FACTORS INFLUENCING LOSS OF HOUSEHOLD INCOMES DUE TO LIVESTOCK DISEASES IN SELECTED SITES OF KYUSO SUB COUNTY, KITUI COUNTY

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DECLARATION

I, Peter Musyoka Kithuka, understand that plagiarism is an offence and therefore declare that this thesis report is my original work and has not been presented to any other institution for any other award.

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DEDICATION

I dedicate this thesis to the Lord for giving me good health despite the many challenges faced during the study period. This work has also been dedicated to my family for their encouragement throughout the study period.

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LIST OF ACRONYMS AND ABBREVIATIONS

A.I Artificial Insemination

ANOVA Analysis of variance

ASAL Arid and semi-arid lands

ASF African Swine Fever

CBAHW Community Based Animal Health Workers

CBPP Contagious Bovine Pleuropneumonia

CCPP Contagious Caprine Pleuropneumonia

CRD Chronic Respiratory Disease

DAO District Agricultural Officer

DFID Department for International Development

DDO District Development Office

DDP District Development Plan

DOP Department of Planning

DVO District Veterinary Officer

FAO Food and AgricultureOrganizationof theUnited Nations.

FMD Foot and Mouth Disease

GDP Gross Domestic Product

GOK Government of Kenya

IBD Infectious Bursal Disease

IFAD International Fund for Agricultural Development

ILRI International Livestock Research Institute

KNBS Kenya National Bureau of Statistics

LSD Lumpy Skin Disease

ND Newcastle Disease

PPR Pestis de PetitsRuminants

RP Rinderpest

SRA Strategy for Revitalizing Agriculture

SEA South East Asia

SSA Sub-Saharan Africa

SSPS Statistical Package for Social Sciences

TBAD Trans-Boundary Animal Diseases.

TTBD Tick and Tick Borne Diseases

UNDP United Nations Development Programme

ABSTRACT

A cross sectional study was conducted in Kyuso Sub County to determine factors influencing household incomes. The broad objective of the study was to determine the factors that influence household income losses due to livestock diseases and document common and prevalent livestock diseases. The study used descriptive and inferential data collection and analysis methods. The data was collected through primary and secondary data methods. Semi-structured questionnaires were administered to households in Gai and Mitamisyi sub locations using stratified random sampling techniques. Data collected was analyzed using Statistical Package for Social Sciences Software (SPSS) version 18. A total of 100 households were interviewed. The most prevalent livestock disease in cattle was Anaplasmosis 30.0%, contagious caprine pleuro-pneumonia(CCPP) for goats 29.8%, newcastle disease(NCD) for poultry 30.0%, helminthiosis for donkeys 18.7% and anaplasmosis for sheep 32.6%. The majority of respondents accessed animal health inputs and services. The costs of treatments of diseases and influence of indigenous knowledge on disease management were high for majority of respondents. The study showed goats were the livestock which provided quick sources of incomes. The main sources of incomes were from livestock and products and there were high income losses due to diseases. Multiple linear regression showed that gender of household decision maker, main occupations, levels of education, availability of animal health services and costs of treatments to be significant predictors of household income losses at $p<0.05$.The multiple correlation coefficients was 0.723, the coefficient of determination R-Square was 0.48(48.8) indicating that 48.8% in overall loss of incomes was explained by the six independent variables. Chi square tests of associations amongst similar variables in the two sites were significant at $p <0.05$ This study reveals that there is need for allocation of more resources towards livestock husbandry and disease control with more focus to goats and poultry as they are key income sources in the study area.

Key Words: **Socio demographic factors, indigenous knowledge, cost of treatments, correlations chi -square, multiple regressions**

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Livestock is an important element of the income strategies and opportunities of the majority of rural households (Thornton *et al.,* 2000). About 70% of the world's rural poor depend on livestock as a component of their incomes (FAO, 2002; Nyariki and Amwata, 2019).

Livestock holdings include cattle, goats, sheep, pigs, chicken, and donkeys (LID, 2005). Livestock are a crucial source of financial capital for the rural poor and form important household cash avenues (Waters and Bayer, 1992). It provides a critical reserve against emergencies and decrease vulnerability to financial shock from ill health, crop failures, and other risks. In a study of poor livestock keepers in Bolivia, India and Kenya households in all the three countries ranked livestock as their best investment (Heffernan *et al.,*2002). About 80% of the total land area in Kenya consists is arid and semi-arid lands (Okoti *et al.,* 2004) where constraining rainfall and temperatures favour livestock rearing.

The livestock sub-sector in Kenya contributes about 12% of the National Gross Domestic product (GDP) and 42% of the total agricultural GDP (FAO, 2008, GOK, 2010;UNDP, 2018). Kenya's ASALs support more than 30% (approximately 12 million) people, 50% cattle, 70% of sheep and goats and the entire camel population (GOK, 2010;UNDP, 2018). It is estimated that the livestock sector provides almost 90% of employment opportunities and more than 95% of family incomes in Kenya's ASALs (FAO, 2008). The Government of Kenya has over the years developed policies and strategies to enhance agricultural growth. In the year 2008 Kenya launched Vision 2030 as the country's long term economic blue print to guide development process. The Visions objectives are to transform Kenya into a newly industrialized middle income country with annual growth rate of 10% providing a high quality life for its citizen by the year 2030. In the vision 2030, livestock sub-sector was identified as one of the important flagship projects to accelerate development.

Livestock diseases are an everyday occurrence to the poor as their animals are more prone to diseases due to lack of knowledge about their management and control, socio-demographic influences, lack of access to services and production inputs (FAO, 2005). In the arid and semi-arid regions livestock production is often the only economic activity to sustain the livelihoods of the rural poor. However, livestock production in these areas is constrained by livestock diseases, poor husbandry practices, inadequate nutrition and lack of adequate markets for livestock and their products (Rubaire *et al.*, 2004).

Kyuso Sub County in Kitui County is an arid and semi-arid (asal) zone characterized by low, unreliable and poorly distributed rainfall (DDP Kyuso, 2014). The area's economy is livestock driven as annual crops failure are high to over 60% (DAO Kyuso (2012- 2016). There are many reported livestock diseases which hinder maximization of livestock productivity (DVO Kyuso, 20012- 2015). Few studies on factors influencing household income losses and the effects of livestock diseases on incomes in Africa have been undertaken but worldwide estimates indicate 25% losses due to livestock diseases (Otte *et al.*, 2005). There is hardly accurate data on factors affecting income losses attributed to livestock diseases in Sub-Saharan Africa,Kenya and the study sites.

1.2 Statement of the Problem

Kyuso Sub-County is semi-arid area in agro-ecological zone (IV to V) with estimated livestock population of 53,660 cattle, 178,228 goats, 27,593 sheep and 178,540 indigenous poultry (KNBS, 2009). Just like any other ASAL area, livestock keeping is the mainstay and a major source of household incomes. Rainfall is bimodal and unreliable (DAO Kyuso, 2012- 2015). Livestock and livestock products cushion the community against adverse weather effects on crops. It also offers the community the necessary shocks and resilience as they act as sources of income, source of milk, purchase of food stuffs, medical care, school fees and virtually all the household needs. The area reports many livestock diseases and conditions such as helminthiosis, contagious caprine pleuropneumonia (CCPP), foot and mouth disease (FMD), vector borne diseases, newcastle disease (NCD), chronic respiratory disease (CRD) and lumpy skin disease (LSD) based on monthly reports (DVO Kyuso 20012- 2015).The diseases lead to high economic losses (incomes and constrained livelihoods) due to

deaths, reduced production, high cost of treatments and control and livestock trade interruptions. However, common livestock diseases, factors contributing to household income losses and effects oflivestock diseases on household incomes have not been studied and documented in Kyuso Sub-County. This study will assist the community to come up with proper mitigation measures on household income losses due to diseases.

1.3 Broad Objectives

1.3.1 General objective

The broad objective was to investigate factors that lead to household income losses, document common livestock diseases and analyze their effects on household incomes

1.3.2 Specific objectives

1. Identify common livestock diseases and determine their indigenous management and control methods
2. Determine the socio demographic factors that influence household income losses due to livestock diseases
3. Analyze the availability and costs of animal health services and how diseases affect household incomes.

1.4 Research Questions

1. Which are the common livestock diseases and which are their indigenous management and control methods?
2. What are the socio demographic factors that influence household income losses due to diseases?
3. Are there available animal health services, what are the costs of treatment and effects on incomes?

1.5 Significance and Anticipated Outputs

The results and findings of the study shall bridge knowledge gaps and contribute to body of knowledge. The study will document the prevalent livestock diseases and demonstrate how they impact on community incomes. It will open gaps for further research and give policy direction on how to prioritize and manage the use of scarce resources in livestock disease control and prevention in the County. The study will also have a predictive model on factors influencing income losses.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Importance of Livestock and Constraints due to diseases globally

Globally livestock sub sector contributes about 40% of the agricultural gross domestic product (GDP) and 30% of the agricultural GDP in the developing world (FAO, 2008). A majority of 1.3 billion poor people live in developing countries and depend directly or indirectly on livestock for their source of incomes (FAO, 2009). These estimates highlight the important contribution of livestock to sustainable agricultural development. In Africa this number is estimated at about 300 million people. It has been estimated that livestock contributes incomes to about 70% of the world's poor (FAO, 2002). It's an income generating asset, indicator of wealth status, source of food and nutrition, security, insurance against shocks and stresses (Randolph *et al.*, 2007).

A (FAO, 2009) analysis of 15 national household surveys showed that between 46-82% of rural households in Asia, Africa and Latin America keep livestock. About 65% of the poorest households own farm animals in Ghana,74% in Madagascar, 55% in Bangladesh, 85% in Vietnam, 87% in Ecuador and 59% in Nicaragua. Foot and mouth disease-FMD, contagious bovine pleuropneumonia (CBPP), sheep and goat pox, trypanosomiasis, tick-borne diseases, Newcastle Disease extends from Africa across to far East and into Asia (Delgado *et al*., 2002). In marginal areas with harsh environments, livestock cushion crop failures (Freeman *et al.*, 2007).

2.2 Types of Livestock Diseases

Livestock diseases can be divided to four groups namely endemic, epidemic, zoonotic and food borne (Perry *et al*., 2001). These diseases are a major threat to livestock keepers. They have economic impacts both through the private and public costs of the outbreak, costs of measures to control infestation and disease outbreaks.

2.2.1 Endemic diseases

This includes vector-bornediseases, helminthes diseases, enteric bacterial diseases, bacterial and viral causes. They exert their effects at the farm level and they can translate to national level losses. Earlier research in Kenya has shown that poor

herders and farmers spend a large proportion of their income treating endemic diseases (Heffernan and Misturelli, 2002)

2.2.2 Epidemic diseases

These are diseases that occur at a frequency above the expected, are highly infectious and exert their influence at both farm and national level and on local marketing and international trade. This group includes foot and mouth disease (FMD), hog cholera and new castle disease (ND). Some epidemics can result in severe economic losses of the poor (Rubaire *et al*., 2006).

2.2.3 Zoonotic diseases

Zoonotic diseases are infections transmitted between animals and humans.Some can be characterized as endemic like meat-borne helminthes, brucellosis, tuberculosis and some as epidemic in nature such as rabies and rift-valley fever. The negative economic impact is due to reduced levels of production, poor health of the people and a country's inability to export meat and milk products (FAO, 2004). Globally, zoonotic diseases are a major problem to livestock production.

2.2.4 Food borne diseases

Food borne diseases include cysticercosis, trichinellosis, Escherichia Coli, and Salmonellosis which can cause problems in the poor due to poor hygiene, sanitation and inadequate resources for cooking animal products. They occur more in developed countries than developing countries and mostly affect human health and cause a lot of suffering (Bayers, 2002).

2.3 Effects of Livestock Diseases

Livestock diseases bring about a wide a range of biophysical and socio-economic impacts that may be both direct and indirect and may vary from localized to global problems. A particularly useful distinction can be made between those impacts associated with overt disease and disease risks (Thornton *et al*.,2007)

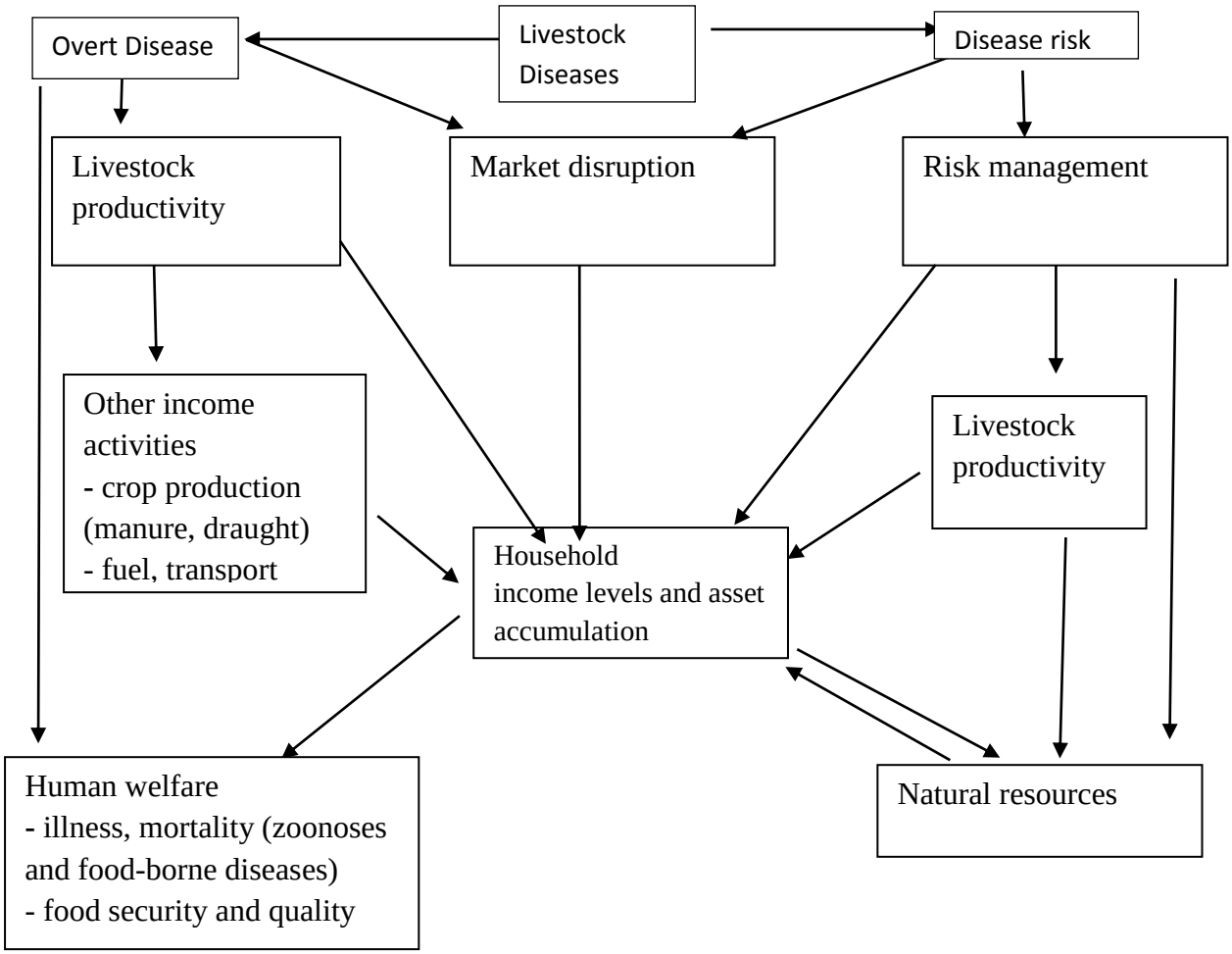


Figure 2.1: Effects of livestock diseases (Thornton *et.al.*, 2007)

2.3.1 Effects of overt diseases

This causes loss of livestock productivity, increased treatment costs, loss of farm productivity, disturbance of human health, welfare and reduction or elimination market opportunities (Curry *et al*., 2006).

2.3.2 Effects of disease risk

There can be economic losses from higher production costs or the public expenditures incurred to prevent the diseases which include prophylaxis and control strategies (Curry *et al*., 2006).

2.3.3 Effects of disease control

Disease control efforts are undertaken to minimize the various impacts of diseases but may bring about un-intended impacts like environmental issues (Curry *et al*., 2006).

2.4 The Roles of Animal Health Service Providers in Livestock Disease Control

There was slow growth of many African economies in the late 1970s, the World Bank and other international donors sought to move the delivery of services from the public domain to the private sector (Umali and De Haan, 1994). Among the activities targeted for privatization was the delivery of animal health services. International experts made bold efforts to retain veterinary regulation and management of epizootic diseases within the public domain but pushed curative animal health care into a private market. Livestock health service delivery in many developing countries is undergoing privatisation for economic development (FAO, 2002). Economic structural adjustment programmes have tended in several cases to weaken the administrative, legal and financial capacity for dealing with major livestock diseases. Animal health was seen as a private good and veterinary services were seen essentially as providing an animal healthcare delivery system (Dehaan and Bekure, 1991).

It is imperative to accept that control of livestock diseases is an international public good. During the 1970s there was hope that the major epidemic diseases of livestock and humans were being brought under control in many countries. During the last 15 years, however, infectious and vector-borne animal diseases have become increasingly important worldwide and disease pandemics are occurring with increasing frequency (Leonard, 2000), even industrialized nations have been affected. Livestock health service delivery in many developing countries is undergoing privatisation as part of an international restructuring for economic development. One widely publicised initiative to refocus livestock health service delivery has been the introduction of community-based animal health workers (FAO, 2002).

In response the state engaged in experimentation with the aim of finding new models for animal health delivery that would be adapted to the prevailing financial reality. With the broad-based market reforms and the scaling down of Government expenditures, the private sector was expected to play a greater role in this field (Otieno-Oruko *et al.,* 2000). It was argued that the private sector would complement the public sector even under imperfect market conditions (Bos, 1991). Research has demonstrated that access to livestock services is a major problem for the poor (Heffernan *et al*, 2002).

2.5 Indigenous Livestock Diseases Management

Indigenous knowledge is the body of knowledge that evolves within a community over time and is orally communicated from one generation to the next with the ultimate aim of molding its thought for the sole purpose of ensuring survival and progress. It is unique to a given culture or society. It contrasts with international knowledge systems generated by universities, research institutions and private firms. It's the basis in local level decision making in agriculture, health care, food preparation, educational, natural resources management in rural communities (Warren, 1991). The information base for a society and the indigenous information systems are dynamic and are continually influenced by internal creativity and experimentation as well as by contact with external systems.

Indigenous knowledge is important in emerging global economy, a country's ability to build and mobilize knowledge capital is essential for sustainable development of physical and financial capital (World Bank, 1997). One of the most important elements of indigenous knowledge systems and practices is in the human and animal health care. Worldwide, there are many different traditional healing practices designed to cure, control or prevent human and livestock diseases (Mathias, 1994).

Significant contribution to global knowledge originated from indigenous knowledge in medicine and veterinary medicine with their intimate understanding of their environments (FA0, 2002). The concept of indigenous knowledge in association with ethno veterinary medicine has been documented for the Fulani nomads and IlkisonkoMaasai (Ole-Miaron, 1997).

2.6 Sample Size Determination in Descriptive Survey

According to (Mugenda and Mugenda, 2002) and (Kothari *et al*., 1985) in a descriptive survey, a sample enables a researcher to gain information about the population. Stratified random sampling was used to get an unbiased representative sample of the entire population and then did inference. Then random sampling was carried out in each of stratum (Mugenda and Mugenda, 2002). Different opinions have been expressed by experts on the subject of sample sizes but majority agree should be at least 10%- 30% of the study population. The sample size of this study was arrived at according to (Uma Sekeran, 2003) in research methods for business 4th edition who observed that too large sample size (over 500) could be a problem and

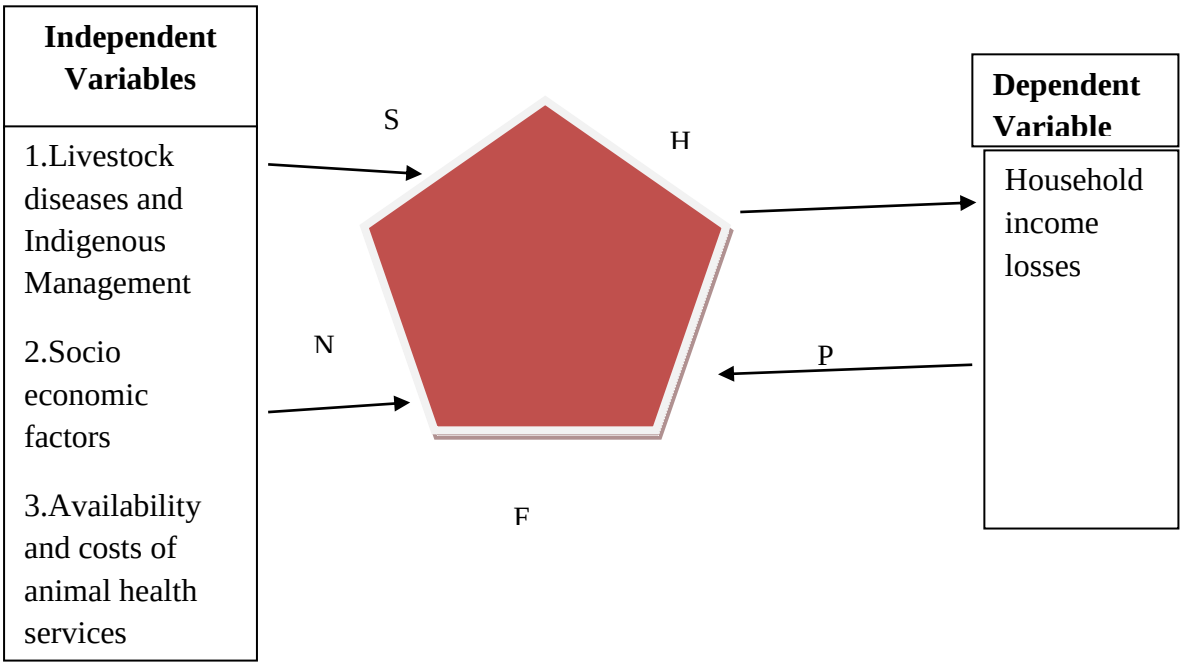
came up with the rules of thumb for determining sample sizes, they proved that sample sizes larger than 30 and less than 500 are appropriate for most research. In support of that Alreck and Settle, (1995) state that it is seldom necessary to sample more than 10% of target population. Gay *et al*, (1992) suggests that at least 10% of the population is a good representation where the population is large and 20% where the population is small. Minimum, acceptable sample size for descriptive research should be 10% of population as recommended by Gay and Diehl, (1992).

2.7 Conceptual Framework

Conceptual framework is considered as an information provider on how the variables should be operationalized and measured, as well as how the research design and samples should be selected (Malhotra *et al*, 2006).The concept is based on the premise that a rural household has access to a minimum amount of resource base (i.e., capital or assets), which can be utilized to fashion out strategies (e.g., crop farming, livestock rearing, off farm employment, etc.) to improve household welfare (Chambers and Conway, 1992). A household's income is sustainable if it can cope with and recover from shocks (such as crop or livestock diseases) and stresses (e.g. recurrent adverse weather and seasonality), maintain or enhance its capabilities and assets, while not undermining the natural resource base (Chambers and Conway, 1992)

2.7.1 Sustainable income framework

The framework consists of three elements, independent variables, an asset pentagon and dependent variable (DFID, 2000).



H=Human Capital; F= Financial Capital;N=Natural Capital; S=Social Capital; P=Physical Capital.

Figure 2.2:Modified sustainable livelihoods framework(DFID, 2000)

2.7.1.1 Financial Capital

Livestock provide a safety net in form of liquid assets and strategy of diversifications for food production (Freeman *et al.*, 2007) and hence they play multiple roles in the livelihoods of the people in developing communities especially the poor. Livestock function as insurance policies and accessable cash in many parts of the developing world (Pell *et al*., 2010). In marginal areas with harsh environments like Kyuso Sub County livestock act as a means of reducing the risks associated with crop failure and a diversification strategy for resource poor farmers. (Freeman *et al*., 2007; Thornton *et al.*, 2007). Financial capital include cash, savings, credits, insurance, gifts, remittances.

2.7.1.2 Human Capital

Zoonosis and food-borne diseases can impair an individual's ability to work, and thus deprive the poor household of its principal income generating asset. Livestock

products account for almost 30% of human protein consumption (Steinfield *et al*., 2006).

2.7.1.3 Social Capital

In many societies, livestock serve as a mechanism for establishing relationships of trust within social networks. Livestock raise the social status of owners and contribute to gender balance by affording womena nd children the opportunity to own livestock, more so small stock (Waters-Bayer and Letty, 2010).Social capital includes wealth, prestige, traditions, respect, identity and human capital.

2.7.1.4 Natural capital

In mixed crop-livestock systems, manure often plays a critical role in maintaining soil fertility.Livestock contribute to crop production through the provision of draught power and manure (Herrero *et al.,* 2010). Diseases may reduce the availability of manure. Natural capital includes meat, milk, eggs, wool, hides, skins, rangeland and pasture.

2.7.1.5 Physical capital

In mixed farming systems, livestock are often the only source of draught power and fertilizer for crops and also utilizing crop residues after harvest (Steinfield*et al*., 2006). Estimates show that globally, livestock provide animal traction to almost 25% area under crop production (Devendra, 2010). Randolph *et al*., (2007) identified specific contributions of livestock to each type of capital. A DFID study by Heffernan and Misturelli, (2002) in Kenya provided evidence of the major importance of livestock keeping in household economy security. Using a ranking exercise, they found that rural households identify livestock rearing as their most important income source. Kristjanson *et al.,* (2004) found out that livestock played a key role in pathways both into and out of poverty.

CHAPTER THREE

3.0. MATERIALS AND METHODS

3.1 Study Area

The study was carried out in Kyuso Sub County ofKitui County and covers an area of an area of 2,422.5square kilometers (DDO Kyuso, 2008). It is divided into four administrative divisions, namely, Kyuso, Ngomeni, Kamuwongo and Mivukoni(Figure 3.1).It boarders Mwingi central and MwingiEast Subcountyto the South, Tseikuru Sub countys to the North, MumoniSubCounty to the west and TanaRiver County to the East. Generally, the area experience hot and dry climate for the greater parts of the year, with bimodal pattern of rainfall with long rains in April to June and short rains in October to December. The rainfall is normally erratic. Livestock keeping, small scale business and crop production are the major key livelihoods activities in the area.In Kyuso, human population is estimated as 46,685 persons in 10,800 households (KNBS, 2010). Two divisions (Kyuso and Kamuwongo) are in agro-ecological zone IV (mixed farming) and Mivukoni and Ngomeni are in agro-ecological zone V (marginal mixed farming)

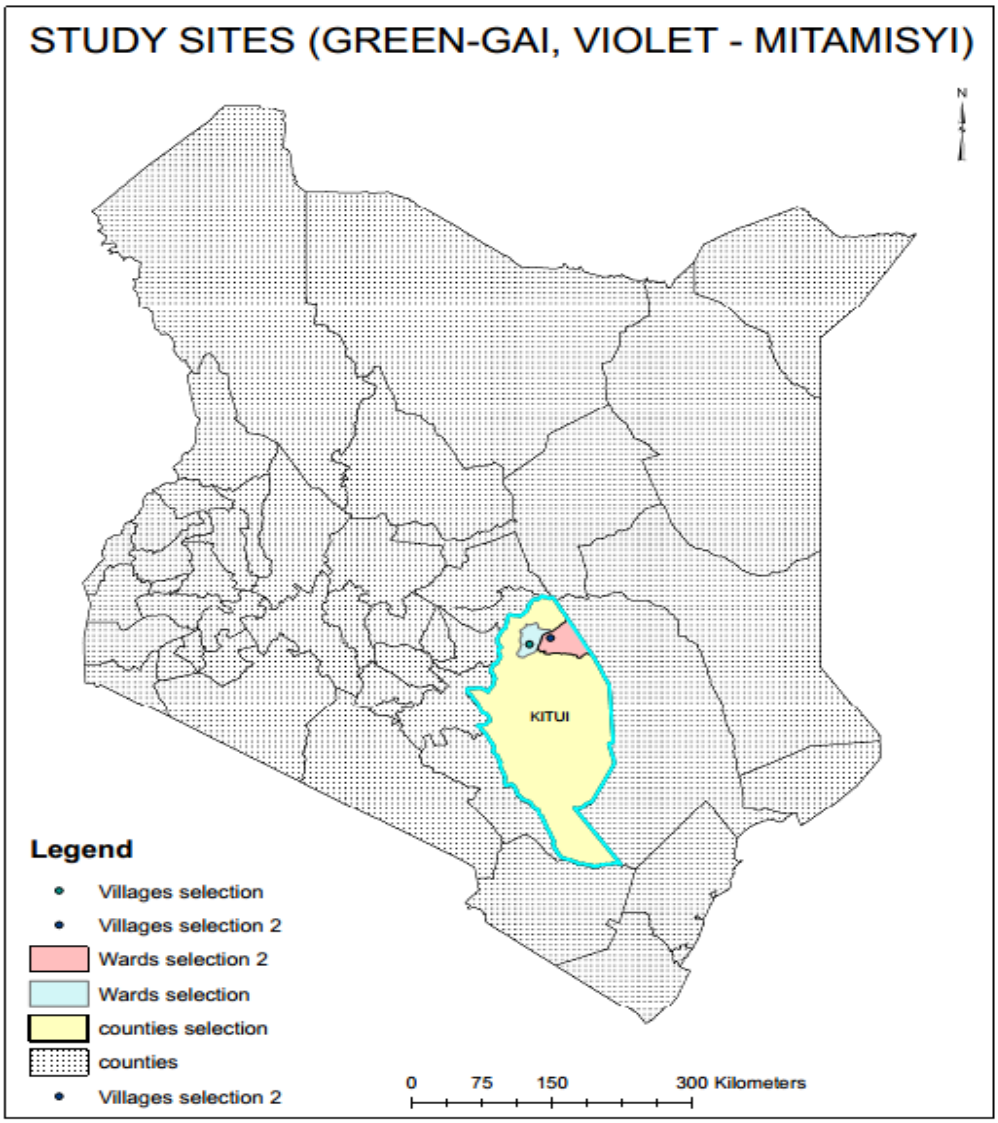


Figure 3.1:Map of Kenya showing Kitui County and the selected study Wards and Villages

3.2 Research Designs

This study was a cross-section survey collecting both qualitative and quantitative data from September to November 2017.

3.3 Target Population

The study targeted households/farmers keeping livestock in Kyuso Sub-County.

3.4 Study Population

Study population was households/farmers with livestock in Mitamisyi and Gaisub locations in, KyusoSub County.

3.5 Sample Size Determination

The sample size of the study was 100 households; 63 households in Gaiand 37 households in Mitamisyi locations respectively. The households in the study area were 567 in Gai and 340 in Mitamisyi (KNBS, 2010). The sample size was calculated as described by Mugenda and Mugenda, (2003) that when determining sample sizes in descriptive studies, 10% of the survey population is adequate.

Table 3.1 :Demonstration of sample size calculation in Gai and Mitamisyi sublocations in Kyuso Sub County

Division/ Village	Total Households (HH)	10% of the HH	10% Non-resonspe	Total sample size
Gai	567	10/100*567=57HH	10/100*57=6HH	63HH
Mitamisyi	340	10/100*340=34HH	10/100*34=3HH	37HH
Total		91HH	9HH	100HH

Then, 95% confidence interval and 5% level of significance was used so as to get the required accuracy, precision and statistical power.

3.6. Sampling Techniques

Two of the four divisions of the sub –county were selected (Kyuso and Ngomeni) were selected using purposive sampling.This was based on high incidences of livestock disease outbreaks and high livestock populations as per sub county veterinary officer Kyuso annual reports from 2012 to 2015 In addition,the selected division were on different ecological zones (IV and V).Using multistage sampling design,all locations in the two divisions were listed, then one location randomly selected from each of the two areas. This was followed by listing all the sub-locations within the selected location and one sub location randomly selected where Gai sub-location and Mitamisyi sub-location were selected as the study sites.The number of households to be sampled in each sub-location was calculated proportionate to size.

Finally, systematic random sampling was used to identify households to be sampled in each sub-location. Household without livestock were replaced with the next household.

3.7 Questionnaire Administration

Data was collected using semi-structured questionnaire administered to the selected households keeping livestock. Prior to the actual data collection, pre-testing of the questionnaire was done at Kyuso division. Ten households (10% of the sample size) were interviewed so as to test the feasibility of the study consistency and ambiguities. Revisions were made based on the pretesting findings. Written consent was sort from the respondent and guided on how to fill the questionnaire. Adequate time was given to the respondents to respond to the questionnaire.

3.8 Reliability and Validity of Research Instruments

According to Mugenda *et al.*,(2002) reliability is the degree to which results obtained from analysis of the data actually represent the phenomenon under study. This was undertaken using pre-testing techniques. Mugenda *et al*, (2002) define validity as the accuracy and meaningfulness of inferences, which are based on research results.Validation of the data was undertaken by interviewing the technical staff and administering the same questionnaire.

3.9 Type of Data Collected

Data collected at household level included, household demographics, livestock diseases, land size and land use, indigenous disease treatment and control, availability of animal services and effects of diseases on income. Diseases reported per species were also collected from the reports.

3.9.1 Data entry

Data collected through questionnaires and interviews was coded, organized, edited and then keyed in the computer software, Statistical Packages for Social Sciences (SPSS).

3.9.2 Data analysis

3.9.2.1 Questionnaires

Data collected using questionnaires was analyzed using descriptive, correlation, Chi square and linear regression methods.

3.9.2.2. Descriptive statistics

Proportion and means were calculated and data presented using means, frequency tables and percentages to describe basic features of the data

3.9.2.3 Pearson's correlation

The study used Pearson's product moment correlation (r) for quantitative variables so as to measure the strengths and direction of association existing between two or more variables (the independent and dependent variables). The variables correlated were household income losses as the dependent variable and age set categories, household sizes, land holdings and land for livestock use as independent variables

3.9.2.4.Chi Square tests

Chi-Square test is a statistical approach used to test for associations, relationships or differences between two categorical variables in the two sites.

3.9.2.5 Multiple regression analysis

Multiple regression analysis was used to determine the factors influencing incomes losses due to livestock diseases among predictor variables. The dependent (predicted) variable was household income losses due to diseases and several independent variables (predictor), which included gender of household maker, education level of household head, indigenous knowledge, main occupation of household head, disease influence by indigenous knowledge, animal health services and cost of treatment. The "R" column represents the value of *R*, the multiple correlation coefficient. R can be considered to be one measure of the quality of the prediction of the dependent variable. The "R Square" column represents the R^2 value (also called the coefficient of determination), which is the proportion of variance in the dependent variable that can be explained by the independent variables (technically, it is the proportion of variation accounted for by the regression model above and beyond the mean model). However, its important to accurately interpret and report "Adjusted R Square" (*adj.* R^2).The *F*-ratio in the ANOVA table tests whether the overall regression model is a good fit for the data at $p < .05$

CHAPTER FOUR

4.0.RESULTS

4.1. Objective 1: The common livestock diseases and conditions, indigenous diseases management and control methods and effects on household incomes

4.1.1 Prevalence of livestock diseases per species

Different livestock diseases/conditions in the two study sites were reported. Goat's diseases were ranked highest (35%) in Gai and (36%) in Mitamisyi.This was followed by poultry (29%) in Gai and 28% in Mitamisyi. Cattle diseases were ranked third (15%) in Gai and 14% in Mitamisyi. Donkeys and sheep diseases were ranked fourth and fifth respectively in the two sub locations. The ranking was in terms of severity, livestock losses, proportion of livestock affected and economic losses incurred as shown in figure 4.1.

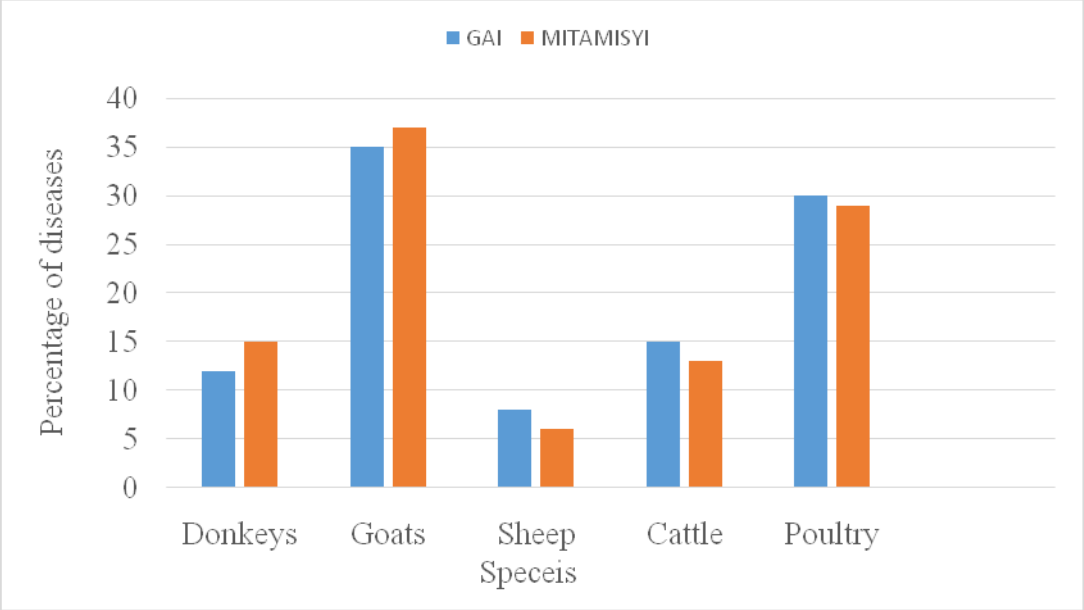


Figure 4.1: Prevalence of livestock diseases per species

4.1.2 Common diseases and conditions in Goats

Contagious caprine -pleura-pneumonia (CCPP) in Gai 28.7% and Mitamisyi 30%,and anaplasmosis in Gai 23% and Mitamisyi 20% were the most prevalent diseases in goats. Other diseases and condition were ecto-parasites at 17% in Gai and 15% in Mitamisyi, helminthiasis at 11.5% in Gai and 13% in Mitamisyi (Figure 4.2).

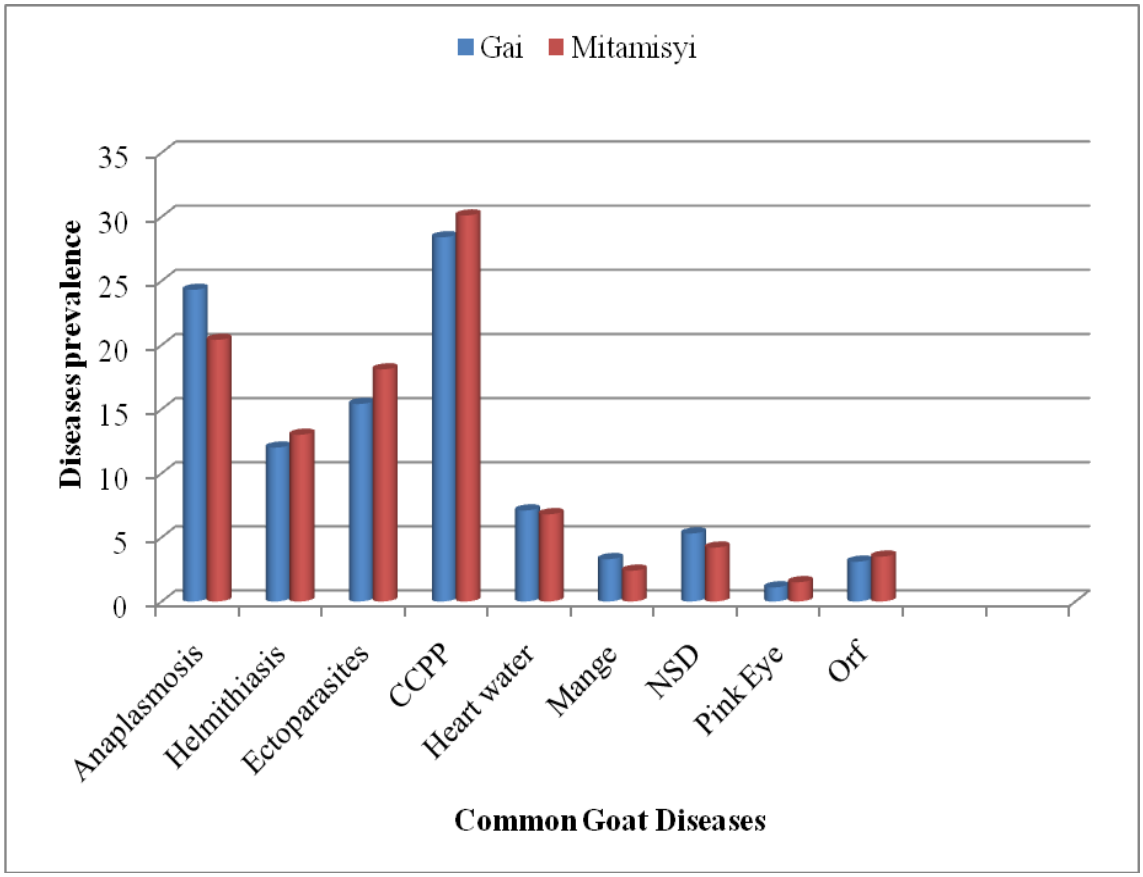


Figure 4.2: Common Goat diseases expressed as percentage in Gai and Mitamisyi

4.1.3. Common diseases and conditions in Cattle

Anaplasmosis 31.5%, helminthiasis 24.2% and ectoparasites were the most prevalent cattle diseases/conditions in 14.1 in Gai. The prevalent diseases/conditions in Mitamisyi were anaplasmosis 28.3%, helminthiasis 25.0% and ectoparasites 11.3% (Figure 4.3).

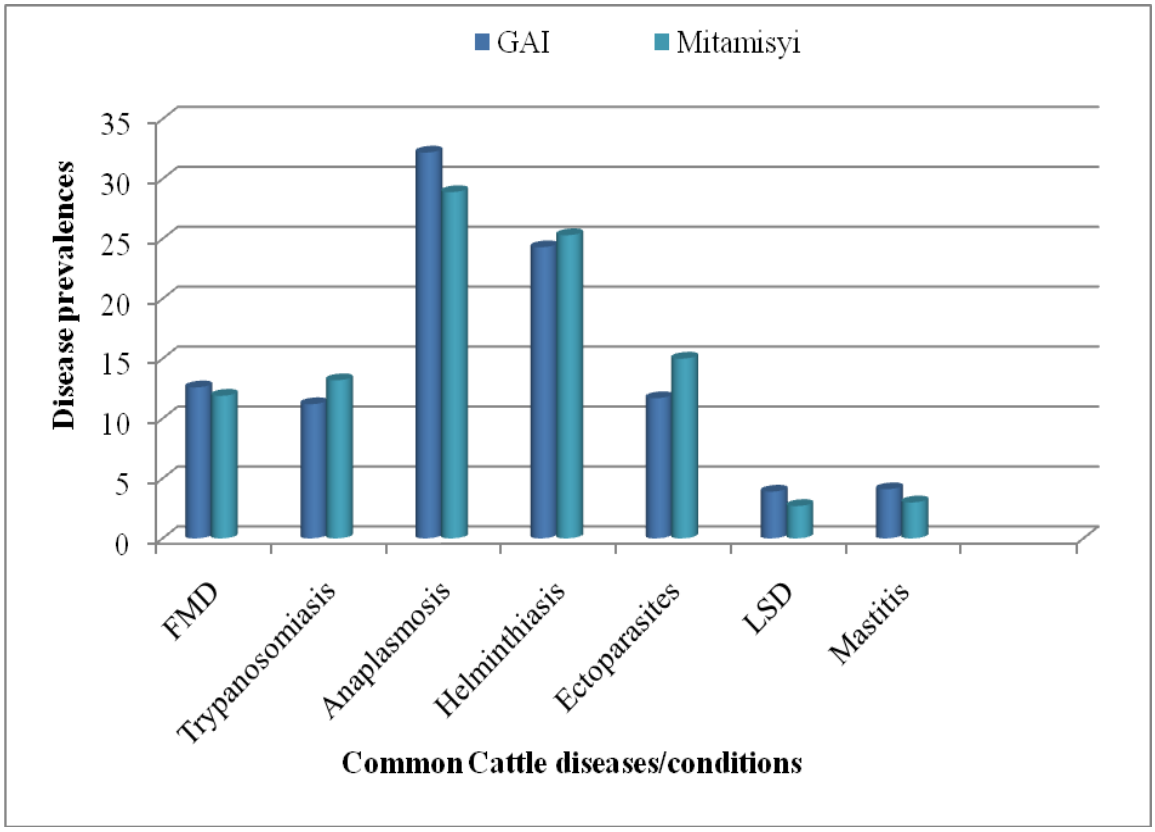


Figure 4.3:Prevalence of Cattle diseases expressed as a percentage in Gai and Mitamisyi

4.1.4 Common diseases and conditions in Poultry

The common poultry diseases and conditions were new castle disease(NCD), fowl pox, chronic respiratory disease (CRD), Fowl cholera, Gumboro, Soft ticks and Ect-oprarasites. NCD.was the most prevalent disease in Gai 30.6% and Mitamisyi 29.5%. Fowl pox 19.5% in Gai and Mitamisyi 18.6% and CRD in Gai 12.3% and Mitamisyi14.1% were also reported (Figure 4.4).

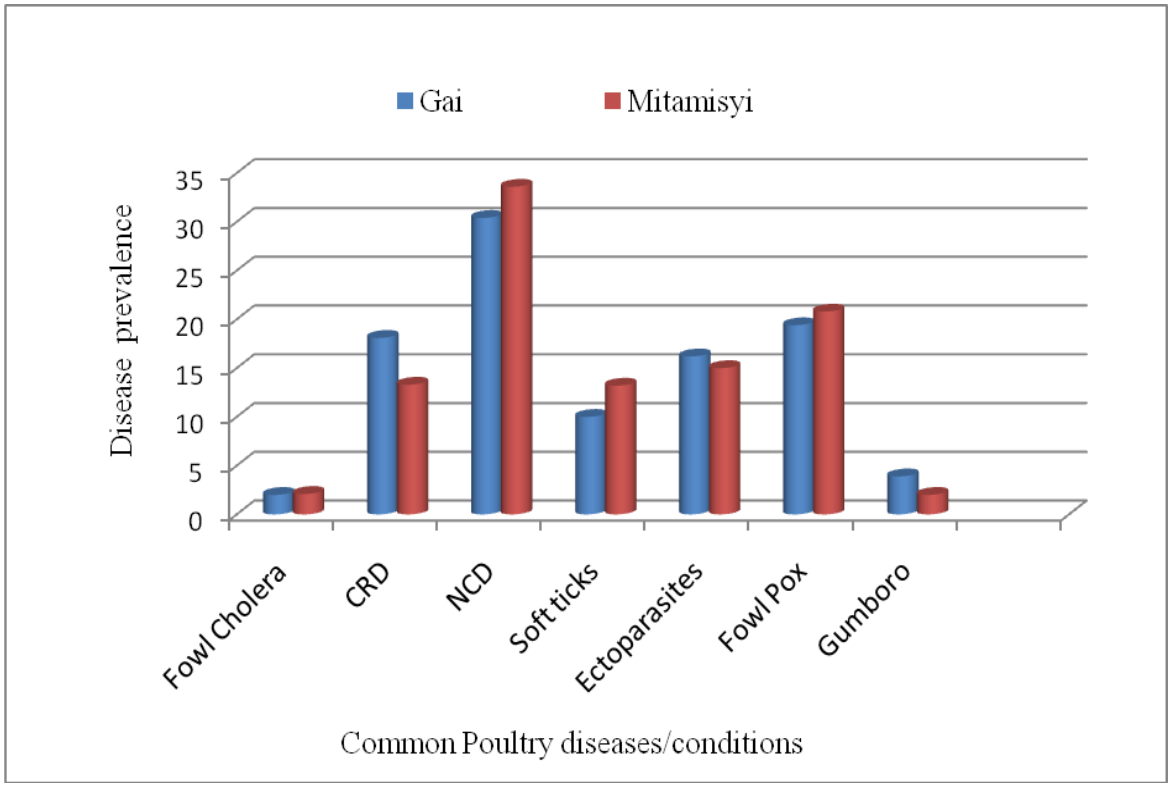


Figure 4.4:Prevalent poultry diseases and conditions in Gai and Mitamisyi

4.1.5. Common Diseases and conditions in Donkeys

Helminthiasis 18.1%, colic 18% and ectoparasites 15% in Gai were the most prevalent.In Mitamisyi helminthiasis 19.3%, colic 16.4% and ectoparasites 14.5% were the most prevalent (Figure 4.5).

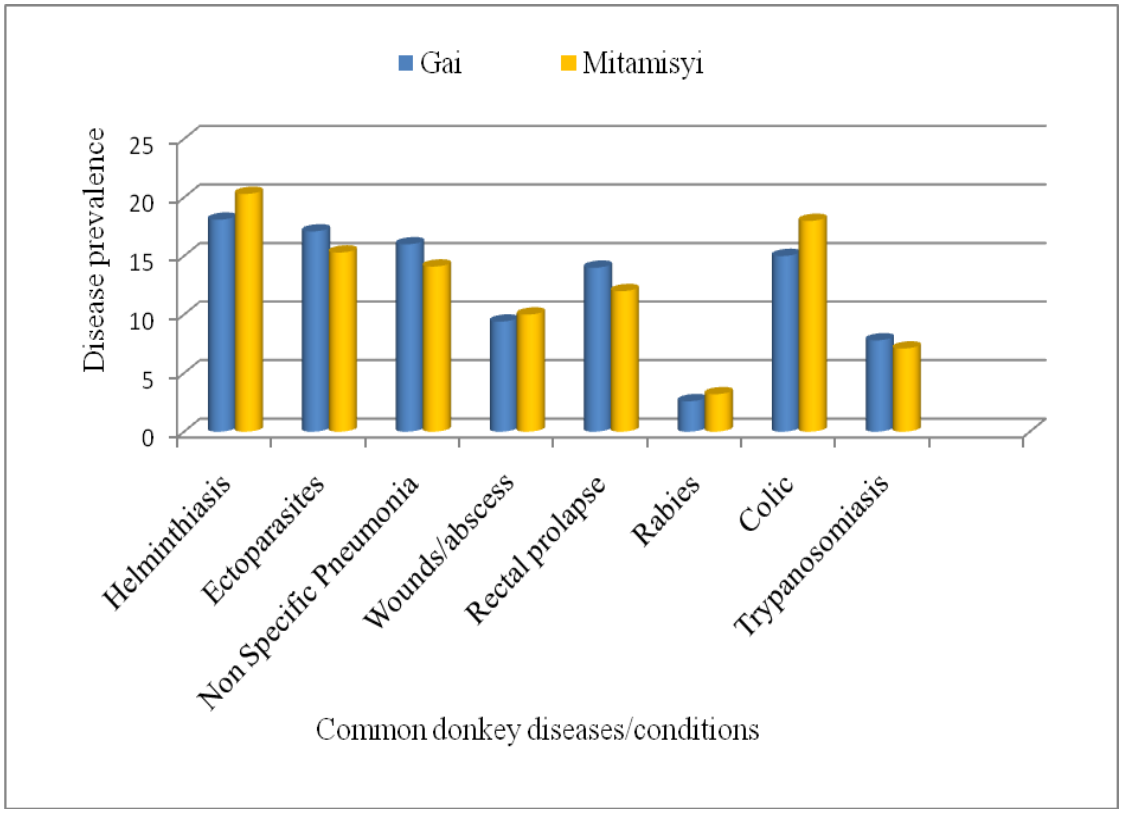


Figure 4.5:Donkeys common diseases/conditions in percentages in Gai and Mitamisyi

4.1.6 Common diseases and conditions in Sheep

Anaplasmosis 5.6%, helmithiasis 32% and ectoparasites 20% were the most common sheep diseases in Gai. In Mitamisyi, anaplasmosis 29.6%,helmithiasis 30.1% andectoparasites 15.2% as shown in figure 4.6

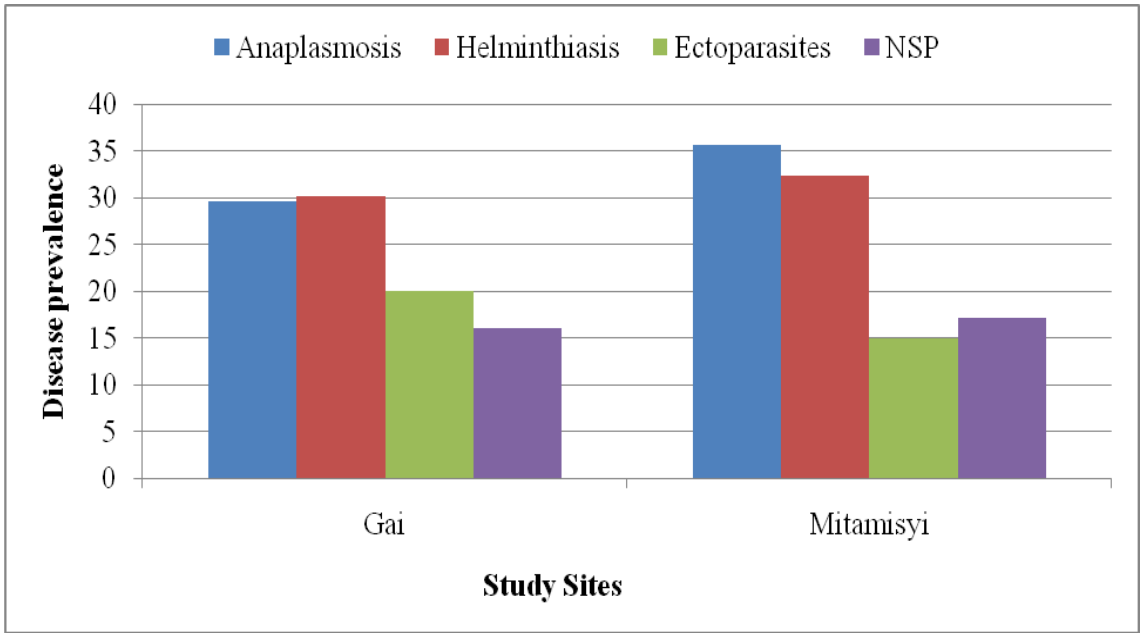


Figure 4.6: Common Sheep diseases and conditions in percentage in Gai and Mitamisyi

4.1.7. Indigenous knowledge awareness

Majority of the respondents in Gai, 94% and Mitamisyi, 87% were aware of indigenous knowledge practices in the area. Chi square tests of associations showed significant associations of indigenous knowledge awareness at the two sites at X^2= 56.5 for Gai and 45.6 for Mitamisyi at p <0.05 (Table 4.1).

Table 4.1: Indigenous Knowledge Awareness

Indigenous Knowledge awareness	Gai(n=63)	Mitamisyi(n=37)	(n=100)	Chi square- X^2
Yes	59(94.0)	32(87)	91(91)	X^2= 56.45, df=2 for Gai and X^2= 45.6, df=2 p< 0.05 for Mitamisyi p< 0.05
No	4(6.0)	5(13)	9(9)	

4.1.8. Influence of indigenous knowledge on Disease Management

Indigenous knowledge practices on disease management was 70 % for Gai and 70.2 % for Mitamisyi. Chi square tests of associations on indigenous disease management at the two sites were statistically significant at X^2= 20.32, df=2 for Gai and 30.62, df=2 for Mitamisyi $p < 0.05$ (Table 4.2).

Table 4.2:The use of indigenous knowledge on disease management

Indigenous Knowledge awareness	n (%) Gai(n=63)	n (%) Mitamisyi(n=37)	n (%) Overall(n=100)	Chi square- X^2
High	44 (70.0)	26 (70.2)	70(70)	X^2= 20.32 for Gai , 30.62 for Mitamisyi, $p < 0.05$
Low	19 (30.0)	11 (29.8)	30(30)	

4.2 Socio- Demographic Characteristics and their influence to household income losses

4.2.1 Gender of household decision maker

In the two study areas, men where the most respondents as reported in Gai,78% and Mitamisyi ,74%.This is shown in table 4.3

Table 4.3: Gender of Household Decision Maker

Gender	Gai n(%)	Mitamisyi n(%)	Totals n (%)
Male	49 (78.0)	27(74)	76(76.0)
Female	14 (22)	10(27)	24(24.0)
Totals	63(100)	37(100)	100(100)

4.2.2. Household Livestock ownership in Tropical Livestock Units (TLU)

The livestock population of households interviewed was standardized to tropical livestock units (TLU) (Storck, *et al.*, 1991). A Tropical Livestock Unit (TLU) is a common unit used to describe livestock numbers across species to produce a single

figure indicating the total 'amount' of livestock owned. Mitamisyi had more cattle and goats TLUs than Gai while Gai had more poultry TLUs than Mitamisyi.The males headed households in both sites had had more tropical livestock units (10.4) than the female headed households (3.4), as shown in Table 4.4

Table 4.4: Household Tropical Livestock Units (TLU)

Animal Category	Tropical Livestock Unit (TLU)	Males headed			Females headed		
		Gai	M/Misyi	Totals	Gai	M/Misyi	Totals
Cattle	0.7	1.1	1.4	2.6	0.4	0.5	0.9
Goats	0.1	1.4	2.1	3.5	0.4	0.6	1.0
Sheep	0.1	0.004	0.007	0.01	0	0	0
Poultry	0.01	1.6	1.2	2.8	0.7	0.5	1.2
Donkeys	0.50	0.6	0.9	1.5	0.1	0.2	0.3
Totals				10.4			3.4

4.2.3 Age set categories

Majority 61% of respondents in the two sites were aged 35 years to 59 years. Respondents over 60 years of age were 21% while below 35 years at 18%. Correlation tests showed that the majority of respondents of age set below 35 years and over 60 years had significantly positive relationship to household income losses than the age bracket of 35 years to 59 years. The age set of 35 years and below had r (0.36) for Gai,r (0.44) for Mitamisyi) while over 60 years had r (0.35) for Gai and r (0.31) for Mitamisyi at $p < 0.05$ level. The age set of 35 years to 59 years had significantly lower influences at r (-0.25) for Gai, r (-0.11) for Mitamisyi at $p < 0.05$. The Chi square tests of associations showed a closer association between age sets at the two sites at $\chi 2$ (8.39, df =3, for Gai, 7.09, df =2 for Mitamisyi) at $p < 0.05$ as shown in Table 4.5.

Table 4.5:Age set categories

Age categories	Gai n (%)	Mitamisyi n(%)	Totals n(%)	Correlation tests(r)	Chi-square value-$\chi 2$
Below 35 yrs	10(15.8)	8(21.6)	18(18.0)	0.36 -Gai 0.44-Mmisyi	$\chi 2$ =8.39, p <0.05 for Gai $\chi 2$ =7.09, p < 0.05 for Mitamisyi
35yrs- 59yrs	43(68.2)	18(48.6.)	64(61.0)	-0.25-Gai -0.11-Mmsyi	
Above 60 yrs	10(16.4)	11(29.7.)	18(21.0)	0.35-Gai 0.31-Mmsyi	

*Correlation significant at the 0.05 level (2 tailed), **Correlation significant at the 0.05 level (2 tailed).

4.2.4 Marital status of the respondents

The majority of respondents were married with a mean of 80.0%. Single, widowed and divorced were at 10%, 6% and 4% respectively in the two study sites. Chi square tests of marital status at the two sites had significant associations at $\chi 2$, = 12.19, df =3, for Gai, 16.21, df =3 for Mitamisyi) at p <0.05 as shown in Table 4.6.

Table 4.6: Marital Status of the household decision maker

Marital status	n (%) Gai(n=63)	n (%) Mitamisyi(n=37)	n (%) Overall(n=100)	Chi square- X^2
Single	4(6.3.)	6(16.2.)	10(10.0)	$\chi 2$ =12.19 for Gai and 16.21 for Mitamisyi at p <0.05
Married	54(85.7)	26(70.2)	80(80.0)	
Widowed	3(4.7)	3(10.0)	6(6.0)	
Divorced	2(3.2)	2(8.1)	4(4.0)	

4.2.5 Educational levels of respondents

In the two study areas, 55% of the respondents had primary level of education, 20% secondary education, 13% were illiterate while 12% had tertiary level of education. Chi square tests of associations revealed that there was statistically significant relationship of educational levels at the two sites although with different values at $\chi 2$= (12.19, df =3, for Gai and 8.39, df =2) for Mitamisyi at p <0.05 as shown in Table 4.7

Table 4 .7: Educational levels of respondents

Educational levels	Gai n(%)	Mitamisyi n(%)	Totals n(%)	Chi-square value-$\chi 2$
Illiterate	7(11.3)	6(11.7)	13(7.0)	$\chi 2$ =12.0 for Gai and 8.39 for Mitamisyi at p <0.05
Primary level	35(55)	20 (54)	55(55.0)	
Secondary level	13(20.6)	7(19)	20(20.0)	
Tertiary	8(12.5)	4(11.5)	12(10.0)	

4.2.6. Main Occupation of Household decision maker

The main occupations of respondents were livestock keeping at 63% for Gai and 70% for Mitamisyi, crop farming 16% for Gai and 11% for Mitamisyi. Chi square tests showed a statistically significant association for main types of occupation at both sites

at sites at $\chi 2$= 25.39, df =3, for Gai, 35.59, df =2, for Mitamisyi at p <0.05 level of significance (Table 4.8).

Table 4 .8: Main Occupation of Household decision maker

Variables	Gai n(%)	Mitamisyi n(%)	Totals n(%)	Chi-square value-$\chi 2$
Crop farming	10(16.0)	4 (11)	14(14.0)	$\chi 2$ =25.39 for Gai and 35.59 for Mitamisyi at p <0.05
Livestock Keeping	40 (63)	26(70)	66(66.0)	
Business	7 (11)	4 (11)	11(11.0)	
Employment	5 (10)	3 (8)	8(9)	

4.2.7. Household sizes

Household size was classified as 1 to 5 members, 6 to 10 and more than 10 members. Most households, 48% had 1 to 5 members while 47% of the household had. 6 to10 members. Only 5% households had more 10 members in the two study sites. Correlation tests showed a statistically significant relationship on household sizes and income losses at p <0.05. Chi square tests showed that household sizes at the two sites had statistically significant associations as shown in Table 4.9

Table 4.9: Household Sizes

Variables	Gai n(%)	Mitamisyi n(%)	Totals n(%)	Correlation test(r)	Chi-square value-$\chi 2$
1-5	30 (47.6)	14(38)	44 (44)	(r)=.2 for Gai and (r)=.3 for Mitamisyi at p >0.05	$\chi 2$=9.39 for Gai and 7.88 for Mitamisyi at p <0.05
6-10	21(33.3)	17 (46)	39 (47)		
Over 10	12(19.1)	6 (16)	17(9)		

4.2.8. Type of Housing for household decision maker

Most households, 42% had houses constructed with bricks/iron sheets/toilets. Moderate executive households were 38% while 20% of the households had grass thatched houses. Correlation tests showed strong significant and positive association of household sizes and income losses at $p < 0.05$. Chi square tests statistics showed that there were significant associations of type of housing at the two sites at $p < 0.05$(Table 4.10)

Table 4.10: Type of Housing

Variables	Gai n(%)	Mitamisyi n(%)	Totals n(%)	Chi-square value-$\chi 2$
Moderate executive	27 (43)	11 (30)	38(38)	$\chi 2$ =14.39, df=2,p= for Gai and $\chi 2$ =16.9for Mitamisyi
Bricks/iron sheets/toilets	25 (40)	17 (46)	42(42)	
Grass thatched/no permanent toilets	11 (17)	9(24)	20 (20)	X^2 =7.39, df=2,p= 0.026 for Mitamisyi

4.2.9. Household land holdings

The results showed that majority of the respondents had land sizes of over 20 acres at 49%, followed by eleven acres to 20 acres at 35% and below 10 acres at 29 %. The land set aside for livestock keeping was more than crop land at 60% for Mitamisyi and 48% for Gai followed by 30 % for 5 acres to 10 acres and 10% for over 10 acres. Test statistics revealed that land sizes had statistically significant correlation to household income losses at r (0.33) for Gai and r (0.43) for Mitamisyi at $p < 0.05$. All the other variables had significant associations to income losses. Chi square tests showed that land sizes had a strong and statistically significant association at both sites at $\chi 2$, (23.39, df =3 for Gai, = $\chi 2$ 36.00, df =2 for Mitamisyi) at $p < 0.05$ (Table 4.11).

Table 4.11: Household Land Holdings

Land sizes	Gai n(%)	Mitamisyi n(%)	Totals n(%)	Correlation test(r)	Chi-square value-$\chi 2$
Less than 10 acres	9 (18.2)	4 (11.7)	16 (29.9)	0.16*, p=0.023 for Gai 0.21*, p=0.05 for Mitamisyi	$\chi 2$ =23.39, for Gai, 36.0 for Mitamisyi at p<0.05
11 acres to 20 acres	23 (34.8)	12 (35.2)	35 (35.2)	0.26*, p =0.023 for Gai	
				0.31*,p=0.05 for Mitamisyi	
Over 20 acres	31(46.9)	18 (53.0)	49 (49)	0.33*,p=0.004 for Gai	
				0.43*,p=0.01 for Mitamisyi	

*Correlation significant at the 0.05 level (2 tailed), **Correlation significant at the 0.05 level (2 tailed).

4.2.10. Land for livestock use

Households with over 10 acres' land for livestock was 60% while 30% had 5 to 10 acres for livestock. The land set aside for livestock keeping was more than crop land at 60% for Mitamisyi and 48% for Gai. Correlation tests revealed that land kept for livestock use had significant relationship to household income losses at r (.53) for Gai and r (.60) for Mitamisyi at p <0. 05. Chi square tests showed that land for livestock use had a strong and statistically significant association at both sites at $\chi 2$, (19.1, df =3 for Gai , = $\chi 2$ 26.00, df =2 for Mitamisyi) at p<0.05 (Table 4.12)

Table 4.12: Land for livestock use

Land sizes	Gai n(%)	Mitamisyi n(%)	Totals n(%)	Correlation test(r)	Chi-square value-$\chi 2$
Less than 5 acres	6 (10)	4 (11.8)	10 (10)	0.13*,p=0.02 for Gai	
				0.18*,p=0.03 for Gai	$\chi 2$ =23.39, for Gai, 36.0 for Mitamisyi at p <0.05
5 acres to 10 acres	20 (30)	10 (29.4)	30 (30)	0.19*, p=0.041 for Gai	
				0.23*, p=0.01 for Gai	
Over 10 acres	40 (60)	20 (58.8)	60 (60)	0.53**, p=0.04 for Gai	
				0.60**, p=0.00 for Mitamisyi	

**Correlation significant at the 0.05 level (2 tailed).

4.3.0. Objective 3: Analyze the availability, costs of animal health services and how diseases affect household incomes

4.3.1 Access to animal health inputs in a Year (2017)

The study revealed that majority of respondents accessed animal health inputs from agro veterinary shops 71% for Gai and 68.0% for Mitamisyi. The ones accessing inputs from Government offices were 10.0% for Gai and 8.0% for Mitamisyi while 11% never accessed inputs in the two sites Chi square tests statistics of associations in the two sites showed that access to inputs in the two sites was significant at X^2= 8.45, df =2, p <0.05(Table 4.13).

Table 4.13:Respondents Accessing to Animal Health Inputs in a Year (2017)

Variable	Gai n(%)	Mitamisyi n(%)	Totals n(%)	Chi-square (value-X^2)
Access to inputs from Agro vet	46 (73)	25 (67.0)	71 (71.0)	
Access from Gok	10 (16.0)	8 (22.0)	18 (16.0)	X^2= 8.45, df =2 p = 0.05
None	7 (11.0)	4 (11.0)	11 (12.0)	

4.3.2 Access to animal health services in the last one Year (2017)

The results of the study showed that 82% of respondents for Gai and 73% for Mitamisyi had accessed animal health services. The respondents who never accessed services in a year were 11% for Gai and 10% for Mitamisyi.Chi square tests of associations revealed a statistically significant associations of access to animal health services at both sites at X^2= 11.32, df =2, p<0.05 (Table 4.14).

Table 4 .14: Access to Animal Health Services in a Year (2017)

Variable	Gai	Mitamisyi	Totals	Chi square(X^2)
Yes	52 (82)	27 (73)	79 (79)	X^2= 11.32, df =2, p = 0.05
No	11 (18)	10 (27)	21 (21)	

4.3.3 Influence of cost of treatments on diseases incidences

The studies showed that majority of respondents were of the opinion that costs of treatments were high at 84.8 % for Gai and 82.3% for Mitamisyi. The ones who said to be low were 15.1% for Gai and 21.3% for Mitamisyi. Chi square tests of associations revealed a statistically significant relationship of costs of treatments at both sites at X^2= 56.6, df =3, p<0.05 (Table 4.15).

Table 4.15:Influence of cost of treatments on respondents

Variable	Gai	Mitamisyi	Totals	Chi square(X^2)
High	53 (84.0)	28 (76)	81 (81.0)	X^2= 56.6, df=3 p = 0.00
Low	10 (16.0)	9 (24)	19(19.0)	

4.3.5. Livestock as quick source of incomes

The study showed goats were the livestock which provided quick sources of incomes at 46% for Gai and 44% for Mitamisyi. This was followed by poultry at 30%, cattle at 15% and donkeys at 7% (Figure 4.7)

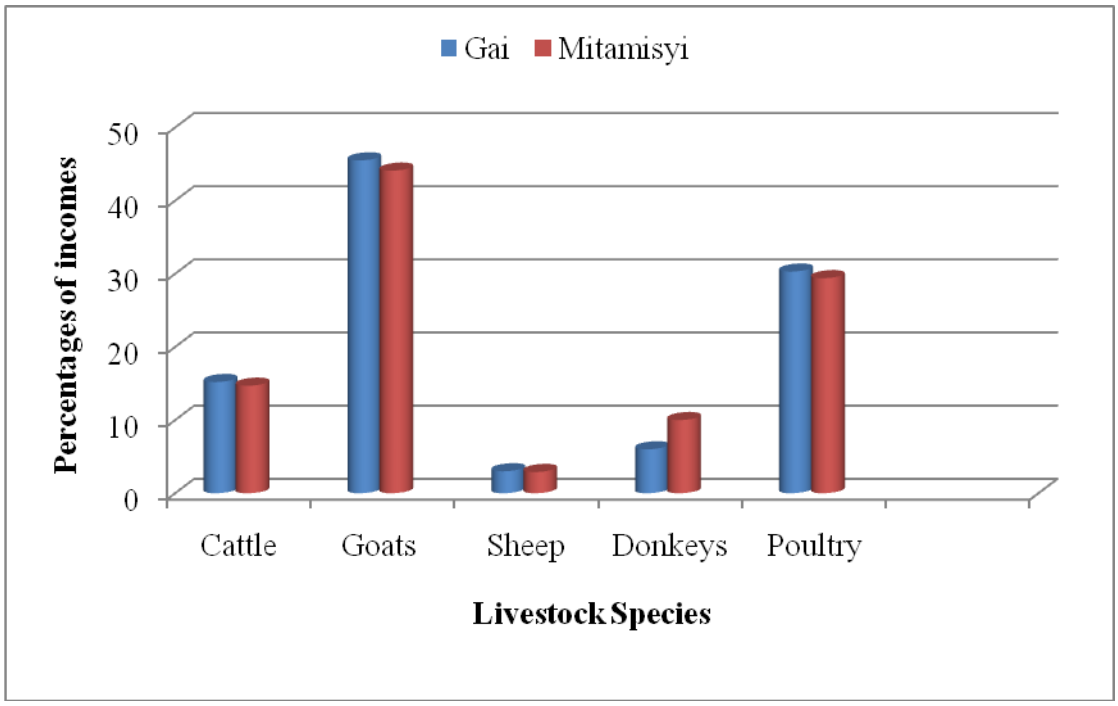


Figure 4.7: The quick sources of incomes from Livestock expressed as a percentage.

The study further analysed each of the species contributions to household income losses. The results revealed that goats and poultry at the two sites had statistically positive and significant relationships at r (0.45) and r (0.44) at p<0.05 (Table 4.16).

Table 4 .16:Contribution to Incomes Losses per Species

Variable	Cattle	Goats	Sheep	Donkeys	Poultry
Gai-Pearson's Correlation(r)	0.16 at p<0.05	0.45** at p<0.05	0.14 at p>0.05	0.26* at p<0.05	0.42* at p<0.05
Mitamisyi-Pearson's Correlation(r)	0.26* at p<0.05	0.55** at p<0.05	0.18 at p>0.05	0.3* at p<0.05	0.50** at p<0.05

*, **Correlation significant at the 0.05 level (2 tailed).

4.3.6. Main sources of incomes

The study showed that the main sources of incomes were from livestock and products at 70.0% for Gai and 80% for Mitamisyi. This was followed by incomes from business at 10% (Figure 4.8)

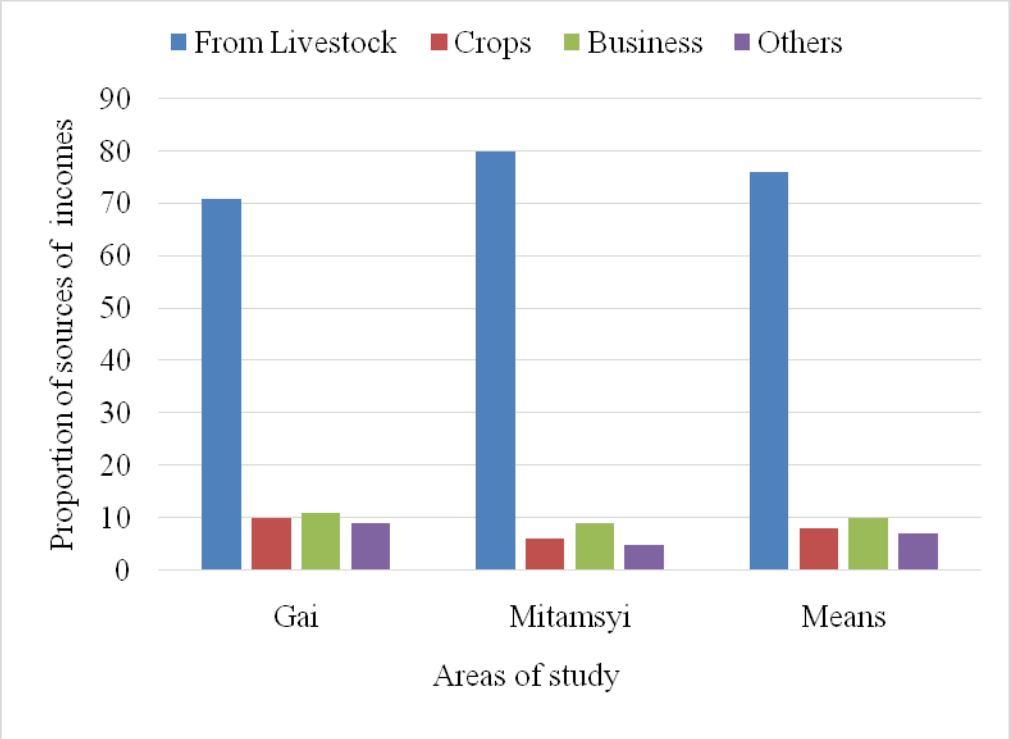


Figure 4.8: Main sources of incomes expressed in percentages

4.3.8. Livestock diseases on people's incomes

The study showed that income losses due to livestock diseases were high for majority of the respondents at 70.1% for Gai and 72.2% for Mitamisyi (Table 4.17).

Table 4.17: Loss of incomes

Loss of incomes	Gai n(%)	Mitamisyi n(%)	Totals n(%)
Over 50%	43(68.0)	24(65.0)	67(67.0)
Less than 50%	20(32.0)	13(35.0)	33(33.0)

4.4. Multiple Regression Analysis

Multiple regression analysis using enter and stepwise analysis was conducted to assess factors influencing household income losses due to livestock diseases. Variables examined were gender of household decision maker, age set categories, main occupations, levels of education, indigenous knowledge practices and whether the community practiced it, diseases influence by indigenous knowledge, availability of animal health services, costs of treatment and influences of costs on diseases.

The correlation coefficient for each pair of variables was undertaken. Each variable correlates perfectly with itself, as evidenced by the coefficients of +1.00 as shown in

Appendix 3 and different variables are significantly correlated at r <0.05. The model summary observes the multiple correlation coefficients(R) was 0.723, the coefficient of determination R-Square was 0.488 and adjusted R-Square was0.307 as shown in table 4.18

Table 4.18: Model Summary

Model	R	R-Square	Adjusted- R Square	Std. Error of the Estimate
1	.723	.488	.307	.38082

Then Analysis of Variance(ANOVA) was undertaken to observe the significane of the regression model at p<0.05.The model value was statistically significant as show in table 4.19

Table 4.19: ANOVA Test Analysis

	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.254	9	.695	7.791	.000
Residual	9.862	68	.145		
Total	16.115	77			

The results of multiple linear regression showed that gender of household decision maker,age categories, diseases influence by indigenous knowledge, influence of costs of treatment and educational levels were statistically significant predictors of household income losses as shown in table 4.20

Table 4.20:Standardized Coefficients

Variable	Standardized Coefficients	t	Sig.
	Beta	B	Std. Error
(Constant)		-.855	.395
Gender of household decision maker	-0.56	-450	0.03*
Age categories	0.2	1.8	0.033*
Indigenous knowledge	-.072	-.738	.463
Main occupations	.151	1.496	.04*
Diseases influence by indigenous knowledge	-.226	-2.145	.036*
animal health services	.005	.045	.964
Cost of treatment	-.133	-1.309	.195
Influence of costs on income losses	.325	3.128	.003*
Education levels	.322	3.238	.002*

CHAPTER FIVE

5.0. DISCUSSIONS OF THE RESULTS

5.1 INTRODUCTION

This chapter discusses the results that were presented and an effort made to interpret the results and also compare them with those from other related studies in Kenya and other parts of the world.

5.2 Livestock diseases in the area

The majority of the respondents 85% and the focused group discussions agreed that there were rampant livestock diseases in Gai and Mitamisyi sub locations. The study showed that the most prevalent livestock disease for cattle was anaplasmosis at 28.9% for Gai and 29.2% for Mitamisyi. The most prevalent goat diseases was contagious caprine pleura-pneumonia (CCPP) at 39.1% in Gai and for 34.3% for Mitamisyi. In poultry the study showed that the most prevalent disease was newcastle disease at 30.6% for Gai and 29.5% for Mitamisyi. The prevalent donkey diseases and conditions were helminthiosis at 18.1% for Gai and 20.3% for Mitamisyi. The results of the study revealed that most common sheep diseases/conditions were anaplasmosis at 35.6% for Gai and 29.6% for Mitamisyi. The results showed slight differences in prevalence of CCPP in the two sites as it was expected that Mitamisyi was to have higher prevalence since it borders the infected zones of Tana River County. This is in agreement with similar studies undertaken in Kenya by (IFAD, 2004) which showed that the most important livestock diseases include East Coast Fever, CCPP, anthrax, foot and mouth Disease, newcastle disease anaplasmosis, Mastitis, Lumpy Skin Disease and helminthiasis. Major constraints affecting livestock keeping were reportedly, livestock diseases, shortage of feed, lack of water/distant watering points, insecurity, wildlife menace and poor markets similar to a study conducted in Marsabit district (Njanja *et al*., 2003).

In Africa, tick-borne diseases are considered to be the most important livestock disease problem (Young *et al.,* 1988). All these diseases conditions are in agreement with Delgado *et al.,* 2002. This is in agreement with Delgado *et al*., 1999 that new castle disease which affects the poultry of the poor often leads to 100% flock

mortality. This is also in agreement with Kingori *et al*., 2010 that new castle disease (NCD) is the most prevalent and fatal disease of poultry in Kenya.

5.3 Prevalence of livestock diseases per species

The study through focused group discussions and pair wise rankings showed that goat's diseases and conditions were the most prevalent at 38.3%, followed by poultry at 32.7%, cattle at 15.7%, donkeys at 8.2% and sheep at 5.1%.

5.4 Indigenous knowledge practices

The study showed that majority of the respondents were aware of indigenous knowledge practices in the area and how it affects diseases.This agrees with studies by Catley *et al*., 2002 that agro pastoralists have a rich indigenous knowledge about animal health problems affecting their herds.

5.5 Influence of indigenous knowledge on disease management

The study revealed that indigenous knowledge influenced disease management. Chi square (X^2) tests were statistically significant at X^2= 20.32, $p < 0.05$ level of significance. This shows that indigenous knowledge is widely practiced in the area due to rampant diseases in the area, high costs of treatments, vastness of the area and availability of the medicinal plants. This is in agreement with studies undertaken by Mathias, 1994. Ethno-veterinary practices are highly useful for disease control (Olayide *et al.*,1981).

5.6 Gender of household head and decision maker

Men dominated livestock keeping activities in the two sub locations. In arid and semi-arid areas of Kenya and in addition to socio-cultural roles of African settings men are expected to take the lead in household decision making. Gender refers to the social roles and identities associated with what it means to be a male or female (FAO, 2011). This study agrees with the findings of African Development Bank (2015) who reported that despite the gains that have been made with respect to gender equality, the distribution of resources and power has not shifted the gender disaggregation in farming. Bukh, 2006 and Kyalo, 2009 reported that men are most often the heads of households in Africa. Chi square tests showed significant associations of the gender of the household decision maker at both sites at $p<0.05$. This could be due to that males were the key decision makers at the two sites, majority have more resources,

are proactive and have past knowledge in animal husbandry practices and are firm in decision making.

5.7 Categories of age groups

Age according to the study influenced the main income occupation enterprise choices, levels of indigenous knowledge and livestock disease control methods. The age set of 35 years to 59 years had more diversification of enterprises (crop farming, livestock keeping, employment, business). The study showed that the majority of the aged had higher TLUs than other categories. This study agrees with Moloi, 2008 that farming is mostly considered as an alternative job for people who are retiring from their lucrative job while the educated, young and active people migrate to the urban areas to seek better employment and they do not consider farming as a potential business. The study revealed significant weak and negative relationship of the age set categories to income losses across the two sites at $r = -0.36$ for Gai and $r = -0.25$ for Mitamisyi at $p < 0.05$ levels of significance. The aged persons had less livelihood losses compared to the young mostly due to experience in husbandry practises, early disease detections and availability of resources. Chi square tests of associations showed a closer associations of age set categories in the two sites although in different agro-ecological zones. This could be due to similarities in age set categories

5.8 Marital status of the respondents

The majority of respondents were married and had more TLUs than the rest. The study agrees with FAO, 2011 that majority of married people are usually more responsible and tend to invest more. The married had lower income losses than the others. Chi square tests showed that marital status had significant associations in the two sites as the percentage of respondents were almost similar.

5.9. Education levels

The majority of respondents had primary level of education. This agrees with earlier studies undertaken which show that, a total of 60% of Kitui county residents have a primary level of education only, KNBS, 2013. The study showed that 12% had no formal education. The study disagrees with similar ones of (KNBS, 2013), that Mwingi North constituency has the highest share of residents with no formal education at 30%. This could be due to recent Governments policy on free primary education.

The level of education attained by the head of household is expected to influence access to information, decision making, incomes and consequently livelihood security of a household. Poverty of a household, whether transient or chronic, is therefore, expected to decrease as level of education of its household head increases. This is because educated household heads are likely to have higher income earning potentials and more alternative income earning opportunities. In Africa, several studies have shown a positive relationship between education levels and agricultural productivity (Mwangi, 1998; World Bank, 1980).

5.10. Main Occupation

The study results showed that the main income sources and occupation of the household heads was livestock keeping. The results are in agreement with a FAO, 2009 analysis that 46% to 82% of rural households in Africa, Asia and Latin America keep livestock. This also in agreement with studies of livestock keepers in Bolivia, India and Kenya households who ranked livestock above business and housing as their best investment Heffernan *et al.,* 2002. The results also agree with other studies undertaken which show that 70% of the world's rural poor depend on livestock as a component of their livelihoods (FAO, 2002; Nyariki and AMwata, 2019)). Further this study agrees with others done by Murangiri *et al.,* (2016), Kivunzya *et al.,* 2018) which indicate livestock farming is a key livelihood activity in Kitui County.

5.11 Household sizes and type of housing

A majority of households had an average of 1 to 5 members. The respondents confirmed that they use incomes from livestock and products to invest and construct houses. This is in agreement with KNBS, 2013 survey which showed that the average household sizes for Kitui County were 4-6 members. The households with houses constructed with bricks/iron sheets/toilets had the highest number of respondents at 52%. This was followed by moderate executive at 38% while 20% had grass thatched houses. This is in agreement with FAO, 2002 studies, studies done in Mwingi North constituency which showed that study area has the highest share of grass/makuti roofs at 41% KNBS,2013.

5.12 Land size and cultivated land in acres

The results showed that majority of respondents had land sizes of over 20 acres. In total land size and cultivated/uncultivated had a strong and moderate positive

correlations with the main occupations and income losses for both sites at (r)=0.60 and (r)= 0.345 at p<0.05. The study showed land size had influence on the main occupation of respondents. This is in agreement with studies undertaken by Muiti, 2008 who found a positive correlation between farm sizes, choice of enterprises and production levels. This is also in agreement with studies undertaken by Nyariki *et al.,* 2009 and Amwata *et al*., 2004 who found a positive correlation between farm sizes, choice of enterprises and production levels. Earlier studies by Chaudhry, 2003 also showed that livestock holdings were positively related with land sizes, incomes and consumption of household.

5.13 Accessibility to animal health inputs

The study revealed that majority of respondents accessed animal health inputs from agro veterinary shops for both sites.Chi square statistics were undertaken to establish any relationships between animal health inputs at the two sites and established a significant relationship at X^2= 8.45, df=2 p< = 0.05. The agro veterinary shops are scattered all over the sub county and the Government privatized services hence most inputs are privately bought by the farmers. There has also been liberization of the sub sector (Chilonda and Huylenbroeck, 2001).

5.14 Access to animal health services over the last one year

The results of the study showed that majority of respondents accessed services. The services were mostly from trained animal health workers and community based animal health workers. The privatization has improved the delivery of veterinary services but with limitations in arid and semi-arid areas (Cheneau*et al*.,2004). Similarly, Holden (1997) found that farmers tended to use para-professionals.

5.15. Influence of costs of treatments on diseases

The majority of respondents perceived that the costs of treatments of diseases were high for both sites.Chi square tests of associations at both sites were significant at X^2= 56.6, df=3, p <0.05. This is in agreement with studies undertaken by Heffernan and Misturelli, 2002 who did a research in Kenya and indicated that poor agro pastoralists spend their large proportions of incomes treating endemic diseases. The respondents who said the costs to be fair were mostly the employed and owning business. The diseases cause loss of livestock production, productivity and were reported to generate

additional costs through veterinary care and changes in management practices (Chilonda and Van Huylenbroeck, 2001).

5.16 Livestock which acts as a quick source of incomes

The study showed goats were the livestock which provided quick sources of incomes followed by poultry. The population of goats and poultry was high and they are short cycle livestock hence their preference. Goats and chickens are therefore the kick-start capital for boosting wealth status of households. This is similar to what was observed by Ngugi *et al., 2*002. Qureshi *et al*., 1996 also found out that livestock are often one of the most important household cash income sources for the poor. Households with less-educated heads as the case of the study area are significantly more likely to keep poultry and goats mainly because household-level poultry is a low-input, low-output activity not requiring high levels of skill and education, Omiti & Okuthe, 2008.

5.17 Main sources of incomes

The study showed that the main sources of incomes were from livestock and livestock products. The study results further revealed over 50% of vital household needs were catered for by incomes from livestock and products. The poor households without other sources of incomes showed significant losses of incomes due to diseases. Other studies show that livestock form a component of livelihoods of 70% of the world's poor (FAO, 2002; Nyariki and Amwata, 2019)). It's an important income generating asset indicator of wealth status, source of food and nutrition, security, insurance against shocks and stresses, Randolph *et al.,* 2007.

5.18 Livestock diseases on people's incomes

The study showed that income losses were high for majority of the respondents. This is in agreement with Heffernan and Misturelli 2001, who did a research in Kenya and indicated that poor agro pastoralists spend large amounts of money in treating their sick animals.About 30% of livestock production in developing countries is lost because of diseases (Upton, 2004). The Rift Valley fever ban is estimated to have cost Kenya US $32 million in lost exports to the Gulf and other negative domestic impacts on agriculture and other sectors such as transport and services.

5.19 Multiple regressions analysis

An inspection of individual predictors revealed that gender of household decision maker, age set categories, level of education, main occupations, influence of costs on

diseases, andinfluence by indigenous knowledge were statistically significant predictors of losses household incomes due to livestock diseases at $p<0.05$.

The model summary observes the multiple correlation coefficients was 0.723 and that the coefficient of determination R-Square was 0.488. This implies that 48.8% of income losses were jointly explained by the independent variables.

The findings show that for every unit change in gender of household decision maker from male to female there was a corresponding 0.56 increase in loss of incomes, for every unit change of main occupation from others to livestock keeping, there was an increase in income losses by 0.151. For education levels, for every unit change on levels of education from illiteracy to primary there was a decrease in income losses by 0.33. Swallow, 2000 notes agro pastoralists with higher education raise more livestock and have better disease control strategies (low income losses) compared to the less educated. Years in education was positively associated with effective demand for animal health and hence reduced losses of incomes due to livestock diseases.

For every unit change in costs of treatment from low to high there was a corresponding increase of incomes losses by 0.133. The animals of most rural farmers are particularly vulnerable to diseases because of high costs of services and production inputs (FAO, 2002). This study is in agreement with Swallow, 1997 that high costs of services and value for inputs have a negative effect on livestock diseases control. In every unit change in indigenous knowledge from low to high there was a corresponding decrease in incomes losses by 0.226. This is in agreement with studies done by Ole-Marion,1997 who showed that traditional indigenous knowledge in ethno veterinary exists and had inverse relationship to livestock diseases and hence losses of incomes due to diseases.The study revealed that for every unit change of age category from high to low, there was a corresponding increase in income losses by 0.2.

Thus the prediction equation for factors influencing household income losses due to livestock diseases was:

Y (Losses of incomes) =Constant+b1(Gender of household decision maker, -0.56) +b2(Main occupations, 0,15) + b3 (Education levels, 0.33+b4 (Costs of treatment,-0.133) +b5 (Influence by indigenous knowledge, -0.226)+b5(Age sets,0.2)

CHAPTER SIX

6.0.CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the key findings of the study, including conclusions and recommendations.

6.2 Conclusions

The main income sources and occupation of the household heads was livestock keeping at 65.7% for Gai and 76.4% for Mitamisyi. The results also agree with studies undertaken which show that 70% of the world's rural poor depend on livestock as a component of their incomes. The study showed that male headed households were the majority and gender of household decision maker had a significant influence on income losses. The age set was a key determinant of the type of livelihood activity undertaken and age sets category of 35 years to 59 years had diversified income sources enterprises. The aged, widowed, divorced and majority of educated households had lower tropical livestock units. Age according to the study is likely to influence the main income occupation enterprise choices, levels of indigenous knowledge and livestock disease control methods. The study results showed that majority of respondents were married and had significantly lower income losses than the others.

The majority of respondents had primary level of education. The majority of educated had lower income losses than the less educated. The level of education of household decision maker influenced the access to information, decision making, incomes and household food security. The majority of households had 1 to 10 members and main type of housing was bricks/iron sheets with toilets.

The majority of households had land sizes of over 20 acres and land set for livestock use was more than crop land. The land sizes and land for livestock use had a strong positive correlation to main type of occupations. There were many reported cases of livestock diseases in the study areas and the most prevalent was contagious caprine pleuro-pneumonia (CCPP) in goats, newcastle disease in poultry, anaplasmosis in cattle, helminthiasis in donkeys and anaplasmosis in sheep. The majority of male

headed households had higher tropical livestock units than female headed. The study revealed that goats were the species which had higher disease prevalence and that acts as a quick source of incomes for household uses.

The majority of respondents accessed animal health inputs and services and many said that the costs of treatments for disease occurrences were high. The households that never accessed inputs and services had significant income losses due to diseases. The study showed that income losses in a year were highest for goats and poultry. The majority of respondents had indigenous knowledge awareness and the ones who practiced indigenous management for disease management had less income losses. The main sources of incomes were from livestock and products which catered for over 50% of household needs. The majority of respondents were of the opinion that the effect of livestock diseases on livelihoods was high. Multiple regression analysis significant predictors on household income losses were gender of household decision maker, main occupations, education levels, costs of treatments and indigenous knowledge

6.3 Recommendations

1. Contingency plans and more resources should be put in place to enhance the preparedness for the control of livestock diseases.
2. Gender mainstreaming in livestock enterprises should be strengthened more in county plans
3. The education strategies of the society should be critically looked into so as to improve on literacy levels
4. Indigenous knowledge practices in depth research should be undertaken
5. More partnerships are needed in disease control and management
6. More research on ethno veterinary issues in the area should be undertaken
7. More resources should be channeled towards goats and poultry production because of their potential in the region

6.4 Future Research Areas

1. More research needs to be conducted on efficacy of herbal plants used by livestock owners for treatments.
2. A more experimental approach to the study is also needed to further verify the perception in regard to indigenous knowledge.

REFERENCES

African Development Bank (2015) Empowering African Women: An Agenda For Action.*www.afdb.org/.../afdb/.../African_Gender_Eq/*

Alreck,P.Land Settle, R.B. (1995). The *Survey Research Handbook,* 2nd edition . Chicago,USA.

Amwata D. A., Nyariki D. M., and Musimba N.R.K. (2015). Factors Influencing Pastoral and Agro- pastoral Household Vulnerability to Food Insecurity in the Drylands of Kenya: A Case Study of Kajiado and Makueni Counties. *Journal of International Development DOI*: 10.1002/jid.

Amwata, D.A. (2004) *Effects of Communal and Individual Land Tenure Systems on Land Use and Food Security* in Kajiado District, Kenya. MSc Thesis, University of Nairobi, Kenya.

Anteneh ,A. (1983). *Financing animal health services in some African Countries*. LPU Working Paper No. 1. Livestock Policy Unit, ILCA, Addis Ababa,Ethiopia.

Ashley, S. D., Pasha, S. A., Mahale, P., Hendy, C. R. C., and Hegde, G. R(1993). *A study of the role of livestock in the livelihoods of communities* in Uttara Kannada. Finland

Ashley, S. D and Carney, T, (1999). *The changing role of veterinary services:* a report of a survey of Chief Veterinary Officers' opinions p-1-3. Crewkerne:United Kingdom

Bennett R, (2003). The 'direct costs' of livestock diseases: the development of a system of models for the analysis of 30 Endemic Livestock Diseases in Great Britain. *Journal of Agricultural Economics. 54:55-57*

Bos D (1991). Privatization. *A theoretical treatment*. Pg20-35.Oxford, ClaredonPres,United Kingdom

Burns, A. and Bush, R.(2000). *Marketing Research* 4th Edition. Pg1-699

Catley, A, and Admassu.(2003).Using *participatory epidemiology to assess the impacts of livestock diseases. FAO-OIE-AU/IBAR-IAEA consultative group meeting on contagious bovine pleuropneumonia in Africa,*12-14 November 2003:Rome: FAO Headquarters,Rome.

Catley,A.(2005). *Participatory epidemiology. Guide for trainers*. Nairobi: African Union/Inter African Bureau for Animal Resources, Addis Ababa,Ethiopia.

Chambers, R., and G. R. Conway.(1992). *Sustainable rural livelihoods: Practical concepts for the 21stcentury. I*nstitute of Development Studies Discussion Paper 296. Sussex, United Kingdom.

Chaundry *et al.*(2003). The Impact of Socioeconomic and Demographic Variables on Poverty*:* A Village Study. *The Lahore Journal of Economics* 14: 1 (summer 2009): pp. 39-68

Coleman P.G., Perry B.D., WoolhouseM.E.J.(2001). Endemic stability , a veterinary idea applied to human public health. *The Lancet* 357:1284-1286.

Curry J., Huss-Ashmore R., Perry B., and Mukhebi A. (2006*).* A framework for the analysis of gender, intra-household dynamics, and livestock disease control with examples from UasinGishu District, Kenya.*Human Ecology, 24* (2): 161-189.

Dehaan, C &Bekure. S. (1991). A*nimal health services in Sub-Saharan Africa: Initial experience with alternative approaches*. World Bank Paper No134.

Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., and Courbois, C.(1999). *Livestock to 2020: the next food evolution. Food, Agriculture, and the Environment*. Discussion Paper No. 228.

Delgado C., Rosegrant M. and Meijer S. (2002). *Livestock to 2020: The revolution continues.P.4-7.* World Brahman Congress, Rockhampton,United Kingdom.

Department for International Development (DFID)(2000). *Sustainable livelihoods guidance sheets. Institute of Development Studies. http://www.livelihoods.org.*

DerconS.(2004). Growth and shocks: Evidence from rural Ethiopia.*Journal of Development Economics* (pg 23-25),Volume 7.

Devendra,.C.(2010). *Small farms in Asia. Revitalizing Agriculture production, food security and rural prosperity*

Disrict Agricultural Office(2012-2016).*Kyuso Annual Reports*,KituiCounty,Kenya

District Development Office (2014). *Kyuso Annual Report*,KituiCounty,Kenya

District Veterinary office (2012-2015). Kyuso Annual Reports,KituiCounty,Kenya

Ellis,F.(2000). *Rural livelihoods and diversity in developing countries*. Oxford University Press, Oxford, United Kingdom.

FAO(2002). *Improved animal health for poverty reduction and sustainable livelihoods*. FAO Animal Production and Health Paper 153.

FAO(2004). *State of Food and Agriculture, Livestock in the balance,* pg-7-9.FAO, Rome, Italy

FAO(2005). *Livestock Sector Brief (Uganda). Livestock information,* Sector Analysis and Policy.

FAO(2006). *Impacts of Animal Disease Outbreaks on Livestock Markets.* Introductory Paper on Animal Disease Outbreaks prepared for 21st Century.

FAO(2008). *Socio-economic Impacts of Trans boundary Animal Diseases in the Near East with Particular Emphasis on Avian Influenza.* Twenty-Ninth FAO Regional Conferences for the Near East. Cairo, the Arab Republic of Egypt, 1-3 march,2008.

FAO (2008) .*Poultry Sector Country Review, Kenya.* FAO Animal Production and Health Division. Emergency Centre for Transboundary Animal Diseases, Social Economics, Production and Biodiversity unit. Philip Nyaga, University of Nairobi, Kenya.

FAO,IFAD;WorldBank,(2008).Gender in Agriculture Sourcebook. www.worldbank.org/genderinag

FAO (2009). *The state of food insecurity in the world FAO and World Bank*., 2010-Collecting livestock data; snapshot survey method

FAO (2009). Gender Equity in Agriculture and Rural Development, A quick guide to gendermainstreaming in FAO's new strategic framework.
ftp://ftp.fao.org/docrep/fao/012/i1240e/i1240e00.pdf

FAO (2010). *Pastoralism in Uganda. Pastoral and environmental network in the horn of Africa. Rome* available at http://www.fao.org/3/a-i5449e.pdf

Frans Swanepoel, Aldo stroebel and SibonisoMoyo, (2004). *The role of livestock indeveloping communities;* Enhancing multifunctionality.

Freeman, A., Kaitibie, S., Moyo, S. and Perry, B,(2007). *Livestock, livelihoods and vulnerability in selected SADC Countries* (Lesotho, Malawi and Zambia)

GOK (2003). *Strategy For Revitalization of Agriculture Sessional Paper no 55*

GOK, (2010) Agricultural Sector Development Strategy 2010-2020.

Gay ,L.R.andDiehl,P .L. (1992). *Research Methods for Business and Management.*MacmillianPublishers;Newyork , USA

Heffernan, C., and Misturelli ,F,(2002). *The delivery of veterinary services to the poor:* preliminary findings from Kenya.

Heffernan, C.L, (2002). *Appendix 5, Livestock in a sustainable livelihood context.* In: Perry B. D., Randolph T.F., McDermott J.J., Sones K.R. and Thornton P.K., Investing in animal health research to alleviate poverty.

Herrero, M.,Thorton, P.K, Gerber, P., Van der Ziipp, A., Van de steeg, J,. Notenbaert, A.M Lecomte, P and Grace, (2010). *The way forward on livestock and the environment*Holden, S., Ashley, S., Bazeley,P.(1996). *Improving the delivery of animal health services in developing countries: a literature review*: 96 pp.Crewkerne,United Kingdom.

ILRI(1995). Livestock policy analysis: *ILRI training manual* 2. Addis Ababa,Ethopia.

ILRI (2002).*Livestock, a pathway out of poverty*.

Kathuri,N.J and Pals,D.A, (1995). *Introduction to educational research*. Egerton University Press,Kenya.

KNBS (2010) .2009 Kenya Population and Housing Census, Kenya National Bureau of Statistics, Nairobi.

KNBS (2013). Kenya Integrated Household Budget Survey.Central Bureau of Statistics, Nairobi,Kenya.

Kingori, A.M., Wachira, A.M and Tuitoek, J.K. (2010) Indigenous Chicken Production in Kenya. A review; *International Journal of Science* Vol.9 (4): 309-316, 201

Kivunzya et al. (2018). The Status of Livestock Production Systems in Semi-Arid Farming and Arid Pastoral Agro-Ecological Zones in Kitui County, Kenya.*International Journal of Education and Research* Vol. 6 No. 2 February 2018

Kombo, D.K., Tromp, D.L.A.(2006). *"Proposal and Thesis Writing: An Introduction,"*2nd Re-print, Don Bosco Printing Press, Makuyu,Kenya.

Kothari, C.R.(1985). *Research Methodology: Methods and Techniques*. New Delhi: Willey Eastern Ltd.

Kothari, C. R. (2004). Chapter 3-*Research Methodology Methods and Techniques.*

Kothari, C. R.(2008). Research Methodology, Methods and Techniques (2nd ed., pp. 109-110). New Delhi: New Age Inter- national (P) Limited.

Kristjanson, P.M., Swallow, B.M., Rowlands, G.J., Kruska R.L. and de Leeuw ,P.N.(1999). *Measuring the costs of African animal trypanosomosis: the potential benefits of control and returns to research.Macmillan Publishers,Kenya.*

Kristjanson, P., A. Krishna, M.Radeny and W. Nindo.(2004). *Pathways Out of Poverty in Western Kenya and the Role of Livestock.*

Kyalo, D. K. (2009).Impact of policy and social economic factors on spartial distribution of livestock production system in River Njoro watershed, Kenya.Master of science thesis, Egerton University,Kenya.

Leeflag, S.(1993). *Some observation on ethno veterinary medicine in Northern Nigeria.* Indigenous Knowledge and Development Monitor.

Leonard, D.K.(2002). *The new institutional economic and restructuring of animal health services.MacmillanPublishers,Nairobi,Kenya.*

Livestock in Poverty Focused Development(1997,2002,2005).*Livestock in Development;*Crewkerne:United Kingdom.

Maholtra, H. and Birks,D.F.(2006). *Marketing Research:* An Applied Approach,NewDehli,India.

Malak, A.K; Mpoke, L; Banak, J; Muriuki, S; Skilton, R.A; Odongo, D; Sunter, J; Kiara, H ,. 2012. *Prevalence of livestock diseases and their impact on livelihoods in Central Equatorial State,* southern Sudan.

Mathias-Mundy, E. and McCorkle.C, (1989). *"Ethnoveterinary Medicine*: An Annotated Bibliography". Bibliographies inTechnology and Social Change, No. 6. Ames, Iowa: Technology and Social Change Program, Iowa State http://www.worldbank.org/afr/ik/ikrept.pdf

Mathias, E. (1994). *Indigenous Knowledge and Sustainable Development*, Working Paper No.553, Silang:International Institute Of Rural Reconstruction.

McCorkle ,C.and Mathias, E. (1994) . *Para veterinary healthcare programs*: a global overview. Paper contributed to the FAO Electronic Conference on Principles for Rational Delivery of Error! Hyperlink reference not valid..

McCorkle ,C.M., Mathias, E. (1997).*Para veterinary healthcare programs: a global overview*. Paper contributed to the FAO Electronic Conference on Principles for Rational Delivery of Public and Private Veterinary Services. January-March 1997.

McLeod, R.M. (2000). *Internal parasites of small ruminants in Asia and Australia. Economic impact analysis.Kenya pp71*

Minja, M., Ole, Neselle., Mziray, W.andDaborn ,C.(1997). *Ethno veterinary knowledge (EVK) research project* at Simanjiro TANZ. VET. J 17:117-125.

Mugenda, O. M. and Mugenda, G. A.(2002). *Research Methods: Quantitative and Qualitative Approaches.* Nairobi: Acts Press.Malhotra, N. K., Kim, S. S., and Patil, A,.2006. "Common Method Variance in IS Research:

Mugenda, O. M. and Mugenda, G. A.(2003). *Research Methods: Quantitative and Qualitative* Approaches. Nairobi.

Mugunieri G.L., P. Irungu and J.M. Omiti. (2004). *Performance of Community based Animal Health Workers in the Delivery of Livestock Health Services*. Tropical Animal Health and Production, 36(6): 523-535.

Mulinge, W and McLeod, A. (1998). *Priorities for animal health research in KARI:*Report for stakeholders. Unpublished paper. Nairobi: Kenya Agricultural Research Institute. 35 pp.New Age International (P) Ltd

Moloi et al. (2014). *Women In Action: Challenges Facing Women Entrepreneurs In The Gauteng Province Of South Africa*.*International Journal of Economics and Business Research* 14(6):835-850 · November 2015.

Mwangi et *al.* (2008). *Marginalization of Rural Women in Kenya*,Vol 1/pg3-8.

Mwobobia. *et al.*, (2016). *Comparing use of ethno veterinary products among rural and periurban chicken farmers in Katulani District, Kenya. International Journal of Advanced Research* (2016), Volume 4, Issue 1, 550- 558.

Nwelte, F.I. and F.E. Winch. (2005). "*Bases for farm resource allocation in the 54smallholder cropping system of south eastern Nigeria:* A Case Study of Awlta and Abakililti Villages" Discussion Paper No 4/80. Ibadan: IITA.

Nyariki *et al,* (2009). Land-Use Change and Livestock Production Challenges in an Integrated System*:* The Masai-Mara Ecosystem, Kenya. *J Hum Ecol,* 26(3): 163-173 (2009)

Nyariki D.M and Amwata D.A.(2019). Value of Patrolism in Kenya.Applicationof total economic value approach,Nairobi,Kenya.

Okoti,M., Ngethe,J.C ,Mbuvi,D.M. (2004). Land use ecology and socio-economic changes in a pastoral production system.J.*Hum Ecolo.*,16 (2):83-89.

Ole Miaron, J.O. (1997).Ethno veterinary practices of the Loitokitok, Maasai pastoralists :*Impact on the environment Tan. Vet. J* 17:159-167

Ole Miaron, J.O. (2000). *The Maasai Ethno veterinary Medicine*: An Avenue of Bio prospecting for Anthelminthics (In Press).

Orodho, J.A. (2004). *Element of Education and Social Science Research Methods.* Nairobi: Masola Publishers.

Otieno-Oruko ,L.O, Upton, M. and Mcleod ,A. (2000). *Restructuring of animal health services in Kenya: Constraints, prospects and options*.Development Policy Review 18:123- 138.

Otte,M.J. and Chilonda,P. (2003).*Indicators to monitor trends in livestock production at national, regional and international levels.*

Otte ,M. J., Nugent, R. and McLeod ,A. (2004).*Trans-boundary animal diseases: assessment of socioeconomic impacts and institutional responses*.FAO Livestock Policy Discussion paper No 9 page 21. FAO, Rome, Italy.2005, 281.

Otte ,J. and Upton ,M. (2005). *Poverty and livestock /agriculture.* WAAP Book of the Year.The Netherlands*:* Wageningen Academic Publishers.Search Google Scholar

Otte and Knips. (2005). *Livestock Development for sub-Saharan Africa,Workingpaper,FAO,Rome ,Italy.*

Otte, J., U. Pica Ciamarra, V. Ahuja and D. Gustafson. (2009). *Supporting Livestock Sector Development for Poverty Reduction*: Issues and Proposals. PPLPI Research Report 09-01, FAO, Rome.

Perry, B. and K. Sones. (2009). *Strengthening Demand-Led Animal Health Services in Pastoral Areas of the IGAD Region.* IGAD LPI Working Paper 09-08, IGAD-LPI, Addis Ababa.

Perry ,B. D., Randolph, T.F. (2003).*Improving the assessment of the economic impact of parasitic diseases and of their control in production animals.* Veterinary Parasitology 84: 145-168.

Perry, B.D., Young, A.S. (1995).*The past and future roles of epidemiology and economics in the control of tick-borne diseases of livestock in Africa*: the case of theileriosis. Preventive Veterinary Medicine 25:107-120.

Perry and Randolph . (1999).*The economic impact of food and mouth disease and its control in South East Asia*: a preliminary assessment with special reference to Thailand. Rev. Sci. Tech. Off. Int. Epi. 8 (2):478-497

Perry, B., McDermott, J. and Randolph, T. (2001).*Can epidemiology and economics make a meaningful contribution to national animal-disease control?* Preventive Veterinary Medicine 48:231-260.

Perry, *et al.* (2002).*The economic impact of foot and mouth disease and its control on smallholder farming 118 systems* in Savannakhet Province of the Lao Peoples Democratic Republic. Nairobi: International Livestock Research Institute (ILRI). 13 pp.

Perry ,B and Thornton, P.K. (2003).*Animal health research priorities to target poverty reduction in the developing world*. Proceedings of the 10th Symposium of the International Society for Veterinary Epidemiology and Economics, November 17-23, 2003, Vina del Mar, Chile.

Perry, B. D., Randolph ,T.F. (2003).*Improving the assessment of the economic impact of parasitic diseases and of their control in production animals.* Veterinary Parasitology 84: 145-168.

Perry, B.D., Randolph, T.F., McDermott, J.J., Sones, K.R. and Thornton, (2005). *Livestock policies for poverty alleviation: Theory and practical evidence from Africa, Asia, and Latin America.* PPLPI Working Paper 27. FAO PPLPI (Pro-Poor Livestock Policy Initiative), FAO (Food and Agriculture Organization of the United Nations), Rome, Italy.

Perry, B. and Sones, K. (2007). *Poverty reduction through animal health: Science,*, 315:333-334.

Perry,B., Sones,K. (2009).*Global livestock disease dynamics over the last quarter century: drivers, impacts and implications*.Rome, Italy*:* FAO. (Background paper for the SOFA 2009).

Perry, B. and K. Sones. (2009). Strengthening Demand-Led Animal Health Services in Pastoral Areas of the IGAD Region. IGAD LPI Working Paper 09-08, IGAD-LPI, Addis Ababa

Perry, B.D., Randolph, T.F., McDermott, J.J., Sones, K.R. (2003). *Investing in Animal Health Research to Alleviate Poverty.* International Livestock Research Institute (ILRI), Nairobi, Kenya, 140 pp plus CD-ROM.

Randolph, T, Schelling, E, Grace, D, Mchalson.CF. (2007). *Role of livestock in human nutrition and health for poverty reduction in developing countries*, International Livestock Research Institute (ILRI), Nairobi, Kenya.

Randolph,Thorton.Perry and Sones. (2007). Role of livestock in developing communities. Revitalising, food security and Rural prosperity. *IJK journal*, 16(2): 133-139 (2009).

Roy, D. (2008). *Economic impact of disease shocks: a methodological review*. Brief No. 1. Pro-Poor HPAI Risk Reduction Strategies Project. Working Brief Paper 1. IFPRI, Washington, DC.

Rubaire-Akiiki, et al. (2004). *The prevalence of serum antibodies to tick-borne infections in* Mbale District, Uganda: *The effect of agro-ecological zone, grazing management and age of cattle*. 8pp. Journal of Insect Science, 4:8, Available online:insectscience.org/4.8.

Rushton J., Heffernan C.L. and Pilling D. (2002). *Appendix 7, A literature review of livestock diseases and their importance in the lives of poor people.* In: Perry B.D., Randolph T.F., McDermott J.J., Sones K.R. and Thornton P.K., Investing in animal health research to alleviate poverty. ILRI (International Livestock Research Institute), Nairobi, Kenya. 129 pp.

Schwabe ,C.W. Williams & Wilkins. (1984). *Veterinary Medicine and Human Health. Baltimore.*

Scoones, I. (1998).*Sustainable Rural Livelihoods: A Framework for Analysis. IDS Working Paper 72.*

Sheridan, Niamh, (2005). *Inflation Dynamics*. Johns Hopkins University. PhD. Dissertation.

Seré, C. and Steinfeld, H. (1996).*World Livestock Production Systems: Current status, issues and trends.* FAO Animal Production and Health Paper 127. FAO, Rome

Shaw A.P.M., Hosten, C.H. (1987). *Trypanotolerant cattle and livestock development in West and Central Africa*. Vol. 1. International Supply and DemanPMC free article][PubMed]d for Breeding Stock. FAO Animal Health and Production Paper 67/1. Rome: Food and Agriculture Organization of the United Nations.

Sonaiya, E. (2007) .Family Poultry, food security and the impact *of HPAI. World's Poultry Science Journal*, Vol. 63

Steinfeld, H and Sere C. (2006).*World livestock production systems: current status, issues and trends.* FAO Animal Production and Health Paper No. 127. Rome: Food and Agriculture Organization of the United Nations.

Steinfield, H. Gerber, P, Wssenaour, T., Castel, V., Rosales, M and de Haam, C. (2006).*Livestock Long shadow; Environmental issues*, FAO, Nairobi, Kenya

Swallow, B.M. (1997).*Impacts of trypanosomosis on African agriculture*. In: Proceedings of the 24thInternational Scientific Council for Trypanosomiasis Research and Control Meeting, 29th September-4th October, Maputo, Mozambique. Organization of African Unity, Scientific, Technical and Research Commission, Nairobi, Kenya. pp. 515-53

Tariku,j, Adamassu,.B,andTesfaye, (2012).*Impacts of Foot and Mouth disease on livelihoods in the Borena plateau of Ethiopia.*

Thornton P.K., Kruska R.L., Henninger N., Kristjanson P.M., Reid R.S., Atieno F., Odero A. and Ndegwa T, (2000).*Mapping poverty and livestock in developing countries.* ILRI (International Livestock Research Institute), Nairobi, Kenya. 132 pp

Thornton, P.K, Boone, R.B, Galvin, K.A, Burnsilver, S.B, Waithaka, M.M, Kuyiah, J, Karanja, S and Herrero, M. (2007).*Coping strategies in livestock dependent households in East and Southern Africa*

Thurlow J, (2010).*Implications of Avian Flu for Economic Development in Kenya.* IFPRI Discussion Paper 0951. Washington, DC: International Food Policy Research Institute.

Turton,T and Cathryn,S.(2000). The Sustainable Livelihoods Approach and Programme Development in Cambodia. ODI Working Paper 130, ODI, London, 2000.

UNDP (2018). Kenya Annual Economic Report.

Uma Sekaran. (2003). *Research method for business*: A skill building Approach, 4th edition, John Wiley & Sons.

Umali, D. L., Feder, G., and de Haan, C. (1994). '*The balance between public and private sector activities in the delivery of livestock services'*, World Bank Discussion Papers, 163. Washington, DC: World Bank.

Umali, DL. Feeder G &Dehaan ,C.(1994).*Animal health services*: Finding a balance between public and private delivery. The World Bank Research Observer9:72-96.

Warren, D. M. (1991). "*Linking Scientific and Indigenous Agricultural Systems."* pp. 153-170, In J. L. Compton, (ed.*),* The Transformation of International Agricultural Research and Development. Boulder: Lynne Rienner Publishers.

Warren, M.D. (1997). *Indigenous knowledge and education project* - CIKARD; Bono

Waters-Bayer, A., and Bayer, W. (1992). '*The role of livestock in the rural economy'* – keynote address in C. P. Gootjes et al. (eds) (1992), pp30–49.

Waters-Bayer, A., and Bayer, W. (1994). *Planning with pastoralists: PRA and more:* a review of methods focused on Africa (vol. 422). Eschborn: GTZ.

Waters-Beyer, A and Letty, B. (2010). *Promoting gender equality and empowering women through livestock*.World Bank 2008–World development report 2008.

World Bank (2009). *Minding the stock: bringing public policy to bear on livestock sector development:* report No. 44010 –GLB The world bank, Washington D.C USA

World Bank (2004).*Indigenous Knowledge, Local Pathways to Global Development.* Knowledge and Learning Group. Africa Region.

World Bank (1998).*Indigenous knowledge for development: a framework for development*. Knowledge and Learning Centre, Africa Region, World Bank. http://www.worldbank.org/afr/ik/ikrept.pdf.

World Bank, (1997). "Knowledge and Skills for the Information Age, The First Meeting of the Mediterranean Development Forum"; Mediterranean Development Forum, URL: http:/g/html/fpd/technet/mdf/objectiv.htm

APPENDIX 1

INTRODUCTION LETTER AND QUESTIONNAIRE

Peter M Kithuka
P.O.BOX 289, 90200,
Kitui
Date_____

Dear Sir/Madam

RE:REQUEST TO FILL QUESTIONNAIRE FOR ACADEMIC PURPOSES

I am a postgraduate student at South Eastern Kenya University (SEKU) Department of Range and Wildlife Sciences, School of Agriculture and Veterinary Sciences. I am carrying out a research on factors influencing loss of household incomes due to livestock diseases in Gai and Mitamisyi sub locations of Kyuso Sub County

The information gathered will be treated as confidential and will be for the sole purpose of this study. Kindly respond to the items in the attached questionnaires to the best of your knowledge.

Kind regards,

Dr. Peter M Kithuka

APPENDIX 2

QUESTIONNAIRE ON FACTORS INFLUENCING HOUSEHOLD INCOME LOSSES DUE TO LIVESTOCK DISEASES

Section A

i) General Information

Questionnaire No.

DateDivision _____ sub-location_____

village_____

Name of Enumerator (Interviewer) Genderof Interviewee 1.Male ( ) 2 Female ( )

Section ii: Household Demographics (Family Information)

Table.1. Personal information for members of the household currently resident: Fill where appropriate

1. 1D	2.Name	3.Age group	4.Marital status	5.Gender	6.Relationship to H/H Head	7.Highest Education Level	8.Main Occupation
		1.<_20 yrs	1.Single	1.Male	1.Head	1.None	1.Crop farming
		2.21-35yrs	2.Married	2.Female	2.Husband/Wife	2.Primary	2.Livestock keeping
		3.36-50Yrs	3.Widowed		3.Son/Daughter	3.Secondary	3.Business
		4.51-59yrs	4.Divorced		4.Mother/Father	4.College	4.Employed
		5 .Above 60yrs	5.Separated		5.Others	5.University	5.Others

						6.Others	6.None

1	2	3	4	5	6	7	8
2							
3							
4							
5							
6							
7							
8							

8. Gender of household head (Key –decision maker (H/H)1. Female __ 2.Male __

9.Total resident H/H members_____

10.Type of housing, roofing, sanitary (toilets)

a) 1. Moderate executive[ ]
b) 2.Bricks, grass thatched, toilet [ ]
c) 3.Grass thatched, toilet []

11. Land size in acres_____

a. Less than 10 acres [ ]
b. 11 to 20 acres [ ]
c. Over 20 acres [ ]

12. Cultivated

a) Less than 5 acres [ ]
b) 5 to 10 acres [ ]
c) Over 10 acres [ ]

13. Uncultivated/Pasture

a) Less than 10 acres [ ]
b) 11 to 20 acres [ ]
c) Over 20 acres [ ]

14.Type of land ownership

a) Communal [ ]

b) Private/Individual []

Section B: Identification of Animal Diseases

15. Are there any livestock diseases in the area?

Yes [ ]

No [ ]

16. Which are the two most common livestock diseases in their order of importance?

Cattle

a. _____

b. _____

Goats

a) _____

b) _____

Sheep

a) _____

b) _____

Poultry

a) _____

b) _____

Donkey

a) _____

b) _____

17. Estimate loss of incomes incurred due to cattle deaths and treatments costs in a year

a) Less thanKsh10,000 [ ]

b) BetweenKsh10,001-30,000 [ ]

c) Above Ksh30,001 [ ]

18. Estimate loss of incomes incurred due to goats deaths and treatment costs in a year

a) Less than Ksh 10,000 [ ]

b) Between Ksh 10,001-30,000 [ ]

c) Above Ksh 30,001 [ ]

19. Estimate loss of incomes incurred due to poultry deaths and treatment costs in a year

a) Less than Ksh 10,000 [ ]

b) Between Ksh 10,001-30,000 [ ]

c) Above Ksh 30,001 [ ]

20. Which arethe two diseases with highest deaths (mortality)in?

Cattle _____

Goat's _____

Poultry _____

Sheep_____

Donkey _____

Section C: Indigenous Disease Treatment and Control

21. Is there any indigenous knowledge practiced in the treatment and management of livestock diseases in the area?

Yes [ ]

No [ ]

22. If yes, do you practice it yourself?

Yes [ ]

No [ ]

23. If no, what do you use to treat sick animals?

a) Conventional modern medicines [ ]

b) Nothing [ ]

24 Are livestock diseases occurrence influenced by the levels of individual'sindigenous knowledge on diseases?

No [ ]

Yes [ ]

If Yes, how?

Low <50% [ ]

High > 50% [ ]

25 .Mentionsome indigenous community knowledge practices undertaken in disease treatment in the area.

_____

Mention a few medicinal plants found in the area.

_____

Section D: Animal Health Services Availability.

26. Where do you get animal health services from?

a) Government employees [ ]
b) Private practitioners []
c) Both [ ]
d) None [ ]

27. Where do you get inputs for animal health services from?

a) Government [ ]
b) Agro vets [ ]
c) Others []

28. In the last six months, have you accessed any treatments services?

Yes [ ]

No [ ]

If yes, is the cost of treatment?

Cheap [ ]

High [ ]

29. Are livestock diseases occurrences influenced by the costs of treatment and availability of animal health services?

Yes [ ]

No[ ]

If Yes, how?

Low <50% [ ]

High >50% [ ]

Section E: Disease effects on incomes

30. Livestock owned (Number)

a) Cattle _____

b) Goats _____

c) Sheep _____

d) Poultry _____

e) Donkey _____

31. Which is the most important livestock which acts as a quick source of money when need arises?

a) Cattle [ ]

b) Goats [ ]

c) Poultry [ ]

d) Donkey [ ]

32. Estimated family incomes from livestock/crop in a year

a) Crops _____

b) Livestock /products _____

33. Which is the main source of income/livelihoods?

a) From livestock [ ]

b) From Crops [ ]

c) From Business [ ]

d) Others [ ]please specify_____

34. How do you use incomes from livestock?

a) Buying food [ ]

b) To buy other livestock [ ]

c) Payment of school fees []

d) Buy clothes [ ]

e) Constructing houses [ ]

f) All the above [ ]

35. What proportion of the money from livestock is used to buy food?

a) <50 %[]

b) >50% [ ]

36. Howdo livestock diseases affect your sources of income?

a) High, above 50% [ ]

b) Low, below50% [ ]

APPENDIX 3. CORRELATION COEFFICIENTS

	Gender	Age Sets	Indigenous kowledge	Main occupations	Disease influence by I.K	Animal health services	Costs of treatment	Influence of costs	Educational levels
Gender	1.000	0.34	0.45	0.5	0.38	0.43	0.46	0.56	0.6
Age sets	-	1.00	0.33	0.28	0.52	0.45	0.38	0.42	0.46
Indigenous Knowledge	-	-	1.00	0.37	0.5	.0.23	0.43	0.42	0.54
Main occupations	-	-	-	1.00	0.57	0.45	0.66	0.68	0.35
Disease influence by I.K	-	-	-	-	1.00	0.42	0.46	0.4	0.2
Animal health services	-	-	-	-	-	1.00	0.4	0.5	0.52
Costs of treatment	-	-	-		-	-	1.00	0.3	0.4
Influence of costs	-	-	-	-	-	-		1.00	0.3
Educational levels	-	-		-	-	-	-	-	1.00