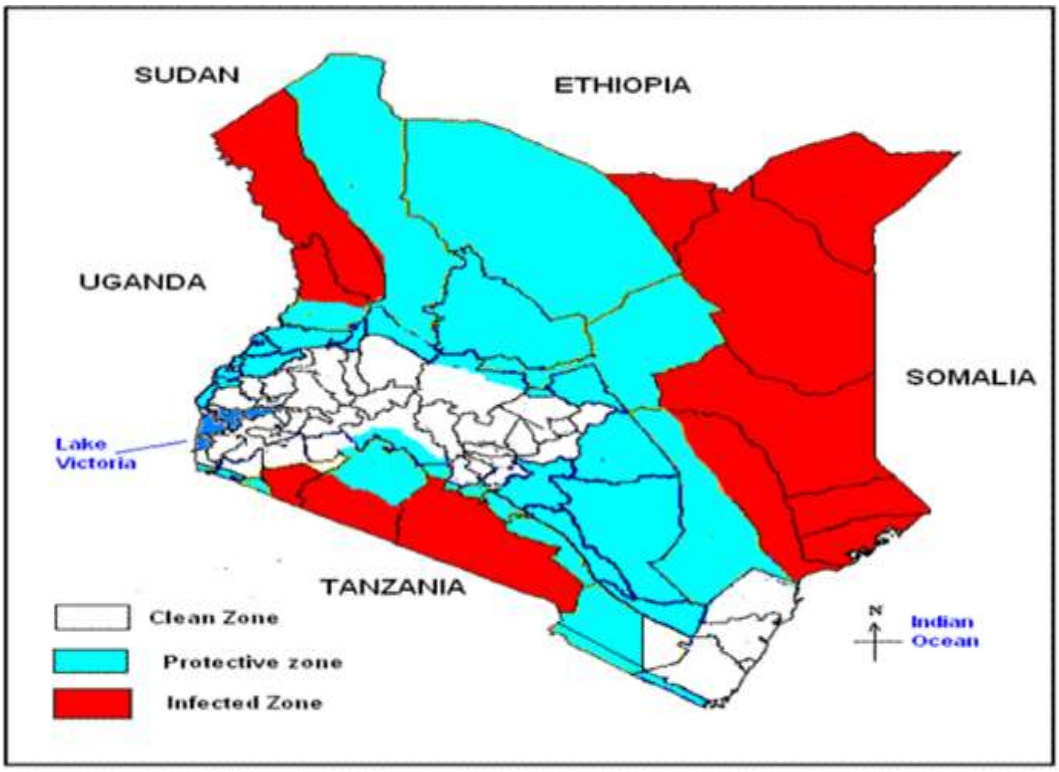

Figure 1.1: Map of CBPP Zonation in Kenya

Source: (GOK, 2010)

It is against this background that this study sought to investigate the influence of communication factors on adoption of CBPP vaccine among Arid and Semi Arid Lands (ASAL) pastoralists in Kenya. The focus on communication was informed by the slow pace of adoption of a livestock vaccine, live T1, 44 to eradicate CBPP in Kenya. Past studies have been done in Kenya on adoption of livestock vaccine such as East Coast Fever (Karanja-Lumumba et al., 2015) and CBPP (Wanyoike 2009, Kairu-Wanyoike et al., 2014, Waithanji et al., 2015), but none of them made inquiries on the role of communications in the adoption of the vaccine although they acknowledged that "publicity" and "awareness" was used in some stages to prevail upon the community to present their cattle for vaccination. The study shifted attention from the vaccine to adoption users, specifically how communication factors influences pastoralists'

acceptance or rejection of CBPP vaccine. McQuail et al., (1981) and Lowery et al., (1995) are of the view that mass communication and research is important in the process of encouraging adoption of innovations both in developing and advanced societies where scientific research have to be applied to replace old methods with new technologies.

Scholars across various disciplines have proposed various theories (Sunding and Zilberman 2001) on the factors and processes which underpin observed patterns of information diffusion and the adoption of innovations. This study was informed by these scholars among them Llewellyn (2007), Feder et al., (1993) Pannell *et al.,* (2006), Rogers (1995), Vanclay (1992) Heffernan et al. (2008), Heffernan et al. (2011), Bhattacharyya (1997), Beck et al. (1993), Rezvanfar (2007), Kairu-Wanyoike et al.,2014 who tried to understand what drives adoption of technology across a wide range of disciplines including communication. One key highlight in these studies is the role of social links and community structure in the diffusion process. Thus, innovation diffusion theory as the process by which an innovation is communicated through certain channels over time among members of a social system informed this study to great extent (Rogers 199, Feder et al. 2006). Communications and information relating to new knowledge, in this case CBPP vaccine, was shown to be embedded within the more general fabric of social interactions among individuals.

Therefore, this study investigated the influence of communication factors on adoption of CBPP vaccine among the ASAL pastoralists in Kenya. Specifically, communication channels, participants, messages and perceived characteristics of CBPP vaccine and moderating effects of demographic characteristics were studied to establish their influence on adoption of this vaccine. A better understanding of the processes by which new knowledge diffuses within and across societies and communities can suggest actions and investments that can be undertaken by governments and firms that aim to promote innovations.

Farmers and members of the rural community, like the case of the respondents studied in Narok South Sub County, have generally been a targets of most efforts of innovation

diffusion in both developed and developing societies. This is because there are many instances where changes originate in scientific research, which, to be effective have to be applied by these farmers and members of the rural community. For example, in Kenya, agricultural researchers are constantly discovering new innovations in an effort to increase livestock and crop yields, reduce loss due to diseases and pests, and increase overall productivity (KALRO, 2018). One of the main factors in these developments is that farmers do not instantly adopt these innovations. Smale *et al.*, (2011) found out that a maize hybrid, H614 released in 1986, still dominates on farms despite an increase in seed suppliers and range of hybrids sold in the seed market. In livestock sector, (Musaba 2010), about five out of ten livestock management practices disseminated to farmers were adopted, and for CBPP vaccinations continue to be low at 20- 60 % (Wanyoike, 2009).

1.2 Statement of the Problem

Contagious Bovine Pleuropneumonia (CBPP) is a threat to the livelihoods of 24 million people across 19 African countries who rely solely on livestock (Thompson, 2005). It is estimated that the costs of the disease in Africa is US$41 million, of which US$6.4 million is attributed to Kenya Tambi et al., (2006). Currently, CBPP is controlled by use of vaccines, although uptake by smallholder livestock farmers is low. World Organization for Animal Health (OIE 2016, OIE 2008) listed it a notifiable disease and infected countries are excluded from international trade of live animals.

The problem is that adoption of CBPP vaccine continues to be low at 20-60%, (Wanyoike, 2009) leaving many pastoralist communities vulnerable to losses. A study by Thomson (2005) showed that about 24.4 million people in 19 Sub-Saharan Africa including 1.3 million in Kenya, of whom 30–50% are living below poverty levels are at risk of diminished livelihoods due to livestock losses caused by CBPP.

The government has since 1980's and 90's provided pastoralists' cattle, particularly in Arid and Semi-Arid Lands (ASAL) with CBPP vaccinations, but the diseases has not been wiped out of Kenya. This points to a possibility of "vaccine hesitancy", defined by World

Health Organization as a delay in acceptance or refusal of vaccines despite availability of vaccination services (MacDonald, 1977). The continued existence of the disease led to a focus on human problem, specifically on how communication factors influence adoption of CBPP vaccine. A communication inquiry has been absent in most of CBPP socio economic studies among them Wanyoike (1999), Kairu-Wanyoike et al., (2014) and Waithanji et al., (2015) but there was indication in some of the studies that adoption or uptake of the vaccine involved communication in one way or another.

Since the initial study on diffusion of innovations by Rogers (1963), over 5,000 similar studies had been done in areas such as ICTs agriculture health, education, and economics (Roman 2004, Díaz-Bordenave 1976, Feder et al., 1985, Gafsi et al., 1979, Coleman 1966, Grunig 1971), but these were undertaken in developed countries. In Kenya, vast listerature on adoption of innovations studies in agriculture mainly focus on crops such as maize (Gerhart 1975, Feders et al., 1993).

A vast literature on adoption of livestock vaccines also exists (such as Heffernan et al., 2008, Heffernan et al., 2011, Bhattacharyya 1997, Beck et al., 1993, Rezvanfar 2007), and in Africa and other developing countries (Fandamu et al., 2006, O'Mara 1971, Karanja-Lumumba et al., 2015, Homewood et al., 1975, Kairu- Wanyoike et al., 2014). However, adoption was presumed to be an economic issue, focusing on poor farmers "willingness to pay" (Kairu-Wanyoike et al., 2010), a delivery issue (LID 1998; Heffernan et al., 2000) or as a function of the characteristics of the adopters, including perceptions and attitudes towards vaccination itself (Beck et al., 1993, Bhattacharyya et al., 1997, Fandamu et al., 2006, Homewood et al., 2006, Rezvanfar, 2007). Most of these studies lacked empirical evidence on the role of communication in aiding adoption of livestock vaccines, and also did not focus on Kenya. Therefore, the purpose of this study was to close this knowledge gap by specifically investigating the relationship between the influence of communication factors and adoption of CBPP vaccine by ASAL pastoralists in Kenya. Rogers (2003) and McQuail et al., (1981) say pursuit of study is important because communication has a role in adoption of innovation particularly agriculture.

1.3 Objectives of the Study

The study was guided by a general objective and four specific objectives as stipulated in sections 1.3.1 and 1.3.2 that follows.

1.3.1 General Objective

To establish the influence of communication factors on adoption of contagious bovine pleuropneumonia vaccine among ASAL pastoralists of Kenya.

1.3.2 Specific Objectives

The study sought to fulfill the following specific objectives

1. Examine the influence of communication channels on adoption of CBPP vaccine among ASAL pastoralists in Kenya;
2. Establish the influence of CBPP vaccine communicators on adoption of CBPP vaccine among ASAL pastoralists in Kenya;
3. Evaluate the influence of the messages on adoption of CBPP vaccine among ASAL pastoralists in Kenya;
4. Determine the influence of perceived characteristics of CBPP vaccine on adoption among ASAL pastoralists in Kenya;
5. Establish the relationship between demographic characteristics and communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya.

1.4 Hypotheses

From all the objectives, the study tested the following hypotheses

1. $H_0.1$ There is no significant association between the influence of communication channels and adoption of CBPP vaccine among ASAL pastoralists in Kenya.

2. $H_0.2$ There is no significant relationship between the influence of CBPP vaccine communicators and adoption of CBPP vaccine among ASAL pastoralists in Kenya.
3. $H_0.3$ There is no significant relationship between the influence of messages and adoption of CBPP vaccine among ASAL pastoralists in Kenya.
4. $H_0.4$ There is no significant relationship between the influence of perceived characteristics of CBPP vaccine and adoption among ASAL pastoralists in Kenya.
5. $H_0.5$ There is no significant relationship between demographic characteristics and communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya.

1.5 Justification of the Study

The contribution of pastoralism to the national economies in East Africa in enormous because the greatest share of livestock raised and marketed comes from the "traditional" pastoral systems (William et al., 2010). Pastoralists in ASALs own nearly 70% of the national herd estimated at the value of Kshs 70 B (GoK, 2011). CBPP is a threat to livelihoods of about 24.4 million people in 19 African countries (Thomson, 2005), including 1.3 million in Kenya. The costs due to sickness and mortality from CBPP in Africa was estimated at US$41 million, of which US$6.4 million is attributed to Kenya (Wanyoike, 2009).

The justification for undertaking this study was twofold- at community and research levels. At community level, it identified communication challenges in the adoption of CBPP vaccine. In Kenya, eradication of CBPP through vaccination is important because it has the potential to transform the livestock sector and secure livelihoods if pastoralists present their animals for vaccination. Vaccination prevented cattle deaths and spread of the disease to other regions of the country. The communication study was likely contribute to other efforts that encourage adoption of CBPP vaccine.

At the livestock research level, the study was justified by the need to identify communication challenges of adoption of the current CBPP vaccine whose coverage ranged from 20- 60%, while the desired coverage was 80% (Wanyoike, 2009). The findings were expected to inform upscaling strategy of a new a cost-effective, safe, and easy-to-produce CBPP vaccine. Earlier studies Kairu-Wanyoike et al., (2010), and Kairu-Wanyoike et al., (2014) provided an insight into socio-economic factors affecting CBPP vaccine adoption, but they did not investigate communication factors. Tan (1984) justified such a study:

> *"……. One of the goals for a communicator is to encourage people to change behaviour towards a certain innovation or practice, but people's values can be particularly resistant to change. An understanding of the complex relationship between a person's knowledge, attitude and behaviour can assist communicators in designing the right approaches to behavioral change."*

Similar studies by Heffernan et al., (2008) in Bolivia and Heffernan et al., (2011) in India used the diffusion of innovation framework, and were able to show that adoption of livestock vaccines behavior was as a result of social drivers. These two studies successfully justified the need to investigate other vaccine adoption drivers such as communications.

1.6 Significance of the Study

The significance of the study on the influence of communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya is stipulated in sections 1.6.1 and 1.6.2.

1.6.1 Significance to ASAL Pastoralists

The study is likely to benefit approximately 1.3 million people in Kenya and 24.4 million in 19 African countries, where 30–50% live below poverty levels, and suffer huge cattle losses resulting from CBPP deaths (Thomson, 2005). The benefits could be in form of empirical evidence on the influence of communication factors on adoption of CBPP

vaccine among ASAL pastoralists in Kenya, and the findings, conclusion and recommendations may form the basis of interventions to support adoption of CBPP vaccine and other vaccines under development. Currently, CBPP vaccinations cover 20-60% of the herds, while the desired coverage is 80% (Wanyoike, 2009). The adoption of CBPP vaccine could translate to healthy cattle, food security and income for ASAL pastoralists in Kenya. Economically, the country including pastoralists could be able to save up to US$6.4 million attributed to costs incurred due to sickness and mortality from CBPP (Ndanyi et al., 2014).

1.6.2 Significance to Government and Other Players

Studies on adoption of livestock vaccines have been undertaken elsewhere, among them Heffernan et al., (2008) and Heffernan et al., (2011), but their findings were not necessarily valid for ASAL pastoralists in Kenya. This study was significant to the Government and other players for several reasons. First, it provided a local context of the variables being investigated. Secondly, it may benefit the Government and policy makers to design appropriate communication interventions to encourage adoption of CBPP and other livestock vaccines in the country. Currently the policy used by the government to control the spread of CBPP is test and slaughter, and quarantines methods which are unpopular among pastoralists (Wanyoike et al., 2004). Thirdly, it may be significant for CBPP vaccine researcher because its findings could inform an upscaling strategy of improved CBPP vaccine under development, and other future livestock technologies and innovations. The gaps that were identified in the study could translate to the coverage of CBPP vaccine from 20- 60% to the desired 80% (Wanyoike, 1999). Fourthly, higher levels of adoption of the vaccine as a result of communication interventions could lead to healthy cattle translating to economic benefits for the country. Currently, CBPP infected countries are excluded from international trade of live animals. Finally, communication researchers interested in investigating adoption of other livestock vaccines can also draw some knowledge from this study and finally, findings can be replicated in other pastoralist areas in Africa where CBPP is prevalent.

1.7 Scope of the Study

The study was within theoretical and geographical scopes. The scope theoretical framework was guided by diffusion of innovation (Rogers, 1995) which have been applied in most development programmes in developing countries (McQuail et al., 1981). The theory has been used as a practical strategy to guide adoption of agricultural innovations in the third world. Social learning theory (Bandura, 1977) reinforced the theoretical framework for this study which Lindner (1980) sees as relevant in agriculture because farmers are actively engaged in search of learning activities to find better technologies. Although the scope of this study was within these two theories, the circumstances under which they were applied slightly changed.

The geogtaphical scope was confined to the Narok South Sub County, which was purposively selected because it had experienced the highest number of CBPP outbreaks in Kenya (Kairu-Wanyoike et al., 2014). Two divisions (Loita and Mara), out of five were purposively picked because the residents had all the attributes that informed this study. Information was therefore collected from these residents and other stakeholders who have a deeper insight of CBPP vaccine.

In the research method, the study applied a descriptive design where both qualitative and qualitative data was collected at a single point in time to esatablish patterns of association between the variables under investigation. Data was collected through a mixed method approach using questionnaires, focus group discussions and key informant interviews. A sampling unit was a household cluster. The population of the study were heads of 62,412 households (KNBS, 2009) in Narok South Sub-county. For content, the study was confined to the influence of communication factors on adoption of innovation among ASAL pastoralists in Kenya only, but relied on local literature and examples from west which were relevant for the settings under investigation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter discusses literature relevant to the study on the influence of communication factors on adoption of CBPP vaccine among the ASAL pastoralists in Kenya. The discussion in this chapter followed several steps which include a review of two guiding theories; diffusion of innovation (Rogers 1963) and social learning (Bandura 1977). A conceptual framework of the independent and dependent variables under investigation was discussed with a view of bringing the interlinkages into focus. The chapter also brought into focus the relevant empirical literature related to the study, provide a critique and show the research gaps.

The present study drew from diffusion of innovation theory (Rogers, 1995) which laid a conceptual framework for understanding of adoption of innovations. Rogers (1995) defines the adoption process as "the mental process an individual pass from first hearing about an innovation to final adoption". The study was also guided by social learning (Bandura, 1977) which is of the view that social interactions are a key determinant in peoples' decision to take up an innovation.

2.2 Diffusion of Innovation

Diffusion of innovations theory (Rogers, 1995) explained how innovation permeated through societies, and is considered as the most influential of all time (Severin *et al.*, 2001). Rogers (1995) views this as a social process in which subjectively perceived information about how a new idea is communicated. The meaning of an innovation is thus gradually worked through a process of social construction. The most important features about the work on diffusion is: the weight which has to be given to non-media (often personal), sources (neighbours, experts, etc.); the existence often of a campaign situation

in which behavioural changes are sought by giving information and trying to influence motivations and attitudes.

Rogers suggested involvement of five adopters; innovators, early adopters, early majority, late majority, and laggards on the basis of personality trait of innovativeness. As the process of diffusion takes place, some sort of S- shaped adoption curve described the proportion of a relevant population of potential adopting units who have taken up at the time at various points in time. The pattern of adoption of adoption (swift or slow) following any particular innovation depended on the particular trait and the characteristics of the social system, as well as the types of people who became aware of its existence and potential value for their purposes. Today, diffusion of innovation study is used to explain major factors in the adoption of innovation; 1) a specific innovation, 2) processes of interpersonal and mass communication that created awareness of the innovation, 3) a specific kind of social system, and 4) Different types of individuals who made decisions at various stages as use of the item diffused. Many studies from a broad variety of disciplines have used the diffusion of innovation framework. Dooley (1999) and Stuart (2000) mentioned some of these disciplines as political science, public health, communications, history, economics, technology, and education. For this study, diffusion of innovations theory (Rogers, 1995) provides a concern on the relative role played by the media versus that of interpersonal channels in creating awareness.

Rogers and Shoemaker's model (1973) illustrated four distinct steps in the innovation-diffusion process. The steps were; knowledge where the individual was exposed to an awareness of the existence of the innovation and gained some understanding of how it worked. The next step was persuasion, where the individual formed a favorable or unfavorable attitude towards the innovation. The next step was decision, where the individual engaged in activities which led to a choice to adopt or reject the innovation and confirmation where the individual sought reinforcement for the innovation decision made but reverses a previous decision if exposed to conflicting messages about the innovation. Figure 2.2 below of an illustration of Rogers and Shoemakers (1973) model of stages in the innovation decision processes

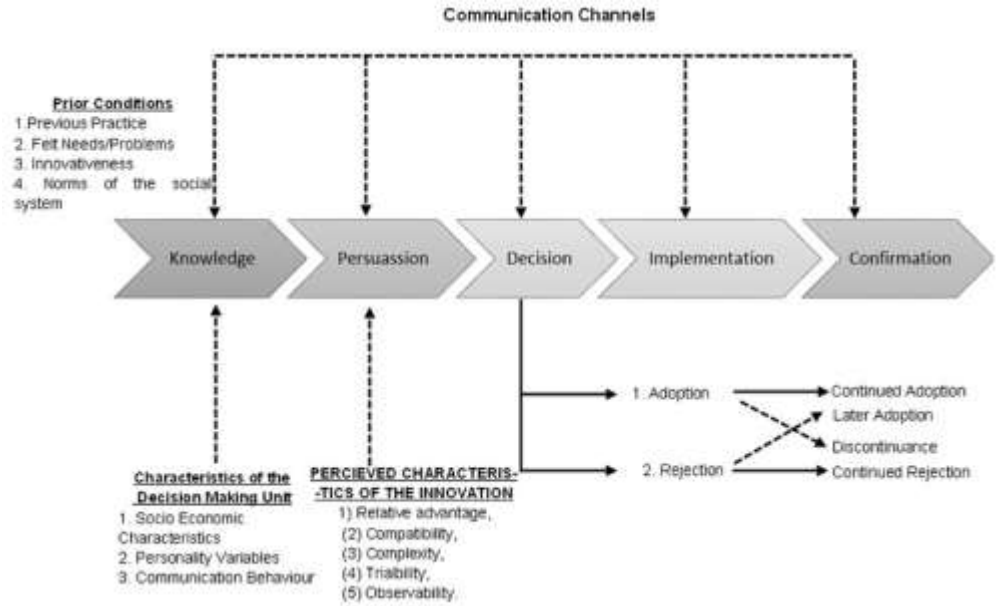

Figure 2.1: A Model of Five Stages in the Innovation-Decision Process

Source: (Rogers, 1983)

This study found the framework useful because it helped to identify drivers of adoption from a communication perspective for several reasons. One, a specific innovation in this case CBPP vaccine with defined attributes (relative advantage, compatibility, complexity, trialability, observability). Secondly, processes of interpersonal and mass communication from either localite or cosmopolite sources that created awareness of the innovation also existed. This was in form of local and national mass media, information, education and communication (IEC) materials and meetings held to communicate CBPP vaccine. Third, a social system existed involving veterinary experts, peers and communities also existed. Fourthly, theory stressed the importance messages, sees uncertainty as an important obstacle to the adoption of innovations because, "innovation-decision process was essentially an information-seeking and information-processing activity in which an individual was motivated to reduce uncertainty about the advantages and disadvantages of the innovation". In establishing the influence of CBPP vaccine messages, Festinger (1957) provided concepts of dissonance or consonance. Through definition of adopter categories as

"the classifications of members of a social system on the basis of innovativeness," Rogers (1995) set a stage for this study to show different types of individuals who made decisions at various stages as the use of the innovation diffused.

Finally, this theory proved helpful because the population being studied lived in rural ASAL counties, with probable similarities with farmers where the diffusion of hybrid corn seed was conducted (Rogers, 1995; Rogers, 2003). Iowa residents were described as, "a rural society and traditional where word of mouth of mouth may have been more important than mass media". Moreover, CBPP vaccine, just like the Iowa innovation (Lowery *et al.*, 1995) was not the kind of innovation that would normally be advertised via the common mass media.

2.3 Social Learning Theory

The use of diffusion of innovations theory in this study was reinforced by social learning theory (Bandura, 1977). Social learning includes both behavioural and cognitive processes of conformation to already known socially acceptable roles and practice (learning to fit in). Lindner (1980) sees the relevance of the theory in agriculture because farmers are actively engaged in search of learning activities to find better technologies. According to the tenets of social learning theory (SLT), behaviors are learned through interactions with the variety of socializing agents to which one is exposed. It is through these interactions where behaviors are either adapted or extinguished (Brown *et al.*, 2005). SLT was based on the assumption that people learn behaviors, attitudes, emotional reactions and norms through direct experiences but also through observing other humans (models). Bandura (1977) posited that learning was a cognitive process that takes place in a social context and can occur purely through observation or direct instruction, even in the absence of motor reproduction or direct reinforcement. Drawing heavily on the concept of modeling, or learning by observing a behavior, Bandura (1977) outlined three types of modeling stimuli: Live model in which an actual person is demonstrating the desired behavior; verbal instruction in which an individual describes the desired behavior in detail and instructs the participant on how to engage in the behavior; symbolic in which modeling

occurs by means of the media, including movies, television, internet, literature, and radio. Stimuli can be either real or fictional characters.

An important factor in social learning theory was the concept of reciprocal determinism. This notion stated that just as an individual's behavior is influenced by the environment, the environment was also influenced by the individual's behavior. In other words, a person's behavior, environment, and personal qualities all reciprocally influenced each other. The theory also held that people reinforced or extinguished behaviors based on perceived appropriate behaviors (Bandura *et al.,* 1961). Through observation of modeled behaviors, attitudes, emotional reactions, etc., a learner made decisions on how to act. However, this learning did not happen through a stimulus/response approach, such as an exact replication of observed behavior. Valente and Davis (1999) argued that "learning occurred most efficiently when individuals are trained by their near peers, whom they had chosen as their models".

The biggest strength of social learning theory is that it could be applied in the real world such as education, social work, and criminology, gender role development, media and could be quickly and easily administered. In agriculture, farmers were associated by what they did and learnt together, and they observed, imitated and compared their own practices to those of other farmers in the neighborhood. In adoption livestock vaccine such as the one being investigated, social learning theory emphasized the systemic dimension of learning, where learning occurred through collective engagement with others rather than through the isolated activity of an individual and was particularly relevant in "situations which are characterized by complexity, uncertainty, interdependency, having multiple stake holding and often ongoing controversy (Collins et al., 2009).

Social learning theory was found to be relevant for this study for several reasons, first, the modeling stimuli could emanate from veterinary experts, CBPP vaccine communicators and mass media, who were the sources of CBPP vaccination behavior perceived to be appropriate. Secondly, the theory's notion that, "individual's behavior is influenced by the environment", prompted a focus on the influence of group membership on individual

decisions to vaccinate their cattle against CBPP. Thirdly, Bandura's (1977) assertion that punishment played an influential role in regulating behavior, provided an insight for this study to examine means, other than government quarantines, of enforcing CBPP vaccinations among pastoralists who observed hierarchy in decision making, and had defined norms for livestock management (Lamprey *et al.*, 2004).

2.4 Conceptual Framework

This study identified and operationalized variables of the influence of communication factors on adoption of CBPP vaccine among the ASAL pastoralists in Kenya within propositions of the diffusion of innovations and social learning theories. These were then used to propose relationships as represented in the conceptual framework (Figure 2:3) to interpret and explain the study findings.

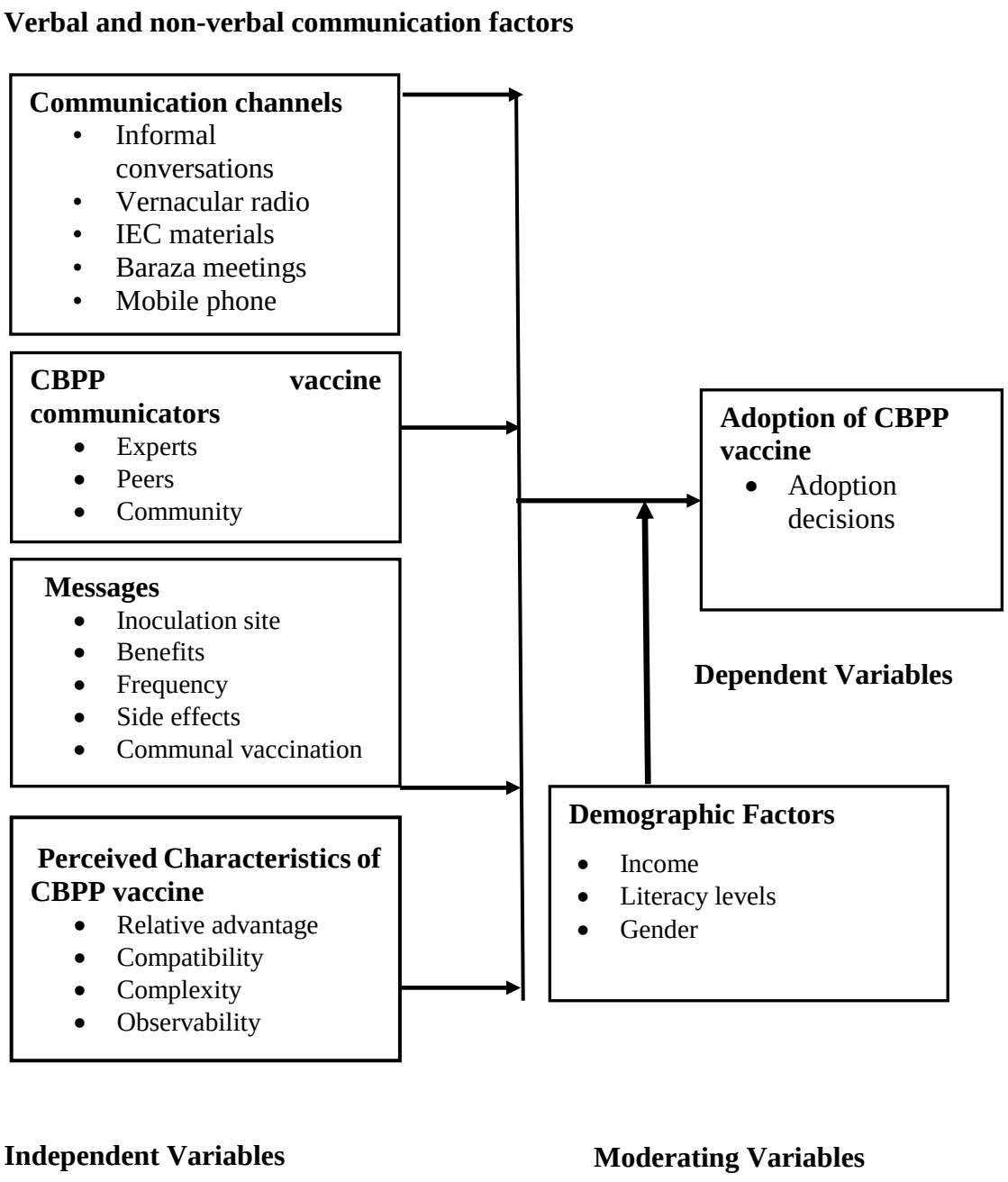

Figure 2.2: Conceptual Framework

2.4 Review of Variables

The conceptual framework was reviewed under four independent variables; communication channels, CBPP vaccine communicators, influence of CBPP messages

and the perceived characteristics of the vaccine. All the four independent variables were tested against a dependent variable (adoption). A moderating variable, whose parameters include literacy, gender, and income were also investigated to establish its effect on the desired outcome which is adoption of CBPP vaccine.

In objective one, communication channels were discussed under the parameters of vernacular radio, information, education and communication materials (IEC), and baraza meetings. The mobile phone and informal conversations were also included after the pretest showed they played a significant influence. In objective two, the discussion on CBPP vaccine communicators focused on experts, peers and the community in encouraging adoption of CPBB vaccine. In objective three, the study examined the influence of CBPP vaccine messages on adoption. These messages included inoculation site, benefits and frequency of vaccinating against the disease, and side effects of the vaccine. Pastoralists' communication of perceived characteristics of CBPP vaccine were also evaluated using relative advantage, compatibility, complexity, and observability attributes in objective four. Objective five moderated between independent demographic characteristics on communication factors, and dependent variable, adoption of CBPP vaccine. Finally, a pattern of adoption among individuals was also established. Each of these variables was explored before undertaking the study as discussed in sections 2.4.1 to 2.4.6 that follow.

2.4.1 Communication Channels

Communication channels were important factors in the diffusion process. In this study, they were examined to establish their influence on adoption of CBPP vaccine. Rogers (1995) stated that the diffusion process included elements of; an innovation, individuals or other units of adoption, and a communication channel. For CBPP vaccine communication channels, was singled out because vernacular radios because they remained the biggest source of information for a majority of Kenyans and pastoralist communities. Radio remained the most widely used media platform in Kenya (MCK, 2015) and was also estimated that vernacular stations commanded 42 per cent of the total

market share (MCK, 2014). Tan (1981) says radio programs designed for farm audience were primary carriers of information into communities, and were used to communicate new ideas to farmers. This study did not found significant documented evidence that the radio was specifically used to mobilize pastoral communities during CBPP campaigns. However, Kairu-Wanyoike et al., (2014) study gave an indication that "publicity" was used to mobilize pastoralists in one such CBPP vaccination campaign in Narok County. Munyua (2000) demonstrated that vernacular radio was widely used where rural farmers were faced with constraints in accessing agricultural information. This study established that community and vernacular radio stations broadcasting in pastoral regions namely Nosim FM, Mayian FM, Sidai FM and Radio Maa were involved in the publicity as reported by Kairu-Wanyoike et al., (2014). Lowery *et al.*, (1995), Rogers (2003) argued that these community and vernacular radio or the mass media in general only created awareness of an innovation and were not important in the persuasion stage of the adoption of an innovation.

In the diffusion of innovation literatures, a general distinction is made between interpersonal and mass media channels when assessing the impact of communication channels on the uptake and adoption of an innovation (Rogers, 1995). While mass media channels include a mass medium such as TV, radio, or newspaper, interpersonal channels consist of a two-way communication between two or more individuals. Where mass communication has the ability to raise awareness of an innovation, it is widely recognized that "interpersonal influence through social networks is the dominant mechanism for diffusion" (Greenhalgh et al., 2004). In the Wellcome Trust project, Wanyoike (1999), found interpersonal communication as having had a central role in communicating CBPP vaccinations among the community in Narok district. The study found that community leaders, government officials and other in the community were used to communicate CBPP vaccination information to pastoralists. The information was specifically communicated when the veterinary extension officers were undertaking CBPP vaccination campaigns.

This study did not find evident of information education and communication (IEC) materials including posters, booklets and brochures were used to disseminate CBPP vaccine information. IEC were particularly useful in behavior change communication, but Thorseth (2020) says most IEC materials are not powerful enough by themselves to change behavior, they needed to be incorporated in other behaviour change packages. Nevertheless, in other dissemination campaigns, these simplified using graphics were found to be useful.

The pastoralists being studied live in a rural environment in an Narok County, and was part of the ASAL region in Kenya. Baraza meetings between veterinary extension workers and pastoralists proved to be the preferred way of influencing pastoralists (Kairu-Wanyoike et al., 2014) to adopt CBPP vaccination. These meetings happened in chief's barazas, livestock markets, and in religious gathering. This is confirmed by Munchunku, et al., (2014) and Berry et al., (2003), who found that like many other publics, residents of ASALs are increasingly distrustful of both news and advertising from mass media, preferring instead recommendations from friends, family, coworkers, and peers. Another study (Haydarov et al., 2014) found that among Somali pastoralists in the Horn of Africa, communication is primarily through word of mouth and oral communication is appreciated above all other forms. Wanyoike (2009) also found baraza meetings as having been widely used to communicate CBPP vaccination among respondents in Narok South District.

2.4.2 CBPP Vaccine Communicators

Rogers (2003) saw diffusion as a social process that involved interpersonal communication relationships which were more powerful in creating or changing strong attitudes held by individuals. McQuail *et al.,* (1981), concurred that personal influence was important for a decision to adopt or not but further advanced that experience of use provided the main later source of confirmation or otherwise. Evidence of the use of interpersonal communication was demonstrated by Wanyoike (2009) in the Wellcome

Trust Project where sources of CBPP information included veterinary officers and other participants as indicated in Table 2.1

Table 2.1: Sources of Information about Vaccination among the Surveyed Farmers

Source	Number of Respondents
Veterinary/NGO personnel	62
Neighbors and family members	57
Local leaders	20
Observation	10
Public written notice	8

Source: (Wanyoike, 2009)

Veterinary experts were sources of CBPP vaccine information and key influencers of adoption. Their role was to make vaccination decisions and to communicate to pastoralists on the importance of vaccination, and to declare and enforce quarantines when necessary. These experts drawn from the ministry of Agriculture, vaccine research, county veterinary services and community veterinary attendants, were considered influential because they were considered "experts."

Peer groups were likely to be sources of influence for each other's beliefs and behavior as found by Muchunku (2015). Peer groups defined as a social or a primary group of people who have similar interests (homophily), age, background, or social status were thus included in the conceptual framework. Although, Kairu- Wanyoike (2014) did not explicitly show existence of peer influence among pastoralists studied, reference to "the key informants or more knowledgeable participants", pointed out to the influence of some members the community on CBPP vaccination.

Pastoralists like any other communities were composed of people with similar enthusiasms, interests and purpose, and possessed internalized shared, tacit and codified understandings (Wenger 1991, Allen 2000). This shared understanding certainly had an impact on the direction of communication flow among pastoralist communities. Their social structures were also characterized by hierarchical clan units (Hinds 2013, Gundel

2006) where traditional leaders, almost exclusively older men were perceived as the most legitimate leaders by their clan members and are the prime force in decision making on issues such livestock diseases, pastures, water, and conflict resolution (Gundel, 2006). Their orientation to each other, sharing or referring their activities (and practice) to norms of the collective meant that the communities were a source of influence for the adoption of CBPP vaccine. However, assimilation of new knowledge could be influenced by members with different knowledge sets and life experiences, since the membership into a community is not static (Wenger, 2000). Interpersonal communication through social networks as suggested by Roger (1995) was of great influence in getting pastoralists to adopt CBPP vaccine to the desired levels of 60-80% coverage. Moreover, oral communication was appreciated above all other forms, and fitted the nomadic pastoralist way of life given the historically limited availability of contemporary communication or media channels (Academy for Peace and Development, 2002).

2.4.3 Influence of Messages on Adoption of CBPP Vaccine

The message variable informed the conceptual framework for a number of reasons. First, it was important to interrogate the influence of CBPP vaccine message, under parameters inoculation site, benefits, required frequency of vaccination and side effects, and how this messages impacted on adoption. Available literature showed that CBPP vaccine was controlled by government which provided for free vaccinations particularly in pastoralist areas (Kajume, 1999), although commercial farms were allowed to purchase and vaccinate under supervision. The government's policy on control included quarantine of herds in infected zones (GoK, 2003; Wanyoike *et al.,* 2004) and movement outside was only in designated slaughterhouses. In messaging, experts advised pastoralists to vaccinate annually or biannually to raise herd immunity from 67% to 95.5% (Wesonga et al., 2000) because the protection period was one year (Wesonga et al., 2000; Nkando et al., 2011). Vaccine messages on benefits of adoption revolved around economic, social advantages, and security of livelihoods. However not all pastoralists vaccinated their cattle against CBPP annually and some even skipped years. Pastoralists cited (Kairu-Wanyoike et al., 2014) absence of outbreak, fear of severe post-vaccination reactions, inappropriate

vaccination season and having no knowledge of the disease or vaccine as the main reasons. A section of others confused CBPP treatment with vaccination, and did not see the benefits of vaccination (Wanyoike, 2009). Kairu-Wanyoike et al., (2014) found that some pastoralists went to the extent of hiding some of their cattle during vaccinations for fear of adverse post-vaccination reactions. Festinger (1957) explains this behaviour cognitive dissonance as mental discomfort that resulted from holding two conflicting beliefs, values, or attitudes. People attempted to relieve this tension in different ways, by rejecting, explaining away, or avoiding new information.

Two, it was important to interrogate attributes of CBPP vaccine messages to enable an indepth understanding how independent (messages) interacted with the dependent (adoption) variable in the conceptual framework. High and low message appeals were reportedly used by government to encourage adoption. Messages of upholding the quarantine was a way of enforcing vaccinations where message low appeals were unsuccessful. Low or high message appeals was used to change people's opinions or behaviors (McGuire, 1969). Eagly 1974, Carbone 1975, Kelman 1974, Petty et al., 1986) also advanced that that message characteristics such as structures, stylistic variables, one sided versus two sided messages, and message appeals determined a persuasive impact on receivers. Tan (1984) predicted that compliance with a message recommendation depended on comprehension of the arguments and rewards promised by the message.

2.4.4 Perceived Characteristics of CBPP Vaccine

Investigation of this perceived characteristics variable was motivated by Rogers (1995). Attributes of an innovation relative advantage, compatibility, complexity, and observability were important in decreasing uncertainty about an innovation such as the one being investigated. These parameters were included under the independent (perceived characteristics) variable for examination. Current literature shows that CBPP vaccine was perceived by experts and pastoralists as having relative advantage than treatments. The following perceptions among the Maasai of Narok South Sub County on the CBPP vaccine was thus captured.

"We prefer the vaccine to treatment as it keeps the disease away for at least 6–12 months. It is the only solution for protection for CBPP because it saves the lives of our cattle and our animals recover if vaccinated" (Kairu-Wanyoike et al., 2014).

Compatibility refered to the degree to which an innovation is perceived as being consistent with existing values, past experiences and needs of potential adopters (Rogers, 1995). Kairu-Wanyoike et al., (2014) and Wanyoike (2009) found pastoralists expressed concern that CBPP vaccination was not entirely compatible with their values for two reasons. First, they felt that vaccination was better combined with other vaccinations such as East Coast Fever (ECF), rinderpest or Foot and Mouth Disease (FMD) since they thought it was more important to control those than CBPP. Secondly, they felt that the best time to vaccinate was when fodder was available and their animals were healthy to withstand adverse post-vaccination reactions, so any other vaccination period decided by experts was inconsistent with their values.

Complexity and observability (Rogers, 2003) respectively are perceived characteristics of an innovation. They are understood be the degree to which an innovation was easy or difficult to use, and how visible the use of the technology is. The complex nature of CBPP vaccine is that it required a cold chain and only administered by government veterinary officers. This posed a delivery challenge in ASAL areas where cold chain infrastructure was virtually non-existent. Veterinary officials (Kairu-Wanyoike et al., 2014) also acknowledge that other shortcomings, such as relatively low efficacy, short shelf life, need for booster doses and sometimes caused side effects. CBPP vaccinations was administered by extension officers, but nevertheless, pastoralists were aware of this complexity in order to appreciate the importance of vaccinating their cattle when vaccination exercises are called. Observing a technology stimulated awareness of the innovation and conversations among one's peers but the question for pastoralists was whether or not the vaccine worked. Kairu-Wanyoike et al. (2014) and Wanyoike (2009) study found that some pastoralists had made positive observations on the effectiveness of the vaccine though vaccination coverage was still lower than the desired minimum of 80% due to fear of post-vaccination reactions. Angelmar et al., (2012) also found that reactors following ECF vaccination

violated peoples trust and represented a safety product betrayal. This betrayal caused negative emotions such as anger, sadness, anxiety, fear and disgust and could also be a cause of rejection of a product in a manner that is disproportionately larger than the harm caused.

2.4.5 Demographic Characteristics

The ASALs counties in Kenya display many characteristics of remote rural areas caught in chronic poverty traps, and interlocking forms of disadvantages (Elmi et al., 2012). Eighteen of the twenty poorest constituencies are in ASALs (was once referred as northern Kenya), and 74% - 97% of the people live below the poverty line of less than 1 USD dollar a day (Elmi, 2012, UNDP, 2010). Such poorly resourced people are less likely to vaccinate their livestock as found by Karanja-Lumumba *et.al,* (2015) on the uptake of the east coast fever (ECF) vaccine. The study found that a higher purchasing power among the livestock owners enabled them to meet the cost of vaccination.

Coincidentally, ASAL regions are also in CBPP infection zones and are characterized by low literacy levels which stand at 8% compared to the national literacy of 61.5% (KNLS, 2007). Low levels of literacy among most of these pastoralists, means that they lack the ability to identify, understand, interpret, create, communicate, written materials associated with varying context (UNESCO, 2017). It is obviously a challenge for veterinary personnel to communicate and encourage adoption vaccine among most of ASALs audiences who have low literacy and poverty levels, although this is not documented in CBPP studies. The effect of literacy on adoption of livestock vaccinations is confirmed by Baltenweck et al., (2000) and Staal et al., (2002) who found that among socio-economic variables, education of the household head is likely to influence the adoption decision positively. Karanja-Lumumba et al., (2015) arrived at similar findings on the parameters of education in positively influencing the adoption decision of ECF vaccine. The positive coefficients of this factor indicate that cattle keepers who were more educated were more likely to understand the benefits and seek more information of the vaccine, and hence

vaccinated their cattle. Those more advanced in age were also likely to have more experience in cattle rearing, and hence understood the benefits of vaccinations.

Though every pastoralist community differ in social organization, Oxaal (1997) says they share some basic similarities, such as strongly marked gender roles, and patterns seem extremely similar across the world (Blench, 1987). This has an obvious effect on communication flows and opinion leadership especially on livestock matters because community decisions are mostly done by men. One such effect (Waithanji *et al*., 2015) is that women are unable to access extension information on CBPP, its control and benefits of its control because their decision-making power and ability to negotiate over what to do with cattle and their products within the household is very weak. Women are not permitted to interact with men from outside the family including male veterinary extension workers (ibid). Although pastoralist women have low social status and literacy levels, restricted roles in public life and in ownership of livestock, elderly women often hold relatively privileged positions in their communities, and can have some voice if they are considered to be wise and put the community's interests foremost (IFAD, 2010). Married women are only allowed to make decisions only if their husbands are deceased, and pastoralist girls have even less voices in their homes and communities than their mothers. Boys on the other hand are allowed to own livestock upon initiation, thus giving them a leverage on decision making (Yiampoi, 2014). Interestingly, gender and socio-economic status i.e. per person/month income above or below the poverty line had no relationship to vaccination adoption within some cultures such as found by Heffernan *et al.,* (2011) in India and Heffernan et al., (2008) in Bolivia. The adoption of livestock vaccination was, on a macro-level, (ibid) was deeply embedded within the existing social caste system and on micro-level, ethno-veterinary knowledge systems.

2.4.6 Adoption of CBPP Vaccine

This study found necessary to discuss this section on adoption of the CBPP vaccine, although it was not listed as an objective, it laid a case the development of an adoption pattern. Current literature shows that pastoralists targeted in CBPP vaccinations, accepted,

skipped and others rejected vaccination to an extent of hiding their cattle during vaccination campaigns (Kairu-Wanyoike et al., 2014). This behavior is not new according to (Defleur et al., 1989) because individuals targeted by change agents to adopt a certain innovation could choose to adopt or resist it. Rogers (1995) used the S shaped curve to show the pattern, process, and the types of people who embraced an innovation on the basis of a personality trait of "innovativeness". This behavior was summed up by a resident veterinarian in Narok South Sub County:

> "*Some people skip vaccinations. Vaccination is unpopular when there is no obvious threat of outbreaks, due to fear of adverse post-vaccination reactions.*

2.5 Empirical Literature Related to the Study

The section discusses empirical studies on each of the variables studied. Several studies Feder *et al.,* (2006), Heffernan *et al.,* (2008), Heffernan *et al.,* (2011) and Llewellyn (2007) established the role of communication in the adoption of innovations. Feder *et al.,* (2006) found opinion leaders were effective in diffusing pest management knowledge. Heffernan *et al.,* (2008), Heffernan *et al.,* (2011) used diffusion of innovation theory (Rogers1995), to establish drivers of livestock vaccine adoption. Rogers (2003) suggested that the innovation-decision process is essentially an information-seeking and information-processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation.

2.5.1 Communication Channels

In communication process, channels are means by which a message got from the source to the receiver (Defluer et al., 2000, Rogers (2003). In the diffusion of innovation, Rogers (1963), radio was found to be effective in reaching out to audiences. Feder *et al.,* (2006) found that more exposure to appropriate information through various communication channels mass media e.g. newspapers, radio and leaflets, reduced subjective uncertainty among adopters of agricultural innovations. This was because, it entailed in most cases, a

subjective risk (yielding was more uncertain with an unfamiliar technique) and quite often objective risks (due to weather variations, susceptibility to pests, uncertainty regarding timely availability of crucial inputs, etc.).

McLean (1992), Hornik (1988), Ray (1978), Cooke et al., (1977), Cerqueira et al., (1979); and Bordenave (1977) also saw radio as the most cost-effective means of providing information and education to diverse target groups in developing societies to promote community development, innovation, and encouraging behavior change. However, there was evidence that radio alone could not bring about desired behavior in a community (Ray 1978, Cooke et. al., 1977), and for effectiveness, argues Cerqueira et al., (1979), and Bordenave (1977), the channel had to be used in conjunction with some form of interpersonal support such as discussion, study groups, printed materials or contacts with extension workers. The views by Cerqueira et al., (1979), and Bordenave (1977) support Roger's (2003) assertion that an interpersonal source could add information or clarify points and perhaps surmount psychological and social barriers (Selective exposure, attention, perception, retention, group norms, values etc.). Mass media channels reached large audiences rapidly, spread information and changed weakly held attitudes while interpersonal channels provide a two- way exchange of information and are more effective than the mass media in dealing with resistance or apathy on the part of the receiver. Lowery *et al.,* (1995) also supported the role of mass communication in reducing uncertainty about an innovation and creating its awareness. Mass communication aroused interest in an individual who then searched actively in a purposive way for more information about an innovation. Rogers (1995) found that interpersonal channels are much more effective at persuading an individual to accept a new idea'. As such, mass communication media such as the radio, television and the internet are less important during the persuasion stage than direct word of mouth.

Roger (1995) categorizes communication channels into either interpersonal or mass media in nature or may originate from either localite or cosmopolite sources. Cosmopolite communication channels are those from outside the social system being investigated; localite channels are those from inside the social system being investigated. The localite

channels referred to by Rogers (2003) included vernacular and community radio stations, which "connect" with the local audiences because of the nature of the broadcasts. In the process of diffusion of an innovation, the mass media which include radio and the cosmopolite channels are relatively more important at the knowledge stage, whereas the interpersonal channels and localite channels are more effective at the persuasion stage. Cosmopolite channels are relatively more important than interpersonal channels and localite channels for early adopters than for late adopters (Rogers, 1995). However, Lowery *et al.,* (1995) maintained that the mass communications as advanced by Rogers (1963) may not be appropriate for traditional society where word of mouth communication channels are more important and effective. Within the context of vaccination campaigns, mass media traditionally has been an important tool, but as Heffernan *et al.,* (2011) found out, reliance on media risked running into selective exposure by audiences.

2.5.2 CBPP Vaccine Communicators

Where mass communication had the ability to raise awareness of an innovation, it was widely recognized that interpersonal influence through social networks was the dominant mechanism for diffusion (Greenhalgh *et al,* 2004). In particular, the role of change agents and opinion leaders were identified as an important factor in influencing technological change. Nutley *et al.,* (2002) identified experts or change agents as being those "who worked proactively to expedite and widen innovation". In the agricultural extension model, these change agents traditionally took the form of extension workers appointed by the state, or private providers, working as intermediaries between researchers/scientists and end users. The ability of change agents to work with both of these groups was critical to their success. Equally, it has been asserted that they work best in partnership with opinion leaders (Nutley *et al.,* 2002). Opinion leaders were thought to exert influence over the adoption decisions of their peers (Rogers 1995, Greenhalgh *et al.,* 2002).

Since the original work by Rogers in 1962, which provides a coherent theory, as well as empirical evidence for many aspects of innovations diffusion, many studies (Muchunku, 2015, Heffernan *et al.,* 2008, Heffernan, 2011, Feder *et al.,* 1985, Gafsi *et al.,* 1979), have

been done on opinion leadership in the diffusion of innovation. Most of these recent work corroborated Rogers (1995) theory on the role and characteristics of opinion leaders. Thus, when ordinary people decided on to what to believe, purchase, join, avoid, support, like or dislike, they turned to opinion leaders for advice. Often, the opinion leader's personal influence is both given and received without either party consciously recognizing it as such. Opinion leadership was thus reflected in the ability to influence others' attitudes and knowledge (Chatman 1987, Valente *et al.,* 1999). Rogers (1995) explained that follower typically seeks an opinion leader of somewhat higher status. Opinion leaders are often more exposed to external sources of information, such as mass media or change agents (e.g., extension workers), had higher formal education or levels of literacy, a more cosmopolitan orientation, and higher income and wealth (Rogers, 1995; Chatman, 1987; Valente, 1996; Weimann, 1994). Similarly, Valente *et al.,* (1999) argue that learning occured most efficiently when individuals were trained by their near peers whom chose as their models. Opinion leaders were thought to exert influence over the adoption decisions of their peers (Rogers 1995).

Roger's (2003) defined diffusion as the process by which an innovation was communicated through certain channels over time among the members of a social system. This brought the role of community into focus and an identification of three types of innovation-decisions; optimal innovation decision based on individual decision-making irrespective of the wider social system, collective innovation decision forged by group agreement and authority innovation decisions made by a select group of powerful individuals. Heffernan *et al.,* (2011) found that most livestock vaccinations campaigns in the southern India relied on an 'optimal' decision-making process irrespective of the legal or legislative framework put in place by authorities to ensure collective behaviour, particularly in relation to livestock diseases such as FMD. Interestingly, Heffernan *et al.,* (2008) and Heffernan *et al.,* (2011) also out that found the adoption of particular vaccines was strongly influenced by socio-cultural grouping i.e. caste, rather than other factors such as income, age, education-level or gender. Similar findings were arrived at by Enticott *et al.,* (2010) found that farmers' acceptance of vaccination was dependent on the wider

social and political environment. McCorkle *et al.,* (1996) says that for vaccination to get appropriate levels of uptake, must fit the emic and etic of traditional ethno-medical/veterinary systems. Heffernan *et al.,* (2008) and Heffernan *et al.,* (2011) studies show that uptake of livestock vaccination was unlikely to improve without knowledge transfer that acknowledges local epistemologies for livestock disease.

Lowery *et al.,* (1995) supported the view that the values in small groups were sources of influence and interpretation. This is because people with similar values tended to be drawn to each other and to form close-knit groups. When people had a close and interdependent interaction they tended to demand a high degree of conformity. An understanding of the community or audience profile enabled communication that considered demographics and psychographics information, education levels, cultural beliefs, values, customs etc (Witte *et al.,* 2001). Such information was useful in the adoption of innovation process since it consisted the salient aspects necessary for designing appropriate messages for a given audience.

Bandura (1977) saw learning as a cognitive process that took place in a social context where cognition, environment, and behavior all mutually influenced each other. In rural societies, families retained strong social ties with neighbours, and farmer to farmer influence was an important factor in decisions to adopt a given agricultural information particularly when ideas come from the outside. Interpretations made by neighbours were critical importance in determining the likelihood of adoption (Harris, 1972). Where the extension service failed to solve a major farm problem (thus eroding farmers' confidence), the most dominant factor was information gained by observing the procedures and performance of neighbors, friends, and relatives who had experimented with the innovation as was the case in a study in India by Harris (1972). Another central proposition was that innovations offering greater relative advantage to farmers were more likely to generate more positive messages about the desirability of adopting and therefore likely to be adopted sooner (Lindner 1987, Defleur et al., 1989), and informal relationships played a big role in shaping decisions to adopt an innovation. Llewellyn (2007), examined an information and learning-based approach to explain why some agronomic innovations

were adopted widely and why others, even if apparently offering major benefits were slow to be adopted. Groups facilitated action learning, participative research, social networks, and capacity building. Information generated through local farmer group activity was perceived to have the relevance thus increased effectiveness and value. However, in some cases, both demonstration and imitation effects sometimes failed to exert influence (Ojo, 1963). Granovetter (1978) concurs that groups with similar average preferences may generate very different results; hence it is hazardous to infer individual dispositions from aggregate outcomes or to assume that behavior was directed by ultimately agreed-upon norms

2.5.3 Influence of Messages on Adoption of CBPP Vaccine

Individuals adopt new innovation based on information they had gathered about it. This was because the innovation-decision process was essentially an information-seeking and information-processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation (Rogers, 2003). Pannell (1999) says it was constructive to recognize that slow adoption of a new technology may be as a result of a rational wait for more high-quality information about its value to become readily available rather than some intractable attitudinal or social barrier to change. Braddocks (1958) argued that although message was an important factor of communications, so was the circumstances under which a message was sent, and the purpose of sending the message. Figure 2.3 shows Braddocks (1958) model of communication.

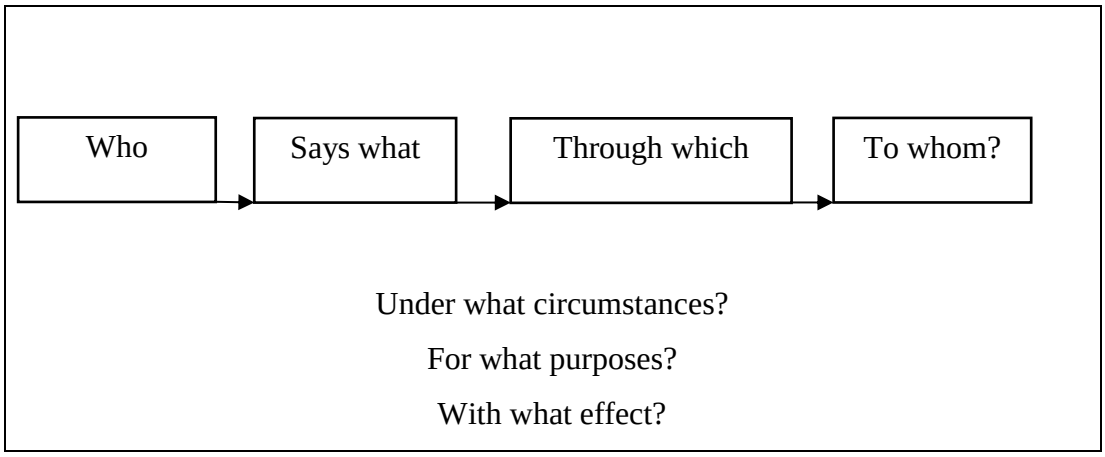

Figure 2.3: Communication Model

Source: (Braddock, 1958)

Messages characteristics affected persuasive impact of achieving maximum learning and agreement in individuals. The manner in which the message was organized, the type of appeal given, the number of repetitions, the vividness of language used, and more could influence the persuasive process (Witte, 1995). It was also important for a message to be simple without being reductionist (Flay *et al.*, 1990). Short of this, it was likely that the receiver may totally misrepresent the message. McQuail et al., (1993) recommended that the audience needed to know who was communicating to them. When the audience questioned the authenticity and legitimacy of the message, it was likely to be rejected. A source presenter who demonstrated behavior or provided a testimonial was much more desirable (Atkin, 2001).

Llewellyn, (2007) supported the possibility that characteristics of information quality contributed to whether particular extension information was considered or dismissed. Occasionally, closer attention to information-related factors in adoption decisions revealed learning-related constraints that may have otherwise be attributed to sociological or psychological factors deemed to be beyond the potential influence of most agronomy research projects (Baerenklau, 2005). In the case of CBPP vaccine, Waithanji *et al.*, (2015)

found that one of the barriers of adoption among women included their inability to access extension information on the disease, its control and benefits.

It was also important for a communicator to consider variables related to the source of the message e.g. credibility, attractiveness, legitimacy, similarity or power. These elements sounded subtle but had significant impact on whether the audience took the message seriously and were motivated to act (McGuire, 1969). McQuail *et al.*, (1993) further observed that often the communicator and the receiver had different meanings from a message and yet communication planners frequently overlooked this disparity. The result, of course is ineffective communication. Kreps et al., (1992) concured with this principle;

> *"……to develop messages, the key attributes of the audience for whom they are intended is important. Messages must appeal to specific audience since the audience members who do not perceive the campaign as personally relevant are unlikely to pay attention, interpret, recall or heed advice offered……"*

2.5.4 Perceived Characteristics of CBPP Vaccine

Rogers (1995) described the innovation-diffusion process as an uncertainty reduction process, where attributes of an innovations to decrease uncertainty. These attributes had five defining characteristics; relative advantage, compatibility, complexity, trialability, and observability and individuals' perceptions of these characteristics predicted the rate of adoption of innovations (Rogers 2003; Rogers et al., 1973)

Following Rogers (2003) and Rogers et al., (1973), this study found relative advantage as the degree to which an innovation was perceived as being better than the idea it superseded. For instance, while innovators, early adopters, and early majority are more status-motivated for adopting innovations, the late majority and laggards perceive status as less significant. Compatibility involved consistency with adopter's needs, value and belief systems. If an innovation is compatible with an individual's needs, then uncertainty

decreased and the rate of adoption of the innovation increased (Sahin, 2006). Furthermore, complexity of the innovation correlated with the rate of adoption. Trialability was the degree to which an innovation was experimented with on a limited basis while observability defines observability as the degree to which the results of an innovation are visible to others, and found evidence.

2.5.5 Demographic Characteristics

Demographic factors represented by the variables such as age, education, gender, income and marital status were often hypothesized as having an influence on the adoption of an innovation. (Rogers, 1995) found differences among adopter groups in terms of their personal characteristics, media behavior, and position in society also influenced adoption. Early adopters were young, had higher financial status and were equipped with greater mental ability than late adopters. Adesina et al., (2002), Baltenweck et al., (2000), and Karanja-Lumumba et al., (2015) agreed that educated individuals were more likely to understand the benefits of the vaccines. Rosen et al., (1995) found that demographic and psychological characteristics such as family income level, and literacy explained technological avoidance by some people. Occasionally closer attention to economic and information-related factors in adoption decisions revealed learning-related constraints to adoption that may have otherwise be attributed to sociological or psychological factors deemed to be beyond the potential influence of most research projects, (Baerenklau, 2005).

On the other hand, Heffernan *et al.,* (2008) and Heffernan *et al.,* (2011) argued that education, gender and socio-economic status per person per month income above or below the poverty line had no relationship with vaccination adoption. These studies found the adoption of particular vaccines was strongly influenced by other socio-cultural drivers such as caste system, rather than other factors such as income, age, education-level or gender. In their knowledge gap hypothesis of the infusion of media in the community, Tichenor *et.al.* (1970) proposed that segments of the community of higher levels of formal education had higher levels of public affairs knowledge compared to those segments with

less education. But Tan (1981), suggested that the critical variable in studying knowledge gaps was interest in the issue and not education. This standpoint the focus on the education variable was criticized as elitist because it implied that segments of the community with lower levels of education are somehow inferior in their information- processing capabilities than segments with more education. Tan (1981) says an issues could be interesting to community members regardless of education, income or occupational class, and that interest can motivate the individual to seek out information which then lead to higher knowledge levels among members a community. Homogeneity allowed members of a community to have more interpersonal discussion of an issue which may lead to what Tan (1981) calls knowledge leveling.

Empirical literature on gender among pastoralists indicated there existed division of labor where men controlled herding decisions and disposal of livestock, while women were responsible for the small stock such as goats, sheep, and chicken. Kipuri et al. (2008) says even women's diminishing control over livestock products such as milk has led to their growing vulnerability. Women were involved in preparing traditional remedies and treating sick livestock, although when modern medicine were bought, they were administered by the men (AU/IBAR, 2011). While pastoral women played a vital role in livestock production, culture prohibited them from interacting with extension officers. Most of them were found to be illiterate not speaking the national language or lingua franca used by government staff.

2.6 Critique of the Existing Literature Related to the Study

This section outlines three major areas of critique of existing literature as related to this study. One, innovation diffusion (Rogers, 1995) had inadequacies to drive this study. The concept was heavily influenced by the history of agricultural extension model which was developed on the basis of viewing farmers as passive recipients of information that they uniformly adopted and applied (Klerkx et al., 2010). Rogers (1986) refered to this model as a set of assumptions, principles, and organizational structures for diffusing research results, specifically within the context of farm audiences in the United States. He asserted

that this model was a centralized one where a government agency was responsible for diffusing agricultural technologies. The theory been subject to longstanding critique (MacVaugh 2010, Kelly 2012, Smith et al., 2008) reflected in a shifting consensus about the linear model of diffusion of innovation;

> *"By the early 1950s there was a broad consensus among scientists and extension officials that the process of behavioural change, in particular the process of technology transfers or innovation diffusion was well understood. By the mid-1970s this consensus was crumbling. Today, in the early 21st century, there is renewed questioning of our understanding and capacity to effectively promote technical change Smith et al. (2008).*

Today, models of innovation have made an explicit the shift from a focus on science push to demand pull (Nutley *et al.,* 2002). This concept has recognized the goals and aspirations of end-users as informing the innovation process has been put into practice through a focus on participatory research approaches. Hoffmann *et al.,* (2007) affirmed that the basic idea behind participatory approaches was because researchers and farmers had different knowledge and skills, and complemented each other by working together achieving better results than by working alone.

Secondly, the inadequacy of social learning (Bandura, 1977) theory was largely seen in the failure to explain some human behaviors. It lacked an overall understanding of the complexity of human behavior, personalities, and biological differences. The theory failed to answer a pertinent question, why do humans respond differently to similar situations? For example, in agriculture, some farmers do not always adopt agricultural technologies neither do they always imitate practices of their neighbors (Ojo, 1963).

Thirdly, most of the existing literature related to this study was done in the Europe and US, in fields such as national development, health, marketing, education, and ICTs. In agriculture for example, most of the literature are on adoption crop technologies (Llewellyn, 2007, Feder *et al.,* 1982; Gafsi *et al.,* 1979; Baerenklau, 2005). Studies on

adoption of livestock vaccines also exists (Heffernan et al., 2008 and Heffernan et al., 2011), but this researcher did not find literature on communications factors influencing adoption of CBPP vaccine. Also, in Africa and Kenya a lot of adoption of innovation literature related to this study was primarily related to agricultural crops, health, HIV/Aids and climate change (Clarke 1999, Kline *et al.,* 1994, Catania et al., *1990,* Wilson et al., *1992,* Ndegwa et al., 2012, Wood, 2011, Prager, 2012, Muchunku, 2015) and was not very valid for the study because the context was different. Local literature on CBPP vaccine offers some insight into the adoption pattern of CBPP vaccinations (Wanyoike 2009; Kairu-Wanyoike et al., 2014; Kairu-Wanyoike 2010) but failed to interrogate communication factors that influenced adoption of CBPP vaccine among the pastoralists in ASALs in Kenya. This pointed to the importance of this study.

2.7 Research Gaps

Numerous livestock vaccines are in use in Africa, but there little empirical evidence on the role communication played to influence adoption of these vaccines. Therefore, the study relied heavily on empirical studies from western countries which had little or no emphasis on developing countries and therefore could not be fully contextualized in Kenya. Researchers could make inquiries into communication factors that influenced adoption of other livestock diseases in Africa, and Kenya.

The study did also not conduct an experiment on communication factors to establish their effectiveness on adoption, so this gap can also be pursued by other communication researchers. Also, the study did not pursue an inquiry on the complex individual psychological behavior such as attitude change or persuasion of the respondents as Kelman (1961), Kelman (1974), Fishbein et al., (1975), and Petty et al., (1986). Research into this gap could be undertaken by other researchers interested in behavioural change communications.

2.8 Summary

Diffusion of innovation and other similar studies have been used to inform upscaling agricultural and livestock technologies across the globe. Most of these recent work corroborated Rogers (1995) theory on the role of mass communication in reducing uncertainty about an innovation and creating awareness of the innovation, and the role of CBPP vaccine communicators and the influence of message in aiding adoption of innovations especially in rural setting such as the one being studied. Additionally, perceived innovation and demographic characteristics represented by the variables such relative advantage, compatibility, age, education, and gender, are often hypothesized as having an influence adoption of an innovation. Innovation-decisions have been seen (Rogers, 1995, Day *et al.*, 1977; Cochrane, 1977; Mahajan. 1985) to be either optimal, collective or authority and farmers follow a sequence in adopting innovations.

However, adoption of livestock vaccinations studies is few particularly in Africa and Kenya thus the need for a study to investigate. The influence of communication factors on adoption of CBPP vaccine among the pastoralists in ASALs of Kenya. Several communication factor variables are being investigated to establish how they influence adoption of CBPP vaccine. Existing literature and theories on diffusion of innovations will be used to navigate the study.

In agriculture, most of studies are on adoption are on crops related technologies, as compared to livestock vaccines. It is hoped that this study added into communication knowledge on adoption of livestock vaccines.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter addressed research methodology for the study on the influence of communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya. It gives information on the research design, study population, sampling frame, sample size, sampling techniques, data collection methods and procedures. It also gives information on pilot test, data processing, analysis and presentation methods used.

3.2 Research Design

This study employed descriptive research design. McCombes (2020) and Sirisilla (2023) advances that this design can use a wide variety of research methods (Creswell et al., 2017) to investigate one or more variables by observing and measuring. The design basically collects information by interviewing or administering a questionnaire to a sample of individuals. The goal of descriptive research is to provide a comprehensive and accurate picture of the population or phenomenon being studied and to describe the relationships, patterns, and trends that exist within the data (Sirisilla 2023) without manipulating variables being studied. In their scholarly work, Osazee-Odia et al., (2021), Abu-Taieh et al. (2020), and Chebet et al., (2023) among others used descriptive research upon which this study was grounded.

Mixed method research on the other hand (Johnson et al. 2017, Bryman, 2007; Creswell et al., 2003), enables combination of qualitative and quantitative research approaches for the broad purposes of breadth, depth of understanding and corroboration of the phenomenon being studied.

This approach also enabled the study to have a quantitative understanding of the relationship between the four independent variables under investigation and to determine

which one performed better on the dependent variable. On the other hand, qualitative research provided an in-depth exploration of respondents' understanding of the influence of communication factors on adoption of CBPP vaccine within their natural setting. Interaction with the ASAL pastoralists enabled the study to hear multiple perspectives, opinions and ideas about the vaccine. Creswell (2003) says mixed designs are advantageous because they allow a view of research problems from multiple perspectives, contextualize information, develop a complete understanding and triangulate results. Triangulation facilitate the study to map out, or explain more fully the richness and complexity of the human behaviour by studying it from more than one standpoint.

3.3 Study Population

The study population were pastoralists who live in Narok South Sub County. These pastoralists own cattle and are aware of CBPP vaccine. They also fitted in Mugenda et al., (2003) Nachmias et al., (1996) and Kothari (2004) definition of population as an aggregate of a case that conformed to some designated set of specifications. Baxter (1977), Grönvall (2015), and Blench (2001) further helped this study to distinguish respondents in categories of pastoralists, agro pastoralists and mixed farmers. For purposes of this study, all the three groups were referred to as pastoralists but stratified sampling (Mugenda et al., 2003) enabled this researcher to bring out in depth knowledge of CBPP vaccine from each strata. Unit of analysis were heads of households in the Narok South Sub County, who were confirmed by Mugenda et al., (2003) as the most typical units of analysis for social science research.

Narok South Sub County was selected as the study site for several reasons. First, the respondents owned big number of herds. According to Narok County Government (2017), and KNBS (2009), there were 701,899 herds of cattle in Narok South County. The population had a deep knowledge of CBPP, its control and benefits of its control because 11 out of 16 CBPP outbreaks recorded in Kenya since independence were in Narok South sub-county; principally in Mara and Loita divisions. Secondly, the sub-county has been a target of CBPP vaccinations, and under permanent CBPP quarantine (Wanyoike 2009,

Kairu-Wanyoike et al., 2014). In Kenya, permanent quarantine entails restriction of cattle movement within some space. Currently, the government only allows movement of cattle outside the sub county to some designated slaughterhouses. These characteristics of the selected population in Narok South Sub County were in tandem with the objectives of the study. Residents of the sub county mainly derive their livelihoods mainly from agriculture and livestock, in form of mixed farming, pastoralism and agro-pastoralists (Narok South Sub County Livestock Office, 2017). Wanyoike (1999) and Kairu-Wanyoike et al. (2014) reported that in Kenya, CBPP is present in the Maasai ecosystem among other parts of the ASALs. Over a 10-year period, the incidence of CBPP in Kenya was 2.8% and 12.7% in endemic and epidemic situations respectively and up to 47% following mass screening of animals.

Narok South Sub County is one of the four sub-counties that form Narok County, and lies in the southern part of the Rift Valley covering 10,333 square kilometers. It comprises 6 administrative units and is home to Maasai Mara Game Reserve which is famous for annual wild beast migration. Figure 3:1 below shows the Map of study area, Narok South Sub County in Narok County.

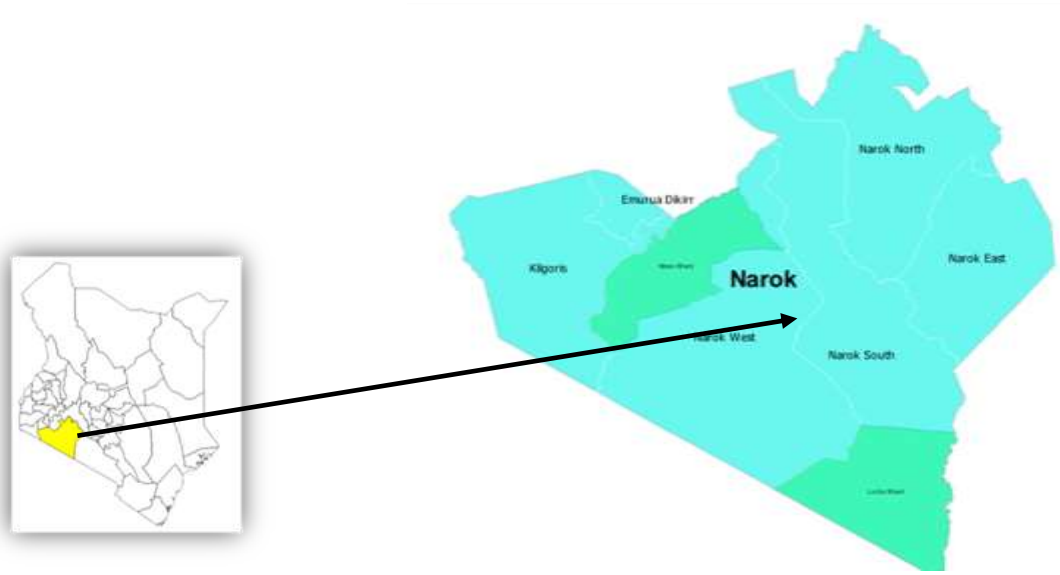

Figure 3.1: Map of Narok South Sub County, Narok County

Source: (http:// Narok.go.ke)

3.4 Sampling Frame

The eligible population for this study was drawn from a sampling frame or source list which was obtained from KNBS (2009). Narok County website and annual report, maps showing CBPP zonation, boundaries and population densities of Narok South Sub County were also obtained to complement KNBS report or to provide additional information. The unit of analysis were heads of households in Narok South Sub County who provided information on communication factors that influenced adoption of CBPP vaccine among ASAL pastoralists in Kenya.

Sampling frames for key informant interviewees were obtained from employee details of organizations that dealt with livestock health. These were national and county government veterinary offices, and Kenya Agricultural and Livestock Research Organisation (KALRO). Employee details provided information on the personnel who deal with veterinary health, rank and designation. These key informant interviewees provided

information sought by this study. Table 3.1 and 3.2 shows the population distribution and pastoralism livelihoods frame in Narok South Sub County.

Table 3.1: Population Distribution and Pastoralism Livelihoods Frame in Narok South Sub County

Division	Pop	H/H	MF	AP	P
Loita	18,963	4,409	0	9,704	8,869
Mara	51,153	14,140	3,134	0	47,967
Mulot	83,416	18,142	79,946	2,770	0
Ololulunga	65,614	18,678	53,035	0	12,000
Osupuko	27,786	7,043	0	8,829	18,386
Total	**317,048**	**80,961**	**139,249**	**31,007**	**144,058**

Key: HH- Households, MF-Mixed farmers, P- Pastoralists, AP- Agro Pastoralists (Source: NCVO, 2010)

Table 3.2: Key Information Interviews Frame

Organisation	No employees	CBPP vaccine informants
KALRO	3,000	1
State Department of Veterinary	1,100	1
Services	10	1
Narok County Veterinary Office	0	1
Religious Organisation (leader)		
Total		**4**

Source*: *Employee records of KALRO, State Department of Veterinary Services,* and *Narok County Veterinary Office (2019)

3.5 Sample and Sampling Technique

3.5.1 Questionnaire Sampling Technique

This study employed multistage sampling technique to select 440 participants who responded to the questionnaire.

In first stage, purposive sampling technique was used to select Loita and Mara in Narok South Sub County. The population living in this two divisions had experienced the highest prevalence of the CBPP in Kenya since 1980s and so had the attributes required for the

study. The population had a deep knowledge of CBPP, its control and benefits of its control because 11 out of 16 CBPP outbreaks recorded in Kenya since independence were in Narok South sub-county; principally in Mara and Loita divisions. (Wanyoike 1999, Kairu-Wanyoike et al. 2014). For this reason, three divisions in the sub county Mulot, Ololulunga, and Osupuko were left out.

In second stage, simple random sampling technique was used to pick sub locations from two divisions, based on proportionate sample size per division. Mara has 14 sub-locations while Loita has 9 (KDHS, 2009). All the 14 sub-locations in Mara division were placed in a container and four sub locations, namely Sekenani, Aitong, Olkinyei, and Siana were randomly picked. Similarly, in Loita division all the 9 sub-locations were placed in a container and 2 sub locations, and Olngarua and Nkopon were randomly picked.

In third stage, stratification technique was used to pick households in the selected sub location within three strata categories where 20 mixed farmers, 357 pastoralists, and 63 agro pastoralists. The sample size for the three stratus was proportionately calculated as follows:

MF= $\frac{3,134}{70116} * 440 =$ **20,** **P=** $\frac{56,836}{70116} * 440 =$ **357,** **AP=** $\frac{9,704}{70116} * 440 =$ **63,**

and further demonstrated in Table 3.3.

Table 3.3: Stratified Study Sample Size for Each Sub Location

Div	POP	HH	HHs	SSL	MF	P	AP	Total	FGDs	KII
Loita	18,963	4409	136	Olngarua	0	41	38	79	12	4
				Nkopon	0	26	25	51		
Mara	51,153	14140	304	Sekenani	3	52	0	55	12	
				Aitong	6	84	0	90		
				Olkinyei	3	52	0	55		
				Siana	8	102	0	110		
Total	**70,116**	**18549**	**440**		**20**	**357**	**63**	**440**	**24**	**4**

Key: HH- Households, MF-Mixed farmers, P- Pastoralists, AP- Agro Pastoralists

In fourth stage, systematic sampling technique was used to identify households from where participants for the study were drawn. Dudovskiy (2016) says this method is effective in primary data collection from geographically dispersed population where face-to-face (e.g. semi-structured in-depth interviews) contact in required. The 4^{th} -12^{th} interval was achieved using Mugenda *et al.,* (1999) rule of interval calculation which is to divide the total population by the sample size.

$$K\ th\ household\ per\ sub-location\ = \frac{Total\ sub-location\ households}{\text{Sub}-\text{location sample size}}$$

The study implemented fair distribution by identifying a starting points e.g. shopping centers, schools, water points or churches and walked to every other 4^{th} to 12^{th} household along existing roads/footpaths. Based on strata proportions, a household head responded to the questionnaire on the influence of communication factors on adoption of CBPP among ASAL pastoralists in Kenya as shown in Table 3.4

Table 3.4: Sampling Interval for the Household Head per Sub-Location

DIV	SL	HH	Pop	Hhs	SI (kth) per SL
Loita	Olngarua	357	1938	79	4^{th}
	Nkopon	228	1071	51	4^{th}
Mara	Sekanani	706	3194	55	12^{th}
	Aitong	1355	6433	90	12^{th}
	Olkinyei	643	3170	55	12^{th}
	Siana	896	4269	110	12^{th}

Key: Div- Division, SSL- sub location, HH- Household, Pop- Population, HhS- Household sample, SI- Sampling Interval per K th

3.5.2 FGD and KII Sampling Technique

Purposive sampling technique was also used to select respondents who had deep knowledge of CBPP vaccine to participate in the focus group discussions. They were selected based on gender, age and livestock ownership. Bryman (2011) supported this because selection of FGD participants depended on relevance of the discussion, but suggested a stratification of the FGD sample to ensure age, gender, hierarchy is observed. In order to get an indepth understanding of CBPP vaccine adoption and gender issues, one of the four groups comprised of women only, because Maasai women like in many other pastoralist communities did not freely express themselves in the presence of men (Ndanyi et al., 2014, Waithanji et al., 2014).

This technique was also employed to select 4 key informant interviews from KALRO, veterinary departments in the national and Narok county government. The researcher requested these entities for interview with experts who had deep knowledge of policy, control, and CBPP vaccine research. The technique was also found to be useful in recognizing rank, position and knowledge of the key informant interviewees. An opinion leader in the study site was also included in order to give an opinion outside government.

3.5.3 Questionnaire Sample

The sample size for this study was 468 respondents inclusive of both qualitative and quantitative samples as summarized in table. A total of 440 responded to the

questionnaire, 24 participated in 4 focus group discussions, and 4 respondents participated in key informant interviews.

Determination of an appropriate sample size is important, but there is no certain rule of the thumb to determine the sample size (Statistics solutions, 2007). However, if it too small it will not yield valid results while a large one will result in waste of money and time. It is also unethical to choose too large a sample size. In this study, the quantitative sample size was determined according to Pagano and Gauvreau (2006), formula designed for large populations. Any population of more than ten thousand (10,000) people is considered infinite, and the sample size is calculated using the formula:

$$n = \frac{Z^2 \times p\ x\ q\ x\ N}{e^2\ (N - 1)\ + Z^2\ x\ p\ x\ q}$$

$$n = \frac{1.962\ x\ 0.5\ x\ 0.5\ x\ 62412}{(0.05)^2\ \ (62412 - 1)\ + 1.96^2\ x\ 0.5\ x\ 0.5}$$

n=381.82

p= 0.5, q=0.5, Z= 1.96, e=0.05 where

n= sample size, N= entire population, Z= level of significance (1.96 confidence level), E= Expected error, p= Probability of occurrence, q= probability of non-occurrence

The sample size of 382 will be over sampled in order to achieve a response rate of 90 percent using the following formula:

$$Number\ of\ tools\ = \frac{100}{90} \times 382\ =\ 424 +\ 16$$

$$=\ 440\ respondents$$

Sixteen additional respondents were included, as the rule of thumb (Mugenda et al., 1999) was to obtain a big sample as possible. Therefore, size for the entire study totaled 468

respondents inclusive of both qualitative and quantitative samples where 440 responded to the questionnaire, 24 participated in 4 focus group discussions, and 4 respondents in key informant interviews. Statistical Package for Social Scientists (SPSS) version 20.0 was used to analyze data and results presented using regression coefficients and ANOVA.

This study used stratified sampling in order to achieve adequate representation where sub samples comprised three categories of the respondents according to their livelihoods of mixed farming, agro pastoralists, and pastoralists. Robson (2002) says stratified random sampling involves dividing the population into a number of groups, where members share particular characteristics. Following the stratification, the proportionate allocations of households per division and strata were; Loita 131 (or 31%) where a sample of 68 respondents were agro pastoralists and 63 respondents were pastoralists. In Mara, the sample was 293 (or 69%) where 18 respondents were mixed farmers and 275 were pastoralists as demonstrated in Table 3.5.

Table 3.5: Stratified Questionnaire Sample in Each Division

Div	MF	APs	P	TS	%
Loita	0	63	67	136	31
Mara	20	0	290	304	69
Total	**20**	**63**	**357**	**440**	**100**

Key: Div- Division, MF-Mixed farmers, P- Pastoralists, AP- Agro Pastoralists, TS-Total sample

3.5.4 Focus Group Discussion and Key Informant Interview Sample

Guided by Mugenda et al., (2003), Obwatho (2014), qualitative research for this study only sought an in-depth understanding of the perspective of respondents within their natural setting, in terms of their personal experiences of CBPP vaccination. Since there were no specific rules (Statistics solutions, 2017) to determine qualitative research sample size, this study considered a sample of 24 respondents as sufficient enough to participate in four focus group discussions. The qualitative sample size was determined by time allotted, resources available, and study objectives. Each of the selected divisions, Loita

and Mara had four discussion groups composed of six respondents each. This decision was also supported by (Patton, 1990). Creswell (1998) and Morse (1994) who recommends a minimum of four or six respondents. Morgan, (1997) says a study risks saturation and may not result to additional perspectives or information when more participants added.

Key informant interviewees sample comprised of four respondents from the organizations involved in CBPP control, vaccine research, and administration namely KALRO, veterinary departments in National and Narok County Governments. Table 3.6 below shows the study sample size.

Table 3.6: Study Sample Size

Sample	Size
Questionnaire Sample	440
Focus Group Discussion	24
Key Informant Interview	4
Total	**468**

3.6 Data Collection Instruments

This study on the influence of communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya developed and collected data using three instruments; a questionnaire and two interview guides.

3.6.1 Questionnaire

Quantitative data was collected using a detailed self-administered questionnaire which was arranged in a logic sequence to solicit basic information. Each item in the questionnaires addressed specific objective or research question of the study. The questionnaire was structured into two sections (A and B) for respondents to complete. Section A focused on demographic information of the respondents, i.e. age, marital status, sex, educational achievement, and ownership of livestock in the family while section B was divided into parts 1- 6 with each part catering for the five objectives of the study. In

part 1 of this section, questions 10-13 were on communication participants. In part 2, questions 14-16 were on communication channels, in part 3, questions 17-20 were on the influence of messages. In part 4, question 21 was on perceived characteristics of CBPP vaccine. Part 5 questions 22-23 was on adoption of CBPP. Part 6 questions 24-25 were on moderating effects of demographics characteristics on communication factors and the influence of adoption of CBPP vaccine. For efficiency, this study uploaded the questionnaire into an open data kit (ODK) replacing paper forms used in survey-based data gathering.

3.6.2 Focus Group Discussions

This instrument was used to guide collection of the qualitative part of the study from focus group discussions (FGDs), and sought information on the objectives set out. The guide helped in probing, clarifying, and keeping the informants focused on communication factors i.e. channels, participants, messages, and perceived characteristics of CBPP vaccine that influence adoption. The study allowed a free discussion through the use of the guide. Four English/ Maa-speaking translators (2 women and 2 men), who doubled up as research assistants helped with the translations where necessary and took notes in English in order to develop and analyze qualitative transcripts.

3.6.3 Key Informant Interviews

The key informant interview guide was used to collect qualitative part of information from key informants. The interview guide was prepared in advance to ensure the study gathered comprehensive information to fill the research gaps of the study in accordance with the objectives of the study.

3.7 Data Collection Procedures

This sections shows data collection procedures used in the survey, focus group discussions and key information interviews. The questionnaire was developed by the researcher and administered with 11 trained assistants in the sampled households. The questionnaire was

semi-structured with two sections (A and B) for respondents to complete; Section A focused on demographic information of the respondents and section B was divided into Parts I to V with each catering for the five objectives of the study respectively (See Appendix 2). Questions were logically ordered, had clear instructions, as brief as possible yet exhaustive, unambiguous, to ensure delivery of necessary data. A letter of introduction (See Appendix 1) was availed to each respondent. This enhanced the rapport between researcher research assistants and respondents during the door to door administration of the questionnaire.

3.7.1 Survey

A survey of 440 households was conducted by the researcher and 12 research assistants. Data was collected using a self-administered questionnaire on communication factors i.e. channels, participants, messages, and perceived characteristics of CBPP vaccine innovation that influences its adoption. The researcher and research assistants familiarized themselves with the geographical area of the study site, and prepared for the field logistics well in advance. The questionnaire was administered baraza with the interviewees and due diligence was taken to avoid the influence of the interviewer on respondents and possibility of systematic bias in answers. The prerequisite of this survey included establishing a rapport with the respondents before the interview, asking questions as they appeared on the interview schedule, recording exactly what was said by the interviewees and kept the questions in the order they appeared on the schedule.

3.7.2 Focus Group Discussions

Four focus group discussions were conducted to collect qualitative data in the study on the influence of communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya. Merton et al., (1956) say that FGD participants are selected because, “they are known to have been involved in a particular situation” and in this case they were purposively be selected on the basis of having knowledge on communication factors i.e. channels, participants, messages, and perceived characteristics of CBPP vaccine innovation

that influences its adoption. Taking Bryman (2011) advice that many FGDs may result to saturation, this study purposively selected 24 respondents to participate in four focus group discussions of 6 respondents each. Two FGDs were conducted in Mara division and two in Loita division. One women FGDs in Mara was also purposively selected, because in pastoralist communities, women do not express themselves in the presence of men. The separation of women and men is meant to maintain gender practices in the community (Ndanyi *et al.,* 2014; Waithanji *et al.,* 2014).

The study undertook two steps to obtain the data. The first step involved introductions, and creating rapport with the participants. In the second step, the researcher explained the purpose of the study and usefulness of the information being collected. An assurance was given that information being sought was confidential and their identities would not appear on the report. The researcher obtained permission to tape record the discussions. In the third step, the researcher allowed a free discussion guided by the focus group discussions guide.

3.7.3 Key Information Interviews

Four key informant interviews were conducted to collect more qualitative data on communication factors i.e. channels, participants, messages, and perceived characteristics of CBPP vaccine that influence adoption. The key informants were purposively selected from organizations involved in CBPP control, vaccine research, and administration; KALRO, Veterinary departments in the National and Narok South County Government, and an opinion leader in the area. The researcher obtained the required data by allowing a free discussion with each of the participants to bring out the salient issues under investigation. The researcher used the KII guide to moderate the discussion. The researcher also obtained permission to tape record the discussions.

3.8 Pilot Testing

A pilot study on the influence of communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya was undertaken for every data collection instrument in order to test appropriateness. The pilot was carried out in one of the randomly selected sub- location namely Nkimpta, Maji Moto, And Nkoilale sub locations, in Mara, Narok South Sub-County. The sites were picked because the population living there had similar characteristics with those of the actual study. A sample of 32 respondents were interviewed outside the sites where the actual study took place. The pilot survey size concurred with Isaac et al., (1995), who suggested that a sample of 10-30 respondents was sufficient to bring out salient issues being tested. The study made the necessary modifications in areas of weaknesses; order, precision, and clarity of the research instruments. The main instrument was further shortened for precision and to avoid redundancy. It was not necessary to conduct a chi-squire goodness of fit test because it was sensitive to sample size (Sandall, 2022) and if the size is less than 50 as in the case of this study.

3.8.1 Validity of Research Instruments

Validity for this study was related to the question of whether results obtained from the analysis of the data actually represented the degree the phenomenon studied. Mugenda et. al., (1999) confirmed that inferences based on such data was accurate and meaningful. Validity (Mugenda et. al., 1999) was three-fold; construct validity which measured the degree to which data obtained from an instrument meaningfully and accurately reflected a theoretical concept. Content validity on the other hand, measured the degree to which data collected using a particular instrument represented a specific domain of indicators or content of a particular content. Criterion related to validity was the use of a measure in assessing subjects' behavior in specific behavior in specific situations. Eventually, the data for this study was a true reflection of the variables, thus inferences made were accurate and meaningful.

3.8.2 Reliability of Research Instruments

Reliability of research instruments used in this study was fundamentally concerned with the issues of consistency of measures even after repeated trials. Results of the pilot test for study were subjected to a reliability test, Cronbach alpha for each variable was calculate using

$$\alpha = \frac{k}{k-1}\left(\frac{sy^2 - \sum si^2}{sy^2}\right)$$

Formula (Edgerton and Thomson, 1947). Reliability was confirmed through three things (Bryan et al., 2011). One, stability which entailed asking whether or not the measures used were stable overtime, so that the results relating to the measure of the sample did not fluctuate. Two, internal reliability, which was concerned with issue of whether or not the indicators that made up the scales were consistent and respondents' scores on any one indicator were related to their scores on other indicators.

Three, inter-observer consistency for this study was also confirmed. The results of the reliability test were shown in Table 3.7

Table 3.7: Cronbach Alpha Values

Variables	Items used	No	Cronbach Alpha	Interpretation
Communication channels	Vernacular radio IEC materials Baraza meetings	8	0.795	Acceptable
CBPP vaccine communicators	Experts Peers Community	10	0.810	Good
Messages	Inoculation site Benefits Frequency Side effects	5	0.991	Excellent
Perceived characteristics of CBPP vaccine	Relative advantage Compatibility Complexity Observability	4	0.983	Excellent
Moderating effects of demographic characteristics	Income Literacy Gender	7	0.710	Acceptable
Overall		**34**	**0.984**	**Excellent**

The study followed rules of the thumb to confirm Cronbach Alpha as recommended by (Edgerton and Thomson, 1947) where _>9- Excellent, _>8 –Good, _>7-Acceptable, _>6-Questionable, _>5-Poor, and _<5-Unacceptable. The study as demonstrated in Table 3.6 above had a high internal consistency of 0.7 and above, deeming the questionnaire reliable.

The validity and reliability of qualitative research, was checked against responses in quantitative research component of the study. Both methods were then triangulated (Creswell, 2011) to establish valid explanations on the study.

3.9 Data Processing and Analysis

In data processing and analysis, the goal of this study was to produce findings that related to the problem motivating the research and to provide steps that contributed to decision-

making process. Data processing involved the following steps; editing, coding, classification and tabulation so that they were amenable to analysis. Data analysis entailed computation of certain measures and searching for patterns of relationship that existed among data-groups. Data processing and analysis was done as advocated by Mugenda et al., (1999), thus bringing order, structure and meaning to mass of information collected from respondents of Narok South Sub County. Integration of both quantitative data in the form of numeric information and qualitative in form of texts (narratives) data was done as advocated by Creswell et al., (2011). In so doing, the study undertook the following steps.

One, quantitative data was cleaned to ensure completeness, accuracy, consistency and uniformity. The data was then coded to enable responses for various categories and for ease of analysis. Data collected was then entered into the computer using Statistical Package for Social Scientists (SPSS) version 20.0 which is the most widely used computer software for the analysis of quantitative data for social sciences.

Two, qualitative data derived from key informant interviews and focus group discussions was transcribed and then coded according to emerging themes in view of the study objectives and research questions. Key narratives or texts was then used to supplement the quantitative data, which Mugenda et al., (1999) says gave a chance to the respondents to be heard.

Quantitative data was statistically analyzed according to study objectives and research questions. The analysis was conducted including descriptive, Chi-square goodness of fit statistical test, ANOVA and moderating multiple regression. The level of statistical significant was considered at $p< 0.05$ for the rejection of null hypothesis. Multiple regression was done to establish the relationship between the independent and dependent variables. Moderating multiple regression analysis was performed where the interaction term was included into the model; demographic variables and independent variables of interest. Results of analysis were shown in chapter 4. The regression model is hereby presented:

$$\text{Model 1: } y\_1=\beta\_1 x\_1+\beta\_2 x\_2+〖\beta\_3 x〗\_3+\beta\_4 x\_4 \quad (1)$$

Where: 〖x〗_1= communication channels, x_2= CBPP vaccine communicators, x_3= messages, x_4= perceived characteristics, x_5= education, x_6= income, x_7= men, x_8= women, While: β_1, β_2, β_3……β_8 are the regression coefficients. Model 1, (1) is the regression model with the dependent variable and independent variables (communication factors) factors without the interaction term (interaction between communication factors and demographic factors).

$$\text{Model 2: } y\_2=\beta\_1 x\_1+\beta\_2 x\_2+〖\beta\_3 x〗\_3+\beta\_4 x\_4+〖\beta\_5 \gamma〗\_ii \quad (2)$$

Where γ_ij= interaction term between the demographic factors and communication factors.

Model 2, (2) is the regression model with the dependent variable, independent variables (communication factors) and interaction term (interaction between communication factors and demographic factors). Chapter 4 provides elaborate analysis of findings.

3.9.1 Ethical Considerations and Permissions

The researcher obtained a letter introducing the researcher as a PhD student from Jomo Kenyatta University of Agriculture and Technology (JKUAT) on 23 February 2018 (Appendix VIII), and research permit from National Council for Science, Technology and Innovation (NACOSTI) on 5 June 2020 (Appendix IX). The two documents were presented to the Narok County Veterinary Director, who assisted with the recruitment of assistants, gave insightful information and logistical support before and during the duration of the research. The study conformed to ethical issues of privacy, confidentiality, sensitivity to cultural and gender differences, and anonymity required in research. This was in view of, “ethical research is considered as one that does not harm” and which gained informed consent and respected the rights of individuals being studied (Madge, 1994).

The researcher recruited 12 research assistants due to the expansive nature of the study site. Before the researcher embarked on data collection, all research assistants were trained. They were trained on key terminologies, objectives and expectation of the research, methods of administering the questionnaire, and general approach of administering it using ODK tool kit on their android mobile phones. Since the research was undertaken just before COVID 19 pandemic period, the assistants were also trained on health and safety measures and, on basic interpersonal communication and public relations approaches. Data collection started after the researcher was satisfied that the trainees well understood their assignments. This helped to minimize errors.

Prior appointments with key informant interviewees and focus group discussants were sought and granted. The research teams adhered to given dates and times without fail. Tape recording of discussions was done with permission from the interviewees. Notes were also taken to back up the recording.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents research findings and discussions of the study thus bringing the study into perspective. The research objectives were to 1) examine the influence of communication channels on adoption of CBPP vaccine among ASAL pastoralists in Kenya, 2) establish the influence of CBPP vaccine communicators on adoption of CBPP vaccine among ASAL pastoralists in Kenya, 3) evaluate the influence of the messages on adoption of CBPP vaccine among ASAL pastoralists in Kenya, 4). Determine the influence of perceived characteristics of CBPP vaccine on adoption among ASAL pastoralists in Kenya and finally to, 5). Establish the relationship between demographic characteristics and communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya.

The study used both quantitative and qualitative data as advocated by Creswell et al., (2011). This integration consisted of combining qualitative data in the form of texts (narratives) with the quantitative data in the form of numeric information. In so doing, the study undertook the following steps. One, quantitative data was cleaned to ensure completeness, accuracy, consistency and uniformity. The data was then coded and posted using Statistical Package for Social Scientists (SPSS) version 20.0, the most widely used statistics software for the analysis of quantitative data for social sciences. The data was then statistically analyzed in reference to study objectives, research questions and hypothesis.

Results of hypothesis tests were presented in summary in accordance to the statistical analysis of questionnaire scales. The level of statistical significance was considered as $p< 0.05$ for the rejection of null hypothesis. Secondly, every hypothesis summary of all influential communication factors observed by more than 50% of respondents was split

and each item was subjected to chi-squire goodness of fit statistical test to determine their level of significance. The data was then presented in form of tables, bar graphs and notes relevant to research objectives and questions. The analysis was conducted using chi-square goodness of fit statistical test, ANOVA and moderating multiple regression. Multiple regression was done to look at the relationship between the independent (x_i) and dependent variables (y). Moderating multiple regression analysis was performed where the interaction term was included into the model; demographic variables and independent variables of interest

Qualitative data derived from key informant interviews and focus group discussions was transcribed and then coded according to emerging themes in view of the study objectives and research questions. Key narratives or texts were then used to build up on the quantitative data, thus giving a chance to the respondents to be heard. The validity and reliability of the findings were further enhanced through triangulation of qualitative and quantitative data.

In the results and discussions section, quantitative data was presented in form of tables, graphs, and other visual presentations to add value to the content. However more detailed table representations of the study are placed in the appendices.

4.1.1 Reliability Analyses

Cronbach's alpha was used to measure reliability of scales and internal consistency for the sample using the formula

$$\alpha = \frac{k}{k-1}\left(\frac{sy^2 - \sum si^2}{sy^2}\right)$$

as advocated by Edgerton and Thomson (1947), and used these scales. The alpha coefficient for the five items were over .70 suggesting that the items had relatively high internal consistency

4.1.2 Response Rate

Data was sourced from 468 respondents of Narok South Sub through a survey, focus group discussions and key informant interviews. Quantitative data was sourced from 440 respondents comprising mixed farmers, agro pastoralists and pastoralists. In the survey, the researcher made a decision to include 16 extra respondents (from initial 424) to cater for non-responses and included these in the analyses since they had no effect on the study outcomes. The study undertook 4 focus group discussions where 24 respondents participated, and 4 key informant interviews. The response rate was 100% making it sufficient for analysis. The study used a tool, Open Data Kit (ODK) that allowed data collection using android mobile devices to submit data to an online server. This greatly improved data collection by researcher and reduced challenges of non-response, as would have been the case with manual data collection. Table 4.1 show the quantitative and qualitative data sources

Table 4.1: Distribution of Study Informants

Type	Targeted	Actual
Survey	424	440
FGD	24	24
KII	4	4
Total	**452**	**468**

4.1.3 Distribution of Survey Respondents by Division, Sub Locations and Cluster

Data for this study was collected from, Loita and Mara divisions in Narok South Sub County. The population had a deep knowledge of CBPP, and benefits of its control. The sub county was purposely selected because 68.8% of CBPP outbreaks recorded in Kenya since independence were in Narok South Sub-County; principally in Mara and Loita divisions. Secondly, the sub-county was a target of CBPP vaccinations, and has been under permanent CBPP quarantine (Wanyoike 2009, Kairu-Wanyoike et al., 2014). Fig 4.1 shows the distribution of respondents by sub- locations.

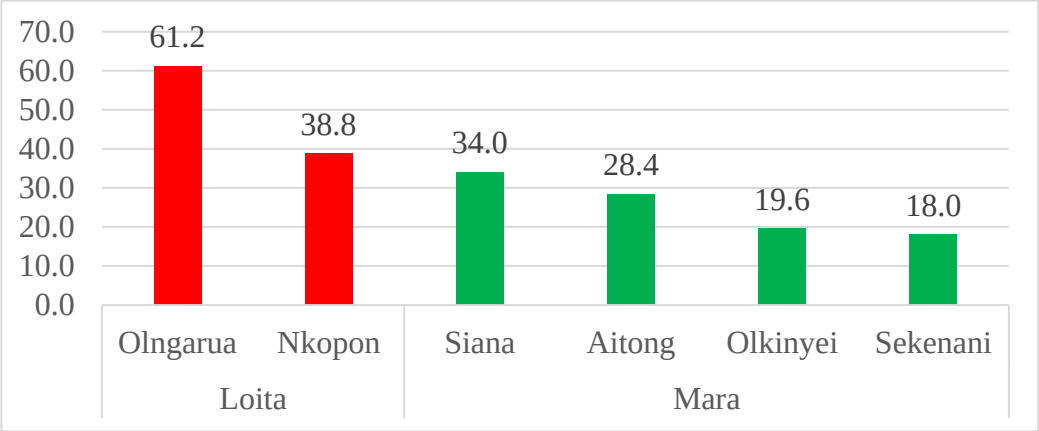

Figure 4.1: Distribution of Respondents by Sub Locations

Loita and Mara divisions of Narok South Sub County contributed to 30.5% and 69.5% respondents respectively as shown in table 4.1 above. The study found out that all the respondents, 30.7% in Loita and 69.3% in Mara were born in the respective divisions, and were found to be knowledgeable about CBPP vaccinations. For purposes of the study, those not born in the sub-county and but had lived in the divisions for a period of more than 4 years were also included in the survey because they were deemed to know about the disease and vaccinations. This also enabled the study to develop an adoption pattern over spanning 4 years.

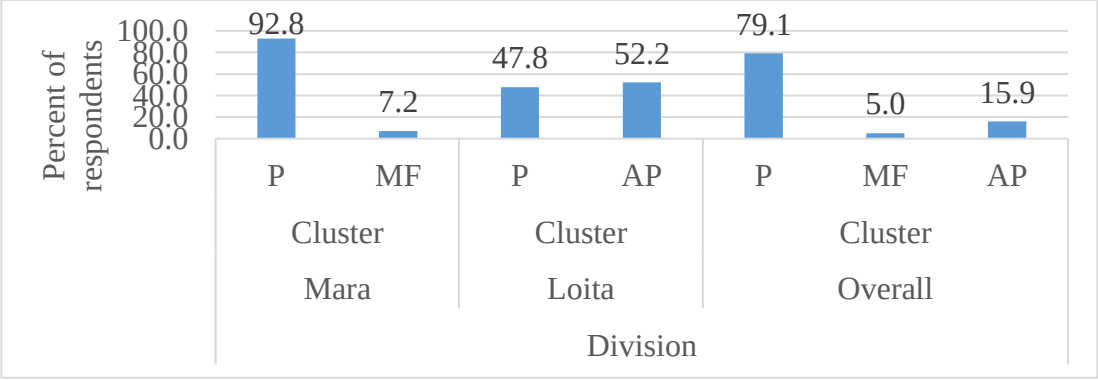

Figure 4.2: Distribution of Respondents by Division and Cluster

The study achieved proportionate representation of three categories of respondents who participated in the study according to their livelihoods of mixed farming, agro pastoralists, and pastoralists. Thus, the study achieved responses in each cluster, with the following outcomes, 5.0% mixed farming, 15.9% agro pastoralists, and 79.1% pastoralists as shown in Fig 4.2.

4.1.4 Demographic Characteristics of the Sample and Cattle Ownership

In this sub-section, the study established demographic characteristics of the 440 survey respondents who participated in the study on the basis of their age, gender, marital status, and literacy levels. The study also established the number of livestock they owned, their awareness of CBPP vaccine, and knowledge of CBPP vaccine use as demonstrated by table 4.2 and fig 4.3

Table 4.2: Summary of Gender, Age, Literacy and Marital Status of Respondents

Variable		Frequency	Percent
Gender	Male	328	74.5
	Female	112	25.5
Marital status	Married	376	85.5
	Single	64	14.5
Age bracket	31-50	204	46.4
	18-30	148	33.6
	51-70	80	18.2
Literacy	Over 70	8	1.1
	University	29	6.6
	College	49	11.1
	Secondary	67	15.2
	Primary	81	18.4
	Adult education	5	1.1
	Never	209	47.5

The study findings in each of the four age brackets was that more males (74.5%) than females (25.5%) responded to the survey. Waithanje et al., (2015) says the reason for such an outcome was because gender dynamics among the Maasai community dictated that men made most decisions associated with cattle production. Majority (85.5%) of

respondents were married and 14.5% were single. Results shown that literacy level of the respondents was 14.5%. This because majority of the respondents (47.5%), had never been to school, those who had primary education were 18.4%, secondary 15.2%, college 11.1%, university 6.6%, and those who attended adult education classes were 1.1%. The study found that almost all respondents except 0.02 % owned cattle. In this regard, 99.98% of the respondents were found to be eligible for the CBPP vaccine study because they met the threshold required to respond to the inquiry. A local veterinarian summed up eligibility of the respondents in participating in the study.

> *"Residents of Narok South Sub County especially Loita and Mara divisions are aware about dangers of CBPP, a cattle lung disease. This area has been under quarantine, and Government has been vaccinating their cattle for many years. However, the disease has not been wiped out due to many challenges including low adoption, accessibility of the vaccine".*

The respondents' knowledge of CBPP concur with a study by Kairu- Wanyoike et.al (2014) the population studied had been exposed to CBPP and had been targets of government vaccinations for a period of time. Almost all of the study respondents (99.5 %) reported using the CBPP vaccine, although they skipped year's thereby exposing animals to infections.

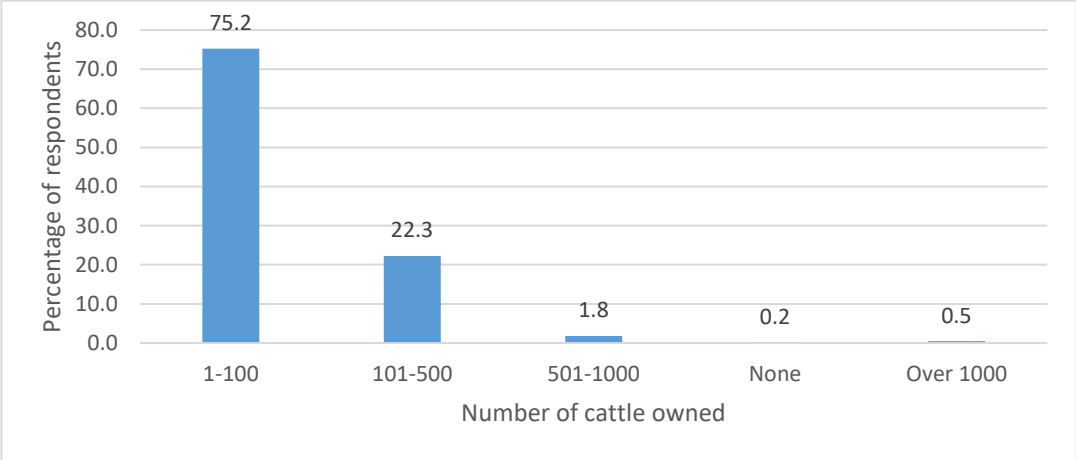

Figure 4.3: Percentage of Ownership of Cattle

4.1.5 Respondents' Knowledge of CBPP Vaccine

The study found that virtually all the respondents did not know the exact name of CBPP vaccine (Kairu-Wanyoike, 2015), which was referred as T144 (Nkando et al., 2011) in veterinary terms. The vaccine was also described as a live attenuated vaccine currently viable option to control CBPP in Africa. Due to long period of exposure, respondents coined descriptions to fit their individual perception of the vaccine, although some confused it with treatment hence the local term "dawa" (instead of *chanjo*) to imply medicine or vaccination. The following the response was recorded;

"Dawa ya mkia ya olkipei ya barafu" (meaning cold CBPP tail treatment)

4.2 Analyses of Study Variables

This section presents an analysis of study varables. In the first objective, on the influence of communication channels on adoption of CBPP vaccine among ASAL pastoralists in Kenya the study analyzed vernacular radio, IEC, baraza meetings and added informal conversations after pretest results showed the effectiveness of this form of communication. In the second objective on the influence of CBPP vaccine communicators on adoption of CBPP vaccine, analysis was under the perimeters of experts, peers and

community. In the expert category, only veterinary officers were studied while under peers were opinion leaders, Maasai elders and family, while under community were herders and neighbours. In the third objective on the influence of messages on adoption of CBPP vaccine, analysis was done under parameters of inoculation site, benefits, required frequency of vaccination and side effects. In the fourth objective the study determined the influence of perceived characteristics of CBPP vaccine on adoption among ASAL pastoralists in Kenya. To achieve this objective, the researcher subjected the respondents to a set of four questions on communications of perceived characteristics (relative advantage, compatibility, less complexity, and observability). The fifth objective the study established moderating effects of demographic characteristics on adoption of CBPP vaccine among ASAL pastoralists in Kenya where income, literacy levels and gender were analyzed. The study utilized inferential and descriptive statistics to analyze quantitative data collected in the study, triangulating it with qualitative narratives. The analyses are provided in the following section.

4.3 Influence of Communication Channels

The first objective of the study examined the influence of communication channels on adoption of CBPP vaccine among ASAL pastoralists in Kenya. Respondents were asked a set of questions leading to this objective. Justification for this line of inquiry was made by Carbone (1975), Tan (1985), Eagly (1974), and McGuire (1969) that persuasive impact is determined by message factors and other variables. In diffusion of innovation process (Rogers,1995) these channels were key in influencing adoption. Also, they were either interpersonal or mass media in nature, originated from localite or cosmopolite (those from inside the social system and outside the social system). The localite channels including vernacular and community radio stations, "connected" with their audiences using local language(s), promoted empowerment and active participation of community members (Rogers 2003, Jallov 2012).

First, the researcher listed seven communication channels and asked respondents pick those often used to communicate CBPP messages. The researcher purposefully included

informal conversations in the study items, after the pre-test survey showed that this channel was mostly used in CBPP communication to the respondents. Secondly, respondents were asked to choose the channels they liked and thirdly, their reasons for selecting them.

The list of communication channels used to communicate CBPP vaccine messages to respondents was tallied and shown in table 4.3. The table showed that majority of respondents cited four channels as having been used; informal conversations 92 %, baraza meetings mostly with veterinary officials 87.3%, mobile phone 72.5%. Vernacular radio was mostly used to reach 64.1% of the respondents. Conversely, respondents listed 3 least used channels were posters and banners, other channels e.g. newspaper, church or school announcements and social media (e.g. WhatsApp, Facebook) which accounted less than 25%.

Table 4.3: Channels Used for CBPP Communication

Communication Channels often used	Frequency	%
Informal conversations (Romon) at livestock markets and shopping centres)	405	92.0
Baraza meetings with veterinary officers	384	87.3
Mobile phone	319	72.5
Vernacular radio	282	64.1
Poster and banners posted in market places	95	21.6
Other channels (newspaper, church or school announcements)	90	20.5
Social media (e.g. WhatsApp, Facebook)	69	15.7

After listing of the channels used to communicate CBPP vaccinations, the study showed that only four channels were liked and three others were not liked by the respondents. The most liked were baraza meetings 98.8%, informal conversations 99.3 %, vernacular radio 96.5%, mobile phone 93.4.5%, while all other categories were below 25%. Those liked were subjected to cross examination to determine their attributes. Results showed that attributes that appealed most were their localite nature, trustworthiness, clarity, and the fact that these channels communicated in Kimasaai language.

The four leading channels selected by respondents were also found to be effective in other studies undertaken by among others AGREN (2000), CCK (2021), Bandura (1977), Baird and Hartter (2017), Rogers (1995) and DeFleur et al., (1983). Impersonal communication among respondents themselves, and baraza meetings especially with veterinary officers was confirmed by Rogers (1995), DeFleur et al., (1983), Nisbet (2018) as effective than any mass media influence in persuading an individual to accept a new idea. Rogers (1995) says this was because interpersonal channels provided a two-way exchange of information and unlike mass media, they dealt with resistance or apathy on the part of the receiver. An interpersonal source could information or clarify points, surmount psychological and social barriers. Furthermore, recipients of orally presented messages could identify with the communicator and can engage in role relationship.

Informal conversations or *romon,* liked by 99.3 % often happened in relaxed environments such as livestock markets water points or shopping centers. This informal means of influence was confirmed by Bandura (1977) in social learning theory, as a processes involving conformation to already known socially acceptable roles and practices where people learned to fit in. New knowledge (such as CBPP vaccine as in the case of this study) was thus generated within, and facilitated by a social structure and interactions where one was exposed.

Vernacular radio which was liked by majority (96.5%) was particularly used by agro shop salesmen veterinary officials to either advertise the vaccine (The study found this bit of information unusual because the vaccine was restricted and access was through Government owned facilities) and county veterinary officers or to make public announcements on vaccination campaigns. Although the study did not undertake an indepth inquiry on vernacular radio stations used to communicate CBPP vaccination activities, the researcher listed Mayian, Emoo, Oltoilo Lemaa, Nosim 9.5 FM, Sidai FM, Radio Maa FM, as radio stations that broadcasted in Kimasaai language. The existence of over 150 radio stations in Kenya including six vernacular radio broadcasting in Narok South were confirmed by CCK (2019) and KARF (Audience Survey Q4, 2013). Announcements in church and school (under the category of "other channels") was liked

by 77.1%. This outcome was validated by Lowery et al., (1995), and APD (2002) because word of mouth was much more appreciated than other forms of communication among nomadic communities and news passed orally fitted their way of life given the limited availability of contemporary communication or media channels.

Although the researcher had not factored the inquiry on the use of mobile phone in the study, a significant number of respondents alluded to its use during the pretest, thus researcher's decision to include it in the study. Consequently, a significant number of the respondents (72.5%) reported that mobile phone was used to communicate CBPP messages to them. It's use in communicating CBPP vaccine messages was significantly liked by 94.3% of the respondents. Widespread use of mobile phone in Kenya was confirmed by CCK (2021), but in this study, respondents reported using it to communicate CBPP vaccine and livestock issues. These reasons for mobile phone usage were corroborated by Baird and Hartter, (2017) who found that the gadgets were useful in transforming poor people's lives and were particularly critical to herding communities in combating pastoralists' greatest challenge, uncertainty. For generations, pastoralists have moved across the landscape in search of forage and water for their livestock, social networks were paramount for sharing information, but communication was challenging. Now, with mobile phones as this study attested, herders could share information easily, quickly and over great distances. They called each other to locate resources or notify others when health emergencies such as outbreak of CBPP arose, vaccination activities, and relayed information to support their traditional herding activities. A Senior Director of Veterinary Services in the Ministry of Agriculture and Livestock Development had this to say about communication channels;

> *"Before we undertake CBPP vaccination exercises, we set vaccination targets mobilize cattle owners to bring their animals. These days, mobile phones are handy even in the remote corners of the country so use them to call the community leaders on mobile phone. These leaders have the greatest influence over the rest of the community. Sometimes we use vernacular radio to place announcement or mount speakers on a vehicle to publics the events"*

The least liked channels were IEC materials e.g. banners, and social media. Ilic and Rowe (2013) and Maier and Thurber (1968) says in some cases IEC materials were effective because they gave a visual representation of an issue and helped to overcome perceived barriers, but their passive nature if not accompanied by an active intervention such as oral presentation to help with aural and verbal learning exchange, they reached a limited proportion of intended audience. Considering that the study found literacy level of the respondents was on average of 16.7 %. Ilic and Rowe (2013) and Maier and Thurber (1968) observation was proved valid because at its most basic, literacy (UNESCO, 2009) is the ability to decode and encode written text and do arithmetic. Social media channels liked by 49.2% of the respondents. This brought to the fore arguments by Prensky (2001), Palfrey & Gasser (2008) that most social media users were youth or "digital natives" born after 1980, who used the mobile phone to keep in constant touch with friends via online communities. Prensky (2001) also found that social media users included older and educated users or "digital immigrants," who used the internet regularly but selectively because they were skeptical about its use. Only 1.1% of respondents liked channels that were town based or cosmopolite. Lazarsfeld, Berelson and Gaudet (1944) and Rogers (1995) says respondents influenced these channels may have been more educated members, or opinion leaders described by users of mass media as having higher levels of gregariousness and a self-perception as influential on others.

On the inquiry of attributes of the channels selected, respondents gave a range of reasons. Clarity of channels used to communicate CBPP messages about vaccination was cited by majority (81.8%) to respondents as one of the main reasons for paying attention. Carbone (1975), Eagly (1974), Mc Guire (1969) say lack of clarity in a message could result in unfavorable evaluation of the source. In relation to clarity, the channels that communicated in the local Kimasaai dialect were reported by 79.5% of the respondents. This is because Maasai had a sense of confidence in their channels, an assertion held by Jallov (2012) that usage of local language(s) by community radio promoted empowerment and active participation of a community.

A significant majority of respondents (76%), trusted the channel, while 74.7% reported accessibility was reason why they liked the channels. These high ratings of trust and accessibility by respondents concurred with among others (Carbone, 1975; Tan, 1985; Eagly, 1974; McGuire, 1969). The localite nature of the channels was liked by half (54.2%) of respondents, and this was because they emanated from within the local social system (Rogers, 1995). Interpersonal influence played a role as reported by a segment (44%) whose reason for liking the channels was because their family, friends, neighbors liked them. McQual and Windahl (1981) reinforced this assertion because change could occur in several stages affecting few influential individuals first, then those integrated into relevant social circles, then later affecting the more isolated or less integrated. A significant fraction (39.9%) said they liked the channel because they incurred little or no costs to receive massages on CBPP vaccination.

Overall, the inclusion of communication channels in this study was justified by McLuhan's (1964) theory that the "the medium is the message not the messages it carries" and Rogers (1995) who saw communication channels as one of the main elements in diffusion of innovations process. Studies by Carbone (1975), Tan (1985), Eagly (1974), and McGuire (1969) found that in any communication situation, persuasive impact is also determined by channel factors among others. In this, AGREN (2003) considered radio useful in sharing of agricultural information, because of its ability to employ native languages to reach the critical rural population. The study finding on the most liked CBPP communication channels and their attributes was corroborated by the qualitative data of the research while Fig 4.4 below demonstrates this.

RQ: Which communication channels are often used to influence the community to vaccinate cattle against CBPP? Why do you like them?

R- "We usually get a lot of CBPP vaccine information during "Romon." The radio that broadcasts in our language is also a very good source of advice. Even mobile phone is now important to us because we use it to report about outbreak of CBPP or let everybody know when our cattle will be vaccinated. We prefer

when our local language is used because of clarity. We trust these channels because we know them and we don't have doubts about they say. Everyone in the village likes them. You cannot introduce new ways because people will question.

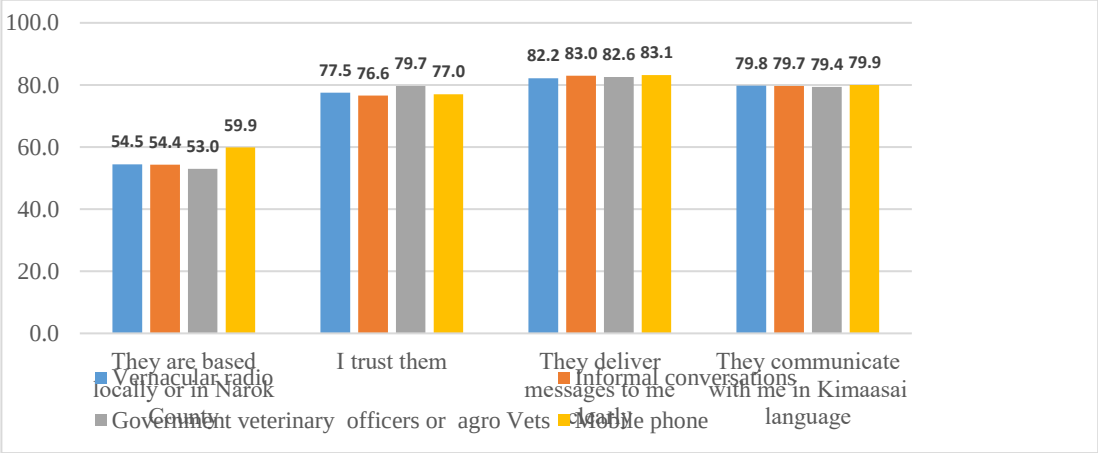

Figure 4.4: Most Liked CBPP Communication Channels and Their Attributes

4.4 Influence of CBPP Vaccine Communicators

The second objective of this study was to examine the influence of CBPP vaccine communicators on adoption of CBPP vaccine among ASAL pastoralists in Kenya. Respondents were asked a set of questions to meet this objective. First, they were asked to state if they engaged in discussions with others before vaccinating their cattle against CBPP. Secondly, from a list of people who included experts, peers, and community, respondents were asked to state who they consulted and to state the qualities of their influencers.

Results from the study showed that almost all (98.9%) respondents reported that they engaged in discussions with one another before vaccinating their cattle against CBPP. Rogers diffusion of innovations and Granovetter's threshold models of collective behavior (Rogers 2014, Granovetter 1978), explained how influence stemmed from person's social ties such as the adoption of CBPP vaccine being studied. In herder communities, Othieno

et al., (2022) reported that interpersonal information sharing and radio were the leading sources of information. CBPP influencers who were consulted on CBPP vaccine are shown in table 4.4 below.

Table 4.4: Those Who Influenced the Community

Inflencer	Frequeny	%
Neighbours	416	95.4
Veterinary officers	397	91.1
Family (wife, husband, children, relatives)	260	59.6
Herders	257	58.9
Maasai elders	169	38.8
Chief and Assistant Chief	98	22.5
Religious leaders and professionals from the community (e.g. teachers & pastors)	52	11.9
Others (State)	1	1.4

This study found that veterinary officers and some members of the community and peers in Narok South Sub-county were more influential than others in adoption of CBPP vaccinations. Thus, neighbours (95.4%), veterinary officers (91.1%) family (59.6%), and herders (58.9%) were cited by most respondents as being influential. The interpersonal influence in Narok South typically occurred at relaxed environments such as watering points, livestock markets, or slaughter houses during interactions referred to as *Romon* (chewing words in literal meaning). In other documented research *(*Munchunku, et al. 2014, Keller et al. 2003, Haydarov et al. 2014), support this study after they found that residents of ASAL regions were distrustful of news and advertising from mass media, preferring recommendations or communication from friends, family, coworkers, and peers instead. The study findings on the influence of CBPP vaccine communicators and their attributes on CBPP adoption was corroborated by a discussion with one focus group;

> *RQ: Are there individuals within the community who are often sought out for advice when people want to make a decision to vaccine against CBPP because they generally seem to know a lot about livestock diseases? RQ: Who are these influencers?*

P1- "We usually seek each other out, family, neighbors, friends and animal health assistants before collectively agreeing to vaccinate against CBPP. We usually discuss and agree on important issues such the dates and venue for vaccination, and also contribute some little money to enable veterinary officers to reach our village. We make vaccination decisions when drought is ended and there is enough pasture for our cattle".

P2- "We are influenced most by our elders and neighbours next to us and in other villages to vaccinate against CBPP. We are also influenced by herders whom we employ because they spend most of their time with our animals and they know a lot about livestock diseases. We vaccinate when we from hear elders and neighbours that herds in the neighboring areas are infected, because we don't want ours to be infected. We pass messages to each on the same and a communal decision is made to vaccinate all the animals, but veterinary people also tell us what to do and we don't question!

The population studied was almost entirely homogenous (Oxaal, 1997) providing an opportunity for the influencers to be successful in persuasion. This is because (McGuire,1969) audiences were attracted to communication sources that shared common demographic characteristics with them such as age, education, occupation, income level, religion, race and place of residence. But Lowery et al., (1995) argues that this might not always be the case. Family and friends may play an influential part, but neighbours' opinions may not be so important due to differences within the social groups resulting to communication breakdown (Newheiser et al., 2012). Connolly (2019) further explains this aspect of human behavior through the conspiracy theory. The theory advances that audiences are a suspicious lot especially when a few people or elitists seemed to be pushing an issue construed to benefit them and not the masses. In CBPP messaging, CBPP vaccine communicators did not clearly address two areas of concern for the respondents-inoculation site and side effects of the vaccine on some animals. Severe post-vaccination reactions, inappropriate vaccination seasons and lack of knowledge of the vaccine (Kairu-

Wanyoike et al.,2014) gave credence to the conspiracy theory, and was evident when some respondents skipped some vaccinations.

On attributes of CBPP vaccine adoption influencers, trustworthiness and credibility of the family was rated at 91.1%, herders at 88.8%, veterinary officers at 82.6% and neighbours at 81.4%. Knowledge of CBPP and other livestock issues was also highly rated among family 74.9%, herders 70.3%, veterinary officers 69.5%, and neighbours 66.5%. Accessibility of family was rated at 83.4%, herders at 79.1%, neighbours 72.3%, and veterinary officers at 70.3%. Ability to explain the benefit of vaccination was herders 75.1%, family 74.9%, and veterinary officers 67% and neighbours at 65.8%. These attributes were key in influencing behavior of audiences as reported by Birnbaum et al., (1979), Fishbein et al., (1975), but Kelman (1961) the power attribute was the most effective. Powerful sources had three characteristics- perceived control, concern, and scrutiny.

Despite their heterophilous state, the officers were successful because they were professionals or change agents who communicated desired adoption decisions. They used the government authority they held to exercise perceived control (an extent to which the audience perceived the source's ability to administer rewards and punishment). They used this power to mobilize communities' to take CBPP vaccine and were instrumental in changing people's attitudes and behaviors towards control of the disease, but in extreme circumstances they instituted quarantines severely enforcing it. Audiences perceived educated information sources as knowing the "right answer," or the correct stand on an issue (Tan, 1985). As earlier pointed, the *Romon* interactions in relaxed environments such as watering points, livestock markets, or slaughter houses provided opportunities for respondents and their influencers engage on matters relating to their community. In so doing, they actively engaged in learning activities from each other including CBPP vaccine innovation. The study finding on the attributes of influencers was corroborated by the qualitative data of the research while Fig 4.5 below demonstrates influential CBPP vaccine communicators and their attributes.

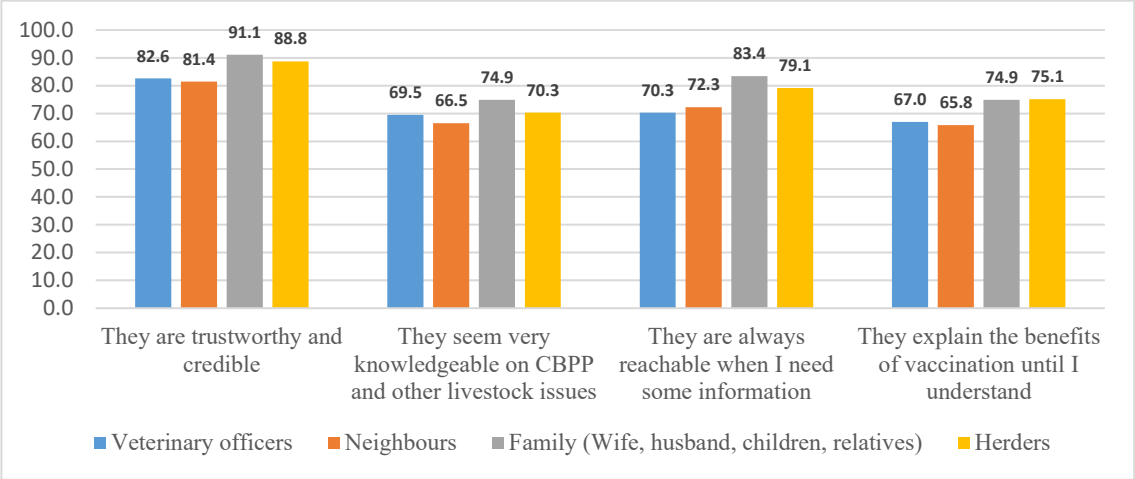

Figure 4.5: Influential CBPP Vaccine Communicators and Their Attributes

The following is an extract from the conversations with one of the FGD who corroborated the findings;

> *"RQ: Please say the reasons you are influenced by the people you selected.Participants: We trust those who talk to us about CBPP vaccination, because they not strangers. All these people are accessible, because they live among us, we interact with them every day. Some of them such as veterinary people are very knowledgeable, and they are from Government, employed to give us services. Education is important, some people seek out educated members of our community to help them understand CBPP issues or maybe to communicate with veterinary officers who are mostly based in town. It does not matter whether one is rich or poor, we all influence each other!*

4.5 Influence of Messages on Adoption of CBPP Vaccine

The third objective evaluated influence of messages on adoption of CBPP vaccine among ASAL pastoralists in Kenya. To realize this objective, responded to a set of questions under parameters of inoculation site, benefits, required frequency of vaccination and side effects. During the pretest communal vaccinations decisions were found to be important,

thus a decision to include this inquiry. Second, they were asked to state the attributes of messages that persuaded respondents to vaccinate. Third, from a set of nine reasons they were asked to state message characteristics that persuaded them to skip vaccinations.

The findings were as follows; 94.8% were influenced by messages on benefits, 88.9% agreed with the practice of a collective community decision to vaccinate within a specified time, 88.7 % agreed with assurances that veterinary experts were best placed to determine the inoculation site. 80.3% said the vaccine elicited side effects on some cattle, but this did not influence their decision to not to vaccinate, although this caused (Kairu-Wanyoike et al., (2004), Wanyoike, 2009) some pastoralists to hide their cattle during vaccinations due to fear of adverse post-vaccination reactions such as painful swelling at site of inoculation sometimes often accompanied by tail loss, fever, and reduction in milk production. 53% heeded to veterinary officers' advisories to vaccinate twice a year. It is widely acknowledged that they pastoralists have a migratory behavior, in case of the respondents, herds are driven to distant grazing fields even as far as Tanzania to graze. For this reason, all the messages helped them to know vaccination details such as vaccination venue, day, costs of vaccination and availability of the veterinary officers. Wanyoike-Kairu et al., (2004) described the days as, "big community events". All the CBPP message were thus found critical for the survival of cattle and security of respondents' livelihoods. A discussion with one community veterinary officer corroborated study findings;

> *Packaging of CBPP messages has been critical for the success of our vaccination activities. Although National and County Government and to educate the pastoralists on the inoculation site, benefits, required frequency of vaccination and side effects, there is still a section who disregard our advisories. This could the reason why the disease is still prevalent.*

The findings on CBPP vaccine messages resonated with Birnbaum and Mellers (1983) McGuire (1969), Eagly (1974), Carbone (1975), Hovland et al., (1959), Petty et al., (1986), that people aggregated the average strength of evidence before making decisions.

Innovation-decisions decisions (Harris, 1972) were three types: optimal, collective and authority determine adoption decisions. Whereas an 'optimal innovation decision' were based upon individual decision-making irrespective of the wider social system, and 'authority innovation decisions' were made by a select group of powerful individuals while the 'collective innovation decision' forged were by group agreement. The two latter decisions seemed to applied in Narok South, one by the government and the other by the residents themselves. The findings on attributes of messages on CBPP adoption were corroborated during a focus group discussion;

> *RQ: How would you describe the CBPP vaccination messages the community receives?*
>
> R: *These messages are delivered for us assemble all our animals at a certain point. Our animals graze as far as Tanzania, but we bring them back on time for vaccination. Timeliness of vaccination message is of essence to us. Most of CBPP vaccination messages that we get are usually advisories to vaccinate. We have been told if we don't, government officials will keep our animals under quarantine. It is difficult to miss CBPP vaccination messages because the consequences. Those messages are clear, but we remind each other. A section of us have a don't care attitude, so no matter what is said, they ignore and don't take their animals for vaccination.*

Results on the inquiry on CBPP messages on inoculation site, benefits, frequency and communal vaccination, side effects and attributes are shown in Fig 4.6 below.

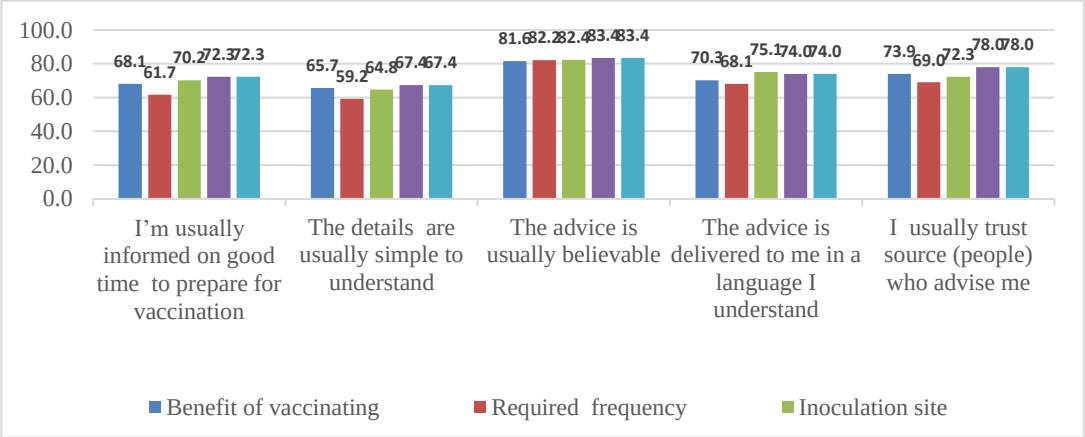

Figure 4.6: Most Influential CBPP Communication Messages and Their Attributes

The study results on attributes of CBPP messages that persuaded respondents to vaccinate were believability (82.1%), trustworthiness (71.1%), Kimasaai language (70.6 %), timeliness (68.8%), comprehensibility (64.4%), repetitiveness (58.7 %), approval by kin and community (41.3%) and high appeal (34.9%). These attributes of were corroborated by Muchunku (2015), and Rogers (1995) found it important for (McQuail et al., 1993) audiences to know who was communicating to them because if they questioned the authenticity and legitimacy of the message, it was likely to be rejected. Approval of CBPP vaccine messages by kin and community was also important (Hovland and Weiss 1951). Kimasaai, a language understood by all respondents was particularly important attribute of CBPP messaging. Local language, (Ochichi 2013, Nabusoba 2012, Chepngetich (2015), was effective in development communication and as a popular adage goes, "speak to people in your language, message goes to their mind, but speak to them in their language and it goes to their hearts"

Fear messages only deterred on a quarter (24.9 %) from vaccinating. Pastoralists were advised (GoK 2003, Wanyoike et al., 2004) to vaccinate twice a year but in cases where pastoralists failed to present animals, veterinary officers communicated messages of continued enforcement of the quarantine which was found to be unpopular with the pastoralists. Quarantine is where movement of cattle is restricted within the infected zone

and movement was only allowed to designated slaughterhouses. As a result, disease outbreaks went unreported. This kind of defiance is explained by Heilman and Garner (1975) as a choice left for receivers of "unfavourable" information from powerful source such as government. When threatened by a powerful source, the receivers were left with a choice between two evils: engage in the non-preferred activity (recommendation) or bear the punishment. These results on message attributes were validated by other experimental studies on persuasion, among them Kelman (1958), Kelman and Hovland (1953), Birnbaum and Meller (1983), Eagley and Chaiken (1975). Further, Witte (1995), and Flay and Burton (1990) say on message characteristics.

> *"The manner in which the message is organized, the type of appeal given, the number of repetitions, the vividness of language used, and more, can influence the persuasive process It is also important for a message to be simple without reductionist. Short of this, it is likely that the receiver may totally misrepresent the message".*

Respondents (47 %) who did not vaccinate biannually were asked why they did so. They reported challenges with clarity (73.7%), language barriers (59.8%), distrust for vaccination messengers (59.8%), believability (56.2%), timeliness (47%), repetitiveness (46.8%), disapproval of messages by kin and community (40.5%) and fear appeal (24.9%). Respondents reported skipping vaccination for failure to get messages on good time to drive back herds some which had migrated as far as Tanzania for pastures. Apparently, there was confusion vaccination with treatment (they used the term used was "dawa instead of "chanjo"). Some cited lack of clarity in simple but important details such as venue, day, costs of vaccination and unbelievability of messages on grounds of inappropriate vaccination period of drought when their cattle weak.

Several scholars underscored the importance of message attributes in communication. Eagly (1974) says receivers must understand a message before they accept conclusions while Kelman (1958), advanced that compliance with message recommendation depended on comprehension of the arguments and on rewards promised by the message. Birnbaum and Stegner (1979) confirmed that believability of expert sources as more influential than

non-expert sources in persuasion. Zajonc (1968), Chafee (1967), Gordon and Holyoak (1983) confirmed that repeated exposure to a phenomenon leads to familiarity which itself is sufficient to produce a liking for the object (or message). Figure 4.7 below demonstrated the tally of CBPP message challenges that led to skipping of CBPP vaccination.

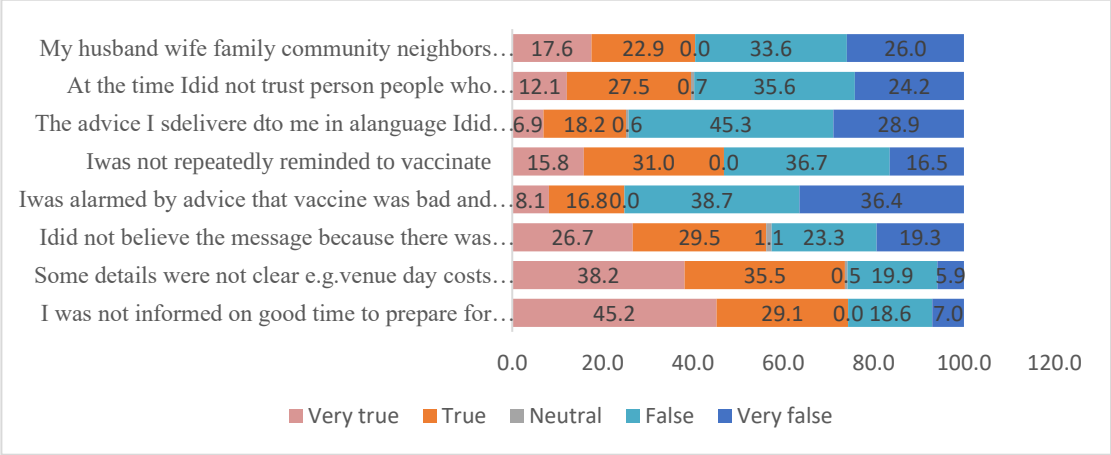

Figure 4.7: CBPP Message Challenges that Led to Skipping of CBPP Vaccination

The following is an excerpt from the conversations in one of the FGD who corroborated the study findings;

> *RQ: What is the influence of messages on peoples' decision to adopt of CBPP vaccine?*
>
> *R: Messages on the benefits have assisted the community. We make sure that stubborn ones among us understand the benefits of this vaccine. We are aware the need to vaccinate twice a year as required because of the messages we have been receiving from government officers. We do not like inoculation site (tail) but we tell each other that that expert (veterinary experts) know better. We do not like lactating ones because the side effects. But we get messages reassuring us that not all animals get post vaccination reactions, so we ignore people who warn us against vaccination.*

The study results were further supported by findings from discussions with FGD confirmed the influence of appeal features of CBPP messages on adoption.

> *RQ: Do you recall an incident where people in the community failed to join communal vaccination for lack of advice on whether to vaccinate or not to vaccinate? For those who failed, what reasons did they give?*
>
> P1- *Yes, but it is rare. People always vaccinate but those who don't give all sort so reasons. They said animals were weak, and others were milking so they failed to present them for vaccination. Here in Aitong, we failed to vaccinate once because we did not trust the animal health assistant, so we had to verify from Tarek (Government divisional headquarters).*

4.6 Influence of Perceived Characteristics

The fourth objective was to determine the influence of perceived characteristics of CBPP vaccine on adoption among ASAL pastoralists in Kenya. This inquiry was informed by Rogers (1995) who postulated that characteristics of an innovation affect their rate of adoption. Therefore, innovations that are perceived by receivers as having 1) greater relative advantage, 2) compatibility, 3) less complexity, and 4) observability will be adopted more rapidly than others. A veterinary research scientist had this to say about communication to pastoralists on characteristics of T1 CBPP vaccine;

> *There has been widespread dissemination of information through social and professional networks on facts about this vaccine. The information cascaded to the cattle owners is that CBPP vaccine should not be confused with treatment. It offers relative advantage because it boosts the immune system of cattle. The government's policy on the current vaccine is that animals get vaccinated twice a year since it provides immunity for 6 months. Cattle owners, especially pastoralists have also been made full aware that distribution is a complex one because the vaccine requires a cold chain. This is a logistical challenge especially in areas outside the national electricity*

grid. Their full cooperation is critical so that all animals are vaccinated at the agreed time. Pastoralists who adhere to this policy are able observe that their herds to do not come down with CBPP even after coming into contact with infected ones. Consultations with community is always sought before vaccinations in order to be compatible with their values and beliefs.

The outcome on the set of four questions on communications of perceived characteristics was as follows; virtually all respondents (99.5 %) strongly agreed on the relative advantages of vaccination. Observability was cited by 96.3 %, and 86.7% complexity of the vaccine. Majority (83.4%) agreed with compatibility of the vaccine with their cultural values.

The first perceived characteristic, relative advantage, was a major driver of adoption and was found to have to have influenced adoption of CBPP vaccine in the case of this study. The Maasai widely accepted vaccination because of its relative advantage over treatment of cattle when they were already sick (Kairu-Wanyoike et al., 2004 and Wanyoike, 2009). This characteristic was widely shared among the respondents of Narok South Sub County. In so doing they were found to share similar adoption behaviors with other adopters who chose and used a technology or an innovation only when it demonstrated a relative advantage over all other options. This inquiry was backed by findings among them Kairu-Wanyoike et al., (2004) and Wanyoike (2009), Rogers (1995), Rogers (2003) and Wellin, (1955). The second perceived characteristic was compatibility, a degree an innovation was perceived to be consistent with the existing values, past experiences and needs of potential adopters. This characteristic was firmly held by respondents that vaccinations should be in line (compatible) with their social practices and beliefs, and should be done when there was enough pasture and their cattle were healthy. As a result of this belief, the respondents were found to resist CBPP vaccinations (Kairu-Wanyoike et al., 2004) during drought. This study contrasted with a case study of an attempt to promote the boiling of water in a Peruvian village where germ theory was used to motivate the adoption of boiling water. However, the villagers had difficulty accepting germ theory as the cause of illness,

and overwhelmingly rejected water boiling as they failed to understand the motivation to do so (Wellin, 1955; Rogers, 2003).

The third characteristic was complexity, the degree to which an innovation was perceived to be difficult to understand and use. A unique characteristic of the vaccine is that it required a cold chain and was administered by veterinary officers on the community's cattle at the same time, (usually in the morning) to avoid infections. Respondents were found to understand this complexity through their communication and reference to the vaccine as, "Dawa ya barafu, or mkia (loosely translated to cold medicine or tail vaccine) stored in a cold box and not just sold to anybody.

A fourth factor in promoting adoptability of an innovation is the opportunity for potential users to experience using the innovation itself. However, this study chose not to make this inquiry on CBPP vaccination because trialability (simulations or test drives) would have been a challenge to apply in cattle vaccination as was the practice with other innovations.

The fifth and most critical factor that shaped innovation diffusion was observability. In case of CBPP vaccination, this was as a key characteristic for almost all (96.9 %) respondents. They conversed during social interactions and formed consensus of having observed vaccinated cattle did not get infected with CBPP even when in contact with sick ones. According Rogers (2003), observation of a technology was important because awareness of an innovation was stimulated and conversations among potential adopters triggering acceptance or rejection. Rogers (2003) found evidence for the power of observability when he plotted the number of adoptions over time. Data on responses in qualitative and quantitative forms is shown below and in Figure 4.8

RQ- Why does the community perceive and communicate characteristics of CBPP vaccine? Does this characteristics influence adoption?

R: We believe vaccination has more advantages because our cattle don't die from the disease. We only insist that vaccinations should be in line (compatible) with our belief that it should done when there is enough pasture, and cattle are healthy. We believe that the complex because unlike others the veterinary officers stores it in a cold box, and administers themselves. We all bring community cattle to be vaccinated very early in morning on the same day. When we get messages that cattle in the neighbouring villages have signs of the diseases, we quickly vaccinate ours because we have observed vaccinated cattle don't get infected with CBPP even when we share grazing and watering points.

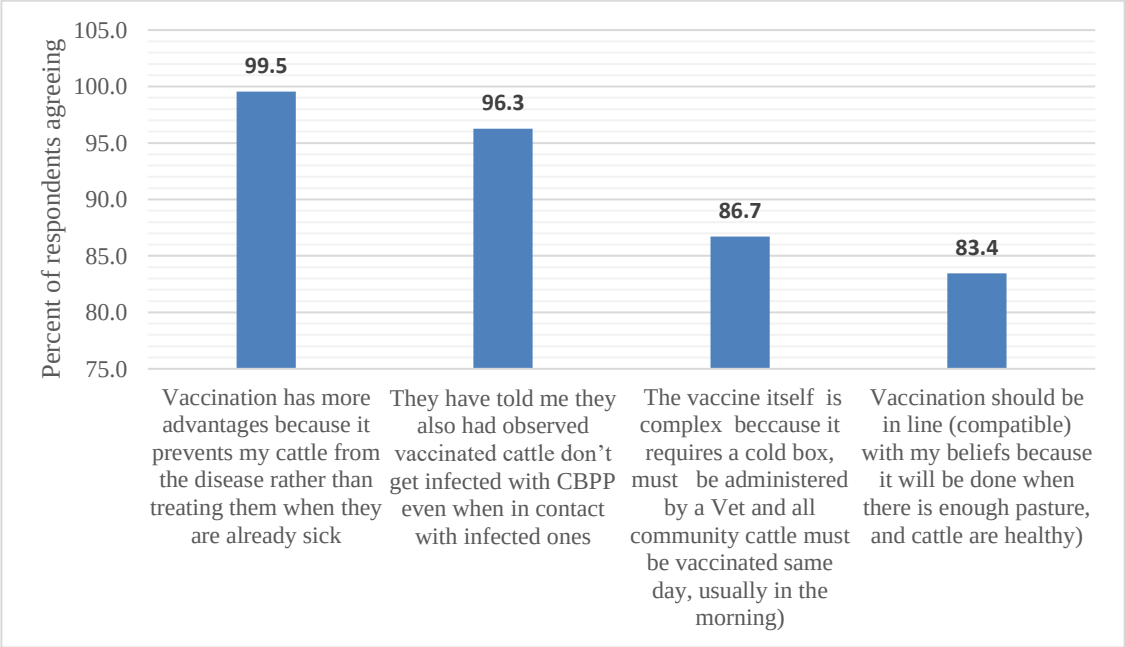

Figure 4.8: Perceived Characteristics of CBPP Adoption of CBPP Vaccine

4.7 Moderating Effects of Demographic Characteristics

The fifth objective established the relationship between demographic characteristics and communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya. To realize this objective, respondents were asked a set of questions regarding literacy,

income, and gender. Their qualitative and quantitative responses were tallied and recorded as shown below and in Figure 4.9.

RQ: What the role of education, income status and gender in making CBPP vaccine decisions?

R: Educated and uneducated people Maasai people have deep knowledge of livestock diseases through experience, so both understand CBPP vaccine communication. Sometimes, we even advice veterinary officers on what we think is wrong with our livestock. Our income status does not affect our understanding of CBPP vaccination because the vaccine is free, even those with few cattle also vaccinate to save them from dying. In our culture, both men and women can report on disease outbreaks such as CBPP but the ultimate decision on whether to vaccinate lies with the men. Women heads of households also make vaccination decisions, but they seek reinforcement of ideas from other men within their families"

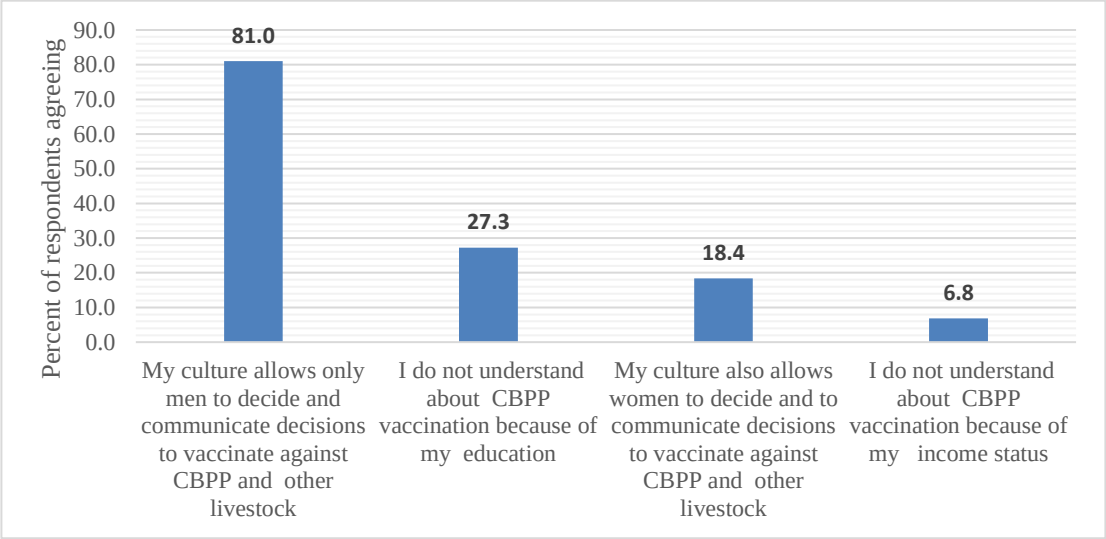

Figure 4.9: Moderating Effects of Demographic Characteristics of Respondents

Moderating effects of demographic characteristics of respondents on communication factors and adoption of CBPP vaccine were insignificant except for gender, where men and women were measured separately. Thus majority (81%) agreed that only men could engage in CBPP communication decisions but only 18.4% agreed that women could make and communicate vaccination decisions. This meant gender had an effect on adoption of vaccine among the pastoralists. Further, literacy and income of the respondents did not have an effect since 27.3% and 6.8% respectively reported this insignificance.

This study mirrors Heffernan *et al.,* (2008) and Heffernan *et al.,* (2011) that education, gender, socio-economic status and income had no relationship with vaccination adoption, although in the case of this study gender had a moderating effect. Adoption of vaccines was strongly influenced by socio-cultural drivers such as caste system, rather than factors e.g. income, age, education-level or gender. Tan (1981), concurred that critical variable in studying knowledge gaps should be interest in the issue and not education. The focus on education variable was considered elitist because it implied that individuals with low levels of education were somehow inferior in information- processing capabilities than more educated yet interest in an issue interest cuts across socioeconomic groups. Interest

could motivate an individual to seek out information leading to higher knowledge levels. Further homogeneity allowed members of a community to have more interpersonal discussion in an issue which may lead to what Tan (1981) calls knowledge leveling.

Conversely, the study's preposition that income status had a moderating effect on respondents' adoption of CBPP was also rejected. Respondents offered an explanation that in fact they stood for each other financially during vaccination, and was not a reason for failure by individuals not to vaccinate against CBPP. But Karanja-Lumumba *et.al*, (2015) found that in Kenya, poor people are less likely to vaccinate their livestock than their resourced counterparts as found on the uptake of the east coast fever (ECF) vaccine. Higher purchasing power among the livestock owners enabled them to meet the cost of vaccination and thus engaged more in information seeking than poor counterparts. Baerenklau (2005) concurs that economic and access to information factors played a part in adoption decisions. In diffusion of innovation (Rogers, 1995) differenced adopter groups in terms of their personal characteristics, media behavior, and position in society also influenced adoption. Early adopters were young, had higher financial status and were equipped with greater mental ability than late adopters.

On gender, Maasai cultural norms and values conferred privileges and rights men to make and communicate vaccination decisions while women were only allowed to do so under some culturally acceptable circumstances. Indeed, Waithanji et al., (2015) upheld that pastoralist women were unable to access extension information on CBPP, its control and benefits of its control because their decision-making power and ability to negotiate over what to do with cattle and their products within the household was very weak. Women are not permitted to interact with men from outside the family including male veterinary extension workers because of (Blench, 1987) genders dynamics of pastoral communities. Yiampoi (2014), said married women were only allowed to make decisions only if their husbands were deceased, and pastoralist girls had even less voices in their homes and communities than their mothers. Boys on the other hand are allowed to own livestock upon initiation, thus giving them a leverage on decision making. To some extent, (IFAD, 2010) elderly women held relatively privileged positions within Maasai communities, and

had some voice if they were considered to be wise and put the community's interests foremost. A religious leader in the study, also a cattle owner had this to say on the demographic characteristics of the respondents in relation to access to CBPP vaccine communication;

> *It is true that uneducated people have challenges in understanding of CBPP communication. Those with few herds are sometimes unable to make little contributions to cater for vaccination logistics. Men access information more because they are household heads, are free to sit in markets where we get information.*

4.8 Inferential Data and Hypothesis Test Results

This section shows results on inferential data and of hypothesis tests for each study objective.

4.8.1 Moderated Multiple Regression

Moderated Multiple Regression (MMR) was used to test for relationship between the dependent variable (CBPP adoption) and independent variables (Communication factors) with an interaction term (moderating effects of demographics). This model was used to show whether the demographic factors influenced the relationship between the communication factors and adoption of CBPP. The results are shown in tables 4.5, 4.6 and 4.7 below.

Table 4.5: Moderated Multiple Regression Model summary

Model Summary									
					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	P-value
1	.522[a]	.272	.259	.382	.272	19.913	8	426	.000
2	.522[b]	.273	.258	.383	.001	.447	1	425	.504

[**a] Predictors: (constant), **x 1**(communication channels), **x 2** (CBPP vaccine communicators), **x 3** (messages), **x 4** (perceived characteristics).

[**b]. Predictors: (constant), **x1**(communication channels), **x2** (CBPP vaccine communicators), **x3** (messages), **x4** (perceived characteristics) x**5** (communication factors*demographic factors)

In model 1 above, the p-value < 0.05, implying that there is a significant relationship between the communication factors and adoption of CPBB vaccine without the interaction effect.

In model 2, the change in R square is not significant (0.001), due to the effect of interaction term. Also the p-value > 0.05, implying the interaction effect between demographic and communication factors (moderating effect) is not statistically significant. Therefore, we conclude that there was no moderating effect of the demographic factors on adoption CPBB vaccine. Table 4.23 gives the regression model for the dependent and independent variables

4.8.2 Regression Coefficients

Table 4.6: Regression Coefficients

Coefficients						
		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**t-test**	**P-value.**
1	(***Constant)***	-.029	.055		-.519	.604
	Communication channels	.060	.040	.069	1.476	.014
	CBPP vaccine communicators	.198	.067	.147	2.945	.003
	Messages	.236	.039	-.279	-6.118	.000
	Perceived Characteristics	.129	.042	-.146	-3.060	.002
2	***(Constant)***	-.027	.055		-.496	.620
	Communication channels	.059	.040	.068	1.463	.014
	CBPP vaccine communicators	.200	.067	.148	2.970	.003
	Messages	.235	.039	-.278	-6.089	.000
	Perceived Characteristics	.129	.042	-.146	-3.055	.002
	Moderating effect	8.199	12.259	.028	.669	.504

Dependent variable: Adoption of CBPP

In table 4.23 above, the p-value <0.05 shows that the regression model is significant and we therefore conclude that the communication factors significantly influence adoption of CBPP vaccine.

4.8.3 ANOVA Analysis

Table 4.7: ANOVA Analysis

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**p-value**
1	Regression	23.279	8	2.910	19.913	.000[a]
	Residual	62.252	426	.146		
	Total	**85.531**	**434**			

The study conducted analysis of variance (ANOVA) in table 4.24 to determine how independent (communication factors) variables were influential and useful in predicting the dependent variable, in this case adoption of CBPP vaccine. Results indicated that the

p-value <0.05 showed the regression model was significant and we therefore conclude that the communication factors significantly influenced adoption of CBPP vaccine.

4.8.4 Summary of Hypothesis Test Results

Results from hypothesis tests on the four communication factors showed that they had a significant influence of communication factors on the adoption of CBPP vaccine among pastoralists in Kenya, p-values <0.05 for the chi-square goodness of fit test. However, the moderating variables were found not to have had influence since the p values > 0.05 for the chi-square test of independence. The following are summaries of hypothesis tests under each study objective

4.8.4.1 Chi-square Goodness of Fit Statistical Test on Influence of Communication Channels on Adoptions of Cbpp Vaccine and Their Attributes

The 1st hypothesis of the study was subjected to chi-square goodness of fit statistical test to determine the at 0.05 level of significance as shown in table 4.8 below:

Table 4.8: Summary of Chi-Square Goodness for Most Liked CBPP Communication Channels

	Informal Conversations	Vernacular radio	Baraza Meetings	Mobile phone
Chi-Square	415.084	408.333	399.239	284.275
Df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

As observed, the p-value <0.05 four communication channels mostly used for CBPP communication (informal conversations, vernacular radio, baraza meetings and mobile phone), had a significant influence on adoption of CBPP vaccine. The study therefore failed to reject the null hypothesis *H0.1a that there is no significant relationship between influence of communication channels and adoption of CBPP vaccine among ASAL pastoralists in Kenya*.

Additionally, the attributes for these channels were tested to determine their level of significance at 0.05 as shown in Table 4.9:

Table 4.9: Summary of Chi-Square Goodness of Fit Test for Attributes of Communication Channels

	Trustworthy	Clarity	Kimasaai language	Accessibility
Chi-Square	123.665	182.435	152.804	107.264
df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

The four attributes of the communication channels (trustworthy, clarity, Kimasaai speaking and accessibility) which were highly rated (> 50%), were statistically significant (p value < 0.05), implying that they significantly influenced adoption of CBPP vaccine. The study therefore failed to reject the null hypothesis (*Ho2b: There is no significant relationship between influence of attributes of communication channels and adoption of CBPP vaccine among ASAL pastoralists in Kenya).*

4.8.4.2 Chi-Square Goodness of Fit Statistical Test on Influence of CBPP Vaccine Communicators and Their Attributes

The 2nd hypothesis of the study as subjected to chi-square goodness of fit statistical test to determine the at 0.05 level of significance. Additionally, the attributes for these participants were subjected to the statistical test to determine their level of significance at 0.05.

Table 4.10: Summary of the Chi-Square Goodness of Fit Test for CBPP Vaccine Communicators

	Veterinary officers	Neighbors	Herders	Family
Chi-Square	290.679	352.440	13.954	14.679
df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

Chi-square goodness of fit test for CBPP vaccine communicators' neighbors, veterinary officers, family and herders who were consulted by the majority of the respondents (proportion > 50%) was statistically significant (p value< 0.05) in influencing respondents to adopt CBPP vaccine as shown in table 4.5 above. The study therefore fail to reject the null hypothesis *H0.2a, that there is no significant relationship between influence of CBPP vaccine communicators and adoption of CBPP vaccine among ASAL pastoralists in Kenya*

Additionally, the attributes for these CBPP vaccine communicators were tested to determine their level of significance at 0.05 as shown in Table 4.11 below:

Table 4.11: Summary of Chi-Square Goodness of Fit for Attributes of CBPP Vaccine Communicators

	Trustworthy and credibility	**Knowledge**	**Accessibility**	**Explaining benefits of CBPP vaccine**
Chi-Square value	2.340	.454	2.704	.021
Df	1	1	1	1
Asy.sign. (2-sided)	0.0126	0.0500	0.0100	0.0484

In summary, the p-values were less than <0.05 for the four qualities of influencers. This implies that the four attribute (trustworthy and credibility, knowledge accessibility and explaining benefits of CBPP vaccine) significantly influenced the adoption of the CBPP vaccine**.** The study failed to reject the null hypothesis, *Ho2b there is no significant relationship between influence of attributes of CBPP vaccine communicators and adoption of CBPP vaccine among ASAL pastoralists in Kenya.*

4.8.4.3 Chi-Square Goodness of Fit Statistical Test on Influence of Messages on Adoption of CBPP Vaccine and Their Attributes

The 3rd hypothesis of the study, was subjected to chi-square goodness of fit statistical test to determine at 0.05 level of significance. Additionally, the attributes for these messages were subjected to the statistical test to determine their level of significance at 0.05.

Table 4.12: Summary of Chi-Square for CBPP Vaccine Messages

	Benefits of vaccination	Required frequency of vaccination	Determination of inoculation site	Vaccine side effects on some cattle
Chi-Square	352.809	106.036	262.727	158.400
df	1	1	1	1
Asymp. Sig	0.000	0.000	0.000	0.000

In summary, the p values were less than 0.05, this implies that messages (on benefits of vaccination, required frequency of vaccination, determination of inoculation site and vaccine side effects on some cattle) on vaccination significantly influenced adoption of CBPP vaccine. The study therefore fail to reject the null hypothesis (*H03: There is no significant relationship between influence of messages and adoption of CBPP vaccine among ASAL pastoralists in Kenya)*

Additionally, the attributes for these appeal features of messages were tested to determine their level of significance at 0.05 as shown in Table 4.13 below:

Table 4.13: Summary of Chi-Square Goodness of Fit for Appeal Features of Messages

	Timeliness	Clarity	Believability	Repetitiveness	Language used	Trusted sources
Chi-Square	61.688	37.578	177.257	13.248	74.312	79.349
df	1	1	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000	0.000	0.000

Since p values were less than <0.05, this implied that the six messages' (timeliness, clarity, believability, repetitiveness, language used, trusted sources) appeal features significantly

influenced adoption of CBPP vaccine. The study therefore fail to reject the null hypothesis *Ho3b: There is no significant relationship between influence appeal features of messages and adoption of CBPP vaccine among ASAL pastoralists in Kenya.*

4.8.4.5 Chi-Square Goodness of Fit Statistical Test on Influence of Perceived Characteristics of CBPP Adoption of CBPP Vaccine

The 4th hypothesis of the study, was subjected to chi-square goodness of fit statistical test to determine at 0.05 level of significance as shown in Table 4.14 below:

Table 4.14: Summary of Chi-Square Goodness of Fit for Perceived Characteristics on Adoption

	Relative advantage	Compatibility with values	Complexity of vaccine	Observability
Chi-Square	431.036	194.669	235.792	368.381
df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

Since p values were less than <0.05, this implied that four perceived characteristics (relative advantage, compatibility with respondents' values, complexity of vaccine, observability), significantly influenced adoption of CBPP vaccine. The study therefore failed to reject the null hypothesis *H_0.4: There is no significant relationship between influence of perceived characteristics of CBPP vaccine and adoption among ASAL pastoralists in Kenya.*

4.8.4.6 Chi-Square Test of Independence on Moderating Effects of Demographic Characteristics and Communication Factors on Adoption CBPP Vaccine

The 5th hypothesis (H_0.5, there is no significant relationship between demographic characteristics and communication factors on adoption of CBPP vaccine among ASAL pastoralists in Kenya) was subjected to the chi-square test to determine their level of significance. To do this, the fifth objective H_0.5 was split into 12 times, ($H_0.5_a$, $H_0.5_b$, $H_0.5_c$,

$H_0.5_d$, $H_0.5_e$, $H_0.5_f$, $H_0.5_g$, $H_0.5_h$, $H_0.5_i$, $H_0.5_j$, $H_0.5_k$, $H_0.5_l$). For each of the study objective, the items that had highest score of respondents was subjected to chi-square test at 0.05 level of significance. Thus moderating effects of demographics on literacy, income status, and gender was tested on the highest ratings of communication factors items (for channels, informal conversations was 92%, for participants' engagement with neighbours was 95.5 %, and for messages on benefits of vaccination was 94.8% while for perceived characteristics of the vaccine, relative advantage was 99.8%. The following results were obtained for each of these split hypothesis tests.

4.8.4.6.1 Moderating Effects of Literacy

$H_0.5_a$: there is no significant relationship between literacy and informal conversations on adoption of CBPP vaccine.

Table 4.15: Chi-Square for Literacy on Informal Conversations

	Literacy	**Informal conversations**
Disagree	Chi-Square	0.533
	df	1
	Asymptotic Significance	0.465
Agree	Chi-Square	1.105
	df	1
	Asymptotic Significance	0.293

From the table above, since the Chi-square for Disagree =0.533, p-values > 0.05 and Chi-square for Agree =1.105, p-value > 0.05. We therefore failed to reject the null hypothesis. Thus there was similar rating of influence of informal conversions among the two groups (literate and illiterate). The study therefore concluded that there is no moderating effect of education/literacy on adoption of CBPP vaccine.

$H_0.5_b$: There is no significant relationship between literacy on and engaging neighbors on adoption of CBPP.

Table 4.16: Chi-Square for Literacy and Neighbors

	Literacy	Neighbours
Disagree	Chi-Square	1.142
	df	1
	Asymptotic Significance	0.285
Agree	Chi-Square	1.105
	df	1
	Asymptotic Significance	0.293

From the table above, since the Chi-square for Disagree =1.142, p-values > 0.05 and Chi-square for Agree =1.105, p-value > 0.05. The study therefore failed to reject the null hypothesis. Thus there was similar rating of influence of engaging neighbours on adoption of CBPP among the two groups (literacy and illiteracy). The study therefore concluded that there was no moderating effect of literacy on adoption of CBPP vaccine.

$H_0 5_c$: there is no significant relationship between literacy and messages on benefits of vaccination on adoption of CBPP.

Table 4.17: Chi-Square for Literacy and Benefits of Vaccination

	Literacy	Benefits of vaccination
Disagree	Chi-Square	1.138
	df	1
	Asymptotic Significance	0.286
Agree	Chi-Square	10.06
	df	1
	Asymptotic Significance	0.002

From the table above, since the Chi-square for disagree =1.138, p-values > 0.05 and chi-square for agree =10.06, p-value > 0.05. The study therefore failed to reject the null hypothesis. Thus there was similar rating of influence of messages (benefits of vaccination) on adoption of CBPP among the two groups (literate and illiterate). The study also concluded that there is no moderating effect of education/literacy on adoption of CBPP vaccine.

4.8.4.6.2 Moderating effects of income

$H_0.5_{d:}$ *there is no significant relationship between income and engaging informal conversations on adoption of CBPP vaccine.*

Table 4.18: Chi-Square for Income and Informal Conversations

	Income	**Informal conversations**
Disagree	Chi-Square	0.105
	df	1
	Asymptotic Significance	0.823
Agree	Chi-Square	1.034
	df	1
	Asymptotic Significance	0.309

From the table above, since the Chi-square for Disagree =0.105, p-values > 0.05 and Chi-square for Agree =1.034, p-value > 0.05. The study therefore failed to reject the null hypothesis. There was similar rating of influence of income on adoption of CBPP among the two groups with and without income. The study concluded that there is no moderating effect of income status in influencing informal conversations on adoption of CBPP vaccine.

$H_0.5_{e:}$ *there is no significant relationship between income and engaging neighbors on adoption of CBPP vaccine.*

Table 4.19: Chi-Square for Income Status and Neighbors

	Income status	**Neighbors**
Disagree	Chi-Square	0.294
	df	1
	Asymptotic Significance	0.588
Agree	Chi-Square	2.143
	df	1
	Asymptotic Significance	0.143

From the table above, since the Chi-square for disagree =0.294, p-values > 0.05 and agree =2.143, p-value > 0.05. We therefore fail to reject the null hypothesis. This implies that

the rating for engaging neighbors were similar for those with income as well without income. The study therefore concluded that income status has no moderating effects on adoption of CBPP vaccine.

$H_0.5_{f:}$ there is no significant relationship between income and messages on benefits of vaccination on adoption of CBPP vaccine.

Table 4.20: Chi-Square for Income Status and Benefits of Vaccination

	Income status	**Benefits of vaccination**
Disagree	Chi-Square	4.526
	df	1
	Asymptotic Significance	0.333
Agree	Chi-Square	3.333
	df	1
	Asymptotic Significance	0.168

From the table above, since the Chi-square for disagree =4.526, p-values > 0.05 and Chi-square for agree =3.333, p-value > 0.05. The study therefore failed to reject the null hypothesis. This implies that the messages on benefits of vaccination had similar rating regardless of income status on adoption of CBPP. The study concluded that income status has no moderating effects on adoption of CBPP vaccine.

4.8.4.6.3 Moderating Effects of Gender (Men)

$H_0.5_{g:}$ there is no significant relationship of men and engaging informal conversations on adoption of CBPP.

Table 4.21: Chi-Square for Men and Informal Conversations

	Men	Informal conversations
Disagree	Chi-Square	2.736
	df	1
	Asymptotic Significance	0.098
Agree	Chi-Square	4.108
	df	1
	Asymptotic Significance	0.043

From the table above, since the chi-square for disagree =2.736, p-values > 0.05 and for agree =4.108, p-value < 0.05. We therefore reject the null hypothesis and concluded that there was a moderating effect of men in influencing informal conversations on adoption of CBPP vaccine.

$H_0.5_h$: there is no significant relationship between men and engaging neighbors on adoption of CBPP.

Table 4.22: Chi-Square for Men and Neighbors

	Men	Neighbors
Disagree	Chi-Square	0.005
	Df	1
	Asymptotic Significance	0.946
Agree	Chi-Square	1.635
	Df	1
	Asymptotic Significance	0.201

From the table above, since the chi-square for disagree =0.005, p-values > 0.05 and for agree =1.635, p-value > 0.05. The study therefore failed reject the null hypothesis. This implies that engaging neighbors had the same rating within gender. The study failed to reject the null hypothesis and conclude that men have no moderating effects on adoption of CBPP vaccine.

$H_0.5_i$: there is no significant relationship between men and messages on benefits of vaccination on adoption of CBPP vaccine.

Table 4.23: Chi-Square for Men and Messages on Benefits of Vaccination

	Men	Messages of vaccination benefits
Disagree	Chi-Square	0.655
	df	1
	Asymptotic Significance	0.418
Agree	Chi-Square	9.133
	df	1
	Asymptotic Significance	0.003

From the table above, since the chi-square for disagree =0.655, p-values > 0.05 and for agree =9.133, p-value < 0.05. The study therefore rejected the null hypothesis and concluded that there was moderating effect of men in influencing messages (benefits of vaccination) on adoption of CBPP vaccine.

4.8.4.6.4 Moderating effects of gender (women)

$H_0.5_j$: there is no significant relationship between women and engaging informal conversation on adoption of CBPP vaccine.

Table 4.24: Chi-Square for Women and Informal Conversation

	Women	Informal conversations
Disagree	Chi-Square	0.469
	df	1
	Asymptotic Significance	0.494
Agree	Chi-Square	0.428
	df	1
	Asymptotic Significance	0.513

From the table above, since the chi-square for disagree =0.469, p-values > 0.05 and for agree =0.428, p-value > 0.05. The study therefore rejected the null hypothesis and concluded that there were no moderating effect of women in influencing informal conversation on adoption of CBPP vaccine.

$H_0.5_k$: there is no significant relationship between women and neighbors on adoption of CBPP vaccine.

Table 4.25: Chi-Square for Women and Neighbors

	Women	Neighbors
Disagree	Chi-Square	0.199
	df	1
	Asymptotic Significance	0.656
Agree	Chi-Square	1.287
	df	1
	Asymptotic Significance	0.257

From the table above, since the chi-square for disagree =0.199, p-values > 0.05 and chi-square for agree =1.287, p-value > 0.05. The study failed to reject the null hypothesis and concluded that there were no moderating effects of women in influencing neighbours on adoption of CBPP vaccine.

$H_0.5_i$: there is no significant relationship between women and messages on benefits of vaccination on adoption of CBPP vaccine.

Table 4.26: Chi-Square for Women and Messages on Benefits of Vaccination

	Women	Benefits of vaccination
Disagree	Chi-Square	0.035
	Df	1
	Asymptotic Significance	0.852
Agree	Chi-Square	6.262
	Df	1
	Asymptotic Significance	0.112

From the table above, since the chi-square for disagree =0.035, p-values > 0.05 and for agree =6.262, p-value > 0.05. The study therefore fail to reject the null hypothesis, and concluded that there was no moderating effect of women in influencing messages (benefits of vaccination) on adoption of CBPP vaccine.

4.9 Adoption of CBPP Vaccine

This section entailed discussions on independent variable (adoption of CBPP vaccine and adoption trend). Although this was not included as an objective, an inquiry was made to

enable development of adoption trend by way of a graph, albeit Rogers (1995) who used a curve to demonstrate adopter categories. Respondents were asked if they were likely to vaccinate against CBPP in future, and to recall vaccination history from 2016-2019. The study findings showed that virtually all respondents 87% reported they would vaccinate their cattle in the future. Fig 4.10 shows a trend of vaccination between 2016 to 2019. For purpose of this study, only those who vaccinated twice as advised by veterinary experts were deemed to have adopted CBPP vaccination. CBPP adopters who heeded veterinary expert advice to vaccinate twice a year to achieve herd immunity were 40% in 2016, 50% in 2017, 52% in 2017 and 53% in 2019. Another category of respondents vaccinated only once every year. These were; 29% in 2016, 33% in 2017, 36% in 2018 and 39% in 2019. During the same period, one group of adopters completely skipped vaccinations. The percentages of the vaccine skippers were 20% in 2016, 19% in 2017, and 10% in 2018 and 2019.

The low uptake of livestock vaccines was often presumed to be an economic issue, fostering a focus on adopters, willingness to pay (Kairu-Wanyoike *et al.*, 2010). Other studies explored the topic as a delivery issue (LID, 1998; Heffernan *et al.*, 2000) or as a function of the characteristics of the adopters, including perceptions and attitudes towards vaccination itself (Beck and Gong, 1993; Bhattacharyya *et al.*, 1997; Fandamu *et al.*, 2006; Homewood *et al.*, 2006; Rezvanfar, 2007, Kairu-Wanyoike *et al.*, 2014) or affordability of the vaccine Karanja-Lumumba et al., (2014). All of these approaches, however, were too limiting (Heffernan *et al.*, 2008) because technology adoption was also largely a function of communication between separate and distinct groups (Rogers, 1995). Cochrane's (1977) technological treadmill model offered possible approach to analyzing the diffusion of innovations in agriculture. The treadmill assumed that farmers were divided into three groups according to their tendency to adopt; early adopters, followers and laggards. It also assumed that farmers faced a sequence of innovations which were adopted one at a time. Thus, the innovators adopted first in the early days of an innovation with the laggards waiting to until the end stages, when the innovation is well known, tried and tested. The speed of adoption related to the slope of the curve with persuasion being

the force that drove adoption up the slope. A rigorous formulation of this approach appeared in Kislev et al., (1973), Day and Singh (1977), Mahajan et al., (1985) who constructed dynamic models of aggregate adoption where individuals' behavior was characterized as cautious optimization, before the extent of adoption is determined in a linear programming model as advanced by Rogers (1963) theory. The speed or rate of the adoption of any new technology occurred via a standard S-shaped or sigmoid curve, where the speed of adoption related to the slope of the curve

Since these suggested reasons were outside the scope of this study, some communication factors in this study were found to be legitimate reasons that led a fraction of respondents to skip vaccinations. These reasons were cited in Fig 4.9 included lack of clarity of CBPP messages, language barriers and distrust for vaccination messengers. Respondents also cited unbelievable and untimeliness of CBPP messages, lack of repetitiveness and disapproval of messages by kin and community, and high appeal messaging (where veterinary officer restricted movement of infected herds) as the main reason they kept away from vaccinations.

The adoption graph established by this study did not parallel Roger's (1995) classification along five adopter categories (Innovators, early adopters, early majority, late majority and laggards) in their rate of adoption of innovations. Neither did the study demonstrate adoption findings (Rogers 1995,) using cumulative adoption numbers plotted over time, through a normal bell curve, or a s-curve. Rogers (1995) described innovators as venturesome, eager to try new ideas and had more cosmopolite relationships than their peers. Early adopters were respectable localites usually with high degree of opinion leadership within the social system. Early majority deliberately interacted frequently with their peers but seldom held leadership positions. Late majority, skeptical often adopt an innovation because of economic necessity or increasing network pressure. Laggards were the last category of adopter who were traditional mostly localite, many near isolates and their point of reference is the past. Mental process of innovation decision process as theorized by Rogers (1995) involved several stages; i) knowledge - exposure to an innovation and some understanding of how it works, ii) persuasions-formation of an

attitude toward the innovation, iii) decision -activity resulting in a choice to adopt or reject the innovation, iii) implementation-putting the innovation into use, iv) confirmation-reinforcement or reversal of the innovation decision made.

This study, although not an experiment, drew a general parallel with Rogers (1995) on some of the adoption aspects. At knowledge stage, respondents of Narok Sub County were exposed to information on CBPP vaccine by CBPP vaccine communicators such as experts, peers and community on CBPP vaccine. Also at this stage, many confused vaccinations with the treatment and any injection was believed to be 'a vaccine'. At persuasion stage, respondents (98.9%) in Narok South Sub County were found to engage in discussions with other people who included experts, peers and community before they formed attitude toward the vaccine. In the next stage (decision making), where individuals engaged in activities which led to a choice to adopt or reject the innovation (ibid), some respondents (99.5%) adopted the vaccine and 0.5% rejected it. During confirmation where individuals sought reinforcement for the innovation decision made, but reversed decisions when exposed to conflicting messages about an innovation, respondents reported seeking reinforcement from their own cultural practices, beliefs and values to support their vaccination adoption decisions. However, reversal of previous decisions was also made where some cattle, especially milking cattle were hidden for fear of post- vaccination reactions. Figure 4.10 shows trends of frequency of vaccination 2016-2019:

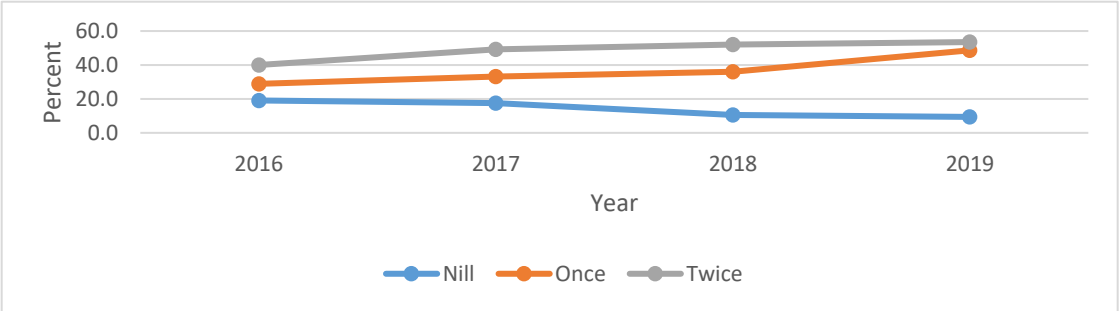

Figure 4.10: Trends of Frequency of CBPP Vaccination 2016-2019

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summative of major findings and relevant discussions on the study on the influence of communication factors on adoption of Contagious Bovine Pleuropneumonia (CBPP) Vaccine among Arid and Semi-Arid Lands (ASAL) pastoralists in Kenya. This section is segmented based on the study objective and specifically summarizes the influence of: 1) communication channels where informal conversations, vernacular radio, IEC materials, baraza meetings, and mobile phone, 2) CBPP vaccine communicators- experts, peers and community were studied, 3) Messages on CBPP vaccine- inoculation site, benefits, frequency, side effects, 4) perceived characteristics of CBPP vaccine- relative advantage, compatibility, complexity, and observability, 5) Moderating effects of demographic characteristics and communication factors on adoption. The study also made an analysis of dependent variable - vaccine adoption

The study finally logically corroborated qualitative and quantitative recommendations, before making conclusions. This enabled a straight forward understanding of each objective and the accompanying summative findings.

5.2 Summary of Findings

Qualitative and quantitative findings of five objectives are summarized in this section. In order to provide a clearer understanding of the findings, these summaries were also presented against the five research questions of the study.

5.2.1 The Influence of Communication Channels on Adoption of CBPP Vaccine among ASAL Pastoralists in Kenya

Some communication channels were found to be influential but others were limiting. The most influential channels were informal conversations or *roman*, (idle talk) followed by baraza meeting, vernacular radio and mobile phone in that order. This study established that informal conversations amongst respondents often in relaxed environments was found to be effective because new ideas or behaviors were communicated, adapted or extinguished through such interactions (Rogers 1995, Brown et al. 2005). Further, baraza meetings especially with experts i.e. veterinary officers and county officials in Narok South Sub County, confirmed by Rogers (1995) and Katz (1957) were effective at persuading respondents to accept the vaccine. Moreover, interpersonal channels (Rogers, 1995) provided a two-way exchange of information and were more effective than the mass media in dealing with resistance or apathy on the part of the receiver or respondents. Interpersonal sources could also add information or clarify points and even surmount psychological and social barriers. Vernacular radio stations particularly Mayian, Emoo, Oltoilo Lemaa, Nosim 9.5 FM, Sidai FM, Radio Maa FM etc. was influential as sources of advertorials and public announcements on vaccination campaigns. Radio traits; portability, affordability, simplicity, and language flexibility made them an effective communication medium CBPP vaccine communication. Mobile phone also played a role in CBPP vaccine communication as attested by significant number of respondents. It was found to be critical in combating pastoralists' greatest challenge, uncertainty on location of resources or notification of health emergencies like an outbreak of CBPP.

Some other communication channels namely IEC materials, social media, and cosmopolite channels had lesser influence in aiding adoption of CBPP vaccinations. IEC materials specifically posters, banners and newspapers, social media and cosmopolite channels influenced less than 40% of respondents. Social media was particularly influential among the youth whom Prensky (2001), Palfrey and Gasser (2008) termed as "digital natives" born after 1980. Older and educated respondents whom Prensky (2001) similarly referred to as "digital immigrants" might have been influenced by social media

although they were said to be selective and skeptical users, who utilized it for beneficial purposes such as sharing CBPP vaccine information in the case of this study.

All the influential channels of CBPP vaccine communication had clarity, used local Maasai language, trustworthy, accessible and were local. These findings were espoused by Carbone (1975), Tan (1985), Eagly (1974), McGuire (1969) as having an effect on persuasion.

In conclusion, channels influenced adoption although interpersonal communication played a major role. McQual and Windahl (1981) say this because change occurred in several stages affecting few influential individuals first, then those integrated into relevant social circles, then later affecting the more isolated. The hypothesis on this inquiry was disapproved, since communication channels were found to have significant influence on adoption of CBPP vaccine. It is therefore imperative for any CBPP vaccination inventions in pastoral regions to leverage on these to succeed in the uptake of the vaccine.

5.2.2 The Influence of Cbpp Vaccine Communicators on Adoption of CBPP Vaccine among ASAL Pastoralists in Kenya.

The study established that virtually all respondents engaged with other people before vaccinating their cattle against CBPP. In that regard, some CBPP vaccine communicators were found to be more influential than others had limited influence. Among those with most influence were experts, peers and community, namely neighbors, county veterinary officers, family, herders in that order. Veterinary officers were successful was because they were professionals or change agents who influenced desired adoption decisions. They usually had government authority and power which enabled them push vaccination decisions through. The influence of neighbors, family and herders was attributed to interpersonal influence (Bandura, 1977), while Kairu-Wanyoike et. al., (2012) established existence of “key informants or more knowledgeable participants” of CBPP. As earlier pointed, the Romon interactions in relaxed environments such as watering points,

livestock markets, or slaughter houses provided opportunities for respondents and their influencers engage on matters relating to their community. In so doing, they actively engaged in learning activities from each other including CBPP vaccine innovation.

But Connolly (2019) in the conspiracy theory argued that audiences were a suspicious lot especially when a few people or elitists seem to be pushing an issue construed to benefit them and not the masses. In CBPP messaging, two areas of concern were not addressed by communication participants; post-vaccination reactions, inappropriate vaccination seasons and lack of knowledge of the vaccine. This seemed to give credence to the conspiracy theory, and was evident when some respondents skipped some vaccinations which was low at 20-60%, (Wanyoike, 2009). Conversely, the study found less influential CBPP vaccine CBPP vaccine communicators. These were chiefs, teachers, are religious leaders and professionals from the community. The limitation of influence by this category of people was not a strange phenomenon because audiences (Tan, 1985) converge an issue of interest to them.

In conclusion, this study found results to be consistent with past studies, Rogers (1995), Bandura (1977) and others. Hypothesis on this inquiry was disapproved, since the CBPP vaccine communicators were found to have significant influence. Future CBPP vaccination efforts could leverage on social networks and professional veterinary networks to disseminate vaccine messages. Communication investments could also be channeled through these networks.

5.2.3 The Influence of Messages on Adoption of CBPP Vaccine among ASAL Pastoralists in Kenya

The parameters of this inquiry were inoculation site, benefits, frequency, side effects and communal vaccination, and attributes of the messages. Although all respondents reported messaging influenced them to vaccinate, some had more impact than others. Inoculation site on the tail was particularly found contentious by Kairu-Wanyoike et al., (2014), but in this inquiry, respondents reported being assured that veterinary experts were competent

enough to make the determination. Kairu-Wanyoike et al., (2014) sums this discomfort, “for effectiveness vaccination should through the ribs as it is close to the lungs or in the neck because it is close to the jugular”. Message on accruing benefits of vaccination was well received by respondents who perceived vaccination to be the solution to CBPP, because “it keeps the disease away for at least 6–12 months”. Only half of the respondents heeded to messages to vaccinate twice a year as required due to communication challenges. Side effects on some cattle did not deter most of respondents from vaccinating their cattle although some animals developed adverse post-vaccination. This phenomenon is best explained by theory on dissonance (Festinger, 1957) as psychologically uncomfortable but respondents seemed found to have sought consonance by convincing themselves that vaccinated cattle survived CBPP outbreaks. Messages on communal vaccinations time was confirmed by majority but the few who disagreed with collective community decisions may have been in the category of optimal innovation decision makers (Rogers, 2003).

CBPP vaccine messages characteristics were key in the success of influencing respondents. For example, as a practice animals were grazed distant fields, and the community needed time to bring them to agreed communal vaccination sites. Comprehensibility and believability of CBPP vaccination messages was important in their decisions to vaccinate must understand message before they could accept its conclusions. The other message characteristics were equally important Tan (1985), says believability was closely linked with credibility of message sources, who in this case were CBPP vaccine CBPP vaccine communicators. Birnbaum and Stegner (1979) confirmed believability of expert sources as more influential than non-expert sources in persuasion. When a source is deemed to source was perceived by the audience to know the “right answer” to the question or the correct stand, then they are able to influence others (Muchunku 2015, Lazarsfeld, Berelson and Gaudet 1944, Rogers 1995). Repetitiveness and language in Kimasaai characteristics were influential, as a popular adage goes, “speak to people in your language, message goes to their mind, but speak to them in their language and the message goes to their hearts”.

Message challenges leading to skipping of vaccinations among them false information about availability of veterinary officers, transmittal of doubtful messages especially drought when cattle weak were to withstand vaccination or had migrated distances away for pasturing. Other respondents were particularly alarmed by advisory messages that vaccine was harmful since some cattle had exhibited serious side effects that led to tails falling off or outright fear of quarantines. In appeals, experts and Government often advised pastoralists to vaccinate as required, but in extreme case where pastoralists failed to present animals for vaccination, the government responded by messages of quarantining (fitting the definition of high or fear appeal) thus instilling fear among them.

In conclusion, CBPP messaging was influenced vaccine adoption, a critical factor for the survival of cattle and security of pastoralists livelihoods. Message attributes in CBPP vaccine communication needed some improvement since receivers failed to understand important aspects of the vaccine e.g. frequency of vaccination and side effects. Audience groups can become avoiders and blockers due to lack of adequate information negative impact on their livelihoods. Connolly (2019) further explains this aspect of human behavior through the conspiracy theory, advancing that audiences are a suspicious lot especially when a few people or elitists seemed to be pushing an issue construed to benefit them and not the masses.

5.2.4 The Influence of Perceived Characteristics of CBPP Vaccine on Adoption among ASAL Pastoralists in Kenya;

The fourth objective the study concerned the influence of perceived characteristics of CBPP vaccine namely; relative advantage, compatibility, complexity, and observability. In determining this influence, this study followed diffusion of innovation theory on characteristics driving adoption. According to Rogers (1995*),* "Innovations that are perceived by receivers as having greater relative advantage, compatibility, less complexity, and observability will be adopted more rapidly than other innovations."

All perceived characteristics of CBPP vaccine were found to have significant influence on adoption. The vaccine was perceived by almost all the respondents as having more advantages because it prevented their cattle from the disease rather than treating them when they are already sick. In support, Kairu-Wanyoike et al. (2004), Wesonga et al., (2000), says respondents were aware that an outbreak of CBPP could result to cattle deaths and healthy herds could get infected if they got in contact with the sick ones. Thus livestock vaccinations were widely accepted among respondents being studied. In so doing, respondents were found to share similar adoption behaviors with other adopters who chose and used a technology (or an innovation) for a specified task, only when it demonstrated a relative advantage over all other options. Further, compatibility with the respondents' life and practices was inquired, and majority of the respondents perceived CBPP vaccinations to be in line (compatible) with their social practices and beliefs only if done when pasture was in plenty. The last perceived characteristic was complexity which according to Rogers (2003) is a degree to which an innovation is perceived as difficult to understand and use. It's noteworthy that CBPP vaccine was not personally administered by pastoralists, nevertheless, understanding of its nature was found to influence its adoption. The vaccine required a cold chain, administered by a veterinary officer, and all community cattle were advised to vaccinate at the same time (to avoid infections), usually in the morning. Respondents strongly agreed with communication leading to an understanding that the vaccine itself was complex because, "it was stored in a cold box and not just sold to anybody". In fact, respondents in the study inferred its complexity, *"dawa ya barafu, dawa ya mkia",* meaning cold medicine, or vaccine of the tail.

The fifth and most critical factor that shaped innovation diffusion (Rogers, 1995) was observability of the CBPP vaccine. Respondents strongly agreed that they conversed with each other during social interactions and formed consensus of observing vaccinated cattle didn't get CBPP infections even when in contact with infected ones. All these characteristics were widely communicated among the respondents of Narok South Sub County.

In conclusion, hypothesis on this inquiry was disapproved, since vaccine characteristics were found to have significant influence. The findings implied that respondents were aware of vaccine characteristics which were acceptable so long as they were in line with their beliefs and values. Communication campaigners and veterinary people could enhance acceptability by consulting the community during vaccination periods.

5.2.5 The Relationship between Demographic Characteristics and Communication Factors on Adoption CBPP Vaccine among ASAL Pastoralists in Kenya.

The study made an inquiry on the relationship between demographic characteristics and communication factors (channels, participants, messages, and perceived characteristics of CBPP vaccine) on adoption CBPP vaccine among ASAL pastoralists in Kenya. The outcome was that literacy and income did not stand in the way of influencing adoption CBPP vaccine. Despite half (53.5%) of the respondents being uneducated, a majority reported that literacy was not important in matters of communication and understanding CBPP vaccine. Heffernan *et al.,* (2008) and Heffernan *et al.,* (2011) who arrived at similar findings while Tan (1981), concurred that the critical variable in studying knowledge gaps should be interest in the issue and not education because homogeneity allows members of a community to have more interpersonal discussion of an issue which may lead to "knowledge leveling". Income status on of the respondents was also found not to have an effect on communication of CBPP vaccine. Respondents said state of being poor or rich was not a reason for failure by individuals not to vaccinate against CBPP since they often stood for each other for any incidental expenditures, because CBPP vaccinations were offered for free by Government. But Karanja-Lumumba *et.al,* (2015) found poor people were less likely to vaccinate their livestock than their resourced counterparts. Higher purchasing power among the livestock owners enabled them to meet the cost of vaccination and thus engaged more in information seeking than poor counterparts. Baerenklau (2005) concurs that economic and access to information factor played a part in adoption decisions while Rogers, (1995) concurred that differences among adopter groups in terms of their personal characteristics, media behavior, and position in society

also influenced adoption. Early adopters were young, had higher financial status and were equipped with greater mental ability than late adopters.

On gender roles, the study found that Maasai culture only allowed men to communication vaccinate decisions, and women had minimal say in vaccination decisions. These findings point to gender dynamics in the community where women were found to have limited degree of independence of livestock decision making and communication in vaccination issues. Waithanji et al., (2015) advanced that women were unable to access extension information on CBPP, its control and benefits of its control because their decision-making power and ability to negotiate over what to do with cattle and their products within the household was very weak. Further, this study found that women are not permitted to interact with men from outside the family including male veterinary extension workers.

Literacy did not stand in the way of influencing adoption due to a situation of "knowledge leveling". Income or state of being poor or rich was not a reason for failure by individuals not to vaccinate against CBPP since information was "freely" shared. Moreover, CBPP vaccinations were offered for free by Government. Gender stood in the way albeit insignificantly. Maasai culture only allowed men to communication vaccination decisions, while women had limited degree of independence in overall livestock decision making and communication in vaccination issues. Hypothesis on literacy and income was disapproved, while gender was approved. Therefore, any community mobilization efforts for vaccinations could mainly target men.

5.3 Conclusion

This study sought to establish the influence of communication factors on adoption of contagious bovine pleuropneumonia vaccine among arid and semi-arid lands pastoralists in Kenya. It was established that communication is an important driver of adoption CBPP vaccine, as is the case with many other innovations. Communication factors channels, participants, messages and perceived characteristics play complementary roles to enable

CBPP vaccine adoption but some events contribute to non-adoption and disregard for expert advice on vaccinations.

In view of this, pastoralists social structures are very relevant in communication organization especially during informal conversations and baraza meetings. The mobile phone enables herders to share information easily, quickly and over great distances but its use for CBPP social media influence is minimal. Local vernacular radios are highly influential due to portability, affordability, simplicity, and language flexibility traits but has little programing on CBPP vaccine. Further, it is evident that interpersonal influence is a dominant mechanism for diffusion of the vaccine. Social interactions between people-neighbors, veterinary officers, family, herders and Maasai elders, influence adoption decision. CBPP vaccine messaging parameters of dosage, benefits, required frequency of vaccination and side effects impacted on adoption. However, there is are gaps in messaging, understanding characteristics of the vaccine and the purpose of the vaccinations. Conspiracy theory explains this phenomenon as triggered by a belief that events are secret plots by some people to benefit themselves and not others. Subsequently, some pastoralists view the vaccine with suspicion and skip vaccination altogether. Adopters' understanding and communication of perceived characteristics on relative advantage, compatibility, complexity, and observability is equally important but there is a need to educate them more on the vaccine characteristics in order to bring vaccination up to the desired scales. Respondents perceived and observed the vaccine as beneficial because of the advantages accrued, but acknowledged its complexity. However, they were cautious and accepted as long as vaccinations were in line with their beliefs and values. Communication campaigners and veterinary people could enhance acceptability through regular communication with the community before vaccination periods. Apparently respondents' demographic characteristics of education and income do not stand in the way of understanding CBPP vaccine information.

However, in gender, the Maasai culture defines men's and women's involvement in livestock vaccinations. Men mostly to decided and communicated decisions to vaccinate against CBPP and other livestock, although women in single headed households had

minimal say. Therefore, any community mobilization efforts for vaccinations could mainly target men.

Although the study did not use cumulative adoption numbers plotted over time using normal Bell curve, a sigmoid or s-curve, adoption of the CBPP vaccine for 4 years was demonstrated using a graph. Through this line of inquiry, the study determined percentages of respondents who vaccinated once or twice as advised by experts over four years.

5.4 Recommendations

This study sees the need to develop a harmonized national and county government communication strategy whose main objective is improved awareness and understanding of CBPP vaccinations among ASAL communities. Further, the study makes several recommendations under each objective.

In objective one on the influence of communication channels, community interpersonal channels could be strengthened more to enhance disease reporting and control. They are highly influential in persuading individuals because they clarified points, and surmounted psychological and social barriers. Future CBPP and indeed any other livestock vaccinations communication plans should first analyze the role of localite and cosmopolite channels and their attributes before disseminating their messages. Further, media owners should particularly have a stake in a policy to provide messaging through programming and editorials on CBPP vaccine adoption on vernacular FM stations listed by this study.

In objective two on the influence of CBPP vaccine communicators, future efforts could leverage them to push adoption to the desired scales. The communication strategy should link all players involved in CBPP communication e.g. veterinary researchers, and communication to attain knowledge leveling. Future communication investments could be made on the community through training opinion leaders on some basic aspects of disease reporting control and eradication. In objective three on the influence of messages,

harmonization across the ASAL counties could enable standardization of messaging to combat the disease, considering that CBPP is a trans-boundary disease. Messages should be disseminated through local activities such as brazes and other activities such as role play, field days, and social gatherings. Social and professional veterinary networks could be used to disseminate vaccine messages since these were useful in influencing respondents' decisions to adopt the vaccine. Further, segmentation could be undertaken to ensure that CBPP vaccine communication reached intended audiences. In objective four on communication of perceived characteristics, vaccine developers could package innovation transfer information. This could in turn be cascaded to cattle owners to enable them comprehend issues of relative advantage, complexity, observability, and compatibility of the vaccine. In objective five, the relationship between demographic characteristics and communication factors, the study established that gender had an influence on adoption of the vaccine. Therefore, community mobilization efforts for vaccinations could mainly target men since they made decisions. However, women headed households could also be involved since they enjoyed some degree of decision making on livestock management.

Diffusion of innovation (Rogers, 1995) and social learning (Bandura, 1977) theories largely informed this study. The latter theory helped the study to show modelled behavior of CBPP vaccine communicators, and adopters who made decisions to vaccinate twice a year as advised by experts. This study recommends that behavioral change theories e.g. theory of planned behavior could be used in a replicate study.

5.4.1 Suggestions for Further Research

This study on communication factors influencing adoption of CBPP vaccine among ASAL pastoralists in Kenya was delimited by a number of factors, making it necessary to undertake further research. First, this research followed a cross sectional study design encountered limitations on how two dependent variables (CBPP vaccine communicators and channels) influenced adoption decisions of the CBPP vaccine. In particular, the researcher did not pursue influence of vernacular radio stations in an experimental setting

on the number of times CBPP vaccine messages were broadcasted, the intervals of exposure, and packaging of messages exposed. In this regard, respondents and a control group were not subjected to an experimental setting to determine the influence of messages on their decision making to adopt CBPP vaccine. This study suggested further research in this area.

Secondly, due to two factors, limitations of resources and time and study design, this study did not demonstrate adoption findings using cumulative adoption numbers plotted over time, demonstrated by a normal Bell curve, a sigmoid or s-curve establishing five adopter categories (early adopters, early majority, late majority and laggards) in their rate of adoption of innovations. Thus this researcher recommended longitudinal or exploratory research (a broad-ranging, purposive, systematic prearranged undertaking designed to maximize the discovery of generalizations leading to description and understanding) to investigate a problem adoption of hybrid corn seed in Iowa, (Rogers 1995, Rogers 2003) could be used to demonstrate adoption pattern of CBPP vaccine. Studies will be required to establish an CBPP adoption pattern over the years following Rogers (1995) and Lowery and Defleur (1995) in which adoption pattern will be established. Further, my study was derived from Narok South Sub County only and findings generalized to ASAL counties were CBPP is prevalent, and comparative studies could be necessary. Lastly, communication studies on respondents' knowledge, attitude, and perception studies were recommended for CBPP vaccine to adoptions motivation.

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APPENDICES

Appendix I: Letter of Introduction

Virginia Wangari Ndungu
School of Human Resources and Development
Jomo Kenyatta University of Agriculture and Technology
P O Box 62000 – 00200, NAIROBI

To Whom It May Concern,

Dear Sir/Madam,

RE: COLLECTION OF RESEARCH DATA

This is to inform you that I'm a post graduate student at Jomo Kenyatta University of Agriculture and Technology, School of Human Resources and Development pursuing a Doctor of Philosophy Degree in Mass Communication. I'm currently undertaking a research on: "The influence of communication factors on Adoption of Contagious Bovine Pleuropneumonia Vaccine among the ASAL Pastoralists in Kenya

I kindly request you to assist me collect necessary data by filling out the attached questionnaire. The information you provide will be used exclusively for academic purposes and will be treated with total confidentiality. This will not take more than fifteen minutes of your time.

Your co-operation is highly appreciated.

Virginia Wangari Ndungu
Mobile phone: 0722 694359
Email: wangaridungu123@gmail.com

Appendix II (a): Household Survey Questionnaire (English)

Serial NO……...

PRELIMINARIES

i) Division: 1 [ ] Loita 2 [ ] Mara

ii) Sub Loc: 1[ ] Olngarua 2[ ] Nkopon 3[ ] Sekenani 4[ ] Aitong 5[ ] Olkinyei 6[ ]Siana

ii) Questionnaire No: 1[ ] 1-80 2[ ] 1-51 3[ ] 1- 52 4[ ] 1-85 5[ ] 1-52 6 [ ] 1-104

iv) Sub –Location Questionnaires (key- MF= Mixed farming, AP= Agro pastoralists, P= Pastoralists):

1: MF [ ] 0-0 AP [ ] 1-41 P [ ] 1-39 **2:** MF [ ] 0-0 AP [ ] 1-27 P [ ] 1-24
3: MF [ ] 1-3 AP [ ] 0-0 P [ ] 1-49 **4:** MF [ ] 1-5 AP [ ] 0-00 P [ ] 1-80
5: MF [ ] 1-3 AP [ ] 0-0 P [ ] 1-49 **6:** MF [ ] 1-7 AP [ ] 0-00 P [ ] 1-97

v) Please indicate which language this interview will use

a [ ] English b[ ] Maasai

Directions for use: Please answer part A accordingly and in part B, tick [√] the correct responses.

PART A - Respondent's Personal Information (Bio - data)

1. Place of Birth (Tick one): a) [ ] Loita b) [ ] Mara

2. Gender (Tick one): a) [ ] Male b) [ ] Female

3. Marital status (Tick one): a) [ ] Married b) [ ] Single

4. What is your age bracket? (Tick one)

a) [ ] 19 - 30 b) [ ] 31-50 c) [ ] 51-70 d) [ ] 71- over

5. What is your highest level of education? (Tick one)

a) [ ] Never
b) [ ] Primary
c) [ ] Secondary
d) [ ] College
e) [ ] University
f) [ ] Adult education classes

6. How many cattle does your family own? (Tick one)

a) [ ] 0 - 100
b) [ ] 100- 500
c) [ ] 500- 1000
d) [ ] 1000- over

7. Are you aware of a cattle lung disease known as contagious bovine pleuropneumonia or *Ol kipei* in Kimaasai language? (Tick one)

1. [ ] Yes
2. [ ] No

8. Does your cattle get vaccinated Ol *kipei*? (Tick one)

1. [ ] Yes
2. [ ] No

9. If yes, in your own words, what do you call the vaccine? _____

PART B: Communication Factors that Influence Adoption of CBPP Vaccine

PART 1: Discussions on Communication Participants

10. Do you usually engage in some form of discussion with other people (e.g. wife/husband, herders, veterinary officers, agrovets, or neighbors) before you make a decision to vaccinate your cattle against CBPP?

a. Yes ( ) b. No ( )

11. If Yes in Q10 above, who among the following people do you consult with before you vaccinate your cattle against CBPP? (Tick as many as you wish)

Influencer	**Tick as many as you wish**
Chiefs	**( )**
Maasai elders	**( )**
Veterinary officers	**( )**

Professionals and religious leaders in the community	**( )**
Neigbbours	**( )**
Herders	**( )**
Family (Spouse, children, and relatives)	**( )**
Other (Please specify)	**( )**

12. From the following list, whose advice do you listen most when they advise you vaccinate your cattle against CBPP?

Influencer	**Mostly don't listen 5**	**Don't listen 4**	**Don't know 3**	**Listen 2**	**Mostly listen 1**
Chiefs					**( )**
Maasai elders					**( )**
Veterinary officers					**( )**
Professionals and religious leaders in the community					**( )**
Neigbbours					**( )**
Herders					**( )**
Family (Spouse, children, and relatives)					**( )**
Other (Please specify)					**( )**

13. Please select the reasons why you picked the people listed in Q12 above (Tick as many as you wish)

Qualities of the Influencer	**Tick as many as you wish**
They have government authority	**( )**
They are rich	**( )**
They are trustworthy and credible	**( )**
They seem very knowledgeable on CBPP and other livestock issues	**( )**
They are social and friendly and easy to relate with	**( )**
They are always accessible when I need some information	**( )**
They are more educated than most other community members	**( )**
It is their job to tell the community about CBPP vaccine	**( )**

They always seem aware about what the radio and TV say about issues	**( )**
They explain the benefits of vaccination until I understand	**( )**
They always have advice on many issues	**( )**

PART 2: Discussions on Communication Channels

14. Which of the following communication methods ***is often used*** by other people to advise you to vaccinate your cattle against CBPP? (Tick as many as you wish)

Communication channels often used	**Tick as many as you wish**
Vernacular radio	( )
Poster and banners posted in market places	( )
Informal conversation (e.g. Romon in livestock markets, & shopping centres)	( )
Baraza meetings with county or agro veterinary officers or chiefs	( )
Social media (e.g. WhatsApp, Facebook)	( )
Mobile phone	( )
Other channels (newspaper, church or school announcements)	( )

15. Which of the following communication methods do you like to be used to advise you to vaccinate for CBPP? (Tick as many as appropriate)

Communication Channels	**Highly dislike 5**	**Dislike 4**	**Don't know 3**	**Like 2**	**Highly like 1**
Vernacular radio	( )	( )	( )	( )	( )
Poster and banners posted in market places	( )	( )	( )	( )	( )
Informal conversations (e.g. Romon in market & shopping centres	( )	( )	( )	( )	( )
Baraza meetings with county or agro veterinary officers or chiefs	( )	( )	( )	( )	( )
Social media (e.g. WhatsApp, Facebook	( )	( )	( )	( )	( )

Mobile phone	( )	( )	( )	( )	( )
Other channels---------- (newspaper, church or school announcements)	( )	( )	( )	( )	( )

16. Give reasons why you selected the communication methods in Q15. (Tick as many statements as you wish).

Reasons of channel selection	**Tick as many as you wish**
They are based locally or in Narok County	( )
I trust them	( )
They deliver messages to me clearly	( )
They communicate in Kimaasai language	( )
My family/friends/neighbors like the channels	( )
They are easily accessible	( )
I incur little or no costs when I use then	( )
They are based in town such as Nairobi	( )
Others_____ (Reasons)	( )

Part 3: Discussions on influence of messages on adoption of CBPP Vaccine

17. Please confirm the following CBPP vaccine messages you get from people

Messages	**Strongly disagree 5**	**Disagree 4**	**Don't know 3**	**Agree 2**	**Strongly agree 1**
I'm told that benefits of vaccination is to prevent cattle from getting CBPP	( )	( )	( )	( )	( )
I vaccinate twice a year because experts say that	( )	( )	( )	( )	( )

this is the required frequency of vaccination					
I have been told that veterinary experts are best placed to determine inoculation site so I vaccinate without worry	( )	( )	( )	( )	( )
Some people say that that CBPP vaccine has side effects on some cattle but this has not influenced my decision to not to vaccinate	( )	( )	( )	( )	( )
I'm often influenced by a collective decision to vaccinate cattle within a specified time as agreed with the community	( )	( )	( )	( )	( )

18. Please pick the reasons why you usually agree with other peoples' advice to vaccinate. (Tick as many as you wish).

Appeal features of CBPP vaccine messages	**Tick as many as you wish**
I'm usually informed on good time for me to prepare for vaccination	( )
The details are usually simple to understand (e.g. venue, day, costs and availability of the veterinary officer	( )
The advice is usually believable	( )
The advice does not alarm me	( )
Advice is delivered repeatedly to remind me	( )
The advice is delivered to me in a language I understand	( )
I usually trust source (people) who advise me	( )
My spouse/family/community/neighbors always approve the advice to vaccinate	( )
Other (Please state)	( )

19. Do you recall an incident where you failed to join communal vaccination for lack of advice on whether to vaccinate or not? (Tick one)

a) [ ] Yes b) [ ] No

20. If Yes in Q19, please pick the following facts that made you skip vaccination (Tick one)

Advice that made respondent skip vaccination	**Very true**	**True**	**Neutral**	**False**	**Very false**
I was not informed on good time to prepare for vaccination	**( )**	**( )**	**( )**	**( )**	**( )**
Some details were not clear (e.g. venue, day, costs and availability of the veterinary officer	**( )**	**( )**	**( )**	**( )**	**( )**
I did not believe the message because there was drought, cattle had migrated, and animals were unhealthy	**( )**	**( )**	**( )**	**( )**	**( )**
I was alarmed by advice that vaccine was bad and I was afraid that tails of my cattle would fall off	**( )**	**( )**	**( )**	**( )**	**( )**
I was not repeatedly reminded to vaccinate	**( )**	**( )**	**( )**	**( )**	**( )**
The advice is delivered to me in a language I did not understand	**( )**	**( )**	**( )**	**( )**	**( )**
At the time, I did not trust people who advised to vaccinate me	**( )**	**( )**	**( )**	**( )**	**( )**
My spouse family/community/neighbors disapproved the advice	**( )**	**( )**	**( )**	**( )**	**( )**
Other (Please state_____)	**( )**	**( )**	**( )**	**( )**	**( )**

Part 4: Discussions on perceived characteristics of CBPP Vaccine

21. Please confirm if the following communication with other people have helped you to perceive characteristics the vaccine

Characteristics of CBPP vaccine	**Strongly disagree**	**Disagree 4**	**Don't know**	**Agree 2**	**Strongly agree**

	5		**3**		**1**
Vaccination has more advantages because it prevents cattle from cattle from the disease rather that treating when are already sick	**( )**	**( )**	**( )**	**( )**	**( )**
Vaccination should be compatible with my beliefs that it should done when there is enough pasture, and cattle are healthy	**( )**	**( )**	**( )**	**( )**	**( )**
The vaccine itself is complex because it requires a cold box, must be administered by veterinary officer and all community cattle must be vaccinated same day, usually in the morning	**( )**	**( )**	**( )**	**( )**	**( )**
They have told me they also had observed vaccinated cattle don't get infected with CBPP even when in contact with infected ones	**( )**	**( )**	**( )**	**( )**	**( )**

Part 5: Discussions on adoption of CBPP vaccine

22. Are you likely to vaccinate your cattle against CBPP vaccinations in the future as a result of advice to you to vaccinate? (Tick one)

a) [] Very unlikely b) [ ] Unlikely c) Neutral d) [ ] Likely e) [ ] Very likely

23. Please indicate if you vaccinated the following years after you received advice

Year and frequency	Nil	Once	Twice	Can't recall
2019	( )	( )	( )	( )
2018	( )	( )	( )	( )
2017	( )	( )	( )	( )
2016	( )	( )	( )	( )

PART 6: Moderating Effects of demographic characteristics

24. Please tick one answer in the matrix below on demographic characteristics

Demographic characteristics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I do not understand about CBPP vaccination because of my education	( )	( )	( )	( )	( )
I do not understand about CBPP vaccination because of my income status	( )	( )	( )	( )	( )
My culture allows only men to decide and communicate decisions to vaccinate against CBPP and other livestock	( )	( )	( )	( )	( )
My culture also allows women to decide and to communicate decisions to vaccinate against CBPP and other livestock	( )	( )	( )	( )	( )

25. What other communication improvement would you like so that everybody vaccinates for CBPP?

Oshe Oleng! Thank you once again for your cooperation

Appendix II (b): Household Survey Questionnaire (Kimaasai)

Serial No…….

PRELIMINARIES

i) Division: 1 [ ] Loita 2 [ ] Mara

ii) Sub Loc: 1*[ ] Olngarua* ***2****[ ] Nkopon* ***3****[ ] Sekenani* ***4****[ ] Aitong 5[ ] Olkinyei* ***6****[ ]Siana*

ii) Questionnaire No: 1[ ] 1-80 2[ ] 1-51 3[ ] 1- 52 4[ ] 1-85 5[ ] 1-52 6 [ ] 1-104

iv) Sub –Location Questionnaires (key- MF= Mixed farming, AP= Agro pastoralists, P= Pastoralists):

1: MF [ ] 0-0 AP [ ] 1-41 P [ ] 1-39 **2:** MF [ ] 0-0 AP [ ] 1-27 P [ ] 1-24
3: MF [ ] 1-3 AP [ ] 0-0 P [ ] 1-49 **4:** MF [ ] 1-5 AP [ ] 0-00 P [ ] 1-80
5: MF [ ] 1-3 AP [ ] 0-0 P [ ] 1-49 **6:** MF [ ] 1-7 AP [ ] 0-00 P [ ] 1-97

v) Please indicate which language this interview will use

a [ ] English b[ ] Maasai

Directions for use: Please answer part A accordingly and in part B, tick [√] the correct responses.

PART A- Respondent's Personal Information (Bio - data)

1. Kaa murua kitounyieki (Tick one): a) [ ] Loita b) [ ] Mara

2. Ira Olee (Tick one): a) [ ] arashu b) [ ] enkitok

3. Iyamishe (Tick one) a) [ ] eton eitu kiyami b) [ ] arashu iyamisho

4. Kaja ilarin liata (Tick one)

a) [ ] 19 - 30 b) [ ] 31-50 c) [ ] 51-70 d) [ ] 71- over

5. Ishomo sukuul, kaji intabaiki enkisuma ina? (Tick one)

a) [ ]Eitu alo sukuul
b) [ ] Secondary
c) [ ] University
d) [ ] Primary
e) [ ] College
f) [ ] enkisuma e gumbaru

6. Kebaa inkishu niatata tenkang inyi? (Tick one)

a) [ ] 0 - 100 b) [ ] 100- 500

c) [ ] 500- 1000 d) [ ] 1000- over

7. Itoningo aikata emuyian najing inkishu irkipieu yioloti enaa *Olkipei* (Contagious Bovine Pleuropneumonia) (Tick one)

a) [ ] Atoningo b) [ ] Eitu aning

8. Iyiolo oshi irkeek ooremi inkishu peiboori emuyian olkipieu? (Tick one)

a) [ ] Ehh Kayiolo b) [ ] Mayiolo

9. Amaa teniyiolo, kejiaa ilo shani? _____

***PART B**: Communication Factors that Influence Adoption of CBPP Vaccine*

PART 1: Discussions on communication participants

10. Keeta oshi iltungana lingorunyie ilomon nikiutaa terishata niyieu nirem inchoo inonol aiboorie orkipieu tenkaraki eeta ninche eyiolouna eramatare ooswami tenebo imuyiaritin enye? (Tick one)

a) [ ] Ehh keta b) [ ] Meeta

11. Teneeta oshi iltunagan linkilikuanishore enaa enitejo te Q10, kakua tungana oshi inkilikuanishore eton eitu irem inkishu inono aibooyo emuyian orkipieu?

Influencer	**Tick as many as you wish**
Olaiguanai arashu oloti lolaiguanani	( )
Iltasati Loormasai	( )
Iltungana omir irkeek loonkishu	( )
Olopisai le serkali oasisho tenkopis e ramatare onchoo	( )
Ilarikok loonkanisani aa irpastani	( )
Ilmalimuni arashu kulie aaisumak lolosho	( )
Iltungana le latia ino Irkchekuti	( )
Itungana lormarei (enkitok ino arashu orpayian lino, oltungana lormarei)	( )
Kulie tungana ake	( )

12. Amaa te sajati e, kaja imakisi nincho kulo tungana laa ninche inkilikuanishore, terishata igira aajo piirem inchoo inonok.

Influencer	**Mostly don't listen 5**	**Don't listen 4**	**Don't know 3**	**Listen 2**	**Mostly listen 1**
Olaiguanai arashu oloti lolaiguanani	( )	( )	( )	( )	**( )**
Iltasati Loormasai	( )	( )	( )	( )	**( )**
Iltungana omir irkeek loonkishu	( )	( )	( )	( )	**( )**
Olopisai le serkali oasisho tenkopis e ramatare onchoo Ilarikok loonkanisani aa irpastani	( )	( )	( )	( )	**( )**
Ilmalimuni arashu kulie aaisumak lolosho	( )	( )	( )	( )	**( )**
Irkchekuti	( )	( )	( )	( )	**( )**

Iltungana lormarei (enkitok ino arashu orpayian lino, oltungana lormarei	( )	( )	( )	( )	**( )**
Kulie tungana ake	( )	( )	( )	( )	**( )**

13. Please select the reasons why you picked the people listed in Q12 above (Tick as many as you wish)

Qualities of the Influencer	**Tick as many as you wish**
Tenkaraki aa ilopisaani le serkali	**( )**
Tenkaraki aa karsis	**( )**
Tenkaraki aa iltungana oosiligayu inkirorot enye	**( )**
Tenkaraki aa iltungana ootieu enaa keeta engeno naipirta emuyian oorkipieu, o ramatare sidai oonchoo	**( )**
Tenkaraki aa iltungana ooiro esidai nelelek engamaari tombaa	**( )**
Tenkaraki etumuoyu teleleki eneeta irkiliku likijo kingilikuan	**( )**
Tenkaraki aa ninche ooata enkisuma e shumata aaisul temurua	**( )**
Esiai enye ina peeliki emurua ramatare oochoo naata orkipieu	**( )**
Ninche oshi ooyiolo imbaa kumok naimakini te Radio o TV	**( )**
Aatolikitio tipatisho orchani lorkipieu omatoningu aitobiraki	**( )**
Ninche oshiaake oouta iltungana toolomon le tipat	**( )**

PART 2: Discussions on Communication Channels

14. Kakua oitoi oshi easishoreki oleng kigirai aaisho irkiliku oipirta tipaisho naremieki inchhoo peemetum emuyian oorkipieu? (Tick as many as you wish)

Communication channels often used	**Tick as many as you wish**
Radio Oormaasai	( )
Impala naasira eeta lelo kiliku	( )
ilomon oinosakinoi	( )
Intumoritin naalikinyieki iltungana irkiliku eg chiefs Agrovet	( )
Inkoitoi e mtandao naijo facebook o watsup	( )
Enkoitoi esimu	( )
Inkulie oitoi (tolimu) newspaper, church or school announcements)	( )

15. Amaa toomakisi, kaa naaji nanare oleng teneasishoreki aalikinyie iltungaan irkiliku ooipirta orkipieu, enaa enaikilikuanuaki te Q15

Communication Channels	**Highly dislike 5**	**Dislike 4**	**Don't know 3**	**Like 2**	**Highly like 1**
Radio Oormaasai	( )	( )	( )	( )	( )
Impala naasira eeta lelo kiliku	( )	( )	( )	( )	( )
ilomon oinosakinoi	( )	( )	( )	( )	( )
Intumoritin naalikinyieki iltungana irkiliku eg chiefs Agrovet	( )	( )	( )	( )	( )
Inkoitoi e mtandao naijo facebook o watsup	( )	( )	( )	( )	( )
Enkoitoi esimu	( )	( )	( )	( )	( )
Inkulie oitoi (tolimu) newspaper, church or school announcements)	( )	( )	( )	( )	( )

16. Tolimu aajo kainyo paa nena ooitoi naishoorieki irkiliku itegelua te Q16, ajo ninche naitabaikinyie iltungana irkiliku oipirta irkeek lemuyian oorkipieu teleleki. (Tick as many statements as you wish).

Reasons of channel selection	**Tick as many as you wish**
Ninche inkoitoi ang (local) te Narok county Ninche naisiligayu	( )
Kelikioo irkiliku teleleki	( )
Kelikio te kimaasai naa ninye ayiolo naningu aitobiraki	( )
Ina oitoi eyiolo nening ilotungana lormarei lai, lelatia orkulie lataaniki	( )
Ina oitoi eyiolo nening ilotungana lormarei lai, lelatia orkulie lataaniki.	( )
Kelelek ina oitoi	( )
Meeta garama	( )
Na Nairobi etti nena oitoi	( )
Inkulie sababuni (tolimu)_____	( )

Part 3: Discussions on influence of messages on adoption of CBPP Vaccine

17. Amaa tenesipa enitejo te ee anato, imbalainyieiyiok kulo kiliku enaa enitangamua

Messages	**Strongly disagree 5**	**Disagree 4**	**Don't know 3**	**Agree 2**	**Strongly agree 1**
Ore irkiliku ooipirta tipatisho orchani loorkipieu, naa ninche naikuna mataasishore ilo shani	( )	( )	( )	( )	( )
Ore irkiliku ooipirta natitin naanarikino nare inchoo ilo shani le orkipieu, naa kaiko mataremo incho katitin are tolari	( )	( )	( )	( )	( )
Ore irkiliku oipirta ewueji naremi inchoo aainei neme ile tipat tenanu tombaa	( )	( )	( )	( )	( )

naipirta orchani loorkipieu to lofisani le veterinary, neaku ore ewueji narem engishu namejalisha					
Ore irkiliku oojo keeta batisho rchani loorkipieu toonkshu, nemaaret teramatare naremie inkishu aainei. Kaka ore nanu na karem ake inkishu ainaei	( )	( )	( )	( )	( )
Karem Ingishu aienai anaa ake kitonyorakinyieki to Kijiji lang	( )	( )	( )	( )	( )

18. Please pick the reasons why you usually agree with other peoples' advice to vaccinate. (Tick as many as you wish).

Appeal features of CBPP vaccine messages	**Tick as many as you wish**
Keitabauni irkiliku terishata naishaakino paitayarisha pe eremi ingishu	( )
Kelelek peibung oltunganai lelo kiliku Keisiligayu lelo kiliku	( )
Keisiligayu lelo kiliku	( )
Meitureishu lelo kiliku	( )
Kelimuni lelo kiliku eigilitai toorishat kumok	( )
Kelimuni irkiliku tenkutuk naningu	( )
Kaimini Iltungana oolimu lelo kiliku	( )
Kenyoraa sii ninche iltungan alormarei lai , irhoreta lainei oltungana lelatia	( )
Inkulie sababuni (tolimu ene_____)	( )

19. Amaa eimu inkirorot oltungana, enoto eretopo niyilounye ewineji neremi enkiteng, esidano olehani lok kipei, erishata naremi, inkishi, enkitanya/ enkileng teneremi? (Tick one)

a) [ ] eeh anoto b) [ ] eitu atum

20. Tegeelu ilomon ooikuna peitu ittum ilo shani loremieki inchoo aibooyo orkipieu (Tick one)

Advice that made respondent skip vaccination	**Very true**	**True**	**Neutral**	**False**	**Very false**
Eitu eitabauni irkiliku terishata naishaakino pee eremi ingishu	**( )**	**( )**	**( )**	**( )**	**( )**
Kegol apa peeninguni lelo kiliku te weji te garama, arashu ketumi oloficai le veterinary	**( )**	**( )**	**( )**	**( )**	**( )**
Meisiligayu apa lelo kiliku tenkaraki etii olamiyu, nedura ingishu netasasita ingishu	**( )**	**( )**	**( )**	**( )**	**( )**
Keitureishu lelo kiliku, amu ketorono ilo shani naa keidum ilkidongo lo ingishu atupuku	**( )**	**( )**	**( )**	**( )**	**( )**
Eitu eigili lelo kiliku irishat kumok neeku eitu aningu aitobiraki	**( )**	**( )**	**( )**	**( )**	**( )**
Etolimuoki irkiliku tenkutuk neitu aningu	**( )**	**( )**	**( )**	**( )**	**( )**
Ore iltungana ootolimutuo lelo kiliku loltungana pa rem ingishu	**( )**	**( )**	**( )**	**( )**	**( )**
Ore le latia, ilo marei, ilchoreta nemegira aanyoraa lelo kiliku	**( )**	**( )**	**( )**	**( )**	**( )**
Inkuliesababuni (tolimu tene_____)	**( )**	**( )**	**( )**	**( )**	**( )**

Part 4: Discussions on perceived characteristics of CBPP Vaccine

21. Amaa eimu inkirorot orkulie tungana, kekitaretutuo piiyiolou kulo oomon ooipirta orchani lorkipieu?

Characteristics of CBPP vaccine	**Strongly disagree 5**	**Disagree 4**	**Don't know 3**	**Agree 2**	**Strongly agree 1**
Keeta ilo shani esidano sapuk teneremi inkishu aibooyo ina muyian oorkipieu alang enebaki ina muyian	**( )**	**( )**	**( )**	**( )**	**( )**
Mepaashari enkirukoto aai, orkeek ooremi inkishu aibooyo orkipieu, eeta ingishu inkujit na sidan ingishu	**( )**	**( )**	**( )**	**( )**	**( )**
Kegol ramatare ele shani aamulasima peepiki ewueji neirobi, naa lasima naa oltungaani aariyia orem inkishu, nenare sii neremi inkishu terishata naje.	**( )**	**( )**	**( )**	**( )**	**( )**
Etii irkiliku laatolikioki aajo ore inkishu naataremoki orchani lorkipieu, nemetum ina muyian hoo duo ninye eneshulare inkulie kishu naata emuyian oorkipieu	**( )**	**( )**	**( )**	**( )**	**( )**

Part 5: Discussions on adoption of CBPP vaccine

22. Amaa esuju irkiliku litangamayie ooipirta irkeek ooremi inkishu aibooyo emuyian oorkipieu, kelelek irem sii iyie inchoo inonon toonkolongi natii dukuya? (Tick one)

a). Melelek Oleng (b). Melekek (c) Maiyiolo(d). Kelelek)

23. Tolimu tenaa ore eimu inkirorot orkulie tungana ,nikinchoo ina enduata nilotie dukuya aarem inchoo inonok tekuna rishat (Tick one)

Year and frequency	**Nil**	**Once**	**Twice**	**Can't recall**
2019	( )	( )	( )	( )
2018	( )	( )	( )	( )
2017	( )	( )	( )	( )
2016	( )	( )	( )	( )

PART 6: Moderating Effects of demographic characteristics

24. Please tick one answer in the matrix below on demographic characteristics

Demographic characteristics	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Ore tengaraki aitu aisuma, nemayiolou enejo iltunganak kulie enetiu ilo onchani le CBPP	( )	( )	( )	( )	( )
Ore tengaraki maata oropiyiani namaidim atayiolou enejo iltunganak enetiu ilo shani le CBPP	( )	( )	( )	( )	( )
Ore te Kimila olmasai, na irpayiani ake onarikino pe wol pee erimi ingishu to olchani le CBPP o ngulie shoo	( )	( )	( )	( )	( )
Ore to Masai na kenyoraa Intomonok pe ewol metaremi Ingishu to Olchani le CBPP o ngulie shoo	( )	( )	( )	( )	( )

25. Kaji kingo pee kiwal e nyamali oolomon peyie kidim ata yiolou onchani le CBPP.

Oshe Oleng!

Appendix III: Interview Guide for Focus Group Discussions

FGD No_____ Sub location [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6

Division a) [ ] Mara b) [ ] Loita

PART A - Self-introductions and discussion on general information

1. Introduction

My Name is Virginia W. Ndungu. The purpose of this meeting is to gather information from the community on The influence of communication factors on adoption of CBPP vaccine. As I welcome fruitful, open and active participations, I wish to assure you that all your contributions shall be treated with outmost confidentiality and, shall strictly and only be used as valuable input to this study.

PART A

1. Are you aware of a cattle lung disease known as contagious bovine pleuropneumonia or *Ol kipei* in Kimasaai language?

2. Do you know a vaccine used to prevent your cattle from contracting *Ol kipei*?

3. If yes, what does the community call it? (Various names)

PART B: The influence of communication factors on Adoption of CBPP Vaccine

PART 1: CBPP vaccine communicators

4. Explain how the community engages in some discussions with veterinary officers and agrovets, before a collective decision is made to vaccinate cattle against CBPP.

5. Please list people in your community who are usually consulted before vaccination takes place.

6. Please discuss the reason these people you picked are consulted before a community decision to vaccinate your cattle is made

PART 2: Communication channels

7. Which communication channels is ***often used*** by your community to advise each other to vaccinate cattle against CBPP?

6. Which of the following methods do you find most suitable for communicating CBPP vaccination to your community?

7. Please explain why these channels are the suitable in communicating the community to vaccinate cattle against CBPP.

8. Please recall and discuss an incident where some members of community failed to vaccinate because communication channels used was not suitable.

Part 3: Influence of Messages on Adoption of CBPP Vaccine

9. Have discussions among community members helped them know facts about inoculation site, benefits, side effects, and how times they need to vaccinate their cattle against CBPP?

10. Please discuss the following

a) The community vaccinates because they are influenced by messages about the enormous benefits of vaccinating cattle against CBPP. What do the community say are the benefits?
b) The community vaccinates twice a year because they are influenced by messages on the required frequency of vaccinations. Explain
c) The community vaccinates because they are influenced by messages of people telling them that vets experts are best placed to determine inoculation site so that does not worry anybody.
d) "Some people say that that CBPP vaccine has side effects on some cattle, but this has not influenced our decision to not to vaccinate".
e) The community is usually often influenced by a collective decision to vaccinate cattle within a specified time as agreed.

11. Please discuss the following reasons why the community agree with Q9 on messages.

Including the advice is usually delivered on time for the community to prepare for vaccination, the advice is usually simple to understand, is usually believable, the advice does not alarm the community. Sometimes, the advice is delivered repeatedly to remind the community, and in a language we understand. We usually trust sources (within and outside the community) who advise us and we all approves the advice

12. Please discuss how the national and county government veterinary officers reaches out to the community with messages during CBPP vaccination campaigns.

13. Please explain how some individuals in the community make decisions independently because they are never influenced other people.

14. Do you know people who have skipped vaccination because of delivery of message problem?

[] Yes 2. [] No

15. If yes, please discuss the following facts that made them skip the vaccination.

The advice was not delivered on time for the community to prepare for vaccination. The advice was not clear (on venue, day, costs of vaccination and some people were not sure about the availability of the Vet).

The advice was not believable (because there was drought, cattle had migrated, and it was obvious cattle were unhealthy). Some people were alarmed by advice that vaccine was bad and they were afraid that tails of their cattle would fall off. People were not repeatedly reminded to vaccinate, so some forgot. The advice is delivered to the community in a language they did not understand.

At the time, we did not trust person(s) (within and outside the community) who advised to vaccinate me and the community disapproved the advice

Part 4: Perceived characteristics of CBPP Vaccine

16. Please discuss what people say about the vaccine in regard to the following:

a) Vaccination has more advantages because it prevents cattle from the disease rather that treatments for already sick cattle.
b) Vaccination has been done in line (compatible) with my beliefs (i.e. when there is enough pasture, and cattle are healthy)

c) The vaccine itself is complex i.e. it requires a cold box, must be administered by a Vet and all community cattle must be vaccinated same day, usually in the morning)
d) They have told me they also had observed vaccinated cattle don't get infected with CBPP even when in contact with infected ones

Part 5: Adoption of CBPP Vaccine

17. Do you believe the community has adopted CBPP vaccine as required?

[] Yes [] No

18. If yes, what is the percentage of vaccinated animals (Tick one)

[] 0-50% [] 50-100%.

19. How long does it generally take the community to vaccinate after the community are advised by the people you picked in **Part 1 Q 2?** (Tick one)

[] Days [] Weeks [ ] Months [ ] Years

20. Is communication important in influencing the community to vaccinate cattle for CBPP?

PART 6: Moderating Effects of Demographic Characteristics

21. Please discuss how the following factors determine the community's understanding of CBPP vaccine information and adoption.

a) In our community, the level of education usually affects some people's understanding of CBPP vaccination communication
b) In our community, the levels of income status usually affect understanding of CBPP vaccine communication
c) In our community, culture allows only men to communicate decisions to vaccinate against CBPP and other livestock
d) In our community, culture also allows women to communicate decisions to vaccinate against CBPP and other livestock.

22. What other communication problems you do you encounter during vaccination for CBPP?

23. Please state how these communication problems for CBPP vaccination can be solved

Oshe Oleng! Thank you once again for your cooperation

Appendix IV: Interview Guide for Focus Group Discussions

*Serial No*_____

PART A - Self-Introductions and Discussion on General Information

1. Introduction

Ore enkipirta ena tumo naa enasotunyeki induat ooltung'anak tialo ilkiliku/nkoitoi oishoo easishoreki olchani le CBPP (ilkipieu). Keeta olajurrorni osiligi ajo ore ntai irara loopeny emurua, naa iyatata ematua sapuk tialo biotisho oswam inyi, neisulaki eremoto olchani le CBPP peiboori nkasarani nitumitoto oshi tiatua larin kumok. Kalo naa aitoomon ntai peekipuo aimaki ele omoni, naa kaibalakinye sii ntai ajo ore mbaa naimakini tene naa keasishoreki ake tenkoitoi e dupoto tialo ena jurrore.

PART B: **The influence of communication factors on Adoption of CBPP Vaccine**

PART 1: Discussions on CBPP Vaccine Communicators

1. Amaa iltung'anak oosesh eikilikwani peeitayu ewutaroto teneyieu iltung'anak nerem swam olchani le CBPP, naa iloota eng'eno naipirta moyiaritin ooswam?

2. Ore paa kesipa enkikilikwanishore e dukuya Q1, tisira nkarran enye.

3. Tisira ninche anaa Enkarriano enye naata

4. Tolimu mbaa nikinchoo igelu iltung'anak litolimuo te Q2 anaa Ilang'eni oisho iltung'anak metonyorrai eremoto olchani le CBPP (ilkipieu)

PART B: **The Influence of Communication Factors on Adoption of CBPP Vaccine**

PART 2: Discussions on Communication Channels

5. Kakwa oitoi easishoreki oleng' aitayu ilkiliku le tipat oleng tenkop inyi?

6. Kakwa oitoi enyorr iltung'anak tenelimunyeki ilkiliku lolchani loorkipieu (CBPP)?

7. Tolimu mbaa 1-5 naaisho iltung'anak enyorru nkoitoi oolkiliku nitolimuo te Q6

8. Tolimu aajo emaa te nena ooitoi nimbalie te Q7, kaa kiroshi eeta pookin elikinyeiki iltungana meetaasishore irkeek loorkipieu tooswam enye.

9. Kaarishata eitu etumoki ilaramatak aatarem iswam enye tenkaraki eitu elikini aaitobiraki inkoitoi naaidim aatusuj teina ramatare?

10. Kelo neetai ilaramatak ootaremo inkishu enye ilo shani loorkipieu eitu elikini hoo inkiotoi naasuj?

Part 3: Discussions on Influence of Messages on Adoption of CBPP Vaccine

11. Ekitareto ilomon liimakitia okulie tungana tayiolo esipata naipirta tipat enkishoororto orkeek oorishie inkishu emweyian e CBPP, tenebo sii eyiolounoto oorishat naishikinore peyie eishori inkishu ele shani? (Tegelu nabo)

1. [ ] eee aatareto 2. [ ] eitu aaret

12. Amaa tenesipa aajo kitareto, tolimu sii iyie enkipirta e kulo kiliku litoningo eimu ilo shani oiboorieki emuyian oorkipieu (CBPP) tooswami.

a) Ore irkiliku ooipirta esidano ele shani lorkipie netaa ile tipat eikok ilaramatak metaasishore ilo shani tooswami enye.
b) Ore irkiliku ootolikioki ilaramatak oipirta erishat naanare neremi iswami ilo shani, netareto metonyorai aarem iswami katitin are tolari.
c) Messages on inoculation site are not important in influencing the community to vaccinate
d) Ore irkiliku ooibali ajo keitasur ilo shani iswami, neme ile tipat terishata gira ilaramatak aagelu enaaa kenyoraa ilo shani arashu menyoraa.
e) Ore irkiliku oishooki ilaramatak, ojo kenare neremi iswami ilo shani toorishata naaje, netaa ile tipat oleng erumoo ilaramatak metaremo nna swami enye terishata naishaakino.

13. Tolimu isababuni naa ninche etusuja ilaramatak peetonyoraitie ake aarem iswam enye eitu eilikini hoo oltungani oje, enaa enajo enkikilikuanata e Q10.

(*Including messages are delivered on time, simple to understand, believable, not alarming, delivered repeatedly, delivered in a language understood by the community, people who deliver the message, family/friends/neighbours approve the messages)*

14. Imbalunyie inkoitoi oshi naasishore ilopisaani oitasheiki ramatare ooswami te serkali kitok o serkali oonkauntini aabaikinyie ilaramatak eyaki irkiliku oipirta tipatisho orchani loorkipiei (CBPP)

15. Kelo neetai iltungana ooasa ake ninche imbaa enye maate eitu einining irkiliku hoo oje ooyakini ilangeni oitasheiki irishat naaje?

16. Keetai ilaramatak leitu etum iswami enye irkeek loibooyo ina muyian orkipiei tenkaraki inyamalitinneitu baikinyi irkiliku oipirta ilo shani

1. [ ] Ehh keetai. [ ] Meetai

17. *If yes, please discuss the following facts that made them skip the vaccination.*

(Including messages were not delivered on time, difficult to understand, unbelievable, alarming, not delivered repeatedly so people missed out, delivered in a language that people did not understand, the people/person who delivered the messages, family/friends/neighbours disapproved the messages, and other have low opinion of the CBPP vaccine)

Part 4: Discussions on Perceived Characteristics of CBPP Vaccine

18. Kakua omon oshi ejo iltungana eimakita orchani loorkipieu te kuna oitoi:

a. Esidano wentoroni naimakaki tialo orchani lorkipieu (CBPP)

b. Keeta enchankar natijingaka erishata naji ninye eishaa neremi inkishu orchani loorkipieu?

c. Engoloto natii teremore eilo shani neisulaki eyioloi ajo keyieu ilo shani neshumi tewueji neirobi, naa lasima sii paa oltungani ake ariyia orem inkishu, olomoni oji lasima neremi inkishu terishata naje.

d. enjuro najuruni inkishu naataremoki iloshani pedoli aajo meigil aatum ina muyian oorkipieu (CBPP)

Part 5: Adoption of CBPP Vaccine

19. Itaasishore aikata ele shani? [ ] Eee [ ] Eitu

20. Amaa tenaa ee itaasishore, kebaa inkishu ninchoo ele shani (Tegelu nabo)

[ ] 0-50% [ ] 50-100%.

21. Kebaa oshi enkata niya peyie itum aishoo inkishu ele shani enaa neikitolikitio iltungana litolimuo **Part 1 Q 2?** (Tegelu nabo)

[ ] Inkolon'gi naara esiana [ ] iwikii [ ] ilapaitin [ ] ilarin

22. Tolimu siiyie tenaa eikidimie ilomon linosa/litan'gara orkulie tun'gana inchoo inkishu orchani lorkipieu.

PART 6: Moderating Effects of Demographic Characteristics

Imbalunyie eneiko kuna baa peyiee eeta enkiroshi teningunoto oolomon oipirta ele shani le CBPP, neidimie sii metaasishore ilo shani loorkipieu CBPP.

23. [ ] enaaba enkisuma

24. [ ] Ilomon oinosutua ilewa

25. [ ] Ilomon oinosutua inkituaak

Oshe Oleng!

Appendix V: Demographic Details Questionnaire for Focus Groups

FILL IN YOUR ANSWER OR TICK THE APPROPRIATE

Name _____

Mobile phone _____ Place of Birth_____

1. Place of Birth (Tick one): [ ] Loita [ ] Mara

2. Gender (Tick one): [ ] Male [ ] Female

3. Marital status (Tick one): [ ] Married [ ] Single

4. What is your age bracket? (Tick one)

[ ] 24- 30 [ ] 30-50

[ ] 50-70 [ ] 70- over

5. What is your highest level of education? (Tick one)

1. [ ] Never 2. [ ] Adult classes 3. [ ] Primary 4. [ ] Secondary 5. [ ] College 6. [ ] University

6. How many cattle does your family own? (Tick one in the box provided)

0 - 100		100- 500		500- 1000		1000- over	

Thank you for taking the time to complete this questionnaire

Appendix VI: Interview Guide for Key Informant Interviews

Part A - Self-Introductions and Discussion on General Information

Serial No_____

Rank or profession or position of the key informant

PART B: **The Influence of Communication Factors *on* Adoption *of* CBPP**

PART 2: Discussions on CBPP Vaccine Communicators

1. Are there individuals within the community who are often sought out for advice when people want to make a decision to vaccine against CBPP because they generally seem to know a lot about livestock diseases?

2. If Yes in Q1, please list them down.

3. Please rank them in the order of the most to the least influencer

4. Please give reasons why the people you have listed in Q2 usually influence others to vaccinate for CBPP.

PART 1: Discussions on Communication Channels

5. Which communication channels are often used to advice the community on the importance of vaccinating cattle against CBPP?

6. Which channels does the community prefer to be used to communicate CBPP vaccination messages to them?

7. Give reasons why the community prefers the communication channels you have just mentioned in Q11?

8. Please rank those reasons Q 12 in the order of the most important to the least important why the channels are preferred.

Part 3: Discussions on Influence Of Messages on Adoption of CBPP Vaccine

9. Have the community been ever been exposed to any messages on inoculation site, benefits, frequency, side effects, and vaccination periods of CBPP vaccine?

10. If Q13 is yes, please discuss the following statements on CBPP messages

i. Messages on the benefits are important in influencing the community to vaccine.
ii. Messages on the required frequency are important in influencing the community vaccinate twice year.
iii. Messages on inoculation site are not important in influencing the community to vaccinate
iv. Messages that the vaccine has side effects on cattle are not important in influencing the community decision to vaccinate
v. Messages that all targeted cattle must be vaccinated within a specific time are important in influencing the community to vaccine.

11. Please discuss the reasons why the community agrees with the messages in Q10.

(*Including messages are delivered on time, simple to understand, believable, not alarming, delivered repeatedly, delivered in a language understood by the community, people who deliver the message, family/friends/neighbours approve the messages)*

12. Do some people skip vaccination because of delivery of message problem? If yes, please discuss the following facts that made them skip the vaccination.

(Including messages were not delivered on time, difficult to understand, unbelievable, alarming, not delivered repeatedly so people missed out, delivered in a language that people did not understand, the people/person who delivered the messages, family/friends/neighbours disapproved the messages, and others have low opinion of the CBPP vaccine)

Part 4: Discussions on Perceived Characteristics of CBPP Vaccine

13. Please discuss if communication with others have helped the community to understand that: -

i. Vaccination has more advantages than treatments
ii. Vaccination is not in conflict with Maasai beliefs (i.e. when to vaccinate)

iii. Vaccine is complex because it requires cold box, must be administered by a trained person and all cattle must be vaccinated at agreed period
iv. Vaccinated cattle don't get CBPP even when in contact with infected ones was also observed and communicated to me by others

Part 5: Discussions on Adoption of CBPP Vaccine

14. Is communication important in influencing the community to vaccinate cattle for CBPP?

15. How long does it generally take the community to vaccinate after communication with community?

PART 6: Moderating Effects of Demographic Characteristics

16. Please discuss the following statements

i. Maasai culture allows only men to communicate decisions to vaccinate against CBPP and other livestock vaccinations
ii. Maasai culture also allows women to communicate decisions to vaccinate against CBPP and other livestock vaccinations
iii. Maasai culture allows old people only to communicate decisions to vaccinate against CBPP and other livestock vaccinations
iv. Maasai culture also allows young people to communicate decisions to vaccinate against CBPP and other livestock vaccinations

17. Are there individuals who miss out on vaccination of CBPP because of other communication problems?

18. Please advise how these communication problems can be solved?

20. Please explain how government undertakes communication campaigns to eradicate CBPP.

Appendix VII: Breakdown of Chi-Square Goodness of Fit

The study provided a detailed breakdown of Chi-square goodness of fit statistical tests on the influence of communication factors in adoption of CBPP vaccine

6.1 **Chi-Square Goodness of Fit Statistical Test on Influence of Communication Channels on Adoptions of CBPP Vaccine**

H_0.01 There is no significant relationship between influence of communication channels and adoption of CBPP vaccine among ASAL pastoralists in Kenya.

Table 6.1: Summary of chi-square goodness of for communication channels most liked

	Informal Conversations	**Vernacular radio**	**Baraza Meetings**	**Mobile phone**
Chi-Square	415.084	408.333	399.239	284.275
df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

Since the p value< 0.05 for the four communication channels (informal conversations, Vernacular radio, baraza meetings and mobile phone), that majority of the respondents (more than 50%) liked to use, we therefore conclude that communication channels significantly influenced adoption of CBPP vaccine.

The researcher further split hypothesis No 2 into four times (H01a, H01b, H01c, H01d,) for communication channels that obtained 50% influence to adopt CBPP vaccine, and tested at 0.05 level of significance. The following results were obtained.

H_0.1a: Informal conversation do not significantly influence adoption of CBPP vaccine

Table 6.1a: Chi-square on informal conversations

	Observed N	Expected N	Residual	Chi- squire value	P value
Dislike	3	213.5	-210.5	415.084	0.000
Like	424	213.5	210.5		
Total	**427**				

Since the Chi-Square = 415.084, p value < 0.001 which was far away less than 0.05, it was therefore concluded that informal conversations significantly influenced adoption of CBPP vaccine

H_0.1b: Baraza meetings do not significantly influence adoption of CBPP vaccine

Table 6.1b: Chi-square on baraza meetings

	Observed N	Expected N	Residual	Chi- squire value	P value
Dislike	5	209.5	-204.5	399.239	0.000
Like	414	209.5	204.5		
Total	**419**				

Since the Chi-Square = 399.239, p value < 0.001 which was far away less than 0.05, it was therefore concluded that there was a significant difference among the pastoralists who like using baraza meetings and those who did not. This implies that baraza meetings significantly influenced adoption of CBPP vaccine

H_0.1c: Use of mobile phone do not significantly influence adoption of CBPP vaccine

Table 6.1c: Chi-square goodness for mobile phone

	Observed N	Expected N	Residual	Chi- squire value	P value
Dislike	22	183.5	-161.5	384.275	0.000
Like	345	183.5	161.5		
Total	**367**				

Chi-Square = 284.275, p value < 0.05 was therefore a significant difference among the pastoralists who used mobile phone and those who did not. This implies that using mobile phones significantly influenced adoption of CBPP vaccine

H_0.1d: Vernacular radio do not significantly influence adoption of CBPP vaccine.

Table 6.1d Chi-Square for Vernacular radio

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Dislike	6	216.0	-210.0	408.333	0.000
Like	426	216.0	210.0		
Total	**367**				

Since the chi-square = 408.333, p value < 0.001 which was far away less than 0.05, it was therefore concluded that CBPP vaccine communicators who used Vernacular radio significantly influenced adoption of CBPP vaccine by the pastoralists

6.2 Chi-Square Goodness of Fit Statistical Test was Conducted on Attributes of Channels that Influenced on Adoption of CBPP Vaccine.

a) Chi-square goodness of fit statistical test was conducted on attributes of channels that influenced on adoption of CBPP vaccine.

H_0.1i There is no significant relationship between attributes of CBPP vaccine communicators and adoption of CBPP vaccine among ASAL pastoralists in Kenya

Table 6.2: Summary of chi-square goodness of fit of attributes of communication channels

	Trustworthy	**Clarity**	**Kimaasai language**	**Accessibility**
Chi-Square	123.665	182.435	152.804	107.264
df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

The four attributes of the communication channels (trustworthy, clarity, kimaasai speaking and accessibility) which were highly rated (> 50%) were statistically significant (p value < 0.05), implying that they significantly influenced adoption of CBPP vaccine.

H_0.1ii: Clarity of the communication channels do not significantly influence adoption of CBPP

Table 6.2a: Chi-Square for clarity

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Dislike	78	219.5	-141.5	182.435	0.000
Like	361	219.5	141.5		
Total	**439**				

Since chi-square = 182.435, p value < 0.05 it was therefore concluded that clarity of the communication channel significantly influenced adoption of CBPP vaccine

H_0.1iii: Trustworthiness of the communication channels do not significantly influence adoption of CBPP vaccine

Table 6.2b: Chi-square for trustworthiness

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Dislike	111	219.5	-108.5	123.665	0.000
Like	328	219.5	108.5		
Total	**439**				

Since Chi-Square = 123.665, p value < 0.001 which is far away less than 0.05, it was therefore concluded that trustworthiness of the communication channels significantly influenced adoption of CBPP

H_0.1iv: Accessibility of communication channels do not significantly influence adoption of CBPP vaccine.

Table 6.2c: Chi-square for accessibility

	Observed N	Expected N	Residual	Chi- squire value	P value
Dislike	111	219.5	-108.5	107.264	0.000
Like	328	219.5	108.5		
Total	**439**				

Since chi-square = 107.264, p value < 0.001 which is far away less than 0.05, it was therefore concluded that communication channels that were easily accessible to the pastoralists significantly influenced adoption of CBPP vaccine

H_0.1v: Communication in Kimaasai language do not significantly influence adoption of CBPP vaccine

Table 6.2d: Chi-square for Kimaasai language

	Observed N	Expected N	Residual	Chi- squire value	P value
Dislike	90	219.5	-129.5	151.804	0.000
Like	349	219.5	129.5		
Total	**439**				

Since Chi-Square = 152.804, p value < 0.001 which is far away less than 0.05, it was therefore concluded that channels that communicated in Kimaasai language significantly influenced adoption of CBPP vaccine

6.3: Chi-square goodness of fit statistical test on influence of CBPP vaccine communicators on adoptions of CBPP vaccine

H_0.2 There is no significant relationship between influence of CBPP vaccine communicators and adoption of CBPP vaccine among ASAL pastoralists in Kenya

Table 6.3: Summary of the chi-square goodness of fit test for hypothesis H02

	Veterinary officers	**Neighbors**	**Herders**	**Family**
Chi-Square	290.679	352.440	13.954	14.679
df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

Chi-square goodness of fit test for CBPP vaccine communicators' neighbors, veterinary officers, family and herders who were consulted by the majority of the respondents (proportion > 50%) was statistically significant (p value< 0.05) in influencing respondents to adopt CBPP vaccine as shown in table 4.5 above.

The researcher further split hypothesis No2 into four times (H02a, H02b, H02c, H02d,) for CBPP vaccine communicators (neighbors, veterinary officers, family and herders) who obtained 50% influence to adopt CBPP vaccine, and tested at 0.05 level of significance. The following results were obtained.

H_0.2a: Neighbors do not significantly influence adoption of CBPP vaccine.

Table 6.3a: Chi-square for neighbors'

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
No	22	218.0	-196.0	352.440	0.000
Yes	414	218.0	196.0		
Total	**436**				

Since the chi-square = 352.440, p value < 0.001 which was far away less than 0.05, it was therefore concluded that respondents' consultation on CBPP vaccination with neighbors significantly influenced adoption.

H_0.2b: Veterinary officers do not significantly influence adoption of CBPP vaccine.

Table 6.3b: Chi-square for veterinary officers

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
No	40	218	-178.	290.679	0.000
Yes	396	218.0	178		
Total	**436**				

Since the chi-square =290.679, p value < 0.001 which was far away less than 0.05, it was therefore concluded that respondents' consultation on CBPP vaccination with veterinary officers significantly influenced adoption of CBPP vaccine.

H_0.2c: Family members does not significantly influence adoption of CBPP vaccine.

Table 6.3c: Chi-square for family members

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
No	178	218.0	-40.0	14.679	0.000
Yes	258	218.0	40.0		
Total	**436**				

Since the chi-square = 14.679, p value < 0.001 which was far away less than 0.05, it was therefore concluded that respondents' consultation on CBPP vaccination with family members significantly influenced adoption.

H_0.2d: Herders does not significantly influence adoption of CBPP vaccine.

Table 6.3d: Chi-square for herders

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
No	179	218.0	-39.0	13.954	0.000
Yes	257	218.0	39.0		
Total	**436**				

Since the chi-square = 13.954, p value < 0.001 which was far away less than 0.05, it was therefore concluded that respondents' consultation on CBPP vaccination with herders significantly influenced adoption

6.4. Chi-Square Goodness of Fit Statistical Test was Conducted on Qualities of Communication Channels that Influenced on Adoption of CBPP Vaccine

a) Chi-square goodness of fit statistical test was conducted on attributes of channels that influenced on adoption of CBPP vaccine.

H_0.2i There is no significant relationship between attributes on qualities of CBPP vaccine communicators and adoption of CBPP vaccine among ASAL pastoralists in Kenya

Table 6.4: Summary of chi-square for qualities of CBPP vaccine communicators

	Trustworthy and credibility	**Knowledge**	**Accessibility**	**Explaining benefits of CBPP vaccine**
Chi-Square value	2.340	.454	2.704	.021
df	1	1	1	1
Asy.sign. (2-sided)	0.0126	0.0500	0.0100	0.0484

In summary, the p-values were less than <0.05 for the four qualities of influencers. This implies that the four attribute (trustworthy and credibility, knowledge accessibility and explaining benefits of CBPP vaccine) significantly influenced the adoption of the CBPP vaccine.

H_0.2ii Trustworthiness and credibility of influencers was insignificant in influencing the adoption of CBPP vaccine.

Table 6.4a: Chi-square for trustworthiness and credibility

	Observed N	Expected N	Residual	Chi- squire value	P value
No	85	218.0	133.0	162.284	0.000
Yes	351	218.0	133		
Total	**436**				

Since the Chi-Square = 162.284, p value < 0.001 which was far away less than 0.05, it was therefore concluded that CBPP vaccine communicators with trustworthy and credible qualities had a significant influence on respondents' adoption of CBPP vaccine than those who did not have.

H_0.2iii: Accessibility of influencers was not significant in influencing the adoption of CBPP vaccine.

Table 6.4b: Chi-square for accessibility

	Observed N	Expected N	Residual	Chi- squire value	P value
No	129	218.0	-89.0	72.670	0.000
Yes	307	218.0	89.0		
Total	**436**				

Since the chi-square = 72.670, p value < 0.001 which was far away less than 0.05, it was therefore concluded that CBPP vaccine communicators who were always accessible had a significant influence on respondents' adoption of CBPP vaccine than those who were not.

H_0.2iv: Knowledgeable influencers was not significant in influencing adoption of CBPP vaccine

Table 6.4c: Chi-Square for knowledge

	Observed N	Expected N	Residual	Chi- squire value	P value
No	153	218.0	-65.0	38.761	0.000
Yes	283	218.0	65		
Total	**436**				

Since the Chi-Square = 38.761, p value < 0.001 which was far away less than 0.05, it was therefore concluded that CBPP vaccine communicators who were more knowledgeable had a significant influence on respondents' adoption of CBPP vaccine than those who were not.

H_0.2v: Explaining vaccination benefits was not a significant attribute of influencers in the adoption of CBPP.

Table 6.4d**:** Chi-square for explaining vaccination benefits

	Observed N	Expected N	Residual	Chi- squire value	P value
No	156	218.0	-62.0	35.266	0.000
Yes	280	218.0	62		
Total	**436**				

Since the chi-square = 35.266, p value < 0.001 which was far away less than 0.05, it was therefore concluded explaining vaccination benefits until it was understood, was a significant attribute of influencers in the adoption of CBPP vaccine.

6.5: C**hi-Square Goodness of Fit Statistical Test on Influence of Messages on Adoption of CBPP vaccine**

H_0.3: There is no significant relationship between influence of messages and adoption of CBPP vaccine among ASAL pastoralists in Kenya.

Table 6.5: Summary of Chi-Square for CBPP vaccine messages

	Benefits of vaccination	**Required frequency of vaccination**	**Determination of inoculation site**	**Vaccine side effects on some cattle**
Chi-Square	352.809	106.036	262.727	158.400
Df	1	1	1	1
Asymp. Sig	0.000	0.000	0.000	0.000

In summary, the p values were less than 0.05, this implies that messages (benefits of vaccination, required frequency of vaccination, determination of inoculation site, vaccine side effects on some cattle) on vaccination significantly influenced adoption of CBPP vaccine

The researcher further, split hypothesis No.3 was split into four times (H03a, H03b, H03c, H03d, H03e) for 50% respondents who were influenced by particular messages to adopt CBPP vaccine, and tested at 0.05 level of significance. The following results were obtained.

H_0.3a: Messages on benefits of vaccination do not significantly influence adoption of CBPP vaccine.

Table 6.5a: Chi-Square on messages on vaccination benefits

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Disagree	23	220.0	-197.0	352.809	0.000
Agree	417	220.0	197.0		
Total	**440**				

Since the Chi-Square = 352.809, p value < 0.001 which was far away less than 0.05, it was therefore concluded that messages on benefits of vaccination significantly influenced adoption of CBPP vaccine by the pastoralists

$H_0$3b: Messages on required frequency of vaccination do not significantly influence adoption of CBPP vaccine

Table 6.5b: Chi-square on messages on required frequency of vaccination

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Disagree	112	220.0	-108.0	106.036	0.000
Agree	328	220.0	108.0		
Total	**440**				

Since the Chi-Square = 106.036, p value < 0.001 was far away less than 0.05, it was therefore concluded that messages on the required frequency of vaccination significantly influenced adoption of CBPP vaccine

H_0.3c: Messages on determination of inoculation site do not significantly influence adoption of CBPP

Table 6.5c: Chi-square on messages on inoculation site

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Disagree	50	220.0	-170.0	262.727	0.000
Agree	390	220.0	170.0		
Total	**440**				

Since the chi-square = 262.727, p value < 0.001 which was far away less than 0.05, it was therefore concluded that messages on determination of inoculation site significantly influenced adoption of CBPP vaccine

H_0.3d: Messages on the vaccine side effects do not significantly influence adoption of CBPP vaccine

Table 6.5d: Chi-square on messages on vaccine side effects

	Observed N	Expected N	Residual	Chi- squire value	P value
Disagree	88	220.0	-132.0	- 151.400	0.000
Agree	352	220.0	132.0		
Total	**439**				

Since chi-square = 158.400, p value < 0.001 which was far away less than 0.05, it was therefore concluded that messages on the side effects of the vaccine significantly influenced adoption of CBPP vaccine by the pastoralists

6.6: Chi-Square goodness of fit for test on characteristics of CBPP messages

Chi-square goodness of fit statistical test was conducted on characteristics of CBPP messages

H_0.3i) There is no significant relationship between attributes on qualities of CBPP vaccine communicators and adoption of CBPP vaccine among ASAL pastoralists in Kenya

Table 6.6: Summary of chi-square goodness of fit for appeal features of messages

	Timeliness	Clarity	Believability	Repetitiveness	Language used	Trusted sources
Chi-Square	61.688	37.578	177.257	13.248	74.312	79.349
Df	1	1	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000	0.000	0.000

Since p values were less than <0.05, this implied that the six messages' (timeliness, clarity, believability repetitiveness language used, trusted sources) appeal features significantly influenced adoption of CBPP vaccine

H_0.3ii: Timeliness of messages on vaccination do not significantly influence adoption of CBPP vaccine

Table 6.6a: Chi-Square for timeliness

	Observed N	Expected N	Residual	Chi- square value	P value
No	136	218.0	-82.0	61.688	0.000
Yes	300	218.0	82.0		
Total	**436**				

Since the chi-square = 61.688, p value < 0.001 which was far away less than 0.05, it was therefore concluded that timeliness of messages on vaccination significantly influenced adoption of CBPP vaccine

H_0.3iii: Clarity and simplicity of messages do not significantly influence adoption of CBPP vaccine.

Table 6.6b: Chi-Square on clarity and simplicity

	Observed N	Expected N	Residual	Chi- squire value	P value
No	154	218.0	-64.0	37.578	0.000
Yes	282	218.0	64.0		
Total	**436**				

Since chi-square = 37.578, p value < 0.001 which was far away less than 0.05, it was therefore concluded that clear and simple to understand messages significantly influenced adoption of CBPP vaccine

H_0.3iv: Believability of messages do not significantly influence adoption of CBPP vaccine

Table 6.6c Chi-square on believability

	Observed N	Expected N	Residual	Chi- squire value	P value
No	79	218.0	-139.0	177.257	0.000
Yes	357	218.0	139.0		
Total	**436**				

Since the chi-square = 177.257, p value < 0.001 which was far away less than 0.05, it was therefore concluded that believable of messages significantly influenced adoption of CBPP vaccine by the pastoralists

H_0.3v: Repetitiveness of messages do not significantly influence adoption of CBPP vaccine.

Table 6.6d: Chi-square on repetitiveness

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
No	128	218.0	-90.0	13.248	0.000
Yes	308	218.0	90.0		
Total	**436**				

Since the chi-square = 13.248, p value < 0.001 which was far away less than 0.05, it was therefore concluded that repetitiveness of messages significantly influenced adoption of CBPP

H_0.3vi: Trustworthiness of messages sources do not significantly influence adoption of CBPP vaccine

Table 6.6e: Chi-square for trustworthiness

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
No	125	218.0	-93.0	79.349a	0.000
Yes	311	218.0	93.0		
Total	**436**				

Since the chi-square = 79.349, p value < 0.001 which was far away less than 0.05, it was therefore concluded that trustworthiness of messages sources significantly influenced adoption of CBPP vaccine

H_0.3vii: Messages delivered in Kimaasai language does not significantly influence adoption of CBPP vaccine.

Table 6.6f: Chi-Square for Kimaasai language

	Observed N	Expected N	Residual	Chi- squire value	P value
No	128	218.0	-90.0	74.312	0.000
Yes	308	218.0	90.0		
Total	**436**				

Since the chi-square = 74.312, p value < 0.001 which was far away less than 0.05, it was therefore concluded that messages delivered in understood language significantly influenced adoption of CBPP vaccine.

6.7 Chi-Square Goodness of Fit Statistical Test on Influence of Perceived Characteristics on Adoption of CBPP Vaccine

H_0.4 There is no significant relationship between influence of perceived characteristics of CBPP vaccine and adoption among ASAL pastoralists in Kenya.

Summary of chi-square goodness of fit for perceived characteristics on adoption of CBPP vaccine

Table 6.7: Summary of chi-square goodness of fit for perceived characteristics on adoption of CBPP vaccine

	Advantages of vaccination	Compatibility with values	Complexity of vaccine	Observability
Chi-Square	431.036	194.669	235.792	368.381
Df	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000

Four perceived characteristics (advantages of vaccination, compatibility with values, complexity and observability) of the vaccine were p value <0.05, significantly influencing adoption.

Hypothesis No.4 was split into four times (H04a, H04b, H04c, H04d,), for perceived characteristics that obtained 50% influence on respondents to adopt CBPP vaccine, and tested at 0.05 level of significance. The following results were obtained.

$H_0$4a Advantages of CBPP vaccine as a perceived characteristic do not significantly influence adoption

Table 6.7a: Chi-square for advantages as a perceived characteristic

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Disagree	2	219.5	-217.5	431.036	0.000
Agree	437	219.5	217.5		
Total	**439**				

Since the chi-square = 431.036, p value < 0.001 which was far away less than 0.05, it was therefore concluded advantages of CBPP vaccine was a perceived characteristic significantly influencing adoption.

H_0.4b: Compatibility with respondents' beliefs as a perceived characteristic do not significantly influence adoption of CBPP vaccine.

Table 6.7b: Chi-square for compatibility with respondents' beliefs as a perceived characteristic

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Disagree	72	217.5	-145.5	194.669	0.000
Agree	363	217.5	145.5		
Total	**435**				

Since the chi-square = 194.669, p value < 0.001 which was far away less than 0.05, it was therefore concluded that vaccination was perceived to be compatible with respondents' beliefs.

H_0.4c: Complexity of the vaccine as a perceived characteristic do not significantly influence adoption of CBPP vaccine.

Table 6.7c: Chi-Square on complexity of the vaccine as a perceived characteristic

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Disagree	58	218.5	-160.5	235.792c	0.000
Agree	379	218.5	160.5		
Total	**437**				

Since the chi-square = 235.792, p value < 0.001 which was far away less than 0.05, it was therefore concluded that complexity of the vaccine as a perceived characteristic significantly influence adoption

H_0.4d: Observability of the vaccine as a perceived characteristic do not significantly influence adoption of CBPP vaccine.

Table 6.7d: Chi-square on observability of the vaccine as a perceived characteristic

	Observed N	**Expected N**	**Residual**	**Chi- squire value**	**P value**
Disagree	16	215.0	-199.0	368.381	0.000
Agree	414	215.0	199.0		
Total	**430**				

Since the chi-square = 368.381, p value < 0.001 which was far away less than 0.05, it was therefore concluded it that observability of the vaccine as a perceived characteristic significantly influence adoption of vaccine.

6.8 Chi-square test of independence on moderating effects of demographic characteristics on influence of communication factors on adoption CBPP vaccine

Moderating effects of literacy

$H_0.5_{a:}$ *there is no significant relationship between literacy and informal conversations on adoption of CBPP vaccine.*

Table 6.8a: Chi-square for literacy on informal conversations

	Literacy	**Informal conversations**
Disagree	Chi-Square	0.533
	df	1
	Asymptotic Significance	0.465
Agree	Chi-Square	1.105
	df	1
	Asymptotic Significance	0.293

From the table above, the p-values for those agreeing and those disagreeing that education has an effect on adoption of CBPP were greater than 0.05, we therefore fail to reject the null hypothesis (*there is no significant relationship between literacy and informal conversations on adoption of CBPP vaccine.*). There was similar rating of relationship of informal conversions among the two groups of the respondents (agreed, disagreed). The study therefore concluded that there is no moderating effect of Education on adoption of CBPP vaccine.

$H_0.5_{b:}$ *there is no significant relationship between literacy and engaging neighbors on adoption of CBPP.*

Table 6.8b: Chi-square for literacy and neighbors

	Literacy	**Neighbours**
Disagree	Chi-Square	1.142
	df	1
	Asymptotic Significance	0.285
Agree	Chi-Square	1.105
	df	1
	Asymptotic Significance	0.293

The table above shows that, for respondents who Disagree, chi-square=1.142, p-value> 0.05 while for those who Agree, chi-square=1.105, p-value> 0.05. Since the p-values for the two groups (agree, disagree) was greater than 0.05, it implies that there was similar

rating of relationship of engaging neighbors between the two groups. We therefore fail to reject the null hypothesis (*there is no significant relationship of literacy and engaging neighbors on adoption of CBPP)* and conclude that education has no moderating effects on adoption of CBPP vaccine.

$H_0.5_{c:}$ *there is no significant relationship between literacy and messages on benefits of vaccination on adoption of CBPP.*

Table 6.8c.: Chi-square for literacy and benefits of vaccination

	Literacy	**Benefits of vaccination**
Disagree	Chi-Square	1.138
	df	1
	Asymptotic Significance	0.286
Agree	Chi-Square	10.06
	df	1
	Asymptotic Significance	0.002

From the table above (p values> 0.05) for those who disagreed while for those who agreed p-value < 0.05. The null hypothesis (*there is no significant relationship between literacy and messages on benefits of vaccination on adoption of CBPP*) was rejected for those who agreed, this implies that they were preference on benefits of vaccination on adoption of CBPP vaccine among the Kenyan pastoralists. We therefore conclude that there was moderating effects of education on adoption of CBPP vaccine.

Moderating effects of income status

$H_0.5_{d:}$ *there is no significant relationship between income and engaging informal conversations on adoption of CBPP vaccine.*

Table 6.8d. Chi-square for income and informal conversation

	Income status	**Informal conversations**
Disagree	Chi-Square	0.105
	df	1
	Asymptotic Significance	0.823
Agree	Chi-Square	1.034
	df	1
	Asymptotic Significance	0.309

From the table above table (p values> 0.05) for those who disagreed as well as those who agreed that income had and influence on the informal conversations. The null hypothesis: (*there is no significant relationship between income and engaging informal conversations on adoption of CBPP* was rejected), since the p-values >0.05 for the two groups (agree, disagree), the rating for engaging in informal conversation was similar. We therefore conclude that there were no moderating effects of income on adoption of CBPP vaccine.

$H_0.5_{e:}$ *there is no significant relationship between income and engaging neighbors on adoption of CBPP vaccine.*

Table 6.8e: Chi-square for income and neighbors

	Income status	Neighbours
Disagree	Chi-Square	0.294
	df	1
	Asymptotic Significance	0.588
Agree	Chi-Square	2.143
	df	1
	Asymptotic Significance	0.143

The table above shows that, the p-values > 0.05 (0.588, 0.143) respectively for those who disagreed as well as those who agreed that income status had an influence in engaging neighbors on adoption of CBPP vaccine. This implies that the rating for engaging neighbors were similar for those agreeing as well as those disagreeing. We therefore fail to reject the null hypothesis (*there is no significant relationship between income and*

engaging neighbors on adoption of CBPP) and conclude that income status has no moderating effects on adoption of CBPP vaccine.

$H_0.5_{f:}$ *there is no significant relationship between income and messages on benefits of vaccination on adoption of CBPP vaccine.*

Table 6.8f: Chi-square for income and benefits vaccination

	Income status	**Benefits of vaccination**
Disagree	Chi-Square	4.526
	df	1
	Asymptotic Significance	0.333
Agree	Chi-Square	3.333
	df	1
	Asymptotic Significance	0.168

The table above shows that, the p-values > 0.05 (0.333, 0.168) respectively for those disagreeing as well as those who agreeing. This implies that the benefits of vaccination had similar rating on adoption of CBPP. We therefore fail to reject the null hypothesis (*there is no significant relationship of income and messages on benefits of vaccination on adoption of CBPP)* and conclude that income has no moderating effects on adoption of CBPP vaccine.

Moderating effects of Gender (Men)

$H_0.5_{g:}$ *there is no significant relationship of men and engaging informal conversations on adoption of CBPP.*

Table 6.8g: Chi-square for men and informal conversation

	Men	**informal conversations**
Disagree	Chi-Square	2.736
	df	1
	Asymptotic Significance	0.098
Agree	Chi-Square	4.108
	df	1
	Asymptotic Significance	0.043

From the table above table (p values> 0.05) for those disagreeing, while for those agreeing <0.05. This implies that engaging in informal conversation had preference in adoption of CBPP vaccine. We therefore reject the null hypothesis: (*there is no significant relationship between men and engaging informal conversations on adoption of CBPP)* and conclude that there was moderating effects of Men on adoption of CBPP vaccine.

$H_0.5_h$: *there is no significant relationship between men and engaging neighbors on adoption of CBPP.*

Table 6.8h: Chi-square for men and neighbors

	Men	**Neighbors**
Disagree	Chi-Square	0.005
	Df	1
	Asymptotic Significance	0.946
Agree	Chi-Square	1.635
	Df	1
	Asymptotic Significance	0.201

The table above shows that, the p-values > 0.05 (0.946, 0.201) respectively for those who disagreed as well as those who agreed that men had an influence on engaging neighbors on adoption of CBPP vaccine. This implies that engaging neighbors had the same rating on adoption of CBPP vaccine. We therefore fail to reject the null hypothesis (*there is no significant relationship of men and engaging neighbors on adoption of CBPP)* and conclude that men has no moderating effects on adoption of CBPP vaccine.

$H_0.5_{i:}$ *there is no significant relationship between men and messages on benefits of vaccination on adoption of CBPP vaccine.*

Table 6.8i: Chi-square for men and benefits of vaccination

	Men	Benefit of vaccinating
Disagree	Chi-Square	0.655
	df	1
	Asymptotic Significance	0.418
Agree	Chi-Square	9.133
	df	1
	Asymptotic Significance	0.003

From the table above table (p values> 0.05) for those who disagreeing and p-value< 0.005 for those agreeing. This implies that there was preference on benefits of vaccination on adoption of CBPP vaccine. We therefore fail to reject the null hypothesis for those agreeing: *(there is no significant relationship of men and messages on benefits of vaccination on adoption of CBPP)* and conclude that there was moderating effects of Men on adoption of CBPP vaccine.

Moderating effects of Gender (Women)

$H_0.5_{j:}$ *there is no significant relationship between women and engaging informal conversation on adoption of CBPP vaccine.*

Table 6.8j: Chi-square for women and informal conversation

	Women	**Informal conversations**
Disagree	Chi-Square	0.469
	df	1
	Asymptotic Significance	0.494
Agree	Chi-Square	0.428
	df	1
	Asymptotic Significance	0.513

The table above shows that, the p-values > 0.05 (0.494, 0.513) respectively for those disagreeing as well as those who agreeing that women had an influence engaging informal conversations on adoption of CBPP vaccine. This implies that engaging in informal conversation had similar rating on adoption of CBPP vaccine, we therefore fail to reject the null hypothesis (*there is no significant relationship between Women and engaging informal conversation on adoption of CBPP)* and conclude that women has no moderating effects on adoption of CBPP vaccine.

$H_0.5_{k:}$ *there is no significant relationship between Women and engaging neighbors on adoption of CBPP vaccine.*

Table 6.8k: Chi-square for women and neighbors

		Women	**Neighbours**
Disagree	Chi-Square		0.199
	df		1
	Asymptotic Significance		0.656
Agree	Chi-Square		1.287
	df		1
	Asymptotic Significance		0.257

The table above shows that, the p-values > 0.05 (0.656, 0.257) respectively for those disagreeing as well as those who agreeing that women had an influence on engaging neighbors on adoption of CBPP vaccine. This implies that engaging neighbors had similar rating for the two groups on adoption of CBPP vaccine. We therefore fail to reject the null hypothesis (*there is no significant relationship of Women and engaging neighbors on adoption of CBPP)* and conclude that women has no moderating effects on adoption of CBPP vaccine.

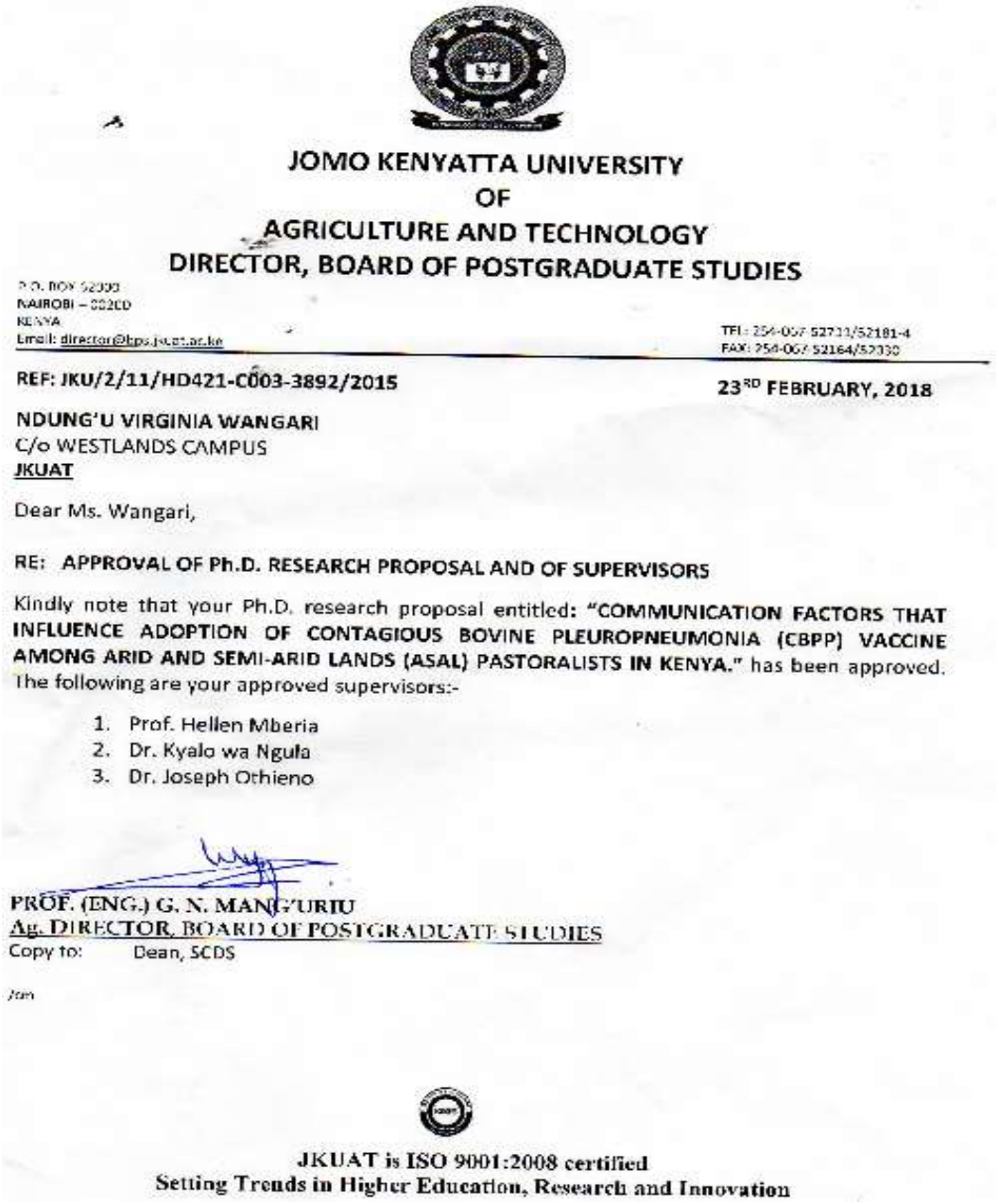
$H_0.5_{l:}$ *there is no significant relationship between Women and messages on benefits of vaccination engaging on adoption of CBPP vaccine.*

Table 6.8L: Chi-square for women and benefits of vaccination

	Women	Benefits of vaccination
Disagree	**Chi-Square**	**0.035**
	df	1
	Asymptotic Significance	0.852
Agree	Chi-Square	6.262
	df	1
	Asymptotic Significance	0.112

The table above shows that, the p-values > 0.05 (0.852, 0.112) respectively for those disagreeing as well as those agreeing that women had an influence on messages (benefits of vaccination) on adoption of CBPP vaccine. This implies that benefits of vaccination had similar rating between the two groups. We therefore fail to reject the null hypothesis (*there is no significant relationship between women and messages on benefits of vaccination on adoption of CBPP)* and conclude that income has no moderating effects on adoption of CBPP vaccine.

Appendix VIII: Letter of Authorization from JKUAT



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23RD FEBRUARY, 2018

NDUNG'U VIRGINIA WANGARI
C/o WESTLANDS CAMPUS
JKUAT

Dear Ms. Wangari,

RE: APPROVAL OF Ph.D. RESEARCH PROPOSAL AND OF SUPERVISORS

Kindly note that your Ph.D. research proposal entitled: **"COMMUNICATION FACTORS THAT INFLUENCE ADOPTION OF CONTAGIOUS BOVINE PLEUROPNEUMONIA (CBPP) VACCINE AMONG ARID AND SEMI-ARID LANDS (ASAL) PASTORALISTS IN KENYA."** has been approved. The following are your approved supervisors:-

1. Prof. Hellen Mberia
2. Dr. Kyalo wa Nguta
3. Dr. Joseph Othieno

PROF. (ENG.) G. N. MANG'URIU
Ag. DIRECTOR, BOARD OF POSTGRADUATE STUDIES
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Date of Issue: **05/June/2020**

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