

**ANALYSIS OF HUMAN WILLDLIFE CONFLICTS ON LIVELIHOOD
DIVERSIFICATION OF COMMUNITIES LIVING ADJACENT TO KAMNAROK
NATIONAL RESERVE, BARINGO COUNTY, KENYA**

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**A THESIS SUBMITTED IN FULFILLMENT FOR THE REQUIREMENTS FOR THE
AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL
PLANNING AND MANAGEMENT IN THE FACULTY OF ARTS, DEPARTMENT OF
GEOGRAPHY AND ENVIRONMENTAL STUDIES,
UNIVERSITY OF NAIROBI**

SEPTEMBER, 2020

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This thesis is my original work and has not been presented for the award of a degree in this or in any other university. I affirm to the best of my knowledge, the thesis contains no material published or written by another person, except where due reference is made in the text of the thesis.

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DEDICATION

I give God all the glory and honour for giving me the privilege and strength to accomplish another stage of my academic pursuit. This work is dedicated to my family which was of great source of support during my entire study period. My sincere gratitude to my wife Pamela and sons Lawrence Kigen, Erastus Kiptoo, Elvis Kipruto, my daughter Joy Jerono and my late Mom Hellen Kiptogoch who passed on when I was about to complete this study. May God rest her soul in eternity for she always wanted the best in the world of academia. It is my wish that my children will draw inspiration from this work as they pursue their individual academic endeavors.

ACKNOWLEDGEMENT

This research work would not have been successfully completed without the support and assistance of many dedicated individuals and organizations of which all of whom cannot be mentioned here. First of all, I would like to thank the Almighty God for sustaining me by His grace. I also wish to acknowledge and thank most sincerely my supervisors Prof. Evaristus M. Irandu and Dr. Thuita Thenya who have guided this thesis with a lot of enthusiasm and patience. Their valuable advice, insightful criticism and encouragement during the entire period of preparing this thesis enabled me to make progress.

I would also like to thank the pastoralists of Barwesa Division and especially the residents of Muchukwa, Lawan and Kerio Kaboskei locations. Despite the fact that they make a living under very difficult circumstances, where human wildlife conflicts and limited resources constrain their livelihoods, they welcomed and willingly shared information with me. I will forever be indebted to them. A word of thanks is also extended to all members of academic and non-teaching staff at the Department of Geography and Environmental Studies for providing an invigorating academic and social environment. Words cannot express how grateful I am to my wife Pamela and our children Kigen, Kipruto, Jerono and Kiptoo for their patience and sacrifices. My wife was always by my side to develop my profession as an academician. Through her love, patience, support and strong belief in me, I have been able to complete this long journey. Things were not always easy and with their support I soldiered on. Last but not least, I thank all those who in one way or another contributed either directly or otherwise to the completion of this study. To all of them I say May the Almighty God bless you! Any errors and omissions in the thesis are mine.

ABSTRACT

There have been increasing cases of human wildlife conflicts affecting local communities living adjacent to wildlife conservation areas. These pose a great challenge to the communities as they adversely affect their livelihoods. This is the case around Kamnarok National Reserve (NR) in Baringo County. Incompatible livelihood diversification has been linked to the escalation of human wildlife conflicts in the study area thus the objectives of the study were to;- i) examine the types of human wildlife conflicts in the study area ii) analyze the impact of human wildlife conflicts (HWC) on community well-being iii) analyze community motivation for livelihood diversification and iv) assess the relationship between livelihood diversification and human wildlife conflicts. Three (3) hypotheses were formulated and tested using the collected data. These were (a) no significant relationship between local community livelihoods and Kamnarok National reserves' resources; (b) there is no significant relationship between human wildlife conflicts and community livelihoods and (c) there is no significant relationship between livelihood diversification and the rising cases of human wildlife conflicts within Kamnarok NR adjacent areas. Random sampling was used to select 384 respondents from households adjacent to Kamnarok NR. Purposive sampling was used to identify Key informants and Focus Group Discussants. Data collected was analyzed using content analysis, chi-square goodness of fit test, Pearson Product Moment correlation (PPMC) and multinomial regression (MR) test. The results were presented using graphs and tables.

The results from the study revealed that crop raiding (72%) and livestock predations (46%) were the main causes of human-wildlife conflicts. Chi-square statistics and Pearson product Moment correlation coefficients showed that land rights contestation, competition for the NR resources, increase in wildlife populations, inadequacy of livelihood sources and the NR management style were other main contributors to the prevailing conflicts in the study area. Elephants were identified as the most destructive in farm raiding incidences. Furthermore, 71% of the households suffer human wildlife conflicts (HWCs) with human injuries (11.4%) and deaths (2.7%) being the main direct human bodily forms of conflicts manifestation. Coefficients of the logistic regression model indicated that the main factors influencing community livelihood diversification in Kamnarok NR were wildlife related factors ($\beta = 1.218$; $p < 0.05$); education levels ($\beta = 0.442$; $p < 0.05$) and agro-climatic factors ($\beta = 0.861$, $p < 0.005$). However, HWCs significantly differed by gender ($X^2 = 8.265$, $df = 4$, $p < 0.001$) as more male headed household bear the brunt of conflicts. However, other causes included imposition of policies without effective participation (66.4%), climate change (58.4%), conflict of interest among resource users (56.2%), and culture of cattle rustling (38.1%).

The study further established that households diversified livelihoods into various portfolios including land sales, local transport business, and sale of merchandise in open-air markets as a result of wildlife conflicts. Finally this study recommends that (a) Kamnarok NR management authorities should address community land right issue by exploring more amicable solutions that ensure community support for wildlife conservation, (b) Promote the development of more sustainable alternative livelihoods such as tourism which reduce pressure on already strained resources of Kamnarok NR (c) Encourage livelihoods land uses such as livestock ranching which promote local livelihoods as it is compatible with wildlife conservation and (d) integrate community views in the management of the reserve.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASALs	Arid and Semi-Arid Lands
BBCP	Broad Based Community Participation
BCDCP	Baringo County Drought Contingency Plan
BWCA	Benoue Wildlife Conservation Area
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CBA	Community Based Approach
CBC	Community Based Conservation
CBNMP	Community Based Natural Resource Management Programme
CIDP	County Integrated Development Plan
CWCCC	County Wildlife Conservation and Compensation Committee
GAR	Green Agricultural Revolution
GIS	Geographical Information System
CMTEF	County Medium Term Expenditure Frame Works
CWS	Community Wildlife Services
GoK	Government of Kenya
GPS	Global Positioning System
FAO	Food and Agricultural Organization
FNTPS	Forest Non- Timber Products
HCC	Human Crocodile Conflicts
HH	Household
HWC	Human Wildlife Conflicts
ICDP	Integrated Conservation and Development Project
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter Tropical Convergence Zone
IUCN	International Union of Conservation of Nature
IPAR	Institute of Policy Analysis and Research
KWS	Kenya Wildlife Service
KNPO	Kenya National Park Organization
KNR	Kamnarok National Reserve

LED	Local Economic Development
LUP	Land Use Planning
MDGs	Millennium Development Goals
NAAIAP	National Accelerated Agricultural Input Access Programme
NDMA	National Draught Management Authority
NR	National Reserve
NSGRP	National Strategy for Growth and Reduction of Poverty
NGOs	Non-Governmental Organizations
PAs	Protected Areas
PPMC	Pearson Product Moment Correlation
RBCs	Resource Based Conflicts
ROI	Return on Investment
SACCOs	Saving and Credit Co-operative Organizations
SLF	Sustainable Livelihood Framework
SSA	Sub Sahara Africa
SPSS	Scientific Package for Social Science
UNDP	United Nation Development Programme
WCED	World Conference on Environment and Development
WPC	World Park Congress
WVI	World Vision International

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Wildlife Protected Areas (WPAs) are storehouses of biodiversity and the last remaining bastion of vital resources which propel continuous ecological, economic and social development. However, conflicts between pastoralists, farmers and wildlife dates back to the dawn of human civilization. Human wildlife conflicts trends based on their severity in different parts of the World are contributed by competition between local communities and wildlife species in the use of available natural resources. According to Thakadu, (2005) there is growing evidence of escalating human wildlife conflicts globally as wildlife continue to pose serious social-economic threats to local communities in wildlife rangelands. According to Van Aarde and Jackson (2007) problems of human wildlife conflicts occur when foraging activities intersect with those of humans leading to loss of properties, human livelihoods and raising insecurity concerns. Therefore, their escalations and apparent impacts on local community's livelihoods globally has fueled a lot of debates.

Wildlife Protected areas (PAs) cover approximately 12% of the World's terrestrial surface and approximately 27% of tropical forest (Kabra, 2015) with almost every country having some PAs (UNEP-WCMC, 2012). Research reviews suggest that between 56% and 85% of PAs in developing countries have local communities residing inside and in adjacent areas (Marco *et al.*, 2014 and Laham, 2016) generating diversity of human wildlife conflicts. These conflicts have evolved considerably for many years and are fast becoming a serious threat to the survival of many local communities (Li and Huntsinger, 2011). According to Muruthi (2015) human wildlife conflicts is a problem of resources utilization in conservation areas. Competition

between human kind and wildlife for limited resources has been reported from time immemorial. Mbau (2013), argued that human wildlife conflicts are global problems which have occurred for centuries and shall continue as long as humans and wildlife compete for the same landscapes and resources.

Recent studies in different parts of the world demonstrate the severity of the problems and the challenges associated with human wildlife conflicts. The conflicts have arosen controversies and debates on whether PAs exacerbate local community livelihoods or contribute to poverty alleviation among communities living adjacent to wildlife protected areas (Kiringe and Okello, 2007). Validation of whether PAs benefit or impose costs on local communities depends on many underlying relationships between the local community, the PA management authorities and the use of PAs natural resources. Increase in human populations around PAs, shifts in cultural traditions, increasing demand for land for livestock & crop production, settlements and other uses has fundamentally put wildlife in direct conflict with people (IUCN, 2005, Nyhus *et al.*, 2015). The nature and magnitude of the of HWC has been observed to vary from country to country depending on human population growth, conservation methodologies and the scarcity of critical natural resources, especially land, vegetation cover and water (IPAR, 2005). As human activities continue to intensify on and around protected areas and wildlife continue to threaten the livelihoods and the economic security of the local communities, human wildlife conflicts are bound to escalate.

Kenya's high potential areas have continued to experience pressure due to an accelerated human population growth and more demand for productive agricultural land for farming (Goldman *et al.*,

2010). This has contributed to the movement of populations from predominantly high potential areas to relatively drier and ecologically more fragile marginal environments. Also, there has been a remarkable transition from semi - nomadism to sedentary semi agricultural settlements and the developments of small-scale farming in areas that have historically been known to be prime wildlife habitats, wildlife migration corridors or natural wildlife buffer zones. In an endeavour to get adequate food, water, shelter (habitat) and space, both wildlife and people have found themselves in competition for the aforementioned resources generating conflicts (Kagiri, 2002).

Disputes relating to the contribution of wildlife protected areas in supporting and sustaining local community livelihoods has been on the rise in Kenya. Differences in contribution have caused local communities to have varied attitudes towards wildlife and their conservation. In Kenya, a large proportion of rural communities are dependent on land for their livelihoods. Together with the presence of many species of wildlife, this has led to high frequencies of conflicts between people and wildlife. In turn, this has created friction between managers of wildlife resources and the local communities. Consequently, the resulting human wildlife conflicts often have undermined local support for wildlife conservation (Gusset *et al.*, 2009).

Human wildlife conflicts among communities living in wildlife rangelands have been addressed in several studies across East Africa and Kenya (Northon-Griffiths *et al.*, 2008, Northon-Griffiths and Said., 2010, Okello *et al.*, 2011 and Ogutu *et al.*, 2011) but little attention has been paid to the link between the severity of human wildlife conflicts and livelihoods diversification. While Kamnarok national reserve's wildlife resources have been plundered over the last 30 years

(Campbell *et al.*, 2010), they are still very significant. There are significant wildlife populations within and outside the reserve and in some communal areas occupied by resident communities. These wildlife resources still represent a valuable opportunity for tourism investment and if properly managed, it can benefit the local people who share the same area of land through sustainable utilization.

The local communities living adjacent to Kamnarok NR are steadily lifting themselves up from one of the highest levels of poverty in Kenya. They are among the poorest in Baringo county (Campbell *et al.*, 2010) and poverty in most households has created an increasing pressure on available natural resources most of which are found within the protected area where human wildlife conflicts is the greatest contemporary threats to their livelihoods. These communities are vulnerable to the adverse impacts of HWCs and also climate variability and climate change (Okello *et al.*, 2011). This is because their livelihood dependency is on natural resources which they share with wildlife. Furthermore, their economic prosperity are hindered by limited access to technology, human capacity and capital to invest in alternative livelihood options which are less prone to HWCs and the effects of climate change (Frost *et al.*, 2007).

As both human and wildlife populations' increase in the area and continue to occupy new lands and diversify livelihood portfolios, the level of conflict is likely to increase. These livelihood diversification and unresolved human-wildlife conflicts issues has created negative attitudes towards both the Government (KWS) and the proposed new wildlife related developments by the Baringo county government. In view of this, livelihood diversification as a coping mechanism

and as a risk reduction strategy has been adopted by the local community to counter the impacts and effects of human wildlife threats.

While there is increasing evidences of human wildlife conflicts in the study area, no comprehensive study has yet been conducted to determine the extent of these impacts on the different portfolio livelihoods of the local communities. The understanding of these issues are important in rangeland conservation context because livelihood diversification has been considered one of the important practices that have potentials of uplifting lives of rural poor in marginal environments. The motivation for undertaking this study primarily stemmed from the fact that despite resource investment in the mitigation of human wildlife conflicts, no significant impact has been noted on household livelihood diversification as a response to human wildlife conflicts whose occurrences has been frequent in the study area. Therefore, this study aimed at examining the impacts of human wildlife conflicts on livelihoods of the local community and its influence on livelihood diversification. It would be interesting to establish whether livelihood diversification among communities living adjacent to protected areas could be the best way to address the problems of human wildlife conflicts. How this is achieved provided the motivation for this study.

1.2 Problem Statement

In Kenya and other developing countries, Wildlife Protected Areas (WPAs) are often established on lands possessed and used by local communities. The local communities especially those living around the established WPAs often have important long-standing relationships with these Wildlife Protected Areas (WPAs). The local indigenous communities depend on the resource of

these areas for their livelihoods and cultural among other requirements. Therefore, these protected areas are both directly and indirectly affect rural communities who have been living in and around these natural ecosystems.

According to a growing body of literature, rural communities in Kenya depend mainly on indigenous natural resources within their immediate surrounding for their daily livelihoods (Okello *et al.*, 2011). Arid and semi-arid lands (ASALs) in Kenya including Kamnarok NR adjacent areas are experiencing a rapid increase in both occupation and intensity of use by the rapid growing human populations. Activities such as crop cultivation, intensive grazing, wood harvesting and expansion of settlements, which earlier were concentrated in high potential areas are now taking place and shape in the ecologically fragile ecosystems.

The adjacent lands of Kamnarok NR are some of the areas in Kenya where elephants, leopards, zebras, buffalos, crocodiles, hippopotamus and other large faunal species still exist and roam freely within and outside the protected area (Kagiri, 2004). Often these wild animals move outside the protected area into villages causing damage to property and human fatalities. Kamnarok NR adjacent areas is a critical wildlife dispersal area for wild animals from Kamnarok National Reserve. The reserve is surrounded by private and communal lands with over 3000 people living within the reserve's adjacent areas, dispersed in small villages and at natural water points whose livelihoods has been curtailed by wildlife (Baringo County, 2014). Kamnarok NR adjacent areas are home to many households whose livelihoods are dependent on agriculture at subsistence level.

Human wildlife conflicts in the study area occur between Kamnarok NR adjacent households, wildlife and wildlife managers. The adjacent households comprise of farmers of different sub-ethnic backgrounds while subsistence agriculture is the main form of livelihood and a strong factor influencing conflicts. The wildlife managers are the Kenya Wildlife Service and the wildlife department of Baringo County government. The conflicts between reserve adjacent households and the parties interested in wildlife conservation of Kamnarok NR is two way. Firstly, the extraction of the reserve natural resources by the adjacent households leading to destruction of reserve ecology and secondly, destruction of property and the livelihoods in adjacent villages by wildlife.

Livelihood diversification in Kamnarok national reserve adjacent areas has evolved since the gazettement of reserve in 1983 (Wishitemi, 2008). The problem in the study area lies on the premise that human wildlife conflicts are on the rise and are being ignored while local community continues to develop and diversify livelihoods some of which are incompatible with wildlife conservation. Secondly, limited information exist on the extent of how human wildlife conflicts has influenced household livelihood diversification. Analyzing the past and on going patterns of human wildlife conflicts and the root causes of livelihood diversification can assist in planning for future developments in the area. This study analyzed human wildlife conflicts on livelihood diversification among communities living adjacent to Kamnarok National Reserve in Baringo County and try to argument a range of measures either to prevent or reduce HWCs and support the adjacent community in the improvement on their livelihood portfolios.

1.3 Research Questions

The study was predicated on the need to generate answers to several questions about livelihood diversification as a factor that influences dynamics of human wildlife conflicts in Barwesa division in Baringo county where Kamnarok NR is located and therefore, the study aimed to answer the following research questions: -

1. What are the major human wildlife conflicts in Kamnarok National Reserve?
2. How has human wildlife conflicts affected livelihoods and well being of the local community living adjacent to Kamnarok NR?
3. What are the motivations for livelihood diversification among the local community living adjacent to Kamnarok National reserve?
4. How has human wildlife conflicts influenced livelihood diversification in the study area?

1.4 Research Objectives

The study addressed the following specific objectives: -

1. To assess types of human wildlife conflicts in Kamnarok National Reserve.
2. To analyze the extent to which human wildlife conflicts affect the livelihoods and well being of the local community living in and adjacent to Kamnarok National Reserve
3. To examine community motivation for livelihood diversification.

4. To discuss the relationship between livelihood diversification and human wildlife conflicts in the study area.

1.5 Research Hypotheses

The study hypothesized that human wildlife conflicts are influenced by livelihood diversification activities with the following null hypotheses: -

H₀: There is no relationship between livelihoods of the local community and Kamnarok National Reserves' resources.

H₀: There is no relationship between human wildlife conflicts in the study area and community Livelihoods.

H₀: There is no relationship between livelihood diversification and the rising cases of human wildlife conflicts within Kamnarok NR adjacent areas.

1.6 Significance of the Study

The study is considered significant because of the following reasons i) the findings of the study will enhance our understanding of interrelations between human wildlife conflicts and local community's livelihood diversification ii) the study findings will be useful in informing planners and other rural development actors on how to effectively assist households in wildlife rangelands prone to human wildlife conflict menace to mitigate its effects and ensure prosperity and well being of the locals through diversification of livelihoods iii) Results of the study provide data which explain how and under what condition human wildlife conflicts lead to diversification in local livelihoods and how this has affected wildlife conservation and also iv) Results of the study

provide data which explain the effectiveness of environmental planning as a tool to improve rural livelihoods and enhance conservation of wildlife resources.

1.7 Scope and Limitations of the Study

The study examined human wildlife conflicts and livelihood diversification among Kamnarok National Reserve adjacent community. It analyzed and discussed factors which influence livelihood diversification. Both human wildlife and other related factors are considered. However, potential impacts of livelihood diversification on wildlife conservation was excluded from the study because of time constraint and financial implications on the wildlife census counts which requires aerial counting.

Furthermore, in the course of the study, the researcher encountered some limitations. These included respondents' 'fatigue', inability to communicate effectively in English nor Kiswahili especially the elderly and some respondents were suspicious of the purpose of the study. This was mainly due to the respondents' claim that previous studies had brought no tangible benefits to them and thus did not see the reason to respond to them. Also, their existed strained relationship between the local community and the Kamnarok NR management authorities (*KWS and Department of Wildlife and Natural Resources of Baringo County Government*) as the community members felt intimidated to freely share information. To overcome these challenges, local enumerators were used to assist in administering questionnaire, separate interviews were held between the different parties and a lot of time was spent trying to convince the respondents to respond to questions posed to them as the study was purely for academic purpose. However,

despite these limitations the researcher ensured that the instruments used in the study yielded valid and reliable data.

1.8 Assumptions

The study operated on the basis of several assumptions. First, the study assumed that the various research respondents were going to be willing to give information to the researcher and that they were going to be honest in giving the information because the study findings were to be arrived at largely based on their information. Secondly, it was assumed the participants in the study completed the questionnaires with honesty and without bias. Additionally, it is assumed the participants understood the questions used in the surveys and that the surveyed respondents had encountered or observed different effects of human wildlife conflicts and any related impact on their livelihoods.

1.9 Operational Definitions of Terms

The following terms assume the stated meanings in the context of the study.

Biodiversity: This refers to variability among living organisms from all sources including ecosystem and the ecological complexes of which they are part, comprising ecosystem, species and genetic diversity (Earth Trends, 2003).

Conservation: Refers to the protection, preservation, management or restoration of natural environments and the ecological communities that inhabit them. It includes the management of human use of natural resources for current public benefit and sustainable social and economic utilization (IUCN, 1991).

Development: An improvement in people's well being (Gordon and Craig, 2001).

Ecology: The study of interactions among organisms and between organism and their environment (KWS, 1990 and Kameri - Mpote, 2002).

Ecosystem: Any entity or natural unit that include living and nonliving parts interacting to produce a stable system in which the exchange of materials between the living and non-living flow in circular paths (Maes *et al.*, 2016).

Environmental Degradation: The deterioration of environment through depletion of resources such as wildlife (GoK, 2016).

Fortress Conservation: Conservation model which excludes active participation of local communities in conservation (IUCN, 1991).

Human Wildlife Conflicts: Any human wildlife interaction which result in negative effects on human social, economic or cultural, on wildlife conservation or on the environment (Gok, 2013).

Households: Include all the persons who occupy housing unit. A house unit is a house, an apartment, a mobile home, group of rooms, or a single room that is occupied as a separate living quarters. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements (US. Bureau of the census 2000 in: <http://factfinder.census.gov>).

Land Tenure: The degree of reasonable confidence not to be arbitrarily deprived of the land rights enjoyed and/or of the economic benefits deriving from them. It includes both "objective"

elements (nature, content, clarity, duration and enforceability of the rights) and “subjective” elements (landholders’ perception of the security of their rights) (Cotula *et al*, 2004).

Livelihoods: People’s capacity to generate and maintain their means of living, enhance their well being and that of future generations (Togoch *et al.*. 2020).

Livelihood Diversification: An attempt made by individuals and or households to find new ways to raise income and reduce environmental risks and differ sharply by the degree of freedom of choice and the reversibility of the outcome (Hussein and Nelson, 1998).

Natural Resources: Materials that occur in nature and are essential or useful to humans such as water, air, land, forests, fish & wildlife, topsoil and minerals (World Bank, 2005).

Problem Animal: Any wildlife animal which has caused or is causing damage to or harm to human life or property (GoK, 2013).

Reserve: A protected area with clearly defined geographical space recognized, dedicated and managed through legal or other effective means to achieve the long term conservation of nature with associated ecosystem services and cultural values (Martin, 2015).

Resilience: The capacity of a system, community or society to resist or to change in order that it may obtain an acceptable level in function and structure (FAO, 2015).

Sustainable Development: A process that meets the needs of the present generation without compromising the ability of future generations to meet their needs by maintaining the carrying capacity of the supporting ecosystem (UNEP-WCMC, 2005).

Vulnerability: A set of conditions and processes resulting from physical, social, economic and environmental factors, which increase the susceptibility of a community to the impact of hazards (Barnes *et al.*, 2013).

Wildlife: This was constructed to imply the presence of wild animals within the context of their natural environment (IUCN, 1991).

Wildlife Protected Areas: Areas with clearly defined geographical space recognized, dedicated and managed through legal or other effective means to achieve the long term conservation of nature with associated ecosystem services and cultural values (GoK, 2013).

1.10 Organization of the Thesis

This study is organized into six chapters as outlined below;-

Chapter one deals with introduction, background to the study, problem statement, study objectives, research questions, significance, scope and the limitation of the study.

Chapter two of the thesis provides relevant literature reviewed. The section gives an overview of the issues of human wildlife conflicts around the globe, and demonstrate the wide variety of circumstances under which it can occur as well as the myriad of factors that can affect its intensity together with identified knowledge gap that the study addressed.

Chapter three presents discussion and a brief review of the main methodologies used for the study. Research design and sampling techniques used are explained. The methods of data collection, analysis, presentation and interpretation are discussed. This chapter is concluded with operationalization definition of variables which attempts to associate the objectives with methodology and provide a map to the expected results.

Chapter four presents the results of household survey of human wildlife conflicts in general. The section examine and reports the magnitude of human wildlife conflicts on the adjacent communities of Kamnarok NR, the reasons for conflicts, reported levels of depredations & wildlife attack upon humans, level of retaliation against wildlife and key determinants of human wildlife conflicts.

Chapter five focuses on the findings particularly on the community motivational factors for livelihood diversification and the relationship between Kamnarok NR adjacent communities' livelihood diversification and human wildlife conflicts.

Chapter six provide summary of the findings, discussions of the study findings, the conclusions, research recommendations, and suggested areas for further studies and contribution of this study to the body of knowledge.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides a summary of reviewed theoretical and empirical studies that are relevant to the study theme. The existing literature is critically examined in order to evaluate the contributions made by other scholars in the area of study. Major findings of the previous studies are reviewed, highlighting clearly areas of agreements and disagreements among researchers in this important area of wildlife conservation and community livelihood diversification. The gaps, scope and limitations of these studies are identified with a view to rectifying them for purposes of the current research topic. More importantly, the literature review is carried out in order to identify gaps existing in the previous studies which are then filled in the present study.

2.2 History of Human Wildlife Conflicts

Wildlife and people have interacted in Africa for thousands of years. According to International Union for the Conservation of Nature (IUCN) and World Park Congress (WPC) conference held in 2003, human wildlife conflicts occur when wildlife requirements encroaches on those of human populations with liability costs to both local community and wildlife. IUCN (2005), defined human wildlife conflicts as interactions between human and wildlife with negative consequences, whether real or perceived for one or for all parties, however, human-wildlife conflict has been observed to occur when the needs and behaviour of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife (Baral and Heinen, 2007) and as such, it is a very common global phenomenon. Treves *et al.*, (2004) in their study of lethal control of wild animals in Sekute Conservation area in Zambia argued that direct contact with wildlife occur in both rural and urban areas, but are generally

more common around protected areas especially where wildlife population are higher and in circumstances where they stray into adjacent cultivated fields or grazing areas.

According to Adamic *et al.* (2014), human wildlife conflicts have been in existence for as long as humans and wild animals shared the same landscapes and resources, this statement compliment the argument by Treves and Naughton-Treves (2004) in their documentary article on human wildlife conflicts acknowledging wildlife conflict menace as old as agriculture in Africa. The conflicts further extended to crop and livestock depredation which was first recorded around 10000 years ago (Berger, 2009) and today it occurs in different contexts and spans arrange of animal taxonomic groups and countries (Okello, 2005, Davison *et al.*, 2011). Barnes, (1996) attributed the severity and extensiveness of the problem to pre-colonial period and early 19th century and not on human livelihood requirements, while Ogutu *et al.*, (2011) stated that historians were the first people to document and describe areas in Africa and other parts of the World where elephants invaded human cultivated fields causing food shortages and displacement in human settlements.

According to Parker and Osborn (2006), the exploitation of larger African mammals begun from 19th to mid 20th centuries with ivory and hides forming a corner stone of early trade in the Orient and within the European countries while wild meat formed an essential product for the African people alongside the colonialist (Muruthi, 2015). According to Ogada and Ogada (2004) exploitation of wildlife resources diminished with the introduction and expansion of modern agriculture which exacerbated human wildlife conflicts with larger wildlife species increasingly dominating the conflicts.

African Wildlife Fund for Nature (AWF, 2005) documented human wildlife conflicts (HWCs) and human crocodile conflicts (HCCs) in many African countries. The report highlighted 33 countries where the conflicts has been intense both in the tropics and sub-tropics. AWF (2005) report alluded that regions and countries where the problems of conflicts existed, do occur and manifest themselves in different forms notwithstanding their status and level of development. Barnes *et al.*, (2003) in their study on human wildlife vulnerability found that agro pastoralist in developing countries were more vulnerable that those in developed nations.

2.3 The Global Extent of Human Wildlife Conflicts

According to Messmer (2000), HWCs are particularly common in game reserve and wildlife protected areas' borders where wildlife species which rely on extensive territories for foraging come in contact with human settlements. Espinosa and Jacobson (2012) argued that these border zones are wildlife population sinks. Woodroffe and Ginsberg, (1998) in their study of HWC in Chobe National Reserve in Namibia argued that wildlife protected area peripherals are wildlife critical zones in which conflicts is a major cause of totality of conflicts. These case scenarios also demonstrate that conflict are most acute in zones where a range of wildlife species co-exist with high density of human population. Ogada *et al.*, (2003) findings acknowledges wildlife protected areas which borders densely populated human settlements to experience the greatest HWC challenges.

According to Musiani *et al.*, (2003) HWCs in North America still continues in areas where livestock is raised for household and commercial purposes. Another research by Berger and McGraw (2007) showed that several wildlife species are responsible for substantial damages to both crops and regenerating forests in in North America and Europe and some have been labeled

as ‘pests’ and are killed during the hunting season, but the monetary losses associated with human wildlife conflict in some European nations is significantly high. According to Imam *et al.*, (2002), large felid predators (tigers, leopards, lions and snow leopards) and the Asiatic elephants are the principal source of conflicts in Asia. Choudhury, (2004) in his study on human elephant conflicts in North East India argued that traditional and cultural/religious attitudes towards wild animals in Asia and by extension Indian communities make them tolerant towards wildlife, despite damages to crops and livestock depredation caused by this wildlife. According to Chartier and Zimmerman (2014) findings on Indian wildlife cultural beliefs, Orthodox Hindus sub ethnic community consider monkeys to be sacred animals to be preserved and protected, a traditional cultural dimension in the conservation of wildlife and a mitigation towards HWCs. In addition, Karanth *et al.*, (2013) in their findings reported that religious/cultural beliefs and the traditional attachment to monkeys greatly influence people’s perception of the conflicts resulting in partial acceptance of wild animals.

Young *et al.*, (2010) examined human – carnivore conflicts in Kashmir region of Jammu and Kashmir state of India as a conservation concern that has increasingly threatened the continued existences of carnivore species like leopard and black bear. Agreeing with this finding, Maikhuri *et al.*, (2011) in their study also highlighted the increasing human population around Kashmir region with subsequent encroachment on wildlife conservation areas by the locals often resulting in negative outcomes for both humans and wildlife. The need for alleviating this problem is not only a challenge for the India government but also a global issue of concern to other world governments experiencing similar problems. Further research by Zang and Wang (2013) on HWCs in China revealed that human elephant conflicts had significantly eroded community

economic livelihoods by 48%. Similar studies by Liu *et al.*, (2010) in the mountainous regions of Simao and Xishuang nature reserve in China showed that elephant damages reduced community's annual income by USD 314,600. Such financial loss is particularly damaging if occurring in regions within underdeveloped economies such as Kamnarok NR adjacent areas.

2.3.1 Human Wildlife Conflicts in Africa

Available literature indicates that Africa has over 3000 protected areas which host the World's largest reservoir of wildlife populations in terms of density and diversity (Mbaiwa, 2005). This represents the biggest concentration of wildlife in Africa as compared to the rest of the world (Davies *et al.*, 2011; De Georges and Reilly, 2008). According to Mackenzie (1997), it is estimated that about 50% of protected areas worldwide have been established on land traditionally occupied and used by indigenous people.

Although there are a number of studies on human displacement in fortress conservation in Africa, a number of researchers (Cock and Fig, 2000; De Georges and Reily, 2008) have alluded local population evictions to give space for the establishment of wildlife sanctuaries as the worst retraction on ancestral lands. According to Anthony (2007), many African communities bordering wildlife protected areas who were compressed into poverty and impoverished still do exist to date. Anthony (2007) findings argued that wildlife protected areas were created at the expense of the local communities livelihood, and the norm is still prevalent to date. He further argued that the livelihoods of local communities residing on the edge of these protected areas often get involved in the direct exploitation of natural resources bringing them into conflicts with wildlife and protected area management authorities.

According to Craigie *et al.*, (2010), extreme cases of human wildlife conflicts have been documented in many parts of Africa including Western, Central, Southern and Eastern Africa. Keller and Golley (2000) in their research on human wildlife conflict manifestations in Southern Africa (Namibia & South Africa) and the Eastern Africa (Kenya & Tanzania) argued that human deaths and injuries although less common than crop damages were the most severe manifestations of human-wildlife conflict in Africa. Their studies singled out hippopotamus as responsible for more deaths than any other large wild animal in Africa. However, Baldus (2015) findings showed that the lion, elephant and crocodile had superseded the hippopotamus in human deaths. According to the findings of Fergusson (2002) and FAO (2009), crocodiles still kill people in Lake Nasser region in Egypt and within towns in Mozambique. Unpublished documents in Zambia (Zambia Wildlife Authority, 2016) records indicates that crocodiles have caused the greatest number of human deaths.

In Mozambique many death cases from wildlife go unreported simply because of the difficulty of getting to government offices to file report (Magane, 2013). According to FAO (2015) report on impacts of human wildlife conflicts on human security in Mozambique for the year 2015, close to 770 people were killed by lions in Cabo Delgado province of Mozambique over a period of 12 months. The report further indicated that most of the victims were out at night protecting their livelihoods (crops) from elephants. The report concluded that over 300 people were estimated to have been killed by wildlife nationwide in Mozambique during the report period.

In South Africa, more than 205 wildlife sanctuaries and over 108 Biosphere Reserves which are managed and promoted as tourist destination are points experiencing human wildlife conflicts (Frump, 2016), however, he argued that incidences of human wildlife conflicts have been reported in many of the wildlife sanctuaries including the world-famous Kruger National Park. According to Baldus (2005), the main HWC problem in South Africa is crop destruction and livestock depredation. Baldus (2005) in his findings noted that primates particularly the Samango monkey (*Cercopithecus mitis labiatus*) and the blue monkey (*Cercopithecus mitis*) damaged over 5% of pine plantations and over 8% of crop fields. The study argued that primates target young pine trees by selecting trees species that have higher tannin mineral content. The study further observed that the monkeys strip pines as well as eucalyptus and wattle trees and feed on the inner layer of cambium making the plantation trees not to produce the straight timber for which it was intended for. This illustrate economic burdens caused by wildlife to the communities.

According to Packer and Osborn (2006), human wildlife conflicts in the southern part of Tanzania had increased three-fold since the country's independence, notwithstanding the country's conservation efforts especially on the endangered species of wildlife. Baldus (2008) argued that lion's predation in south Tanzania was wide spread. According to the Baldus (2008) study on felids dominance in River Rufiji, Tanzania, lions have mauled hundreds of humans and his findings showed that felids including the lions had killed 34 people and 653 persons sustained bodily injuries. Baldus (2015) study in Jukumu Wildlife Management Area (JWMA) on the level and frequency of human wildlife conflicts noted that over 15000 households had reported incidences of conflicts with wild animals with 57 household having lost their loved ones. Another study by Dickman (2010) in Tanzania acknowledged local community resentments

toward the government regarding wildlife protection measures. In her study, Dickman (2010) observed that the local resentments towards wildlife conservation stem from the local displacements from their ancestral lands with little compensation for the foregone land. She further highlighted that human wildlife mitigation measures such as banning and restriction on local communities from accessing and using resources in wildlife protected areas in Tanzania was aggravating the problem.

According to Stander (2006), Namibia is a country of particular interest in wildlife conservation due to its policy on devolved rights over wildlife to land holders (Community Based Natural Resource Management (CBNRM)). Historically, Namibian government gave user rights over wildlife to land owners especially to white freehold farmers. A study by O'Connell - Rodweel *et al.*, (2014) attributed the successful conservation of wildlife resources in Namibia to devolved rights on wildlife and that much of the wildlife industry has been progressively developing around sport hunting, photographic tourism and the production of wild meat through culling. However, a study by Murphy (2017) noted that human deaths from crocodiles and wildlife in the Caprivi region was increasing as the local community encroached into wildlife protected areas for resource extraction. His findings support the study by Muruthi (2015) who argued that Namibia's elephants' populations, one of the largest free ranging populations of elephants in southern Africa were responsible for the escalation of human wildlife conflicts in the region. Murphy (2017) further observed that Namibia's human population was relatively low compared to other countries in southern Africa but as the population was increasing with the burgeoning wildlife populations, human wildlife conflicts are bound to escalate which require urgent solutions.

In Ghana, Martin (2015) observed that leopards and lions have preyed on hundreds of human beings over the past decades. Osborn and Parker (2012) further noted that elephants of Kakuma Conservation Area in Ghana were responsible for crop field damages. They observed that approximately 30-40% of field crops were raided by elephants and an average of 500 households are food insecure because of human wildlife conflicts. Barnes *et al.*, (2013) on their study on elephant population growth and tree cover in Kakuma Conservation Area they observed that habitat destruction by elephants jeopardize the survival of sympatric wildlife species such as the Giraffe. Their finding supports the study by Ben-Sharar (2009) who noted that elephant destruction of *Acacia seyal* near ponds in Waza National park in Northern Cameroon endangered the survival of giraffe who browse on the trees. Another study by Alfa (2014) in Chobe National Park in Namibia, argued that elephant alteration of environment near Chobe River was detrimental to the survival of the indigenous Chobe bush buck. Also, his survey on human wildlife conflicts around Djona hunting zone in Northern Benin revealed that 80% of the adjacent households had lost food crops (livelihoods) to elephant raids. From these reports, it seemed that elephants are the most gregarious animals to both man and other wildlife species.

Kpera *et al.*, (2007) in their assessment on the impacts of human wildlife conflicts on human livelihoods in Cap Blanc Nature Reserve in Mauritania, Western Africa, noted that the smallest wild animals occurring in vast numbers have the greatest impacts. They noted that locust was responsible for the frequent outbreaks of famine in and across many of the West African countries. They continued to state that the red billed Quelea birds (*Quelea quelea*) had caused over USD 22 million on grain losses. Another study by Berger (2009) in Djebel Bouramli Nature Reserve in Tunisia observed that Grass cutters damages had surpassed those of other larger

animals including the African elephant (*Loxodonta africana*). However, a study by La Grange (2016) in Ngamiland National Park, Botswana argued that larger herbivores such as Buffalos (*Syncerus caffer*) and Hippopotamus (*Hippopotamus amphibious*) and other large mammal carnivores including the lions (*Panthera leo*), leopards (*Panthera pardus*), cheetahs (*Acinonyx jubatus*), spotted hyenas (*Crocuta crocuta*), wild dogs (*Lycaon pictus*) and crocodiles (*Crocodylus porosus*) are traditionally seen as the animals representing the greatest threats to human lives and their livelihoods and are responsible for the majority of human wildlife conflict. However, Linnell *et al.*, (2005) and WWF, (2006) findings attributed this to the fact that local communities often regard large wild animals as government property. The impacts of the activities of large mammals on farms and other livelihoods sources are enormous and even traumatizing when people are killed.

2.4 Overview on the Causes of Human Wildlife Conflicts

Many studies have examined the causes of human wildlife conflicts the world over (Krester *et al.*, 2009, adamic *et al.*, 2014), but conflicts between humans and wildlife especially in areas bordering protected areas are very common worldwide (Shemwatta and Kidegheso, 2000; Hill *et al.*, 2002). According to Woodroffe *et al.*, (2005) and Wilkison *et al.*, (2014), human wildlife interactions occur across a variety of social and landscapes contexts due to rapid changes in the world bio-physical environments and social-cultural systems. Treves *et al.*, 2004; Mishra, 2007, Shota and Takuhiko, 2011) study findings on causes of human wildlife conflicts in Salambala and Mayuni wildlife conservancies in Namibia showed a definite association of factors influencing human wildlife conflicts. They argued that locations of human wildlife interactions are highly influenced by landscape characteristics and configuration, which in turn influence

animal habitat selection. Another study by Pretorius *et al.*, (2011) on wildlife habitat selection and human wildlife conflicts in Osse River Park in Nigeria observed that habitat quality and richness in areas surrounding wildlife sanctuaries attract a significant population of herbivores. They further alluded the emergence and the rise in conflicts to resource scarcity or when larger herbivores in their normal foraging behaviours select the “good” patches leaving the “poor” patches. However, Krester (2008) and Vijayan and Patil (2002) in different studies observed that, beliefs and social characteristics drive emotional responses to wildlife problems and in most cases relate to more recent experiences. Tsi *et al.*, (2008) in their human wildlife conflict survey in Northern Cameroon observed that idle and less educated people who inhabit areas surrounding national park territories are more prone to wildlife crimes thus the escalation of conflicts among the locals and the wildlife management authorities.

According to a study by FAO (2015), Sub Sahara Africa (SSA) is dominated by smallholder subsistence farmers cultivating a mixture of crops corresponding to different soils and rainfall regimes. The study further stated that the Sub Sahara (SSA) pastoral communities who mostly live in remote and undeveloped areas are plagued by drought and diseases and therefore these areas are associated with levels of vulnerability to food insecurity. Another study by Roser (2015) and Muriithi (2008) in Kenya revealed that pastoral areas occupy about 77% of the country’s land mass with variations between counties. These studies established that Kenya’s pastoral areas are generally less suitable for crop production and livestock husbandry remains the most common farming practice in arid regions and compatible with wildlife conservation. According to Graham *et al.*, (2015), the causes of conflicts between human and wild animals are limited by inconsistent and sparse data and a few are discussed below.

2.4.1 Livelihood Factors

The availability and quality of livelihood factors influence animal foraging behaviours both at temporal and spatial scales. A study of livelihoods and their influence on human wildlife conflicts (HWCs) by Kagiri (2004) in wildlife ranches in Northern Kenya and parts of Laikipia indicated that human livelihood practices have increasingly fragmented wildlife habitats confining wildlife in smaller pockets of unsuitable habitats. She further, argued that intensification of human activities around protected area has become prevalent within the protected area buffer zones, but her findings never highlighted livelihood diversification as a major factor in human wildlife conflicts. The situation has led to human and wildlife increasingly coming into contact thus increasing incidences of conflicts. Okello (2005), in his study of human wildlife conflicts in Tsavo East National Park highlighted diversity of human livelihoods programmes which influence human wildlife conflicts. He noted agriculture, infrastructural development, fishing, tourism development and urbanization among other livelihood programmes undertaken as possible factors contributing to the conflicts.

According to Bengis *et al.*, (2012), sharing of resources between wildlife and livestock is a leading cause of direct and sometimes indirect contact as the case with water and pasture resources which has been considered a recipe of disease transmission. They further established that the demand for fish for subsistence and commercial purposes as a livelihood strategy has led to increasing exposure of humans to crocodile and hippo attacks in most African waters. This finding support FAO (2005) study report on crocodile attacks in Limpopo River where the study alluded human fishing exploitation as a livelihood practice depriving crocodile their primary source of food hence the attacks. Furthermore, study by Ogada *et al.*, (2003) and Ferguson (2012)

on the recovery of the declining or near extinct of wildlife populations such as the Rhino and elephants in Eastern Africa attributed it to successful wildlife management and protection practices as the case with Kamnarok National Reserve. Anderson and Grove (1997) and Ferguson (2012) findings posit that the increasing populations of elephants in Binga National Park in Zimbabwe had resulted in a concomitant increase in conflicts within the surrounding villages.

2.4.2 Local in – Migration for Security and Food Safety

A study on the migration of local people from high productive areas to wildlife rangelands has been associated with destruction of wildlife habitats (Liu *et al.*, 2011). According to the Okello and Kioko (2010) study on the local encroachment to Amboseli National Park in Kenya, they observed that immigration has been occasioned by a number of factors including search for farm lands, civil unrest, war, natural disasters, floods, drought, natural calamities and in search for better livelihood options. Ogada *et al.*, (2003) in the study of Masai Mara National Reserve revealed that local communities under pressure tend to migrate into wildlife areas in order to obtain resources to sustain their livelihood which unfortunately is a territory inhabited by wildlife and a precursor for conflicts. This finding supports the report of Government of Mozambique (2006) and Madhusudan (2003), where war and civil unrest forced people to seek refuge in wildlife wilderness where human wildlife conflicts ensued. Another study by Government of Kenya (2009) on local communities' encroachments to protected areas revealed that local communities living adjacent to Tsavo West National Park encroached on the park dispersal areas in search of better livelihood options precipitating conflicts. It has also been observed that drought and desertification have forced people to migrate to wildlife rangelands in

Kenya (Patterson *et al.*, 2004) who tend to settle near remaining pockets of natural resources within and around protected areas, thus exposing themselves to human wildlife conflicts.

2.4.3 Habitat Factors

There are many factors specific to a particular environment that are likely to affect the intensity of damage caused by wildlife. According to Tweheyo *et al.*, (2005), characteristics of the physical environment and crops located near forest edges are more exposed to wildlife than those far away and risks of being raided are high. Parker and Osborn, (2006) and Linkie *et al.*, (2007), observed that wildlife crop raids often increase when alternative sources of foraging are scarce. Methods of land use and management can also substantially alter the likelihood of conflict occurrence. A study by Patterson *et al.*, (2004) in Amboseli adjacent communal lands argued that alternating maize crop with chilli which is less palatable to crop raiding elephants (*Loxodonta africana*) has the potential of improving local livelihood security and reduce conflicts.

A study carried out by Bauer, (2003) and Hamissou and Di Silvestre (2008) in Chambi National Park in Tunisia established that natural factors such as droughts, bush fires and climate change has contributed to a decrease in suitable wildlife habitats, thus influencing the occurrences and extent of human wildlife conflicts. They further argued that seasonal modification of habitat influenced human wildlife conflicts around Waza National Park in Cameroon where Lions were found to have a high preference of attacking livestock during the rainy season. In Tanzania, it was reported that wet season was driving lions to more and frequent attacks than during the dry season. The findings revealed that the attacks were meted on people found guarding in makeshift huts protecting nocturnal crop raiding pests mainly bush pigs and Warthogs.

However, to the contrary, Graham *et al.*, (2005) and Parker and Osborn (2006) study findings alluded wild predators attacking livestock during the dry season near water points.

2.4.4 Behaviours

According to Woodroffe *et al.*, (2007), social behaviours of both humans and wildlife within a particular environment obviously has implications for the magnitude of wildlife damages experienced. In their study on the relationship between human social behaviours and human wildlife conflicts, they established that human beings can effectively decrease the risk of wildlife damage by better protecting their crops, livestock and other assets, by use of dogs, herders and enclosures to protect livestock from predators. However, the study observed that, patterns of animal behaviours often affect conflict intensity. The findings alluded that territorial behaviours of migratory elephants and other herbivores resulted in increased incidences of them damaging crops, and killing people which is a common source of human wildlife conflicts in most African countries. All these behavioural factors can play a major role in determining the actual level of wildlife damage caused, and therefore the costs of conflict to local people.

Conflict issues which are related to communities' livelihoods are difficult to overcome (Nyhus *et al.*, 2015). Many studies on human wildlife conflicts and human livelihoods have argued that there is no single factor nor condition that explain conflict across the African continent. However, Baral and Heinen (2007), argued that issues such as loss of extraction rights and losses due to wildlife interferences and lack of financial compensation as the root causes of conflicts between local communities and protected areas management authorities. Similar finding by Karanth, (2003) in India, where illegal livestock grazing and extraction of environmental products from

the protected areas caused the imbalanced relationship between the locals and the wildlife authorities. According to Baral and Heinen (2008) on the best management practice for Kuno Wildlife Sanctuary in India, the finding stated that, damage to crops, livestock, property and also human life by wildlife was regarded as one of the severe problems faced by protected area management. Perez and Pacheco (2006) and Nyhus *et al.*, (2015) observed that wildlife protected area (PAs) interests and people conflicts due to wildlife interference in the community's livelihood often jeopardize the relationship between local communities and the protected area management. Thus, the deteriorating relationship between two key stakeholders (*the local community and wildlife management authority*) threatens the long-term management of protected areas.

2.5 A Review of Wildlife Conservation in Kenya

According to Kamfor (2007), Kenya has a total surface area of about 582,650Km². According to Ministry of Lands (2014) report, 512,694 Km² of Kenyas' land mass is dry land and 17% of it is classified as medium and potential lands suitable for agricultural production. According to the report (2014), 83% of the Kenya's dry land surface area is arid and semi arid (ASAL) lands suitable for livestock production and wildlife conservation. A study by Wishtemi *et al.*, (2012) on the status of Kenyas' biodiversity in ASAL regions, showed that approximately over 35,000 species of biodiversity exist in forest resources, aquatic ecosystems, wildlife rangelands and agricultural lands in the ASAL regions requiring urgent protection to enhance their conservation.

Globally, the number and extent of nationally designated PAs has increased dramatically over the past century (Getzner *et al.*, 2012). According to Gupta (2015), there are over 157,897

protected areas (PAs) covering more than 24 million square kilometers of land and sea world wide and in comparison to the global figures, Kenya has done an exemplary work by establishing good number of protected areas network which include over 28 national parks, 40 national game reserves and numerous wildlife conservation areas spread over in different parts of the country (Wishtemi *et al.*, 2012; KWS, 2018b).

2.5.1 Wildlife Conservation in Kenya: An Historical Perspective

The history of wildlife conservation in Kenya goes back to 1891 when colonial laws controlled the use and management of wildlife resources. According to Nyeki (1992), formal conservation of wildlife began with a group of explorers at an historic pristine campfire in Yellowstone, USA in 1870. According to available literature, USA was the first country to establish a wildlife protected area and use the words ‘National Park’. Thereafter, many other countries followed suit: Canada established formal protection for mining springs at Banff in 1885; Sweden established the Laponia National Reserve in 1909. The first protected area in Africa was Sabi Game Reserve founded by president Kruger of South Africa in 1892, which later became the world-famous Kruger National Park. In 1900, the east African Game regulations were developed, and led to the creation of the Kenya Game Department in 1907.

Nyeki (1992), argued that the Ordinance Act of 1937 passed by the Kenyan Colonial Administrators strengthened the protection and conservation of wildlife resources. Nyeki (1992) in his review report on the history and times of wildlife resource in Kenya stated that the game policy committee of 1938 is credited for the numerous wildlife protected areas established in Kenya. According to Mwanjala (2005), the Ordinance Act No. 9 of 1945 which was referred to

as the National Park Ordinance (NPO) provided for the establishment of a board of trustees which was charged with the responsibility of administering land designated as national parks and game reserves prior to Kenya's independence. Further more, the available literature argues that the Ordinance Act No. 9 of 1945 led to the creation of Nairobi National Park in 1946, Tsavo National Park in 1948 and Mt. Kenya National Park in 1949. According to KWS (1994) report, most of the current Kenya wildlife protected areas were established after independence and currently Kenya has, courtesy of the Wildlife act of 2013, over 28 National Parks and 40 Game Reserves including Kamnarok National Reserve which was established in 1986.

A study by Mwanjala (2005) on the terrestrial surface area occupied by Kenya's wildlife, it was established that 844,720 km² of surface area was under wildlife conservation representing 7.7% of Kenya's total land surface area. However, protected areas (PAs) in Kenya have played a significant role in the conservation of biodiversity but restrictions of local communities in using PAs resources has created resource conflict and wildlife induced damages in form of human harassment, killings, crop damage and livestock depredation which has brought negative sentiments towards wildlife conservation in Kenya.

2.5.2 Wildlife Conservation in Post-independence Kenya

According to Thirgood *et al.*, (2005), the establishment of Kenya National Park Organization (KNPO) and Game Department (GD) in 1945 was the cornerstone conservation developments in Kenya. His finding argued that the two organizations were charged with the enforcement of conservation policies and overseeing wildlife resource conservation. The two institutions jurisdictional functions included transformation of wildlife areas into tourist resort areas for the

benefit and enjoyment of the general public; working with and assisting local communities and authorities on the establishment of game reserve and reduce poaching and other forms of wildlife resource exploitation (Wishitemi *et al.*, 2008). Other functions were to encourage local communities to understand and appreciate the need for conservation of wildlife and its associated resources and develop good relations between the conservation departments and the local communities.

According to the available literature, Kenya National Park Organization (KNPO) and Game Department (GD) were merged through an Act of parliament (*the Wildlife Conservation and Management Act of 1977*) in 1978 to create wildlife conservation and management department (WCMD) which hitherto was under ministry of Tourism and Wildlife. This department brought together all matters concerning wildlife conservation (Wishitemi *et al.*, 2012) in Kenya and it became the only overall wildlife authority on matters wildlife and conservation both in private, public, community and in trust lands. This body was charged with overall conservation and management of wildlife resources in Kenya. However, it was also mandated to ensure that these wildlife resources gave back to the people, the local community and the entire nation in terms of aesthetic, cultural and economic gains is a debatable issue. This utilization was intended to be carried out in a way that was not harmful to conservation principles (Naughton'Treves & Treves, 2005, Treves, *et al.*, 2006, Wishitemi *et al.*, 2012).

Another study by Kiringe *et al.*, (2007) on hunting and poaching on wild animal in East Africa alluded that wildlife poaching and hunting was common in East African countries and indicated that the vices were well coordinated and poaching continued to destroy wildlife in Kenya on a

large scale. Wishitemi *et al.*, (2012) argued that extreme exploitation of wildlife resources forced the government to ban all hunting of wildlife animals and handling of or trading in game trophies in 1978 and 1979 vide a legal notice No. 120 of May 1977 and legal notice No. 181 of August 1979. Though the ban led to the closure of professional hunting companies and curio dealers dealing in game trophies did not solve poaching problems nor has the problem disappeared to date (Kiringe and Okello, 2007). Western *et al.*, (2006) observed that poaching has continued to reduce the population of certain wildlife species especially the elephants and the black rhino in Kenya. The elephant and black rhino populations have declined in the margins of 85% and 97% respectively between 1976 and 2010 (Okello *et al.*, 2013). Thus, in the late 1990's change of wildlife conservation and management policies became essential in Kenya to save the remaining stock of wildlife animals. Consequently, Wildlife Conservation and Management Act was amended and establish Kenya Wildlife service (KWS) in 1989 (Nyeki, 1992, Wildlife Conservation and Management Act, 2013).

2.5.3 Wildlife Conservation in Kenya under Kenya Wildlife Service

Wildlife conservation in Kenya confronts persistent, complex and possibly overwhelming socio-economic and ecological problems from local communities and poachers (Wishitemi, 2013). Indeed studies have found that Kenya has an established and extensive system of wildlife protected areas which occupy 8% of the country's land surface area and currently these protected areas are distributed in all ecosystems in which they provide an important habitats for the protection of flora and fauna (KWS, 2006).

KWS (1990), in its publication bulletin on “*Conservation Policy Framework and Development*” indicate that the agency was established by an act of parliament in 1989 as a self –governing state corporation. The act mandated it to conserve Kenya’s natural environment together with her flora and fauna for the benefit of the present and future generation both in Kenya and the world. Its responsibility includes sustainable utilization of Kenya’s wildlife resources for the country’s economic development and for the benefit of the local communities living in wildlife areas. Kenya Wildlife Service (KWS) 2013 in its recommendation plan for Kijabe group ranch highlighted KWS corporate responsibility to include among other roles, the protection of community and their properties from damages by wildlife from which the institution has been facing monumental challenges in the fulfillment of this obligation.

According to KWS (1990) and Nyeki (1992), the parliamentary Act which created KWS empowered the minister responsible for wildlife conservation and management to appoint board of trustee members to run the affairs of the corporation which is still the case to date in the current Wildlife Conservation and Management Act (WCMA, 2013). The trustees under the leadership of the chairman of the board are delegated the duty of making policies and regulations for the protection and management of wildlife in Kenya. These policies are then approved and published in the Kenya gazette by the minister before they become law. In addition, the board has the powers to establish, de-gazette or close a national park, game reserve or a wildlife sanctuary but their policies and decisions are rarely seen nor felt by the local communities who bear the brunt of human wildlife conflicts. The trustees also have the powers to vary park and reserve boundaries as it deems necessary. According to Okech (2011), KWS Director wields a lot of executive power on all wildlife affairs in Kenya. The Director issue utilization licenses and

consults with county governments, local communities and other wildlife entities on matters conservation and management of wildlife resources. According to Matiko (2000), 65-80% of Kenya's wildlife are found outside protected areas at any given time and hence the obvious limitations of protected area approach to conservation. With this limitation, KWS initiated the *Community Wildlife Service Programme (CWSP)* in 2002 and *Park Beyond Parks Programme (PBPP)* in 2006 as a community-based conservation initiative approach as methods of minimizing human wildlife conflicts and to boost local community livelihood strategies (Okello *et al.*, 2013). Community based conservation was intended to allow communities particularly those sharing habitats with wildlife to be an integral part of KWS wildlife conservation policy through the establishment of private and community conservatories.

According to Okech, (2011) and Okello *et al.*, (2013) recommendations, the CBC should have three broad objectives: The conservation of biodiversity, the sustainable use of natural resources and equitable sharing of benefits arising from activities related to conservation (Kimwele and Waweru, 2006). CBC initiative approach has been popular as it is perceived to be an effective mechanism for addressing problems of human wildlife conflicts, social justice and enhancing diversification of local livelihoods. However, its success on the ground has been limited due to several complex factors such as its requirement for huge investment, need for highly skilled manpower, a realistic long-term period and full involvement of local communities in the formulation and implementation of its policies and conservation programmes (Serneels and Lambin, 2011).

According to Smith *et al.*, (2012), Wishitemi *et al.*, (2012) and Okello *et al.*, (2013) the success of the Community based management (CBM) initiative in promoting wildlife conservation to the satisfaction of all the stakeholders requires long term commitment of funds, strong local community participatory links, clear, precise, achievable objectives and careful evaluation of costs and benefits of the initiatives and programs at community and household level which has been lacking in the Community Based Conservation initiatives (CBCIs). In addition to this, Ben Sharar (2009) observed that changing land use in areas surrounding protected areas has also made it difficult for CBC initiatives to succeed. These areas are experiencing livelihood desertification as there is the expansion of small holder cultivation in areas which were once wildlife dispersal areas. The situation has been reported to be reducing animal home ranges leading to increased human wildlife conflicts (Serneels and Lambin, 2011).

2.5.4 Wildlife Conservation and Management Approach in Kenya

According to United Nation Environmental Programme (UNEP) discussion paper of 2009 on wildlife resources management in Kenya it defined human wildlife conflict as a clash between people and wildlife over space, food and life. The paper further stated that human wildlife conflict as any and all disagreements or contestations relating to destruction, loss of life or property and interferences with rights of individuals or groups that are attributed directly or indirectly to wild animals (UNEP, 2009, cited in Wishitemi *et al.*, 2013). Taylor (2000), in his study on human wildlife conflicts showed that conflicts escalate because of changes in land use especially in the expansion and intensification of arable farming and sedentarization of pastoralists in rangelands has increased immigration into wildlife areas. However, his study

never considered the effects of human-wildlife conflict on the human populations involved in livelihood programmes which can equally be vast conflict sources.

Inadequate wildlife control, ban on hunting and capture of wildlife by traps and snares are some of the factors contributing to HWCs. KWS in their April 2014 annual report argued that human wildlife conflicts relates to wildlife conservation policies and laws which hitherto includes wildlife management and utilization of wild resources outside protected areas. The wildlife Conservation and Management Act (2013) which tends to operate on modern conservation and land use policies, practically needs a lot of awareness and sensitization for effective and desirable results which is yet to bear fruits. For instance, it is against the act to proceed with consumptive utilization of wildlife resources at the commercial scale for the benefit of land owners under the present condition of prohibitive legislation. Some of the legislation which prohibitive consumptive utilization of wildlife resources include the presidential directive prohibiting all hunting and wild life animal capture of 1984, the ban on hunting (Legal Notice no. 120 of May 1977, the ban on trade on all wildlife trophies and products (Legal Notice No. 181 of August 1979 all of which are still in force and are a major hindrances in the search of human wildlife conflict mitigation measures.

2.6 Human Wildlife Conflict Hot spots in Kenya

The problem of human-wildlife conflict (HWC) in Kenya has posed a lot of risks to the preservation of livelihoods as well as wildlife conservation. HWC has affected food security of people, it has decreased their physical and psychological well-being as well increasing their workload (Wishitemi, 2013). In Laikipia for example, where the largest concentration of wildlife

in Kenya exist where elephants and large predators are also found and the local people are least able to bear the costs of losses and damages (Okello *et al.*, 2010). The significant number of wildlife is not only putting pressure on the ecosystem, but has also led to increased HWC. The wildlife numbers pose a threat to human life, with official statistics indicating that between February 2018 and June 2019, 20 deaths by elephants and several injuries were recorded (KWS, 2018b).

In Laikipia, elephants' encroachments onto community household homesteads, not only kill people but also destroy crops, thereby impoverishing the rural communities who heavily rely on farming for their livelihoods. Hidden costs in form of diminished psycho-social well-being and disrupted social activities has raised additional concerns (Okello *et al.*, 2013. According to KWS (2018), Human Wildlife Conflicts incidents report for 2018 in Laikipia County and its environs showed a total of 206 incidences recorded from 19 conservancies and other wildlife protected areas during 2018. According to the Laikipia County Government HWCs report, this figure may be an underestimation, given the fact that only a few conservancies reported their HWC figures for the year 2018. Furthermore, according King *et al.*, (2018) study on HWC in Tsavo West National Park, their findings indicated that HWCs are gradually increasing due to growth in wildlife populations and the shifting patterns of movement of humans and wildlife in response to drought. Livestock attacks in Laikipia have shown a substantial increase as from 2016 (KWS, 2018).

According to KWS (2018) report on HWC types, there was an average of 23 incidences per conservancy, of which an average number of 21.6 were livestock attacks (up from an average

number of 12.9 per conservancy in 2016) and 13.1 were incidents of crop damage, while the average number of human attacks per conservancy were only 2.6. Other conflicts related to wildlife and humans are damage to property such as water points and boreholes, fences, gates, maize granaries and houses while damage to vegetation and competition with livestock for forage were some of the other incidences reported.

Other HWC hot spot regions in Kenya where incidence cases of human wildlife conflicts have been reported are also areas which host large and extensive protected areas. According to KWS (1990), KWS (2012) and KWS (2018b) crop raiding was most prevalent in Taita Taveta County, while livestock depredation and property damage were prevalent in Narok and Kajiado Counties. Laikipia, Taita Taveta, Narok and Lamu are the counties with the largest number of HWC incidence reported cases. These counties alone accounted for about two-thirds of the incidences reported in Kenya every year (King *et al.*, 2018). According to KWS (2018a), the most problematic wildlife species included elephant, baboon, buffalo, hyena, leopard, and lion. Elephants, baboons, and lions were responsible for most of the HWC cases in Taita Taveta County (Okello *et al.*, 2017) while the highest number of conflicts attributed to hyena and leopard were reported from Narok County (KWS, 2018a). On the other hand, the highest numbers of conflicts related to buffalo were reported in Lamu County and then followed by Narok and Nakuru Counties (KWS, 2018b).

2.7 Human Wildlife Conflicts in Baringo County

Human wildlife conflicts in Kenya and in Kerio Valley region demonstrate the severity of the conflict and suggest a greater in-depth analyses of such conflicts are needed in order to avoid

watching the problem and undermining the conservation of threatened and potentially endangered species. Akama *et al.*, (1995), evaluated impacts of human wildlife conflicts and community attitudes towards wildlife conservation within Kerio Valley Conservation Area (KVCA). The objectives of the study was to understand how communities have been affected by human wildlife conflicts, how they are adapting to it as well as their perception about the gravity of the conflict phenomenon. The findings of the study were that the effects of human wildlife conflicts were alarming. Human wildlife conflicts had negatively altered livelihood sources of Kamnarok NR adjacent households including the bio physical geography of the study area. The findings further reveal that Tugen sub ethnic group of Kalenjin tribe were displaced from their hunting and gathering areas when Kamnarok NR was proclaimed National Reserve vide gazette legal notice no. 101 subsidiary 216/47 of June 1983.

The negative communal perception, the increasing populations of wild animals, land contestation and loss of access to natural resources have made wildlife conservation increasingly more difficult and thus aggravate human wildlife conflicts in the area (Woodroffe *et al.*, 2005). Furthermore, the negative attitudes by local community towards wildlife conservation has also worsen the situation of conflicts. Displacement of the local community has affected their institutions since they no longer have full authority to decide or use resources found in the reserve (Wishitemi, 2008). This problem has also occurred in other parts of Kenya (Scoones, 2009, Mbau, 2013, Bolaane, 2014). Mbaiwa (2005) supported this argument and stated that conflicts had persisted simply because the government adopted British colonial policies and programs for natural resource conservation and management. In order for the conservation efforts in the area to work, a positive attitude towards local wildlife is not sufficient in itself but

the management of Kamnarok NR need to view positively the concerns and livelihoods of the local community in order for any conservation strategy to succeed.

Government pro-conservationists institutionalized nature protection policies of 1980s, 1990s and 2000s which are to date insufficient and ineffective in protecting biodiversity in Kenya (Anthony, 2007). According to Anthony (2007), local communities have been excluded from resource management and this is attributed to governance in resource centralization. In his findings, he noted that exclusion was associated as well with escalation of hunting and poaching by local communities who had been displaced from Kamnrok NR. Their hunting has been illegalized and people were labeled as poachers leading to decimation of key mammals such a giraffes, rhinos, lions, elephants, lesser Kudu and elands among other wildlife animals. Mbaiwa (2002) and Western *et al.*, (2009), examined the impacts of poaching on the viability of wildlife populations in Samburu National Reserve and noted the vice to be responsible for the declining populations of wildlife. To date both hunting and poaching are banned and are illegal in Kenya. Hunting and poaching in Kenya are illegal because it does not conform to any conventional approach of wildlife use particularly preservation and conservation which are being promoted by government and wildlife conservationist alike.

The Department of Wildlife and Environmental Affairs of Baringo County Government argues that environmental and human factors are the main cause of human wildlife conflicts in Kamnarok NR adjacent areas. This may be partly so considering failures by both the national and county governments in offering better livelihood options to local communities and in controlling human populations migrating to wildlife rangelands for better livelihood opportunities

(Lelenguyah, 2013). According to Mbaiwa (2005) and Sitati *et al.*, (2005), the degradation of natural resources in Kerio valley ecosystem in particular the wildlife conservation areas of Rimoi and Kamnarok NR is a critical issue. Wishitemi *et al.*, (2005) argued that the Kerio valley ecosystem is among the most threatened ecosystems in Kenya. They attributed it to the region's resource richness thus a critical livelihood resource points for the local community. However, Kamnarok NR is important mainly because of rich natural resources it possesses particularly the permanent water supply of Kerio river, wildlife, Lake Kamnarok fish, reeds, firewood, thatching grasses and as a grazing field.

Okello *et al.*, (2011), study on community interests in conservation among Kerio Valley residents observed that community's interests in conservation and adaptive management in mitigation of human conflicts and threats to wildlife from incompatible livelihood practices has increased in the recent past as pressure on the ecosystem has also increased. Wasonga *et al.*, (2011) noted similar findings in Kibale National Park in Uganda. General analysis and reviews over the past two decades have identified a suit of pressures protected areas in Baringo county face. Baringo County Government have contended that to prevent further escalation of human wildlife conflicts and encroachment to protected areas and reduce incompatible livelihood practices, it is necessary to address underlying causes such as community livelihood options, land ownership disputes and poverty. According to Connell-Rodwell *et al.*, (2000), livelihood sources and poverty are factors in resource conflicts because the poor tend to over harvest environmental resources in order to survive and to achieve their needs. They noted poverty alleviation and conservation as fundamental to policy agendas towards addressing human wildlife conflicts in Baringo County.

According to Kgathi *et al.*, (2014), resource competition, land ownership disputes, land use conflicts and poverty are some of the causes of HWCs in areas adjacent to Kamnarok NR. Most of the households live in what the United Nations have defined as human poverty (Agrawal and Redford, 2006, Kgathi *et al.*, 2014). UNDP (2005) described human poverty as a composite measure of life span, health, knowledge, economic provision and degree of social inclusion. The UNDP report observed that poverty has created conditions for over utilization of natural resources by local communities living within and adjacent to wildlife protected areas (WPAs). Human wildlife conflicts and resources degradation in the Kamnarok NR and its environs can be ameliorated partly through the achievement of household livelihoods security and better livelihood options (Thakadu, 2005, Arntzen *et al.*, 2007, Kgathi *et al.*, 2014). According to Ellis (2000) different livelihood portfolios determine the use of natural resources.

A study by Thakadu (2005) on local livelihoods in the mist of scarce natural resources in Amboseli, Kenya argued that local communities' livelihoods can be improved when they have better livelihoods options and the pressure on the collection and use of rangeland resources is reduced as local community are enabled to buy food than use of wild resources and thus this will reduce human wildlife conflicts. However, the study did not examine changes in livelihoods among the wildlife protected areas adjacent households such of Kamnarok NR whose natural resources influence and contribute to the escalation of human wildlife conflicts.

Sitati *et al.*, (2005) in a study in Masai Mara National Reserve on natural resource conflicts revealed that wildlife resources such as small antelopes, thatching grass, fish, wood materials and other natural resources have a long history of sustaining livelihoods of traditional societies in

wildlife protected areas, but the authors never considered the use of different environmental resources by local communities as being dynamic and changing overtime. For example, *Cymbopogon excavates* a thatching grass is extensively used by local households which has consistently fueled conflicts between the local community and the wildlife management authorities (Bolaane, 2014). Butt *et al.*, (2009) further argued that this grass specie is traditionally harvested by local people to thatch huts they live in. Changes in the use of this grass and other wildlife resources including the giraffes, lions, hyenas, rhinos, elephants and zebra among others have not been adequately studied in this region. These resources in Kamnarok NR are threatened and are on a decline (Waiganjo *et al.*, 2011). Traditionally, these resources were hunted for meat and their skin were used in households as sleeping mats and clothing (CSO, 2005).

Kamnarok NR and the adjacent lands are under contestation. Whereas the adjacent lands has been encroached with human settlement (Wishitemi *et al.*, 2008), the continuous encroachment has increased the contacts between households and wildlife further intensifying human wildlife conflicts. The forms of conflicts in Kamnarok NR adjacent areas include crop damage, competition for grazing and water, livestock diseases, human injuries and death. This has raised fundamental question of whether it is reasonable to expect these resource poor local people to co-exist with wildlife.

2.7.1 Management and Mitigation Strategies to Human Wildlife Conflicts

According to a study by Breitenmoser *et al.*, (2005), effective management and mitigation strategies are necessary in order to resolve human wildlife issues. Woodroffe *et al.*, (2007) argued that a wide range of technical approaches exist for management and damage limitations.

These techniques can undoubtedly help lessen conflicts, as they can significantly reduce magnitude of wildlife damage incurred. Shipton (2010), suggested that conflict resolution should be relatively simple strategies and appropriate to deter problematic animals. However, Marker (2002), Webber *et al.*, (2007) in their assessment on wildlife mitigation measures suggested that complete long term conflict resolutions are rare, even when such strategies are implemented with good intentions. This suggests that despite more people citing direct wildlife damage as the reason for their antagonism towards wildlife (Sillero-Zubiri and Laurenso, 2001, Serneels and Lambin, 2011), the causes of the conflicts are often complex and deep seated, and a broader approach must be utilized in order to ameliorate such conflicts in the long term.

The use of economic incentives is a widely acceptable method to affect behavior and perceptions of local people towards wildlife positively. HWC carries significant economic costs to humans and compensation is a measure, which aims to alleviate conflict by reimbursing people for their losses. According to Kameri-Mbote (2002), compensation schemes as a means of mitigation which can promote efficient protection of biodiversity by maintaining positive attitudes towards and support for conservation initiatives among the different stakeholders. However, the existing models are based on compensation in cash or goods including land and rights for conservation related losses to livelihood, income, property, health, or loss of life. Adams *et al.*, (2010) in their study on viability of different compensation schemes observed that many heterogeneous approaches to compensation do not take into account spatial variations in factors influencing conservation success, even within a single protected area. It must be noted, however, that compensatory schemes do not always suffice to satisfactorily solve disagreements among wildlife stakeholders.

According to Avci *et al.*, (2010), the most reliable compensation scheme is ethnographic approach which complements economic incentives, initiate and promote conservation measures with positive behavioral changes towards wildlife among communities. For instance, Samburu community represents a successful example of how to involve the local community who have a culture inclination of tolerating wildlife. In a region where firearms are readily available and poaching can affect wildlife population, the involvement of local people in conservation is of paramount importance. Kgathi (2005) observed that cultural tools such as legends, myths and tribe-specific customs about wildlife can stimulate people's interests in wildlife conservation.

Resettlement of communities could be another viable mitigation option if local communities are willing to surrender their land rights for wildlife conservation. According to Schmidt-Soltau and Brockington (2007), community resettlement tends to be successful only if implemented on a truly voluntarily basis. Resettlement provides a solution that is based on a preventive separation of people and biodiversity-related issues and fully addresses the root of the problem. However, this option is arguably the most controversial option (Karanth, 2007) and is subject to compliance with international agreements, including Article 10 of the Declaration on the rights of indigenous people (UN, 2007).

Barriers have the function of preventing spatial overlapping among wild animals and local communities. They are usually man-made, but natural barriers such as rivers, coasts or mountain ranges may occur along a nature reserve boundary. Spatial barrier separation has been proved to be a successful strategy when physical barriers enclose a large protected area (Nyphus, 2004). However, spatial separation is not always a satisfactory solution. A remarkable study was

undertaken by Ogada *et al.*, (2003) who looked at Kenya's traditional systems of livestock husbandry and explored the effectiveness of various types of barriers and fences as discussed below.

In Laikipia County for example, pastoralists gather their herds and keep them inside enclosures at night, when most carnivore attacks take place. They use different traditional techniques, which are popular among the Maasai and Samburu local communities. The enclosures can be made of stone or wooden posts of *Acacia* trees or branches woven around cedar poles or made of wire mesh (wire). The effectiveness of the different enclosures in defending livestock from predator attacks was investigated; it was observed that not only did domestic animals experience a lower depredation rate when penned in corals over night, but also that the type of pen was a significant factor associated with a lower total loss for sheep and goats, being kept in wire, acacia, or solid enclosures (*listed from the most effective to the least in that order*). They concluded that good husbandry practices based on traditional approaches demonstrate the ability to limit depredation by large carnivores.

2.8 Land Tenure in Kenya

According to Osemeobo (1993), land tenure is the set of rules that determines how land is used, possessed, leveraged, sold, or in other ways disposed of within societies. These rules may be established by the state or by custom, and rights may accrue to individuals, families, communities, or organizations. A study by Kameri-Mbote, (2002) on general land tenure in Africa observed that customary land tenure predominates the African continent with different states being skeptical on the recognition of it but she did not outline the appropriate land

tenureship for wildlife conservation. In Kenya, customary tenureship still dominate land surrounding wildlife protected areas, but tenure security remains the biggest challenge. Kameri-Mbote (2002) argued that land tenureship is the assurance that the land one owns or holds for an agreed period of time or purpose is certain. Therefore, tenure security requires property rights that are clear in purpose and duration and accepted as legitimate and legal for households to derive meaningful livelihoods.

Land is the basis of human society because it provides food, water, energy, clothing and shelter, however, it is becoming scarce in Kenya and elsewhere. According to Ottichilo (2000) and Seno and Shaw (2002), land ownership has exacerbated social conflicts and poverty due to the inequality the commodity has brought to the society. They observed that the social conflicts brought by land issues to societies relate to its inadequate access and the benefits from its use. Generally, good land policies with well defined tenureship in broader context is fundamental for general development especially in agrarian development. However, World Bank Agenda 21 report of (2010) noted that land tenure insecurity was the main cause of local political contestation influencing wildlife conservation and livelihoods pursued by communities living in wildlife range lands.

Land tenure and property rights issues are of key importance in Kenya where land-related conflicts, institutional deficiencies, and overlapping customary and formal laws are leading to tenure insecurity over land. The Kenyan land tenure system comprises of three tenure regimes: government lands, trust lands, communal land and private land (Mumma, 2007, Okello *et al.*, 2013). These land tenure systems originate from statutes dating back to the early colonial period.

Prior to colonial rule, land was owned on a communal basis by community groups; households and individuals within an area acquired use and access rights to land according to customary practice and by virtue of membership to a social unit, such as a clan (Mumma, 2007). According to Waiganjo and Ngugi, (2001) the customary leaders (typically, council of elders) had the authority to allocate land and resources within the group, regulate use, and exclude or negotiate rights with outsiders.

The history of Kenya's land problems is rather complicated. In broad strokes, from the late 1880s to the mid-1950s, the British colonial government took over control of about 50% of prime agricultural land (mostly in the middle of the country) and large parts of the coast (Campbell, 1993). In some instances the land was simply taken; in others, it was ceded to the British government by treaties of questionable fairness (Seno and Shaw, 2002) often by leaders who had no authority over the land they ceded. Much of this land was either sold or leased to white settlers and became famously known as the "White Highlands" (Campbell, 1993).

According to Campbell *et al.*, (2003) the decision by the Kenyan post-independence governments to maintain the colonial period status quo of land rights at independence was, in essence, a perpetuation of the land rights system used by the British. Land purchased from the settlers or redistributed by the British government became private land. The land the British had declared crown land became government land. The President, through the Commissioner of Lands, took on the powers of the colonial governor to allocate that land as he saw fit, although ostensibly only for "public interest" (Campbell, 2003). Most "native" land became "trust" land, governed by county councils in trust for the inhabitants. Many of the problems of the colonial

period still persist with different actors. "Private" land was, and still is, largely owned by the rich and powerful and obtained through a combination of (often ill-gotten) wealth, luck, and influence peddling (Njonjo *et al.*, 2002). Thousands of Kenyans were, and are still and will be landless and squatters.

2.8.1 Land Use and its Characteristics in Kenya's Arid and Semi Arid Lands

Kenya's policies on land use are normally well intended but their limitations to narrowly defined sectors of the economy has often led to undesirable ecological and socio-economic implications for biodiversity and local livelihoods in arid and semi-arid lands (ASALs). A study by Seno and Shaw (2002) observed that Kenyan governments in an effort to address rapid population growth and to attain self sufficiency in food production developed agricultural policies which sought to increase the productivity of ASAL areas through dry land agriculture and diversification of livelihoods.

These policies have provided agricultural communities occupying high potential agro-ecological zones with a perfect opportunity to seek alternatives land for settlement and crop production in ASAL rangelands especially ecological zone IV. Thus, over the past few decades, Kerio Valley wildlife rangelands has witnessed a steady immigration of agricultural households from nearby high potential agro-ecological zones into Kamnarok buffer zones. The situation has subjected natural habitats that formerly served as communal grazing lands and wildlife dispersal areas to sustained fragmentation and alteration as these migrant households take up land for settlement and crop cultivation (Agarwal *et al.*, 2011). The most affected zones are those along Kerio and Katmok rivers which are also critical for livestock and wildlife, particularly during the dry

season. The situation has led to increased resource competition among wildlife, livestock and agriculturalists.

Consequently, Kamnarok national reserve and its surroundings have increasingly witnessed complete interactions between conservation and socio-economic need pursuits of households in its buffer zones. Some of the indicators of these interactions include land use related land cover changes and disputes arising from conflicts of interest among agriculturalist and conservationists with wildlife as the common ground of contention, particularly along Kerio river and eastern boundary of Kamnarok NR. Therefore, Kamnarok National Reserve is a classical case of Kenya's protected area that is currently degenerating into an ecological Island due to increasing degradation largely contributed by overgrazing and an expanding small holder farmland which are taking shape in the National Reserve buffer zones.

In the pre-colonial era, Kenya's ASALs supported nomadic pastoral communities and large wildlife populations. The pastoral livestock production was largely subsistence economy based mainly on milk production, although other products such as meat, blood, hides and skins were also important. Ekaya, (2001) observed that livestock played an important role in the livelihoods and culture of the pastoral communities. Livestock not only provided social status, but was also used as a reserve of family wealth; they were also a form of social capital and an insurance against disasters (Williamson and Payne, 1978). To ensure survival in the face of frequent and often extreme environmental fluctuations, the pastoral production system was characterized by such coping mechanism as high mobility and flexibility, milk based diet, herd splitting, use of dry season grazing reserve, stocking of herds with a high proportion of breeding females and use

of social security systems of stock loans and redistribution (Southgate and Hulme, 1999). Though pastoralists still apply this coping mechanism so much has changed. In an effort to address rapid increase in human population and the desire for self sufficiency in food production, Kenya's post independence governments have formulated profit oriented and technocratic land use policies in ASALs range lands which has been promoting intensification of livestock production, dry land agriculture and wildlife-based tourism (Campbell *et al.*, 2003). These policies have tended to ignore the perception and emotion of indigenous pastoral groups on ASAL resource management which have been shaped by their experiences and familiarity with constraints of rangeland environments over several years.

According to Herlocker, (1999) Kenyan arid and semi arid lands (ASALs) are characterized by low, erratic, and unreliable rainfall, high temperatures, low humidity, low soil fertility and poor drainage. ASALs areas have marginal agricultural productivity with livestock and wildlife conservation as the principal land use types. ASALs, therefore are largely uncultivated areas that support grazing and browsing animals with vegetation and water as the most critical natural resource (Southgate and Hulme, 1996, Herlocker, 1999, Sernel, 2001). Pratt and Gwyne (1977) cited in Maalim (2001) on human spatial densities of arid lands in Northern Kenya observed that ASALs make up 87% of Kenya's total area and support over 25% of the country's total human population, 52% of the total livestock population and 90% of the Kenya's wildlife resources. He argued that more than 14 million Kenyans engaged in full-time livestock production as a form of livelihood. ASAL lands are important in supporting both rural and urban livelihoods. For instance, it is estimated that the total value for livestock in the Kenyas' ASALs is more than 70 billion, which account for about 90% of the pastoral economy and 10% of the National Gross

Domestic Product (Wekesa, 2011, Heifer Project International (HPP), 2012). ASALs, are also important in supporting tourism industry through which Kenya earns about 50 billion annually based largely on the viewing of wildlife in the protected areas (Atieno, 2014).

2.8.2 Land Use and Wildlife Conservation

Kenya's land use policies do not always adequately address issues of human wildlife conflicts, however, the importance of land as a fundamental resource in conservation of wildlife cannot be over emphasized. Mwangi (1995) in a study on biodiversity conservation and local displacement linked the success of the global conservation movement to mass dislocation of indigenous peoples across the world. He argued that the local people were increasingly being expelled from their ancestral land, while others were threatened with dislocation to pave way for biodiversity conservation. Wells (1992) and Karidozo (2007) also observed that protected area network expanded rapidly in the 1950's particularly in the developing countries where successful attempts to conserve wildlife resulted in an increase in wildlife populations particularly large mammals.

In developing countries, protected areas are mostly surrounded by densely populated agricultural farm lands that has resulted in escalation of conflicts between local communities and protected area management authorities over land use rights and practices (Okello *et al.*, 2011). In rural areas where most wildlife is found, a significant proportion of the landscape is used for agriculture, grazing, and settlement. As human population density near wildlife rich areas increases (Wittemyer *et al.*, 2008), even more land is needed for livelihood maintenance. This has increasingly brought human land-use zones into contact with conservation areas (Crooks and

Sanjayan, 2006). Therefore, there has been a negative trade-off between rural communities' interest in land use and conservationists' interest in healthy wildlife populations.

In Mwalukanje wildlife sanctuary in Kwale District, Kenya, local people have been compelled to leave their productive land because of crop raiding animals such as elephants, baboons, and monkeys (KWS, 1996). The conflict between the Bénoué Wildlife Conservation Area and the adjacent communities in Northern Cameroon (Weladji and Tchamba 2003) is another example of the tension arising from co-existence between human land-use activities and wildlife conservation. The root cause of the negative attitudes towards conservation among Khwai communities around Moremi Game Reserve in the Okavango Delta in Botswana is the displacement of these communities in order to provide land for gazettement of wildlife protected areas (Mbaiwa, 2005). In some areas of Western Serengeti National Park in Tanzania, wild animals have found themselves on the front line of land-use conflict with pastoralists (Holmern *et al.*, 2006). Displacement of Wagalla people from Ugalla Game Reserve in Western Tanzania in the 1960s (Little *et al.*, 2008) contributed to the current poor support of local communities towards wildlife conservation efforts. All these are only a few examples showing how land and its resources have become a source of friction between wildlife and human beings.

2.8. 3 Land use and Land Rights in Baringo

As already indicated, land tenure is considered an essential prerequisite to livelihood improvement. Most communities in Kenya believe that land acquisition and the issue of land titles are necessary to give the real impetus to land development and livelihood diversification. Furthermore, land tenure in Kenya is a problem of extra-ordinary complexity and differs from one community to another. In many areas in Kenya there is growing trend towards

individualization of rights to land even in the absence of proper mechanism to acquire or register for land titles. The Lelenguyah (2013) study on pastoralism and land conflicts among the Kerio valley communities noted that the underlying issues behind the land conflicts in the Kerio Valley are issues related to land tenure system but the study overlooked on livelihood diversification as a potential contributor to the experienced conflicts.

According to Waiganjo (2001), Kenya has four distinct land tenure regimes; public, private, communal, and contested. Private land tenure is absolute ownership over the land, where any livelihood or resource use can be practiced and one has a physical title deed to the land. The contested land has no distinct owner and is managed by the government. Public and communal land share similarities, in that it is used by a group of people, but the difference between the two is the regards to the right to access and use. Wildlife resources are alien to these regimes. Public land is occasionally open to anyone with no restrictions. When a resource is open with no management, the resource often becomes over used and exhibits the tragedy of the commons. Communal land is managed in an attempt to avoid the tragedy of the commons by limiting access to members in an attempt to achieve sustainability on the land resources.

Although the current system of communal ownership of land is credited with promoting equity in land distribution in Baringo County, it has failed to ensure tenure security to the holders which are considered essential for growth and better land management (*this study*). For these reasons the land question remains at the centre of the debate on agricultural development and poverty reduction in Baringo and more so to the communities along the Kerio Valley. However, as Kerio valley community population increase as well as the increasing population of other migrant

tribes, the communal land become crowded and their management has significantly deteriorated. Land sub-division has been pressured by the young members of the community who want a piece of the land as well as the affluent older members who have more to gain from the sub-division. However, from a wildlife conservation standpoint, increased sub-division has fragmented habitats thus an increase in human wildlife conflicts (Campbell *et al.*, 2010).

2.9 Livelihoods: Concept and Context

Globally, livelihood has become a popular concept in development discourse. Livelihoods are better understood from the confines of five capitals which are physical, financial, social, natural and human. According to Ellis (2000), Ellis and Freeman (2004), livelihoods are about the means and ways by which one earns the necessities of life for oneself and family. Livelihoods are sustainable when they can cope with, and recover from stresses and shocks, maintain or enhance its capabilities and not undermining the natural resource base. However, Conway *et al.*, (2002) defined livelihoods as the way of how people creating a living for themselves. They noted that livelihoods to include a wide variety of basic resources such as health, education, food, shelter, ecological and environmental factors that have the potential of affecting survival. In rural Kenya, studies have demonstrated that human wildlife conflicts are impacting negatively on resources, which local communities rely on as bases of their livelihoods. Accessibility of livelihood resources are influenced by variety of variables in a society which takes into account socio-political stability, skills, knowledge acquisitions, favorable climatic conditions, strife and conflicts (Campbell *et al.*, 2010). Moreover, a combination of these factors has implications on how the local people access and use their resources to earn decent livelihoods.

UNDP (2005) and Abass (2010) defined sustainable livelihood as “*the capability of people to make a living and improve their quality of life without jeopardizing the livelihood options of others either now or in future*”. However, sustainable livelihoods are efforts to conceptualize human needs in a holistic way by capturing the many complexities of human needs including constraints, challenges and opportunities that may exist. Livelihood constraints and opportunities are shaped by numerous factors (Ellis, 1998 and Barret *et al.*, 2001) ranging from global, regional to national level trends and structures over which individuals have no control, and may not even be aware of. Recent literature indicates that household assets are central to sustainable livelihoods approach and livelihood diversification, but not all individuals in a household have equal decision-making powers, or benefit equally from household assets or incomes.

Researchers such Scoones (1998), Ellis (2000) and Conway *et al.*, (2002) among others have conducted numerous research studies on different thematic fields of livelihoods and livelihood diversification. Thus, they argued that studies on livelihood orientation address issues that compound mankind and attitudes towards other livelihood options. Rural communities living adjacent to wildlife protected areas (WPAs) are diversifying livelihoods from on farm-based operations to off farm livelihood strategies in order to cope with perturbations from human wildlife conflicts. Therefore, escalation of human wildlife conflicts in wildlife rangelands necessitates diversification of livelihoods. According to Ellis (2000) and Barret *et al.*, (2001), livelihood diversification approach promotes innovations that turns local communities into viable economic entities by diversifying from farm-based activities to off farm and non farm based operations to include the provision of goods and other essential services. Thus, diversification is a complementary component of livelihood strategies and this is true as rural households

construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living.

In recent times, livelihood diversification and sustainable livelihood (SL) frameworks has been viewed as appropriate and applicable rural survival strategies. Ellis (2000) outlined the livelihood framework to include; (i) assets such as human capital which comprise of education, technical skills and health well-being of household members. (ii) Physical capital which includes sewing machines, farm equipment and machinery while (iii) social capital comprise of the social networks and associations to which the household members belong to. (iv) Financial capital constitutes savings, credits and livestock possessed and lastly (iv) natural capital which are composed of natural base resources available and accessed by households. In the pursuit of livelihood portfolios', different livelihood strategies are at play (Barret *et al.*, 2001, Goodhand, 2001) and are mediated by social factors such as social relations, institutions and organizations. Also, livelihood strategies are influenced by exogenous trends such as economic trends and shocks such as drought, diseases, floods and wildlife conflicts.

2.9.1 Rural Livelihoods in Historical Context

Livelihood diversification in the rural areas of the developing world got importance in the literature and research since the 1990s with the introduction of the livelihood frameworks. Rigg (2006), noted that two-thirds of the world's population reside in the rural areas of low-income countries and mainly depend on subsistence farming and other natural resources for their livelihood. The relationships between rural households and natural resource exploitation's among rural households suggest that they combine a diverse set of income generating and social

activities to construct a ray of livelihood portfolios to meet and enhance their livelihood outcomes. These are important trajectories of rural livelihoods with considerations of how various on- farm and non-farm activities contribute to the rural population well-being. 60-70% of world rural dwellers depend on agriculture as the source of sustenance and most of them are living in absolute poverty (Rigg, 2006, Stifel, 2010), However, high dependence on agriculture, declining farm productivity, limited access to non-farm opportunities have triggered severe poverty in Kenyan rural areas.

Human wildlife conflicts coupled with climate change, low productivity farming and limited accessibility of non-farm income sources have been increasing vulnerability of rural households often depriving them of decent standards of living. According to Velded *et al.*, (2012), diversification of the rural economy is a sectoral shift of rural activities away from farm to non-farm activities. These shifts are associated with the expansion of the rural non-farm economy. However, diversification in the broader sense is a process of economic structural transformation of rural areas to include both on-farm and off-farm activities. In Kenya, rural livelihood strategies are heavily reliant on the natural resource base with agriculture playing a key role (Start, 2015). Agriculture and agricultural land are extremely important to millions of rural households as is the main source of livelihoods. Therefore, access to agricultural land is of great economic significance to the rural households as their livelihood dependency is on agricultural land production for employment, income and food security (UNDP, 2005). Thus, diversification is vital in daily livelihoods and also as prospects for escaping poverty among the poor households.

2.9.2 Livelihood Diversification

Livelihood diversification has long been used and promoted as a strategy for increasing incomes and managing risk among poor and vulnerable households (Haggblade *et al.*, 2007, Bezu *et al.*, 2010, Njeru, 2013). Livelihood diversification has received much attention from researchers and policy-makers in the past decades, with a believe that promoting it can offer a pathway for poverty reduction and economic growth in sub-Saharan Africa. Barret *et al.*, (2001), defined rural livelihood diversification as the process by which households construct a diverse portfolio of activities and social support capabilities for survival and in order to improve living standards. But diversification may occur either as a deliberate household strategy or as an involuntary response to a crisis. The motivation for diversification strategies therefore varies in terms of household characteristics, location, assets, income level, opportunities, institutions and social relations (Ellis 2000). However diversification tends to categorize livelihood sources as either farm or non-farm (Ellis and Freeman, 2004) with the latter often implicitly being taken to be non-natural resource based such as trading, construction and in service industries.

The tendency for rural household to engage in multiple occupations is often remarkable but few attempts have been made to link this behavior in a systematic way to human wildlife conflicts. In wildlife rangelands, there is a drive to shift away from predominance of pastoralism and on farm-based activities to off farm opportunities (Reardon *et al.*, 2000, Davis and Bezemer, 2004). Davis and Bezemer (2004) argue that pastoralism and on farm livelihoods create plentiful income opportunities in rural economy via linkage effect. However, this assumption is no longer tenable for many poor rural households living adjacent to wildlife areas. Pastoralism and farming on their own coupled with human wildlife conflict issues are unable to provide sufficient means

of survival. Farming by use of new technologies and diversifying livelihoods to other non farm options will enhance household survival in the mist of conflicts.

Factors influencing rural household to diversify livelihoods including income portfolios are better understood than policies which infer household sources of income. Considerations of risks spreading, consumption smoothing, labour allocation smoothing, credit market failures (Barret *et al.*, 2001) and coping with human related conflicts contribute to the adoption and adaptation over time to diverse rural livelihoods. However, livelihood diversification (Deshingkar, 2004, Lanjouw *et al.*, 2007) is attributed to complexity of interactions with poverty, income distribution, farm productivity, gender issues and environmental conservation conflicts which are never straight forward. Empirical evidence from a variety of different studies suggests that rural households do indeed engage in multiple activities and rely on diversified income portfolios.

Also, it has been observed widely that the very poor and the comparatively well off have the most diverse livelihoods, while the middle range display less diversity. In South Asia, on average, 60% of rural household income is from non-farm sources (Ellis, 2010), however, this proportion varies widely between landless households and those with access to land for farming. 30–50% of household in Sub-Saharan Africa rely on non-farm income sources (Scoones, 2009), but Sub-Saharan Africa reliance on agriculture tends to diminish continuously as income level rises. According to Lemi, (2010) the more the diverse income portfolio the better-off is the rural households.

2.9.3 Motivation for Livelihood Diversification

According to Ellis (2000), Ellis and Freeman (2004), poor people in risk prone and uncertain regions of the world diversify sources of livelihoods in order to survive. There are multiple motives prompting rural households and individuals to diversify assets, incomes and other livelihood activities to include livelihood risk reduction, responses to household shocks, and asset accumulation strategies which are classified into two sets of motives i.e. push and pull factors. Push factors include risk reduction, reaction to liquidity constraints, high transaction costs and natural calamities (Reardon, 2000). However, available literature on household motivations for livelihood-diversification strategies indicates that both push and pull factors determine the levels and types of diversification, depending on household's endowments, off-farm opportunities as well as other exogenous factors (Lipper *et al.*, 2010).

According to Lay *et al.*, (2012), key push factors driving households towards diversification are: i) managing risk (including market and price risks) and income variability, ii) adapting to heterogeneous agro-ecological production conditions, and iii) adapting to changing weather conditions. From the push factor perspective, diversification is driven by limited risk bearing capacity in the presence of incomplete or weak systems, constraints in labour, climatic uncertainty and other natural calamities that create strong incentives to select portfolio of activities in order to stabilize households' income flows and consumption.

On the other hand, pull factors are the realization of strategic complementarities between activities, and specialization due to comparative advantage given by superior technologies, skills and endowments. From the pull factor perspective, realization of strategic complementarities

between activities such as crop-livestock integration or local engines of growth such as commercial agriculture (Barret *et al.*, 2001) or proximity to an urban area creates opportunities for livelihood diversification in productivity and expenditure-linkage activities. From the above classifications, household livelihood diversification can either be seen as a matter of necessity and survival, where diversification is born out of desperation, or driven primarily by the household's poverty status. However, it can also be a matter of choice and opportunity motivated by a desire to improve household living standards (Ellis, 2000). Livelihood diversification is associated with the struggle of success towards achieving livelihood security under improving economic conditions as well as with livelihood distress in deteriorating conditions (Dube and Vargas, 2013, Booth *et al.*, 2017). However, livelihood diversification can be a form of coping strategy in a situation of stress and for survival.

2.9.4 Livelihood Diversification in Baringo

According to Orindi *et al.*, (2007), intensive agricultural practices remained undeveloped throughout Kerio Valley until 1970s. Prior to 1970s, the prevailing livelihood strategy throughout the valley region had been livestock herding by pastoralists. In Baringo County and within the entire Kerio Valley region, most communities were predominantly pastoral and were principally dependent on livestock (Davis and Bezemer, 2004, Wesonga *et al.*, 2011b), however, there was variabilities in herd management strategies, social organization, land tenure, degree of dependence on limited agricultural products, interactions with outside communities and differentiation of tasks by sex and age. It is common knowledge that throughout history, agriculture has not been nearly as extensive throughout Kerio Valley region as it is today (Lelenguyah, 2013, Togoeh *et al.*, 2020) and traditionally the communities within Baringo have

been dependent on their livestock not only for food and resources, but also as a means of displaying their wealth. Wesonga *et al.*, (2011b), avers that not all pastoralists live in one common way. Pastoralists have been observed over time to rather sustain themselves through different levels of dependence on each of their resources.

It has been noted that livelihood diversification generally relates to development of existing livelihood portfolios, but these aspects happens as a response to sudden change in circumstances. For example, a new road may improve market access or the discovery of oil mineral and gases may offer new livelihood opportunities. World Bank, (2009) report, argue that in the absence of sufficient strong market incentive, diversification of livelihood portfolios is risky and unlikely to succeed. However, the development of more generic livelihood skills such as improved education (technical skills), business development skills with the aid of business services such as information centers and micro-finance institution improves individual abilities to identify and size new livelihood diversification opportunities in a range of sectors (Togoch *et al.*, 2020).

Kamnarok NR adjacent areas represents one of the major food deficient and famine prone parts of Baringo County (NDMA. 2016, Baringo CIDP, 2016). Food insecurity, poverty and vulnerability to livelihood crisis have increased since the drought years of 1980s and early 1990s in Kerio Valley (Mwanjala, 2005, Lelenguyah, 2013), but for decades, subsistence agriculture has been the most important livelihood strategy pursued by the local community. Low levels of income, declining farm sizes, agricultural shocks due to human wildlife conflicts and biophysical factor limitations have been major obstacle to sustainable livelihoods of the local community (Wasonga *et al.*, 2011a). However, food insecurity attributed to climatic variabilities and human

wildlife conflicts is persistent and widespread in the entire Kerio valley regions including adjacent areas of Kamnarok NR (Lelenguyah, 2013).

2.9.5 Policy on Livelihood Diversification

There is considerable debate over appropriate policies and strategies in regard to livelihood diversification. From the viewpoint of Barret *et al.*, (2001), livelihood diversification policies are insights of integrated rural developments which range from farming systems to participatory approaches. Reardon (2000), examined the role of livelihood diversification policy in household assets and the results of the study showed that policy makers and planners need to know the factors that influence livelihood diversification among rural households especially those in wildlife rangelands. It is necessary to state in livelihood policies the extent to which rural communities attempt to cope with risks and uncertainties in order to achieve livelihood securities by adopting appropriate off-farm and non-farm activities.

Taylor *et al.*, (2000), emphasized the existence of various strands of livelihood diversification policies with first appreciation of diversity of livelihoods of rural people and secondly the roles of different types policies on assets in rural people's livelihoods and third the importance of the wider social, political and economic environment in mediating access to assets. While it is common knowledge that rural people engage in different types of income generating and livelihood activities (Maxwell, 1998, Moser, 1998, Reardon, 2000), it has to be recognized that the ability of rural communities to engage in non-agricultural activities is often very dependent on good relevant policies and their access to assets. This implies that different types of

livelihoods activities require different combination of financial, human, social, physical and natural capital policies.

Swift (1989) studied determinants of livelihood coping strategies among households living adjacent to Bhadra wildlife sanctuary in India. The results of the study showed that policies and conservation regulation were the main factors determining livelihood coping strategies. Coping strategies aim to cushion household against the vagaries of wildlife conflicts by maintain a minimum level of livelihood flows and by allowing exchange and/or consumption in periods when wildlife conflicts impacts are severe (Shipton, 2010). Household's assets and livelihood diversification therefore have an important consumption, smoothing, risk management and production function. Policy strategies and household assets analysis in rural livelihood context examines the function of different asset types within the context of asset portfolio held by household with different livelihood strategies. Such livelihood strategy policy analysis must progress beyond categorization of all the types of capital and to identify priorities for policy and for other interventions supporting livelihood diversification.

Ellis (2000), Tsi *et al.*, (2008) and Ravitch and Carl (2016), argued that household adopt livelihood policy strategies that try to match expected resource availability with expected demand while allowing for unexpected fall in resource supply or increase in demand. Households do this by making saving in assets that can be converted later to liquid or consumption asset for example holding livestock or by borrowing to gain current resources at expense of later debt repayments and by adjusting consumption patterns. According to Blaikie and Soussan (2000), Orindi *et al.*, (2007) and Shipton (2010), households select and diversify

their productive activities and time their investment in productive assets to even out and buffer resource availability. The dynamic relationships between asset with different functions and various livelihood activities and process in pursuit of household well-being is not intended to imply that there is always a clear distinction between consumption, productive and convertible assets.

On the contrary, Degefa (2005) noted that one asset may fulfill all the desired livelihoods to some extent, but assets differ in relative effectiveness regarding to each function. For example, saving is highly convertible assets with no direct production or consumption benefits (Ellis, 2005). Investment may take many forms and may or may not be associated with production or consumption benefits (Orindi *et al.*, 2007). The productivity of saving in livestock vary with markets, management, the type of livestock etc. (Shipton, 2010). We suggest here that household livelihood diversification policy strengths lie in bringing together in a fairly simple and readily assimilated number of complex components and attributes of livelihoods (Table 2.1).

Table 2.1: Asset Attributes and Component

Main Attribute	Component
Productivity	Normal productivity; Variability, sensitivity to and resilience under different conditions e.g appreciation of asset value
Utility	Normal utility; variability, sensitivity to and resilience under different condition. Probability of each asset being utilized under different condition
Security	Risk of theft, damage, loss of control or access to asset, susceptibility of assets for the need of risk collateral or collateral substitutes
Holding costs	Maintenance of input costs including time, claims etc borne by different households/stakeholders. Also, depreciation in time and use
Life	Expected period over which asset will be held. Asset value profile including season, life cycle change etc
Convertibility	Exchange costs; variability under different conditions Access; variability under different conditions
Complementary	Effects on and of other assets and their functions
Ownership/Control	Private (individual or household); communal, public, gender rights and responsibilities for disposal, acquisition, renting and costs

Source: *Davis and Bezemer, 2004*

2.9.6 Challenges of Human Wildlife Conflicts and Livelihood Diversification

According to Reardon *et al* (2000), struggles over access to and control over natural resources have been the root cause of tension and conflicts. Reardon *et al.*, (2000) examined quality and quantity of natural resources as a factor in human wildlife conflicts. The findings reveal that shrinking natural resources largely attributed to declining economic activities were responsible for tensions between human and wild animals. However, human wildlife conflicts present an increasing challenge on rural livelihoods to communities living adjacent to protected areas in Kenya. The level of human wildlife conflicts, its intensity and magnitude contribute to rural community's livelihood failure by weakening their social and economic fabric (Davis and

Bezemer, 2004). These conflicts are a major threat to rural livelihoods. Conflicts restrict and blocks access to one or more resources assets. When this happens, people try to find other ways of surviving or compensate for the loss of one or by diversifying efforts to secure other livelihood portfolios.

2.10 Theoretical Issues of the Study

In this study, two (2) theoretical frame-works, namely stakeholders' and diversification theories where adopted. This theoretical framework assisted the researcher in contextualizing the research into a scholarly academic outfit.

2.10.1 Stakeholder Theory

Pioneered by Freeman in (1984), this theory suggests that a phenomenon is characterized by its relationships with various groups and individuals who can affect or who are affected by its activities. A legitimate stakeholder is one who has the right and capacity to participate in the process. A stakeholder who is impacted by the decisions of other stakeholders has a right to be involved in order to moderate those impacts, but also must have the resources and skills (capacity) in order to participate (Aadil *et al.*, 2015). As key stakeholders in wildlife conservation areas, local community livelihood need, benefits and other requirements have to be identified, considered and subsequently satisfied.

Anthony (2007) stated that key stakeholders must be satisfied at least minimally, otherwise policies, organizations, communities and even the country may fail in wildlife conservation matters. Treves *et al.*, (2005) argued that return on investment (ROI) for wildlife conservation is

a function of stakeholder' satisfaction. For Treves, *et al.*, (2005) it is stakeholder focus that is the strategic imperative as opposed to consumer focus. Therefore, successful conservation strategies are those that integrate the interests of all stakeholders, rather than maximize the interest of one group within the limitations provided by others. In order for the balance to be achieved and sustainable conservation to be successful, a range of stakeholders (Freeman, 1984, Dickman, 2010) must be involved in the process. However, stakeholders are people, communities, and conservationist among others who hold conversational values (Jackson *et al.*, 2013) which drive their behaviours as individuals, communities and organizations to adhere to those values. Wildlife conservation values vary across groups and cultures as well as across individuals and communities (Woodroffe *et al.*, 2005).

In view of this theory, Kamnarok NR adjacent community interests as key stakeholders in wildlife conservation, management and their involvement can affect their attitudes and support towards the conservation of wildlife and related resources. However, effective and sustainable conservation of wildlife resources with minimal effects of human wildlife conflicts require support and the involvement of multiple stakeholders with diverse and divergent views and values as they assume collective responsibilities for success or failures of any conservation initiatives. Mitigation and solutions to HWCs in Kamnarok NR adjacent areas should therefore involve the collaborative efforts of all the adjacent households and other key stakeholders to avoid creation of imbalance in the mitigation of human wildlife conflicts, however, conservation practices and management of wildlife resources in the study area ought to involve the locals as key stakeholders. Reasons being that wildlife have disenfranchised local livelihoods, lost

traditional rights to land and to the resources on reserve and have never been adequately compensated both for land lost and for livelihood damages.

2.10.2 Livelihood Diversification Theory

The study also adopted Markowitz (1952) livelihood diversification theory in analyzing human wildlife conflicts and livelihood diversification. According to Markowitz (1952), explanations on livelihood diversification theory is based on the understanding of risks in societies. Ellis *et al.*, (2000) elaborated the underlying issues of the livelihood diversification as constituting trade offs between livelihood risks and returns. The livelihood risks in this study comprise of crop and property damages, livestock predation, disease infections, human injuries & deaths, insecurity, fear, disturbances and inconveniences from wildlife. Livelihood returns comprise of material goods, incomes, wealth, food security, good health, well-being, abundance of resources and general prosperity. Integrated in the theory is the idea of desirability of preference for convex combination of choices in which households diversify livelihoods against the prevailing risks. However, according to Wishitemi (2012) human wildlife conflicts present risks to rural livelihoods that need to be managed and mitigated through diversification. Ashley and La Franci (2007) in a study carried out in Zambezi region of Namibia observed that livelihood diversification requires development of new innovative strategies and livelihood skills to be able to learn about and use new environmentally friendly technologies, opportunities and resources to maintain and improve livelihoods.

Ellis and Freeman (2004), argued that human wildlife conflicts are livelihood risks which encourage households to diversify livelihoods into non-farm activities to supplement incomes. Moreover, some scholars have attributed livelihood diversification to prevalence of poverty (Gurr, 2005), while others assert that diversification is synonymous with wealth accumulation and exploration of the available opportunities in order to improve household's welfare and standards of living (O'Connor, 2014). However, available evidence shows that in Kenya, human wildlife conflicts induce life threats and livelihood vulnerabilities to local people in wildlife adjacent areas and in responds, households are forced by such circumstances to develop strategies to cope with the increasing vulnerabilities associated with conflicts through diversification and moving out of on-farm activities. Therefore, livelihood diversification among Kamnarok NR adjacent households is a consequence of wildlife conflicts and as an amelioration effort to the riskiness brought by the conflicts.

2.11 Conceptual Framework

The study conceived diversification of livelihood as a mechanism that Kamnarok NR adjacent communities have consciously adopted to ensure their survival and improve their standards of living as their traditional livelihood components which support their normal livelihoods have been altered by wildlife intrusion. Specifically, alterations had occurred within their livelihood domains whereby wildlife conflicts have triggered chain of events which has led to new transformation of livelihoods (diversification).

The study identified three interlinked matters that constitute the conceptual framework. First is the indicators of human wildlife conflicts, secondly the factors influencing diversification and thirdly are the levels of diversification (Figure 2.1). According to the framework, human wildlife conflict factors are important indicators to use in assessing the level of household's livelihood diversification. Property and crop damages, livestock predation, disease transmissions, human injuries and death are used to measure the level of prevalence and severity of human wildlife conflicts. However, it is important to establish the different human wildlife conflict impacts to the households so as to assess households' responds in terms of livelihood diversification.

The household respond assessment on livelihood diversification included assessing the levels of diversification which ranged from not diversify, slightly diversify to intensively diversify. While diversification is a strategy adopted for countering human wildlife conflict impacts (Home wood *et al.*, 2009b, Salafsky and Wollenberg, 2017) where the consequence of diversification may not result in improved livelihoods nor economic stability (De Sherbinin *et al.*, 2008). Costs to households' systems resulting from additional diversified activities are significant especially on increased time and distances between home and work points. However, different diversified activities have different types of risks which may reduces household livelihood exposures to human wildlife conflict stress.

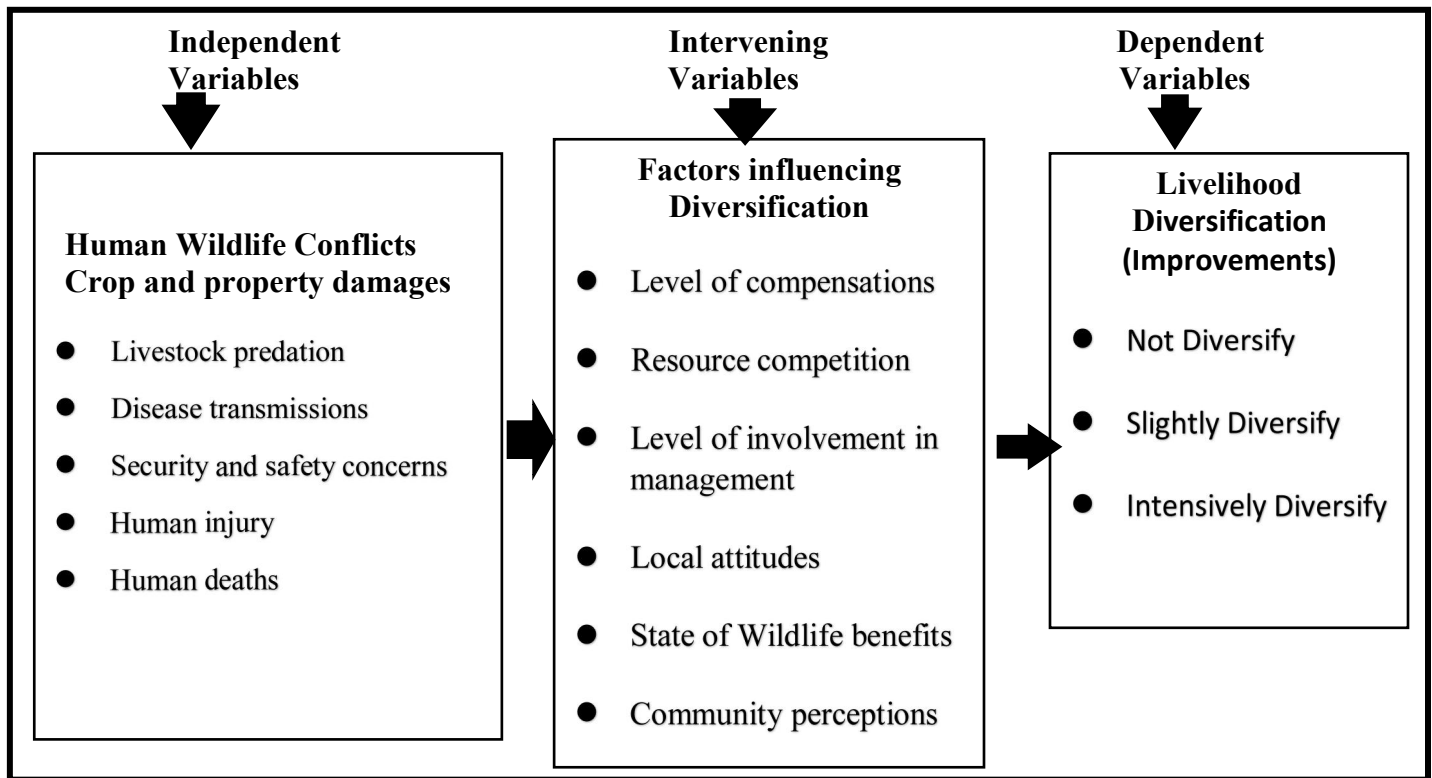


Figure 2.1.1: Conceptual Framework for studying Human Wildlife Conflicts and Livelihood Diversification

Source: *Author, 2017*

The conceptual framework on which this study was anchored is the link between human wildlife conflicts and livelihoods of natural resource dependent communities through their extraction, provisioning, regulating, supporting, cultural and recreational services. The principal premise of the study is that wildlife protected area together with its natural resources provide foundation for livelihoods and human well being. A change in wildlife populations and its' management has consequences for the supply of community socio-economic services and livelihoods improvement. The direct link between human wildlife conflicts and livelihood diversification improvements is illustrated in Figure 2.1. The figure describes the relationship between various types of human wildlife conflicts and their impacts on livelihoods and human well being as well as the principal human activities in and around Kamnarok NR. It also depicts the linkages

between the conflicts, the principal human activities, and the components of human well-being for livelihood diversification.

2.11.1 Research Gaps

The review of literature related to this study established that there are knowledge gaps to be filled. In most of the developing countries such as South Africa, Botswana, Namibia, Kenya, Tanzania and Ethiopia among others where wildlife conservation has taken root, researchers have elaborated the existence of human wildlife conflicts (Wishitemi *et al.*, 2008, Yaro *et al.*, 2010, and Kagiri, 2011), and their findings indicated lack of land use planning, none involvement of local communities in management of wildlife resources, land rights contestation, weak national economic policies on wildlife conservation to limited compensations as a panacea for the experienced human wildlife conflicts. However, most other research studies (Brian, 2006, Abudalgha, 2013, Amaja, 2014 and Kabra, 2015) have focused on the causes and mitigations of the human wildlife conflicts (Appendix II) but overlooked on; i) the relationships between human wildlife conflicts (HWCs) and community livelihood diversification, ii) effects of livelihoods diversification, human intrusion into wildlife protected areas and wildlife management authorities iii) how livelihood diversification affect the functioning of wildlife protected areas and wildlife management institutions iv) the link between conservation and displaced peoples' livelihoods, hence this study was undertaken to bridge the knowledge gaps identified.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methods used in this study. This study involved field-work where questionnaire and focus group discussion (FGD) schedule guide was used in data collection in addition to field observation record sheet. Also, methods of data analysis and the scope of the study are outlined.

3.2 The Study Area

3.2.1 Location

Kamnarok NR was chosen as the area of study due to the presence of the culturally significant Kerio river and Lake Kamnarok and because the area experiences frequent human-wildlife conflicts. Both Kerio river and Lake Kamnarok are part of Kamnarok NR which hosts more than a million crocodiles the 2nd largest concentration point of crocodiles in Africa after Lake Chad. Also the wildlife protected area is a holding point for migratory elephants along the Kerio valley trench between Nasalot National Reserve in the north and Kimwarer salt lick in the south.

Kerio Valley where Kamnarok National Reserve is situated is a loosely defined area of 15,000Km² of mostly arid and semi arid rangelands straddling between Keiyo/Baringo border. Kamnaok NR is a wildlife protected area situated 20^o 4N and 00^o 46N and 35^o 3 and 36^o 2 East (Figure 3.1). An overall rainfall gradient in the valley floor is 500mm p.a with the influence of Kerio river, rugged hills and escarpments on both ends of the valley. Barwesa division is situated within agro- climatic Zone IV and V (Wasonga *et al.*, 2011). The rural areas are dominated by both agro-pastoralists and pastoralists, though increasingly upcoming urban settlements is

attracting considerable migration of people seeking better livelihood options (Baringo County Government, 2014).

The study area is also situated in a highly fragmented but ecologically valuable corridor which includes Kerio river and Lake Kamnarok which serves as important elephant and crocodile habitats (Njogu, 2003). The area is characterized by rugged hills, large, flat, open grassy plains dominated by *Acacia tortilies* trees with relatively few trees and shrubs (Wasonga *et al.*, 2011a) which majorly form the reserve vegetation cover while the Reserve adjacent area vegetation is inform of patches of thorn trees, but also roads, settlement and farm lands are some of the major land uses. Kamnarok National Reserve (87.7Km²) was demarcated within the Kerio Valley communal land area in 1983 and placed under the management of Baringo county council. The reserve boundary is still disputed as the surrounding communities were not consulted in its formation nor those whose land was taken away have been compensated. Administratively the Barwesa Division has three locations namely Kabutie, Lawan and Kerio Kaboske.

Table 3.1: Summary of administrative units by Locations

Location	No. of Sub locations	No. Villages Sampled
Kabutie	3	22
Lawan	4	18
Kerio Kaboske	4	12

Source: *Baringo North Sub County Office at Barwesa centre, 2017*

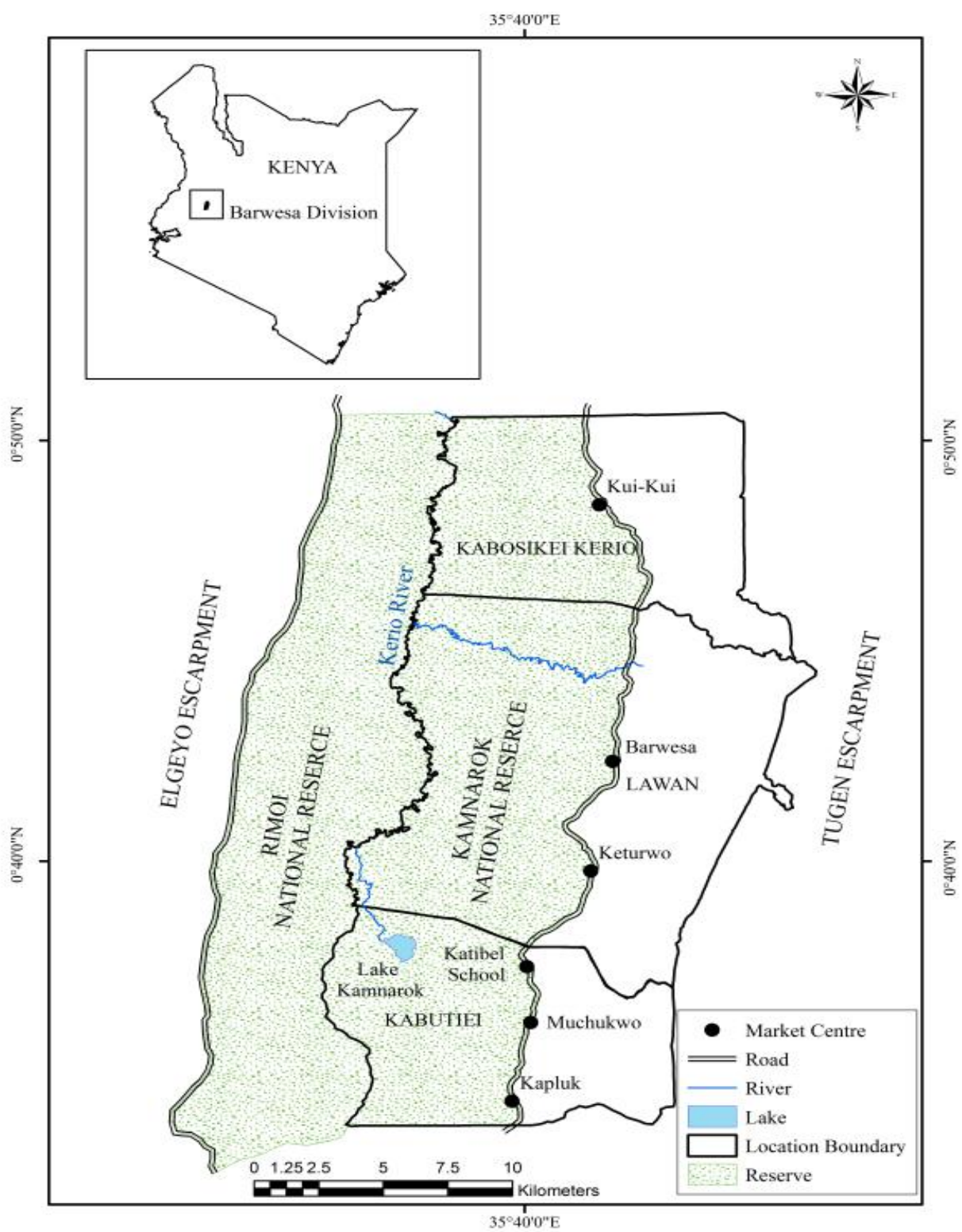


Figure 3.1: Map of the study area

Source: Author, 2017

3.2.2 Population Size and Economic Activities

People of Tugen sub ethnic community predominantly inhabit Barwesa Ward. The population of the area is relatively low by Kenyan standards and the study area has a total population of 22,348 people table 3.2 (KNBS, 2017) with an area of 873.42 km². This means that the average population density of the division is 36 persons per square kilometer and correlates with land potentials (Baringo County Government, 2014). The settlement patterns are dictated by climatic factors, economic and security. Urban centers have higher populations mainly because of the opportunities of business, trading and other associated advantages i.e social amenities.

Table 3.2: Population size and Density

Location	Area in Km ²	2009		2014		2017	
		Popn.	Density	Popn.	Density	Popn.	Density
Kabutie	181.48	6419	38.91	8970	54.37	10072	61.12
Lawan	164.98	4626	25.49	5532	30.48	6349	34.98
Kerio Kaboskei	263.48	332	14.92	4544	17.24	5927	22.50
TOTAL	609.94	14977		19046		22348	

Source: *KNBS, 2017*

The population trend described in the table 3.2 above indicates an average population growth rate of about 2.4% per annum. In all the locations, there is a high concentration of the population in higher altitude areas that are close to Kamnarok National Reserve's periphery and market centers. This is because the area has rich potential for major cash crops in the division and business opportunities. The lower regions along the rivers (Kerio, Kati Mok and Kiboi) are suitable for food crops such as maize, beans, arrow roots, tomatoes, sweet potatoes, cassava,

soya bean, water melons, bananas, Fresh French beans and cow peas. Avocados and mangoes also do extremely well in the area (Barwesa Agricultural Officer, 2017).

Agriculture, livestock and trade are the main livelihood activities with over 72% of the population in the division engaged directly or indirectly with the activities (Little *et al.*, 2008). These three sectors are the highest contributors to household's incomes in the division and therefore contribute to the sustained economic development and poverty reductions. However, unreliable rainfall and other climatic conditions coupled with escalating human wildlife conflicts in the division is frustrating households' sustained economic growth and thus better livelihood sources. In the past, Kamnarok NR natural resources once was not a major driving source of income for many households in the division but currently many families rely on them for their survival (Baringo County Government, 2015).

Households in the division are also engaged in horticultural farming using irrigation water from Kerio, Kati mok and Kiboi rivers. There is also livestock reared for beef and mutton production being the main activity. Livestock reared in the division include poultry, dairy cattle, goats, sheep and camels. Beekeeping is also thriving well as it has been practiced for a very long time (Baringo North Sub county Development Report, 2017). Barwesa division is fairly food secure. Foods have been readily available in the local markets at fair and competitive prices. The national government in collaboration with Baringo County Government initiated strategies to ensure food security through among others provision of farm inputs to resource poor households through the National Accelerated Agricultural Input Access Programme (NAAIAP) and seed subsidy, encouraging traditional food crops, excavation of water pans for micro irrigation,

livestock consumption and for training/field days on crop production and animal husbandry (Baringo County Government, 2015).

3.3 The Biophysical Environment

Understanding how a biophysical environment function is essential to understand how human activities may impact that environment. The living and non-living features of an environment in which an organism lives is called biophysical environment. Therefore this section describes the natural and physical characteristics of Kamnarok NR and its environs that include climate, rainfall, topography, lands and soils.

3.3.1 Climate

The study area is generally characterized by great temperature variation due to the relief dynamics of its air masses. The area experience high annual temperatures of 28⁰C for the last twelve years (GoK records at Salawa Weather Station, 2017). The area also experiences high evapo – transpiration with severe drought which recurs every 8 to 10 years. The most recent drought recurrence were in the following years; 1984, 1995, 2000, 2009 and 2017 (GoK, 2018). These drought incidences can be explained as one of the drivers contributing to the drying up of Lake Kamnarok as a result of high evapo-transpiration. Moreover, the observable climatic changes indicate that the drought has become more frequent and intense hence increased rate of desertification. Also the climatic condition of the study area varies greatly because of the altitude that range from 1000m asl in the Kerio valley floor basin to 2200m asl at the peak of Tugen escarpment (UNEP, 2009). Climate is characterized by harsh conditions of a typical semi – arid lands.

3.3.2 Rainfall

The study area lies near the equator where the Inter Tropical Convergence Zone (ITCZ) passes twice in a year (IPCC, 2001) and the area receives bi-modal type of rainfall occurring between March –May and October – December. Since the area is surrounded by escarpments and mountain ranges both the eastern and western sides, much of the rainfall is relief and conventional averaging 600 – 750 mm per annum. Rainfall pattern of the study area is bi-modal with long rains in March – July while short rains are received between the months of September to early December (Wasonga *et al.*, 2011). The rainfall distribution generally is about 30% reliable with high variability in normal circumstances. The rainfall is often erratic unevenly spread and generally insufficient for agricultural production. Though the rainfall in the Kerio floor is generally low, sometimes rainfall intensities are very high and induce excessive soil erosion. The average annual temperature is 28⁰ Celsius, but the period between January and March is the hottest. This climatic variability significantly affects settlement patterns and livelihood activities.

3.3.3 Topography

The topography of the area constitute part of the flat Kerio valley and has lots of contrasts with varied geographical features which reveal differences in heights between hills, valleys and ridges on the land surface. Barwesa division is characterized by four topographic features namely; river valleys and plains, Tugen Hills, rivers, lakes and volcanic rocks. Rift Valley including the floor of Kerio Valley was formed as a result of Tectonic and Volcanic distribution. The Tectonic and volcanic rock remnants were aligned towards Lake Kamnarok NR and Kerio river which explains why Lake Kamnarok cannot sustain a lot of water. The relief inside Kamnarok Reserve

is a gentle slope in an east – west direction towards Kerio river. The terrain of the area is cut by numerous laggas and dry stream beds broken by a few rugged hills with average temperatures ranging from 28⁰ – 34⁰ degrees Celsius at the valley floor. Tugen Hills together with the escarpment are an important source of seasonal rivers draining across Kamnarok National Reserve.

3.3.4 Drainage and Hydrology

The drainage pattern of the study area appears to be determined by fault lines within the Great Rift Valley. Lake Kamnarok which is situated inside the NR is an ox-bow lake that was formed as a result of Kerio river meanders. The lake is a wet land of significant importance. It is a wildlife habitat providing water for the diversity of wildlife and a breeding ground for thousands of crocodiles and migratory birds. The lake also provide a natural environment for various flora and fauna to flourish. The lake is fed by a number of tributaries including Rarau stream, rivers Kerio, Cheplogoi, Kibunder, Kati Mok and Terrenin constitute surface flow resource of the lake. These hydrological characteristics on a landscape under intense vegetal removal is the cause of increasing erosions and sedimentation of the lake. The rugged nature of the ridges dissected by numerous drainage lines provides spectacular panoramic views over the Kerio Valley floor and Kerio River. The Kerio River and its tributaries Torok falls and Kessup rivers on the western Elgeyo escarpment form the major drainage of the area.

3.3.5 Landscapes, Geology and Soils

The Kerio Valley has been formed by several phases of several intensive volcanic eruptions. Most of the extensive rocks include basalts, phonolite, trachylespsyroclassic rocks and alluvial

deposits. The rock formation in Kerio valley can be divided into basement systems (metamorphic), tertiary volcanic (extensive igneous) and Quaternary alluvial deposits (sediments). Most of the coarse debris in these sediments is basement materials derived from the Tugen hills and escarpment. They were derived from pre-existing sedimentary rocks through mineralogical, chemical and structural processes due to changes in temperature, pressure and changes in chemical environment in the Earth crust (Koskey, 2013).

The soils of the study area range from acidic to slightly alkaline and are mainly clay loam with alluvial deposits from tertiary or Quaternary volcanic and pyroclastic rock sediments that have been weathered and eroded from upland areas of Tugen and Elgeyo escarpments. Both the rugged hills in the east were formed from granite and volcanic rocks which are part of Rift Valley metamorphic complex (Steiner and Osterman, 2008). No free flowing water exists in the area in the form of permanent rivers, but natural water is restricted to the permanent springs and Kerio, Kati mok and Kiboi rivers. Ephemeral pools of water form occasionally after heavy down pours in the rugged hills. While the soils of the study area are generally fertile, high evapotranspiration rates and low variable rainfall create water scarcities that limit intensive agricultural use (Campbell *et al.*, 2003) and as a consequence some farmers are forced to provide water for domestic livestock via artificial water troughs.

3.3.6 Flora and Fauna

The diverse vegetation types of the study area are closely associated with physiographic, geology, soils and moisture regime. These are zones along topographic gradient which more or less run parallel to the course of Kerio River (Wasonga *et al.*, 2011). The Kamnarok National Reserve is

situated in a highly fragmented but ecologically valuable corridor which includes Kerio River and Lake Kamnarok which serve as an important elephant and crocodile habitats (Campbell *et al.*, 2003). The wildlife habitat is characterized not only by reserve vegetation cover and patches of thorn trees, but also roads, settlement and farm lands. The vegetation of the area is dominated by grasses, shrubs and acacia species that are adapted to withstand periods of long drought. Kerio valley rangeland consists of variety of habitats including dense and open shrub land, bush land and woodland. The dominant vegetation on Lake Kamnarok riverine habitat is Naivasha thorn (*Acacia xanthopholea*) while *Acacia tortillis* is found in the drier areas.

The Kerio River and Lake Kamnarok are host to large concentrations of the Nile crocodile. Other reptile species in the area include the monitor lizard, tortoise, and snakes. The water bodies in Kamnarok National Reserve and entire Kerio Valley Conservation Area (KVCA) are host to a number of fish species. Of economic importance include the tilapia fish and the mud fish. Over 300 bird species have been recorded in the Lower Kerio valley Area (Jackson *et al.*, 2018). The riverine vegetation along Kerio River have the greatest concentrations of birds. Bird species of the valley of local importance (on account of their rarity) include the Sombre Bulbul (*Andropadus importunus*) in the thicket habitat. Another species characteristic of thickets is the White-Browed scrub robin (*Erythropygia leucophrys*) (Koskey, 2013). Over 25 large mammal species have been recorded in the area which include Elephants, Buffalo, Hippo, Zebra, Kudu, Eland, Impala, Water Buck, Bush buck, Hyenas, Warthog, Bush big, Leopard, Common Duiker and Jackals. Other mammals found in the area include Monkeys, Baboons, Caracals and Aardvark.

3.3.7 Vegetation Cover

The vegetation cover within the study area is acacia woodland along major rivers, grasslands and shrub lands (Wasonga *et al.*, 2011). The Barwesa division has large chunks of forest cover especially across the Kerio Valley and Tugen Hills. The large coverage of forest cover can be categorized into plantations, indigenous, grassland and bush land. In the observation of County Integrated Development Plans (CIDPs), the county ensures that appropriate activities are put in place to manage harsh climate and their effects on the local community livelihood activities in Barwesa division by utilizing the county available resources in a sustainable manner without affecting the fragile existing ecosystems (Baringo county Government, 2014).

3.4 Livelihood Systems

A livelihood is made up of the capabilities, activities, and assets (including both material and social resource) that contribute to a means of living. According to Chambers and Conway (1992) livelihood comprises the capabilities, the assets (natural, physical, human, financial and social), the activities and the accesses to them that together determine the living gained by the individual members of a households. Pastoralism especially in wildlife rangelands contribute to livelihoods in a range of ways; directly as food as a source of income and through other social benefits, such as reduced vulnerability to poverty. The local people of the study area participate primarily in the traditional resource based livelihood pursuits of subsistence pastoralism, fishing and farming. Commercialization of these commodities are in small scale and serves local markets at the most (Constanza *et al.*, 2007 and Togocho *et al.*, 2018). In part, this can be linked to the scale of production but also in part to the prevalence of human wildlife conflicts and the attitudinal behaviours of households and the entire community at large. Pressures of diminishing resources

compounded by unresolved land ownership and broader societal changes are changing these perspectives which create challenges for the local people and thus the diversification of livelihoods.

Although pastoralism is deemed to be the most preferred form of occupation in Kamnarok NR adjacent areas, other forms of occupations as source of livelihood do exist such employment (both formal and informal), farming and participation in business activities. Empirical evidence from Kamnarok NR adjacent area indicate that households do indeed engage in multiple activities and rely on diversified income portfolios. Furthermore, studies from Kerio Valley has shown that most households are involved in agricultural activities such as livestock, crop or fish production as their main source of livelihood and also engage in other income generating activities to augment their main source of income (Togoch *et al.*, 2020). Very few of them generate all their income from only one source, hold all their wealth in the form of a single asset, or use their resources in just one activity (De Janvry *et al.*, 1991 and Togoch *et al.*, 2018).

3.5 Philosophical Approach and Research Design

3.5.1 Philosophical Approach

A research philosophy is a belief about the way in which phenomena should be analyzed using data that is gathered and interpreted. This study was philosophically and methodically guided by realism in investigating human wildlife conflicts on livelihood diversification among communities living adjacent to wildlife conservation area. We believe that society needs to develop environmental ethics which constraint us from causing environmental degradation as human beings are the measure of all things and that the focus on wildlife conservation, environmental protection should be to protect ourselves and our children livelihoods. However,

the focus on wildlife management should extend beyond conserving wildlife for future generations.

3.5.2 Research Design

Based on the study philosophy discussed above, this study adopted a cross sectional descriptive survey design. Zickmund (2003) noted that surveys provide quick and accurate means of assessing information. According to Fraenkel and Wallen (2000), this design enables the researcher to collect information from a group of people in order to describe some aspect or characteristics such as abilities, opinions, attitude, beliefs and/or knowledge of the population which the group is part of. This design was justified because the conflicts in the area extend geographically across Barwesa division and therefore the, the design helped the study in coming up with the findings about the population by studying a representative of the population.

Ogula (2005) described research design as a plan, structure and strategy of investigation to obtain answers to research questions and control variance. Cross sectional survey design as a method of collecting data allows the researcher to describe a unit in details, in context and holistically. This was considered appropriate for the research because there was an in-depth investigation of the human wildlife conflicts and its influence on livelihood practices in the study area. Also a survey was used to gain the insight into the occurrence of conflicts as a way of obtaining basic information. The area prone to human wildlife conflict was done and estimated to stretch to about one hundred and twenty seven (127 Kms) North of Kamnarok NR which is the epic-centre of human wildlife conflict and had over 1588 households. Kerlinger (1992) argued for the use of surveys because it provide a great deal of information which is accurate.

Based on 2009 population and housing census, the study area population was estimated at 18000 people residing in 1588 households (KNBS, 2015). The household sampled were those spread in the conflict prone areas which included households located in Kabutie, Lawan and Kerio Kaboskei administrative locations.

3.6 Types of Data

The research used secondary and primary data. Secondary data was sourced from digital libraries, internet search engines, project reports from aid agencies, journal articles and books while observation and structured questionnaire was used to collect primary data.

3.7 Documentary Review and Analysis

Documentary analysis involved reviewing the contents of targeted documents with the aim of adding some relevant secondary data (Oso and Onen, 2005). Documentary review was used in collecting secondary data. This type of data was collected from various published and unpublished government, NGO's, CBO's documents such as policies, plans and strategies, assessments, implementation, monitoring and evaluation reports, county medium term expenditure frame works (CMTEF); social development goals (SDGs) implementation reports and the national strategy for growth and reduction of poverty (NSGRP) reports among others. Documentary review was instrumental in collecting information on human wildlife conflicts, climatic data (rainfall), production trends of major crops produced, expenditures facilitating local community rebuilt conflict resolutions and mitigation strategies, compensations and other relevant socio-economic and institutional data. Vegetation cover changes from GIS images and

information on wildlife demographics from Kenya Wildlife Service and human population migration to the marginal range lands of Barwesa division were also reviewed.

3.8 Target Population

Ogula (2005) stated that population is any group of items, objects, people or institutions which have similar feature of characteristics. This study targeted heads of households living adjacent to Kamnarok National Reserves, which is estimated to be 3,588 people (Baringo CIDP, 2013 - 2017, KNBS, 2015).

3.9 Sampling Design and Techniques

The study used both probability and non-probability sampling techniques. The defining property of probability sampling according to Singleton and Strants (2005) is that every possible combination of cases has an equal chance of being included in the sample. The survey was conducted through direct interviews conducted in May 2017 through January 2018. Direct interviews were preferred since clarifications could be made as issues arose. This yielded satisfying responses. In addition, only household respondents who had been affected by human wildlife conflicts and had diversified livelihood portfolios were allowed to answer the questionnaire. This reduced getting biased results from the respondents who had not fallen victim to human wildlife conflicts. The study further sampled and interviewed heads of households living in and adjacent to Kamnarok NR through systematic random sampling. In the initial stage Kamnarok National Reserve was purposely selected. This was done in order to capture differences in human wildlife conflict dynamics, livelihood diversification and responses to the conflicts. The sampling frame consisted of pastoralist and agro pastoralist heads of households

living adjacent to Kamnarok National Reserve. The reserve extends within three locations of Kabutiei, Lawan and Kaboske Kerio in Barwessa division of Baringo County.

3.10 Sample Size Determination

A sample according to Mugenda and Mugenda (2003) is a smaller group of respondents or sub group obtained from the accessible population. Kothari (2014) defined a sample as a smaller group of objects which are obtained from accessing the main population. These sub groupings of respondents was cautiously categorized in order to obtain a representative of the entire population with desired features. Therefore, the selected respondents was believed to represent the large population of Barwesa division.

As the study population was big (1588 households) only a representative sample of households was included in the study. It should be noted that either the household head or an elder person found at the household during the survey was interviewed. An elder person was defined as the any older person found in a household. In selecting the number of respondents for this study the cost and time for research enumeration was considered. There are several criteria for selecting sample size in general, but for this study the formula below as provided by Yamane (1967) was used to determine the sample size:

$$n = \frac{N}{1 + N(e^2)}$$

Where:-

n = required responses (Sample size)

N= Sampling Frame (No. of households)

e² = The precession level (5% for this study. Kerlinger, 1992)

Based on the above formula, the sample size for this study was 384 households from the three locations as shown below (table 3.1).

$$n = \frac{1588}{1 + 1588 * 0.005^2} = 384 \text{ household repondents}$$

3.10.1 Determination of sample size

The study used the 2009 population census figures for Barwesa Ward as a basis for sampling taking into account the 2.25% annual population growth rate for the Baringo County. The target population for the study comprised all households found in Barwesa division. According to the 2009 population census, the total number of households in the division was 1588. In this case a total of 1588 household formed the target population for the study. The study expected that area chiefs and their assistants to be in possession of lists of households residing in their areas of jurisdiction.

Following the theory for sampling techniques by De Vaus (2002) a sample of 3 study locations was drawn purposely from a total of 6 locations (50% sampling intensity) within Barwesa Ward considering that these are the locations in which Kamnarok NR extends into (Table 3.3).

Table 3.3: Sample Size Distribution

Kabutiei	876	147
Lawan	420	120
Kerio Kaboske	292	117

Source: **Author, 2017**

3.10.2 Pilot Survey

Due to the fact that the survey to be conducted was large and results were important in determining livelihoods and household productivity and also to assess the validity and reliability of the questionnaires for use in the research, a pilot survey was carried in adjacent location of the study area (Kapluk location, Kaptara village) prior to the actual survey. This was also done to test whether the research assistants and respondents could understand the questions. A convenience sample of 22 household heads was taken based on their availability and willingness to participate in the pilot study.

3.11. Data Collection Instruments

Different data collection procedures were utilized in the collection of both primary and secondary data relevant to the study and therefore, the following data collection instruments were employed.

3.11.1 Questionnaire

Questionnaires are more practical method of data collection especially the open-ended design which also contributes a large amount of data to the study. The household questionnaires were conducted in three locations (Kabutie, Lawan and Kerio Kaboske) within which Kamnarok NR reserve spreads over. A sample of 384 households were systematically selected (Table 3.3) mainly those who had diversified livelihoods and those who had been affected by human wildlife conflicts. Households interview data were collected with the assistance of four trained research assistants. Questionnaires (Appendix 1) not only helped in determining the level of human wildlife conflicts but also indicated whether this mitigation intervention put in place has been

effective when used in managing human wildlife conflicts. The kind of data collected included characteristics of households, household risks, their strategies, livelihood types, types of human wildlife conflicts and coping strategies. Key informant interviewed comprised of KWS officers, county game wardens, and NGOs staff in the study area, local leaders and government officials (chiefs, agricultural, veterinary and forest officers) who were purposely identified and selected for the interview.

3.11.2 Focus Group Discussion

This method was intended to collect information on challenges of human wildlife conflicts and related mitigation strategies. However, it should be noted here that in order to facilitate the process of FGD among different groups as mentioned above, a guide with series of open ended questions was developed and consequently used to guide the discussion. In this case, the questions in the guide for FGD were designed based on issues stipulated in the conflict vulnerability and capacity analysis (CVCA) and community based risk screening tool-adaptations to HWC and livelihoods (CRISTAL) as a standardized tools among others for analyzing livelihood diversification issues (Sterrett, 2011).

Villages in in Barwesa Division are far spread and few were easily accessible by motor bike but a majority are accessible by foot. Six Focus Group Discussions were held with the villagers from Muchukwa, Turutur, Katibel Konoo, Kaptiony, and Chebara villages. The FGDs were made successful by use of a guiding schedule and also the discussions were narrative-like where the villagers were asked to narrate their experiences with wildlife and their daily livelihood undertakings. Questions by the moderator (the researcher) were structured (Appendix ii).

The number of participants in a FGD is very crucial. Stewart, Shamdasani and Stewartz (1990) and Gill *et al.*, (2008) suggest that it is better to slightly over-recruit for a focus group and potentially manage a slightly larger group, than under-recruit and risk having to cancel the session or having an unsatisfactory discussion. In this study FGDs were conducted in parallel with the household interviews where each FGD had an average of 12 -22 participants all of whom were involved in the Discussion. The information gathered from the FGD was also used to either verify or validate any other information that may not have been clear. Questionnaires are more practical method of data collection especially the open-ended design which also contributes a large amount of data to the study. Questionnaires not only helped in determining the level of human wildlife conflicts but also indicated the effective mitigation that have been used in managing human wildlife conflicts. Heads of households were purposely selected for interview by four research assistants who were continuously provided with assistance whenever an issue needed to be clarified. The research assistants were provided with training on how to fill the questionnaires and how to approach the sensitive question on sources of income and cattle rustling.

3.11.3 Key Informants

Purposive sampling was used to select key informants for interviewing. Key informants were selected from various bodies and sectors including wildlife conservationist, county government officials, NGO's, CBO's representatives, ranchers and farmers who had varied educational background and experiences in different fields. Discussions were carried out by use of structured questionnaire and checklist. Key informants enabled the researcher to elicit and document authentic information which was not possible to generate during the interview with the selected

respondents. Also key informant interviews were aimed at supplementing information collected from households. According to Kothari (2004) key informant interviews help to recognize the views and perspectives involved or responsible in facilitating local community adaptations and mitigation strategies to human wildlife conflicts. Again the information gathered from the Key respondents was used to verify and validate other information that may not have been clear. (For example the different livelihood sources).

Key informant interviews were conducted in which interview structure and specific questions were tailored according to the expertise of the informant. Each of these interviews took approximately 45 minutes to one hour and focused generally on the informant's knowledge and opinions of human wildlife conflicts relations in Kamnarok NR as well as the broader Kerio Valley ecosystem. Key informants were asked questions relating to regional wildlife populations as well as the nature and frequency of their interactions with nearby human communities. Conversely, Barwesa Health Centre practitioners were asked to comment on the main health and well-being issues faced by village residents as well as wildlife impacts on them.

3.11.4 Field Observation

This entails the systematic noting and recording of events, behaviors and objects and also organisms in the social setting chosen for the study (Marshall and Rossman, 2006). It is direct since it enables researchers to study behavior as it occurs therefore firsthand data. Observation can be used in situations where people are unwilling or unable to express themselves verbally. Observation by researcher was utilized as a way of collecting data from the field. Observation, and in particular non participant observation as a method of data collection was used to collect

primary data in the study area. Data collected with this method were those related to observable human wildlife conflicts and livelihood practices such as conservation efforts, land uses and effects of drought (crop failure) among others. The information collected through observation was systematically documented in form of text. At its core, this method was used to complement the information by other data collection methods such as interviews and FGD.

Some of the phenomenon that was observed included the state of conditions of farms, fences, incidences of conflicts, crop destruction by wildlife, wildlife presence in the study area among other aspects of human wildlife conflicts prevailing in the study area. Also responses from the structured questionnaires was supplemented with field observations on various aspects of the livelihood diversification patterns and strategies, prevailing land uses, resource use, wildlife movement areas, community perception and attitude towards wildlife, wildlife benefits and associated conflicts. Of particular importance of observation as a data collection method, participant observation allowed the researcher to gain important insights regarding the nature of interactions between the local community and Baringo County Government policy makers and the Kenya Wildlife Service (KWS) regarding the management of Kamnarok NR and land dispute.

3.12 Validity and Reliability of Research Instruments

According to Saunders *et al.* (2007) validity is the extent to which data collection method accurately measure what they are intended to measure. It indicates the degree to which an instrument measures the construct under investigation (Gall. *et al.*, 2003). Saunders *et al.* (2007) stresses that the questions have to be understood in the way that was the purpose from the

researcher, it has to be answered in the way that was thought from the researcher and the answer must be interpreted by the researcher in the way intended by the respondent.

3.12.1 Validity

In order to enhance the reliability of the research instruments (questionnaire, interview schedule and discussion guide) a pilot study was undertaken. The piloted instruments were edited and refined using results of the pilot study and submitted to three researcher assistants for validation and to assess the reliance of the content. The researcher assistants were specialists in the fields of social sciences. The corrected instruments were then polished and used for data collection during the actual study. Besides, a combination of data collection techniques, which included interviews, questionnaires and focus group discussions, not only exhausted all the aspects under study but also provided an opportunity to assess the validity of information gathered by examining data relating to the same theme from different techniques used that is, data triangulation. Three research assistants were part of this activity and participated in the review of the questionnaire.

3.12.2 Reliability

The study's reliability as proposed by Greswell (2009) was realized by checking the transcripts to ensure they did not have mistakes during transcription. The study used a broad sample of content rather than a narrow one; it emphasized on important materials and also wrote questions to measure appropriate skills. These three principals were addressed when writing the survey instrument items. The researcher constituted a group of three experts in the field of livelihoods and human wildlife conflict who provided input and suggestive feedback on the survey items. Equivalent forms were used to determine reliability of the instrument (Questionnaires).

Equivalent forms were used to determine reliability of the instruments. Two parallel forms were given for a test to the same respondents and the SPSS scores were correlated and found to be reliable.

Likert scale questionnaire was used to collect qualitative data in order to gain an understanding on the levels of human wildlife conflicts and the significance of livelihood diversification. Furthermore, Cronbach's internal consistency reliability was used to assess the reliability of item information questions under consideration. McIver and Carmines (1981) described Cronbach alpha reliability test as a technique for assessment of quantitative data collected by use of likert scale tool were Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer the Cronbach's alpha coefficient to 1.0, the greater the internal consistency of the items in the scale and thus the reliability of the data (Carmines and Zeller, 1979).

3.13 Field Data Collection

In the field, the study used both probability and non-probability sampling techniques. The definition of probability sampling according to Singleton and Strants (2005) is that every possible combination of case has an equal chance of being included in the sample. Following acquisition of the number of households in each sub locations from area chiefs and assistant chiefs, pure random sampling was used to identify sample for household surveys. On the other hand, purposive sampling was used to determine a sample of key informants, FGD members and institutional survey. This non-probability sampling technique allows the researcher to rely on his expertise judgment to determine representative units. This study engaged a total of 384 households for the survey (Table 3.1).

The study population was divided into strata based on the livelihood systems typical of the community in the study area. These are pure pastoralists, agro-pastoralists and those in the urban centres. The basis of classification was that the three groupings could be impacted differently by human wildlife conflicts and having different livelihood diversification as coping mechanisms. Therefore, stratified random sampling technique was used during data collection. Each of the three locations was regarded as a stratum. The household questionnaire for households were administered randomly using simple random sampling.

3.14 Data Analysis

Qualitative and quantitative data analysis techniques were used to analyze collected data. Details of these are given in subsequent sections.

3.14.1 Data Processing

Data collected using various data collection methods were processed prior to analysis. Data processing especially for quantitative data involved checking for errors mainly through editing, cleaning with the purpose of looking for completeness of responses, removing logical inconsistencies and combining similar responses. This process was followed by categorization of data, coding and data entry in the computer programme (SPSS version 21.0) and verification which aimed at removing entry errors.

3.14.2 Qualitative Data Analysis

Qualitative data analysis was used to determine the difference between respondent's willingness to diversify livelihood and the effect of human wildlife conflict on socio-economic welfare of households. The analysis was done by use of content analysis approach. According to Kothari

(2004), content analysis consisted of analyzing the content of documentary and verbal materials. In this regard, the data obtained through documentary review and FGD were both analyzed by using content analysis. The data analyzed using qualitative approach includes information on the status of HWC, household expenditures on HWC mitigation and challenges affecting household efforts in dealing with HWC challenges.

Data collected using household questionnaire was entered in statistical package for social science (SPSS) version 21.0 (SPSS incl. Chicago, USA). Data was later analyzed using descriptive and inferential statistics which involved production and interpretations of frequencies, tables, graphs and pie charts that describe data results. In addition, both descriptive and analytic cross tabulations were used to describe or provide an explanation that requires a combination of information on two or more variables were also employed. Whereas descriptive cross tabulation aimed at describing the problem under study, analytic cross tabulation involves comparing groups in order to determine differences and relationship between variable (Varkevisser *et al.*, 2003). With an aid of logit regression model, Pearson product-moment (PPM) correlation was used to test the strength of relationship between livelihoods diversification with number of cases of human wildlife conflicts.

3.14.3 Quantitative Data Analysis

Qualitative data analysis means the organization of information to provide structure and elicit meaning as qualitative data is an interactive process. According to Lucey (1996), inferential statistics include chi-Square, Pearson product moment correlation and regression. In this study, Chi-squared (X^2) inferential statistics was used to test the difference in data variable,,Pearson

product moment correlation (PPMC) (p) was tested on the strength between variables while multinominal regression (r) was for the assessment of association between variables.

3.15 Logistical and Ethical Considerations

Various ethical issues were observed in the course of this study. First, a letter of introduction was obtained from graduate school, University of Nairobi (see *Appendix XII*) which the researcher used to seek permission from National Commission for Science, Technology and Innovations (NACOSTI) copy of research permit annexed (*Appendix XIII*) to conduct the study survey. These approvals were used to seek administrative authorization from Baringo County Government (Department of Education) to collect data for the study. Secondly, the researcher adhered to individual respondent's privacy, voluntary participation and other requisite human rights and principles. Information collected was treated with confidentiality and used for the purpose of this study. Third, the researcher provided all participants in the study with clear information on the nature and the purpose of the research before embarking on data collection and lastly, the researcher upheld gender equity issues during the selection of the study sample by ensuring that there was gender representation.

CHAPTER FOUR: HUMAN WILDLIFE CONFLICT AND RESOURCE USE IN KAMNAROK NATIONAL RESERVE

4.1 Introduction

Results of this study are presented and discussed in this chapter. Relevant data in relation to research objectives and study variables are analyzed, presented and interpret using methods outlined in chapter three. The analysis is accompanied by comprehensive discussion on the interpretation on the findings.

4.1.1 Data Reliability Statistic

Cronbach's alpha is designed as a measure of internal consistency of items in a questionnaire and therefore data reliability test degree of freedom from random errors. Cronbach's alpha test was performed to check the reliability of questions or items. Table 4.1 display result obtained. The Cronbach's alpha test was performed and it resulted in an overall score of 0.931 indicating a higher reliability and internal consistency of the items in the questionnaire. The test indicated temporal stability and existence of average correlation among all the variables used in the analysis. Cronbach's alpha coefficient values range from 0 to 1 with higher values indicating greater reliability (Briggs and Check, 1987). The total number of questions in the questionnaire was 174 including 64 testing variables on LIKERT scale variables hence "N" of the items in the cronbach's alpha was 174. The convergence of items on 174 different factors showed an evidence of validity of items.

Table 4.1: Data Reliability

Reliable case	No. of Items	%
Valid case	360	87.6
Excluded	51	12.4
Total	411	100.0
Cronbach' s coefficient 0.931		“N” of items 174

Source: *Field survey, 2017*

4.1.2 Returned Responses

Following a pilot study testing survey of the questionnaire, the main data collection phase resulted in 360 complete and usable questionnaires out of 384 being available for analysis. This represented an overall response rate of 93.7% with Lawan, Kabutie and Kerio Kaboske locations' responses as 29.7%, 35.4% and 28.6% respectively (Table 4.2).

Table 4.2: Filled Returned Responses

Location	Expected responses	Responses	%
Lawan	120	114	29.7
Kabutie	147	136	35.4
Kerio Kaboske	117	110	28.6
Total	384	360	93.7

Source: *Field Survey, 2017*

The usable questionnaires were coded and used for data analysis. In the subsequent sections, a description of the sample is offered, followed by a detailed analysis of the human wildlife conflicts and livelihood diversification.

4.1.3 Households Socio - Demographic Characteristics

The sample showed a generally uneven division between male and female respondents. Female respondents accounted for 23.3% while male respondents accounted for 76.7%. Of the sampled,

34.7% of the respondents were married, 46.9% were singles, and separated/divorced accounted for 13.3% and 5.0% could not disclose their marital status. Most of the respondents (21.6%) were aged between 31-40 years, 19.2% aged between 51-59 years, 18.3% were aged between 21-29 years while 20.0% represented those aged above 60 years. 33.9% of the sampled respondents had primary education, followed by 30.0% who had secondary education while 7.5% of the respondents had acquired tertiary education and 5.8% had university level of education. Livestock keeping was the main occupation of the sampled respondents at 28.3%, followed by mixed farming 23.3%. Informal employment occupation represented 20.0% while 14.4% of the respondents were self employed. The rest of the responses are shown in (Table 4.3).

Table 4.3: Household Socio – Demographic Characteristics

Variable	Frequency	%
Age in years		
Below 20 yrs	27	7.5%
21-29	66	18.3%
30-39	78	21.6%
40-49	69	19.2%
50-59	48	13.3%
Above 60	72	20.0%
Gender		
Male	276	76.7%
Female	84	23.3%
Marital Status		
Married	125	34.7%
Single	169	46.9%
Divorced	48	13.3%
Undisclosed	18	5.0%

Education		
None	108	30.0%
Adult literacy	0	0.0%
Primary	122	33.9%
Secondary	82	22.8%
Tertiary	27	7.5%
University	21	5.8%
Occupation		
Informal employment	72	20.0%
Livestock farming	102	28.3%
Formal employment	24	6.4%
mixed farming	84	23.3%
Self employed	52	14.4%
Agriculture farming	18	5.0%
Others	08	2.2%
Ethnic sub grouping		
Tugen	194	53.9%
Marakwet	132	36.7%
Others	34	9.4%

Source: *Field Survey, 2017*

4.1.3.1 Age category of Respondents

The respondent ages were grouped into six categories. The results in Table 4.3 shows that 18.3% of the respondents were aged between 21-29 years. Respondents below 20 years was 15.5% and those in the age bracket 30-39 years was 21.6%, implying that majority of the human wildlife conflict victims are youths and young persons. Respondents below 20 years, more were from Kabutie location representing 5.8%, Kerio Kaboske had 8.8% of the respondents between 30-39 years, while Kabutie location had the most respondents between the ages of 40-49 and those

above 60 years representing 9.4% and 5.0% respectively. A significant ($X^2 = 42.01$, $df=2$, $p<0.05$) majority (68%) of the community aged members had fallen victims of human wildlife conflicts and therefore their inclusion and engagement in this study was holistic (Lederach, 1997). The age response for entire study is presented in Table 4.4. Tugen sub ethnic community were the highest respondents representing 53.9%, followed by Marakwet sub ethnic community at 35.7% and other ethnic tribes represented 9.4%. Kabutie location had the highest number of respondents represented by 42.2% followed by Lawan location and Kerio Kaboske at 35.0% and 22.8% respectively (Table 4.4).

Table 4.4: Household Distribution by Age

		Locations			Total
		Lawan	Kabutie	Kerio Kaboske	
Age group of the Respondents	below 20 yrs	18 5.0%	21 5.8%	17 4.7%	56 15.5%
	21-29	12 3.3%	28 6.3%	32 8.8%	72 20.0%
	30-39	22 6.1%	24 6.7%	21 5.8%	67 18.6%
	40-49	26 7.2%	34 9.4%	12 3.3%	72 20.0%
	50-59	26 7.2%	11 3.1%	14 3.9%	51 14.2%
	Above 60yrs	10 2.8%	18 5.0%	14 3.9%	42 11.7%
	Total	114 29.4%	136 41.1%	110 27.8%	360 100.0%
	Sub-Ethnic distribution	Tugens	74 20.6%	74 20.6%	50 13.9%
Marakwets		42 11.7%	69 19.5%	21 5.8%	132 36.7%
Others		10 2.8%	13 3.6%	11 3.1%	34 9.4%
Total		126 35.0%	152 42.2%	82 22.8%	360 100.0%

Source: *Field Survey, 2017*

4.1.3.2 Household Gender Distribution

Several sociological perspectives, including social distance and social acquaintance theories suggest that survey responses to threatening or sensitive questions may be influenced by interviewer gender (Johnson and Moore, 1993). Indeed interviewer characteristics have long been acknowledged to be a potential source of non sampling error in social survey including race, gender, age, experience, technical competencies and rapport with respondents (Sudman and Bradburn, 1974). In this study, there was no sensitive nor threatening questions that may have been affected by gender of the respondents. Moreover, the sample was collected randomly and the demographic characteristics of the population were expected to be normal in the sense that the population is made up of mostly people of same community living in similar environment.

The sample analysis showed that the respondents who participated in the study were 276 males and 84 females. There was a significant difference between the gender of household respondents in the study ($X^2=12.592$, $df=3$, $P=0.001$). Gender respondent distribution is as shown in (Figure 4.1), however, the study did not target particular gender as either the mother or father was interviewed in the selected household.

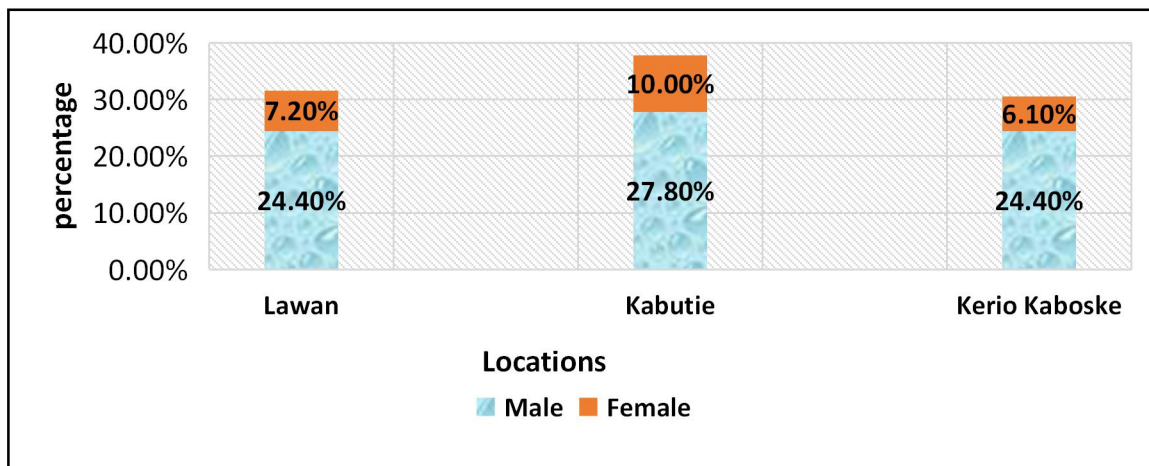


Figure 4.1: Household Gender Distribution

Source: *Field Survey, 2017*

4.1.3.3 Household Size

The household's membership in the study area varied from location to location. Lawan location had many household with household members ranging between 1-4 members (10.8%), 5-9 members (11.7%), and 10-14 members (4.7%) respectively. Kabutie location household membership was diverse. Between 1-4 members (7.2%), 5-9 members (8.6%) and 10-14 members (19.2%) respectively. Generally the study area had an average household membership of 9.29 (Table 4.5).

Table 4.5: Household Size

Household Size	Lawan	Kabutie	Kerio Kaboske	Total
1-4	39 10.8%	26 7.2%	30 8.3%	95 2.6%
5-9	42 11.7%	31 8.6%	21 5.8%	93 25.8%
10-14	17 4.7%	69 19.2%	14 3.9%	100 27.8%
15-19	23 6.4%	17 4.7%	14 3.9%	54 15.0%
More than 20	05 1.4%	09 2.5%	03 3.3%	17 4.7%

Source: *Field Survey, 2017*

4.1.4 Household Land Sizes

Land has been and will continue to be the most significant form of property in rural Kenya. This is because among the poor and the very poor households land play a very important role in determining the socio-economic well-being and contribute both directly and indirect to their livelihoods. In Lawan location majority of the respondents (8.6%) had land holdings of between 11 – 15 acres while 6.9% had land holdings measuring between 6 – 10 acres and 1.9% had less

than an acre. 11.6% of the households in Kabutie location had land holding measuring between 11 – 15 acres while 5.6% had between 6 – 10 acres. In Kerio Kaboske location 15.0% of the households had land holdings of between 11 – 15 acres while 3.3% had land holdings between 1 -5 acres and 21-14 acres (table 4.6). Generally in the study area, 35.3% of the households have landing holdings of between 11 – 15 acres and 13.1 % of households have land measuring 6 -10 acres and 12.8% hold land between 21-25 acres. The average household land holding size within Kamnarok NR adjacent areas is small ranging between 1-25 acres with a mean of 13.07 ± 2.86 acres (Table 4.6).

Table 4.6: Household land Sizes

Farm Size	Locations							
	Lawan		Kabutie		Kerio Kaboske		Total	
	Frq.	%	Frq.	%	Frq.	%	Frq.	%
Less than 1 acre	07	1.9	11	3.0	04	1.1	22	6.1
1 – 5 acres	25	6.9	06	1.7	12	3.3	43	11.9
6 – 10 acres	17	4.7	20	5.6	10	2.8	47	13.1
11 – 15 acres	31	8.6	42	11.6	54	15.0	127	35.3
16 – 20 acres	16	4.4	19	5.3	10	2.8	45	12.5
21 – 25 acres	12	3.3	22	6.1	12	3.3	46	12.8
Total	114	31.7	136	37.8	110	30.6	360	99.8

Source: *Field Survey, 2017*

Land as a natural resource and household livelihoods are intricately connected in rural Kenyan landscapes where land is both a reality and an imaginary in everyday life. In the study area, household respondents placed much more value on agricultural land as it is a mechanism to achieve livelihoods, though their agricultural livelihood systems had been weakened by human wildlife conflicts. In this community, land is the primary mechanism to garner incomes and

sustain household livelihoods. However, given the limited land resources in the Kamnarok NR adjacent areas to expand their farming activities as over 66.4% of households have land sizes measuring less than 15 acres, household heads have resorted to poaching for extra lands for farming in the Kamnarok NR. The situation has made it very difficult for the department of wildlife and natural resources of Baringo County to exercise control over the activities of the reserve adjacent households hence the continual encroachment on the natural reserve lands.

Furthermore, the significance of land resource attachment to livelihood survival by this community is supported by the findings of Kinsey (2014) who established that contemporary household income constructed in the absence of land based activities are vulnerable to economic shocks. Given this, Kamnarok NR adjacent households still grasp fiercely the reserve land with imaginaries as the land was violently dispossessed out of them by government in the 1980's to give space for the establishment of the game reserve to conserve wildlife. The dispossession is still strongly embedded in their cultural memories. The study findings also revealed that household land holding size determine its capacity to cope with major loses inflicted by wildlife.

4.1.5 Household Land Tenure

Inherited communal and family land holdings without title deeds dominate the system of land tenureship within Kamnarok NR adjacent areas. Access and ownership of land is mainly through membership of clan or through inheritance with some few foreigners having bought land from the local inhabitants. The proportion of parcels of land exchanging hands through selling is low because of the absences of title deeds. Most lands surrounding Kamnarok NR have been adjudicated with no title deeds (Figure 4.2). Inherited lands constitute 59.2%, while communal

and rented/leased lands constitute 20.0% and 8.3% respectively. Another form of land holding include purchased land which made up of 12.5% (Figure 4.2).

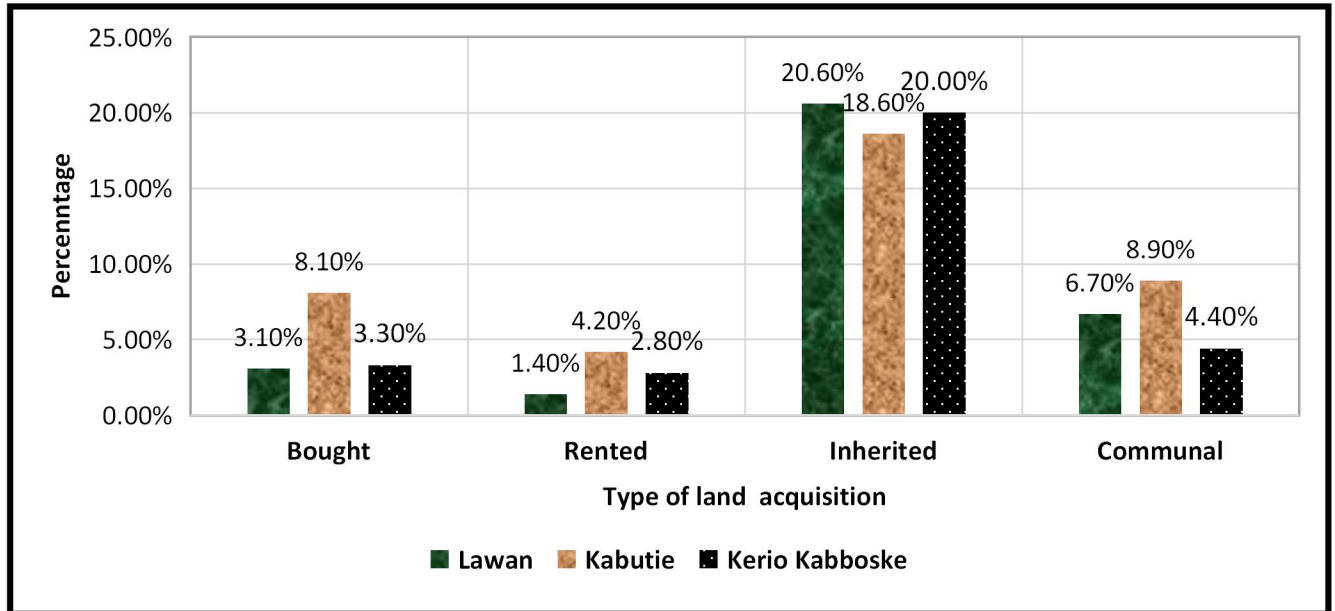


Figure 4.2: Nature of Household Land Tenure

Source: *Field survey, 2017*

Furthermore, the study findings reveal that lack of secure land tenure is still a major issue in the study area as all the land owners do not have land ownership documents to improve their agricultural land for better livelihood development. Land tenurial issues in Kenya has been a factor that contributes to increasing human wildlife conflicts (Kameri-Mbote, 2002). As indicated in this study, land ownership documentation is an essential prerequisite for agricultural improvement which gives the land owners an impetus for livelihood improvement which is lacking in the study area. This finding is consistent with the findings of Abila (2005) where in his study, argued that land tenure instrument is one of the most significant tool for nation- building and in achieving livelihood needs for local communities. Ogolla and Mugabe (1996) in their study of land tenure system in Kenya highlighted that proper tenure rights and documentation provide incentives to the use of land and associated resources in a sustainable manner and

invigorate investment in resource conservation whether for individual or group of individuals hence land tenure documentation is a critical tool for natural resource management.

4.1.6 Average Income

It was necessary to identify the income level of the households to determine whether their livelihood sources were enough to support their basic needs. Therefore, the study sought to establish average monthly incomes for Kamnarok NR adjacent household. The household were asked to indicate their income from all relevant economic activities. Their average monthly incomes are as shown in Table 4.7. The findings indicate that 51.1% of household have an average monthly income of between KES 5,000 – 10,000 compared to 8.3% of households who earn more than KES. 20,000 in a month. Another 21.7% of households earn an average of less than KES 5,000 in a month while 12.2% of households indicate to be earning an average of between KES 10,000 and 12,000. The average monthly household computed income ranges between KES. 5,000 to 20,000 with mean monthly household income of KES. 8,945 ± Ksh 748.44. This was lower than both the county and national average monthly income level of KES 17,430.20 and KES 31,217.00 respectively (Table 4.7).

Table 4.7: Average Monthly Household Computed Income

Average monthly income in Kes	Locations						Total	
	Lawan		Kabutie		Kerio Kaboske		N	%
	N	%	n	%	N	%		
Less than 5000	28	7.8	17	4.7	33	9.2	78	21.7
5001- 10000	48	13.3	77	21.4	59	16.4	184	51.1
1001-15000	18	5.0	22	6.1	4	1.1	44	12.2
15001- 20000	9	2.5	13	4.3	2	.5	24	6.7
20001 and above	11	3.0	7	1.9	12	3.3	30	8.3

Source: *Field survey, 2017*

The low income levels of the households in the study area partly explains their continual dependency on the agricultural activities since little capital is required to finance them. Furthermore, 69.2% of the local households are left with nothing to save or even access the National Health Insurance Scheme (NHIF). This could probably explain the over 71% of the households' dependence on medicinal plant collections in the Kamnarok NR for their medical purposes. According to the Human Needs Theory, the universal needs of humans such as security, identity and development must be met. Therefore the inability of these households to meet their needs due to their low income levels will mean a struggle to gain the control of their environment that is necessary to ensure the satisfaction of these needs. Therefore when discriminatory policies marginalize the local people, it may fume bitterness and social injustices which may generate into conflicts (FAO, 2005).

4.2 Human Wildlife Conflicts

In this section data analysis focused on the nature, extent and distribution of human wildlife conflicts within Kamnarok NR adjacent areas. The study area extends to three locations namely Lawan, Kabutie and Kerio Kaboske which are all located in one division of Barwesa.

4.2.1 Human Wildlife Co-existence

Wildlife conservation is indeed a significant segment which contributes immensely in terms of scenic beauty, employment opportunities and revenue generation in form of tourism. This has generated a lot of interest and concern about wildlife conservation in Kamnarok NR and adjacent environments. Therefore, the study sought to determine the concern of the NR adjacent community in regard to the natural resources of the protected area including wildlife. The findings indicated that 63.3% of the study respondents were very concern about conservation of Kamnarok NR wildlife and other natural resources, 22.7% were moderately concern, while 9.0% were not concern at all arguing that they have for a long time been negatively affected by their existence (Figure 4.3). From the findings it can be argued that the local communities surrounding Kamnarok NR are aware of the importance of Kamnarok wildlife and other associated resources notwithstanding the intensity of human wildlife conflicts they have suffered.

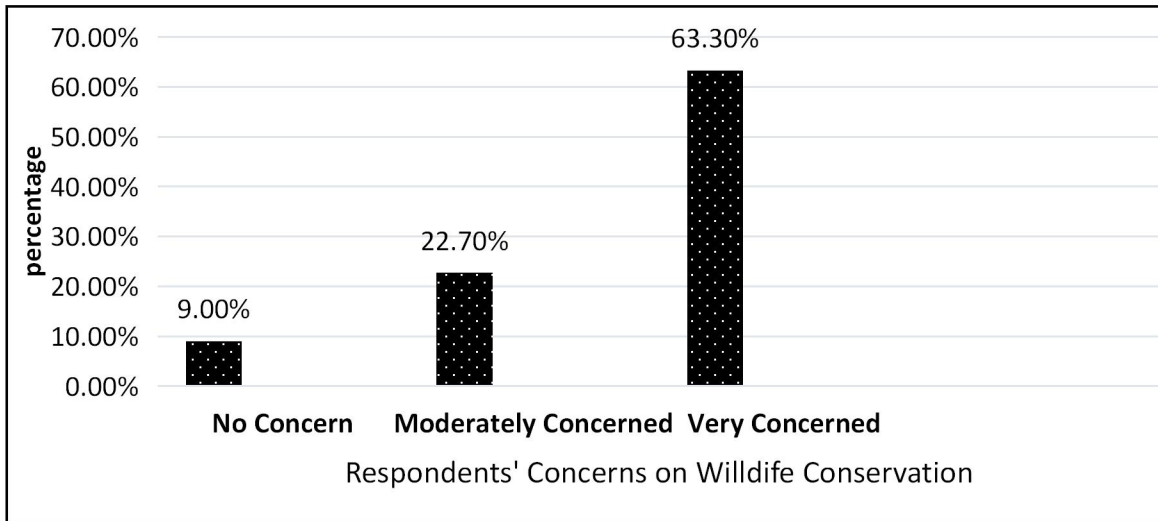


Figure 4.3: Concern on Kamnarok Wildlife Conservation
 Source: *Field survey, 2017*

From the findings, there was sufficient evidence to suggest that despite the problems caused by elephants and other predators, Kamnarok NR adjacent households still value wildlife. The reasons the household advanced for tolerating wildlife varied not only based on financial gains and benefits but also aesthetic value, sense of ownership and empowerment (Osborn, 2012). Kamnarok NR adjacent households, the poorest in Baringo county (Lelenguyah, 2013) also mentioned that elephants (*Laxondonta africana*) damaged infrastructure, compete with them for bush foods and are dangerous for their safety and security however, despite widespread fear they still wanted to live with elephants and other wild animals with an hope that they represented income and employment through tourism. Most of the household respondents were of the opinion that, given a choice, they would prefer to live with elephants than without them (Matson, 2005). A statistically insignificant difference was noted between the gender of household head in the three locations ($X^2 = 10.591$, $df=2$ and $P < 0.001$) and human wildlife conflict tolerance with more male tolerating wildlife existence.

4.2.2 Human Wildlife Conflicts Experiences

The study sought to assess whether the household had experienced incidences of human wildlife conflicts in the past 10 years and whether the incidences were reported. Two terms were used to infer to the opposite ends of the respondents experiences on human wildlife conflicts, YES and NO. The assumption was that both Yes and No would be equally represented in the population. From the findings, 71.1% of the respondents indicated to have experienced conflicts with wildlife whereas 28.9% reported not to within the past 10 years (2006 - 2016) Table 4.8. The proportion of responses on wildlife experiences between 2006 and 2016 insignificantly differed across the three locations ($X^2=12.037$, df 2, $p < 0.001$). The results of this study points out that the residents of the three locations equally bear the brunt of human wildlife conflicts. The overall increase in human wildlife conflict was largely associated with an increase in crop damages (72%) and livestock predation (46%) by carnivores of Kamnarok NR as opposed to 28% and 54% of the respondents who were of contrary opinions. This was mentioned by household respondents across the three locations. A significant proportion of respondents (61%) indicated that protection of wildlife especially elephants has led to an increase in wildlife numbers, hence the increase in human wildlife conflicts in the adjacent areas of the national reserve. This finding concur with the findings of Petterson *et al.*, (2004) whose research in Tsavo East national park found that an increase in elephant populations escalated human elephant conflicts (HECs) in the adjacent areas. Further the results support Woodroffe *et al.*, (2005) findings who argued that recovery of declining populations of many large mammals due to efficient wildlife management and large network of protected areas worldwide has also led to an increase in human wildlife conflicts.

However, 56.7% male headed households indicated to have experienced conflicts with wildlife as opposed to 14.4% of female headed household with male headed households in Kabutie and Kerio Kaboske locations most affected by wildlife conflicts. The proportion of gender respondents who had experienced conflicts with wildlife significantly differed across the three locations ($X^2 = 8.037$, $df = 2$, $P < 0.001$) (Figure 4.4).

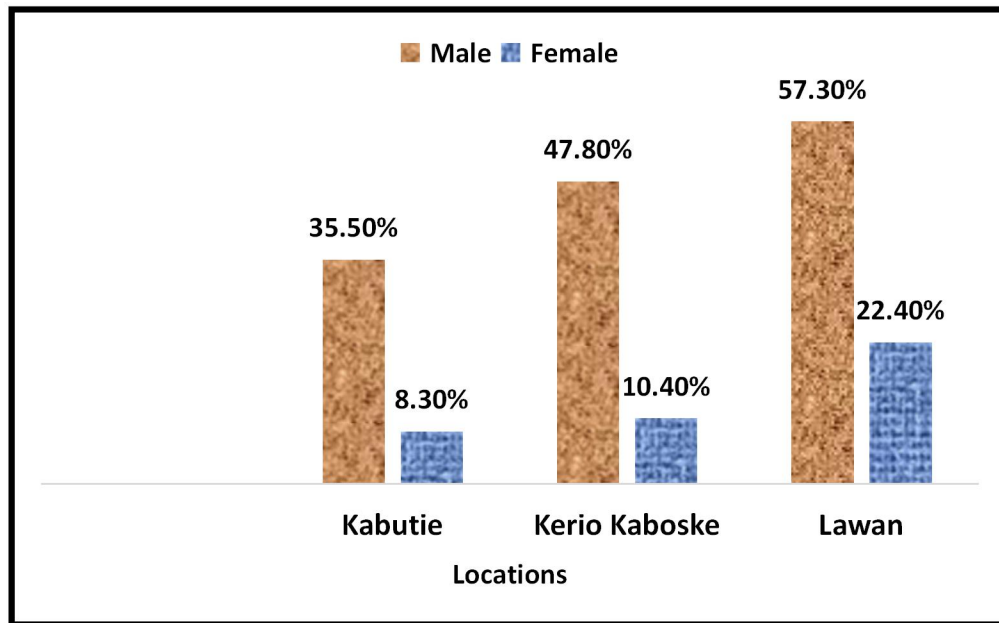


Figure 4.4: Proportion of Gender encounters with human wildlife
Source: *Field Survey, 2017*

Furthermore, the proportion of male headed households to female headed who have encountered human wildlife incidents was more than trice (Figure 4.4). The findings shows that at least more than half of male headed households in Kamnarok NR adjacent areas have been affected by wildlife in one form or another. In fact studies carried out in the past by Ogada *et al.*, (2003) on communities living adjacent to Tsavo National Park confirmed that historically women play subordinate roles and less power in decision making in regard to resource use than men and thus less exposed to human wildlife conflicts. On the other hand, the gender roles prevalent within Kamnarok NR adjacent areas especially on forest resource extractions are male dominated and

the fact that most women perform many household tasks are less exposed to wildlife attacks. This finding contradict Mehta and Kellert (2008), were in their findings established that women are more involved than men in forest resource extraction. Attacks on women and children are less frequently fatal than attacks on adult males. This finding agrees with a study on human-wildlife conflict carried out by AWF, (2005) in the Chobe-Capri corridor between Botswana and Namibia which revealed gender disparity relating to how households are affected by wildlife conflict.

Table 4.8: Household experiences with human wildlife conflicts

Attribute	Response	Locations						Df	X ²	P Value	Overall	%
		Lawan		Kabutie		Kerio Kboske						
		n	%	N	%	n	%					
Have you experienced conflict with wildlife from 2006-2016	Yes	77	67.5	91	66.9	88	80	4	12.037	< 0.001	256	71.1
	No	37	32.5	45	29.1	22	20				104	28.9
	Total	114	100.0	136	100.0	110	100.0				360	100.00

Source: Field survey, 2017

4.2.3 Community Perceptions on incidences of Human Wildlife Conflicts

The overall increase in HWCs in Kamnarok NR adjacent areas was largely associated with increase in crop damage and livestock depredation by wildlife across the three locations. Approximately 69% of the respondents in Kamnarok NR adjacent areas perceive conflicts with wildlife had increased whereas 17.2% perceive to have decreased and 14% of the respondents perceive to have remained the same. However, the perceived decline in human-wildlife conflicts that was indicated by some 17% of the respondents was attributed to shooting of elephants and monkeys as they are problematic animals. Respondents from Kerio Kaboske location attributed the perceived decline in human-wildlife conflicts to illegal killing of animals by the community.

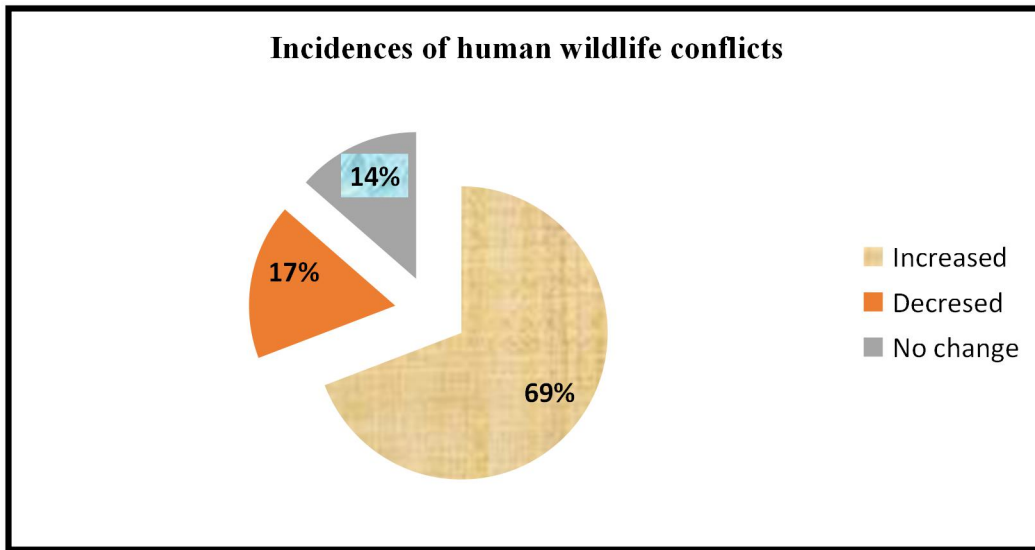


Figure 4.5: Community level of perception on human wildlife conflicts
Source: *Field Survey, 2017*

The study findings further shows that the perception of wildlife population trends differed among the respondents ($X^2 = 18.258$ $df=3$, $P < 0.001$). 69% of the respondents agreed that wildlife populations had increased while 17% disagreed. Household who had suffered from crop damages and livestock predation were likely to agree that there has been an increase in wildlife

population ($X^2 = 6.351$, $df=3$, $P<0.001$) as were respondents whose main livelihoods was farm based ($X^2 = 6.248$, $df=3$, $P<0.001$).

4.2.4 Correlation between Age, Education, Occupation and Human Wildlife Conflicts

HWC was further explored by finding a correlation between household wildlife incidents by age, education level and occupation of respondents. Other demographic factors did not show any relationship between wildlife incident experiences. To analyze the relationship between variables a composite score for HWC was first computed. Two scoring strategies were adopted for the differences in household responses with regard to HWC (independent variable) and other dependent variables (age, education and occupation). HWC responses was rated as follows; No change = 0, Decreased = 1 and increased = 2. Age variable score was rated as follows; 20 yrs > = 1, 20 – 29yrs = 2, 30 – 39 yrs = 3, 40 -49 yrs =4, 50 – 59yrs =5 and 60 yrs > =6. While education was rated as; None = 0, adult literacy = 1, primary level =2, secondary =3, tertiary level= 4 and university=5. Occupation was rated as; No employment=0, Self-employed=1, livestock farmer=2, mixed farmer=3, Employed=4 and in business=5. The means for age, education and occupation was used alongside HWC means to conduct Pearson Product moment correlation (PPMC) to determine whether there was a significant relationship between the dependent variables (age, education and occupation) and Human wildlife conflicts (Table 4.9).

Table 4.9: Correlation between Age, Education, Occupation and Human wildlife Conflicts

		HWC	AGE	EDU	OCPA
HWC	(r)	1			
	P (Values)				
AGE	(r)	.317	1		
	P (Values)	.028			
EDU	(r)	-.406**	.114*	1	
	P (Values)	.004	.392		
OCPA	(r)	.247*	.327**	.524**	1
	P (Values)	.358	.015	.000	

** correlation is significant at the 0.01 level (2-tailed)

* correlation is significant at the 0.01 level (1-tailed)

Key: **HWC**= Human Wildlife Conflicts, **AGE**=Age of household respondents, **EDU**=Educational level of respondent, **OCPA**= Occupation of the Household respondent

Source: **Field survey, 2017**

The PPMC (Pearson Product Moment Correlation) analysis revealed that there existed a significant positive correlation between human wildlife conflicts (HWCs) and household respondent age (AGE) ($r=0.317$, $n=360$, $P<0.001$) (table 4.9). This implies that the more the head of a household grows older and participate more in on-farm activities in the study area, the more their livelihoods are affected by wildlife intrusion. According to Reed *et al.*, (2012) in their study of human wildlife conflicts in Myanmar's wilderness parks, they noted that ages of households affected by wildlife menace positively correlates with the frequency of reported crop damages.

Furthermore, the relationship between human wildlife conflicts (HWCs) and household respondent level of education (EDU) ($r = -0.406$, $n=360$, $P<0.001$) was significantly negative (Table 4.9). The implication of this negative correlation between human wildlife conflicts (HWCs) and level of education is that, household heads in Kamnarok NR adjacent areas who

have adequate education and possess the requisite level of knowledge and technical skills are engaged and are more dependent on non-farm livelihoods which are less prone to wildlife catastrophic intrusion. Keane *et al.*, (2010) and Liu *et al.*, (2010) in their study finding report highlighted that higher levels of education, skills and knowledge relate and are associated with non-farm economic activities with an understanding of environmental awareness as well as a more positive attitude towards conservation of wildlife resources. Furthermore, the level of education attained by an individual is known to have a direct bearing on decision making based on the premise that an enlightened mind will choose the path of conservation and avoid conflict. Thus the need to see how qualification of respondents affects their perceptions and decisions on matters of conflict in the study area. This findings concur with the findings of a case study in Madagascar, (Keane *et al.*, 2010) who found that individuals with a higher level of education, their livelihoods proved to be insignificantly affected by wildlife disturbances.

The study further established that a significant positive weak correlation existed between human wildlife conflicts (HWCs) and household respondent's occupation (OCPA) ($r=0.237$, $n=360$, $P<0.001$). Whereas the significant weak correlation implied that wildlife disturbance effects on households varied among the different occupations minimally, but also the magnitude of the disturbance varied differently between and among the different occupations. Ogada *et al.*, (2003) mentioned that in many parts of Africa, human wildlife conflicts and wildlife disturbances has been noted to vary among individual victim's careers with pastoral and agriculturalists being the worst affected. However, Angelesen & Wunder (2003) argued that human wildlife conflicts (HWCs) have no relationship with peoples' professions with the conflicts being subjective and

are dependent on the underlying relationships between the local population attitudes and the Wildlife Protected Area (WPA) resource use.

4.2.5 Community Attitude towards Wildlife

The attitudes of local people towards wildlife is critical for the conservation of wildlife and the associated natural resources (King *et al.*, 2018). On the other hand, HWC can have an impact on the attitudes of people towards wildlife, as wildlife can have a negative influence on people's livelihoods (Okello *et al.*, 2017). Majority of the local community around Kamnarok NR have very negative attitude towards wildlife as they perceive the reserve as an impediment for their economic development in terms of crop growing and livestock keeping. Majority argued that the protected land could have been used for other purposes instead of conserving wildlife which do not benefit the community. Moreover, the local people do not see the need to protect the wild animals especially the predators and crop raiders which kill their livestock and destroy their livelihood sources subjecting them to poverty. The negative attitude towards wildlife in the study area is attributed to an overall increase in conflicts with wildlife which was alluded by 69% of the household respondents, which is largely associated with crop damages and livestock predation.

The Kamnarok NR adjacent community experienced high human wildlife conflicts and the findings reveal that wildlife destroyed crops as indicated by 78.3% of the households, livestock predation was 21.7% with crop damages greatly experienced in Kabutie and Lawan locations at 28.3% and 26.9% respectively (Figure 4.6). The predation on domestic animals was compounded by the continuous increase in predators' populations as a result of increased wildlife protection. Also the Tugens and Marakwets (*majority of the respondents in this study*) customs and cultures

do not permeate eating of predators like baboons and hyenas as this could have contributed to their population increase since they were not a major target for snaring.

Generally, elephant crop damages in the study area was high. Crop damages occasioned by wild animals has had the potential of influencing local household attitudes towards the wildlife species concern and wildlife conservation in general as observed in Kamnarok NR adjacent areas. Local community attitudes towards wildlife was not very encouraging with 18.4% of the interviewed respondents having very negative attitude towards wildlife, while 61.4% had negative attitudes. Only 16.4% had positive attitudes towards wildlife conservation and the rest (3.8%) were neither positive nor negative on wildlife conservation matters.

It was also observed in the study area that the number of livestock owned by respondents influenced their attitudes, as those who owned more livestock were more likely to depend on income from livestock and thus perceive potential predators as a threat. Similar findings by Suryawanshi *et al.*, (2013) in their study in Spiti Himachal Pradesh National Park in India concluded that villages with higher holdings of economically important livestock perceived the snow leopard to be a greater threat. The study findings is further supported by Okello *et al.*, (2014) who argued that in Laikipia county, peasant farmers perceived many aspects of wildlife conservation negatively due to costs inflicted by crop raiders and dangerous wild animals. Ahcrem and Loe (2014) studied the problem of human wildlife conflict in the Ethiopian Highlands and identified a clear correlation between negative public attitude towards wildlife and livestock herd size in the Bale Mountains because of the more intense competition with high stocking rates.

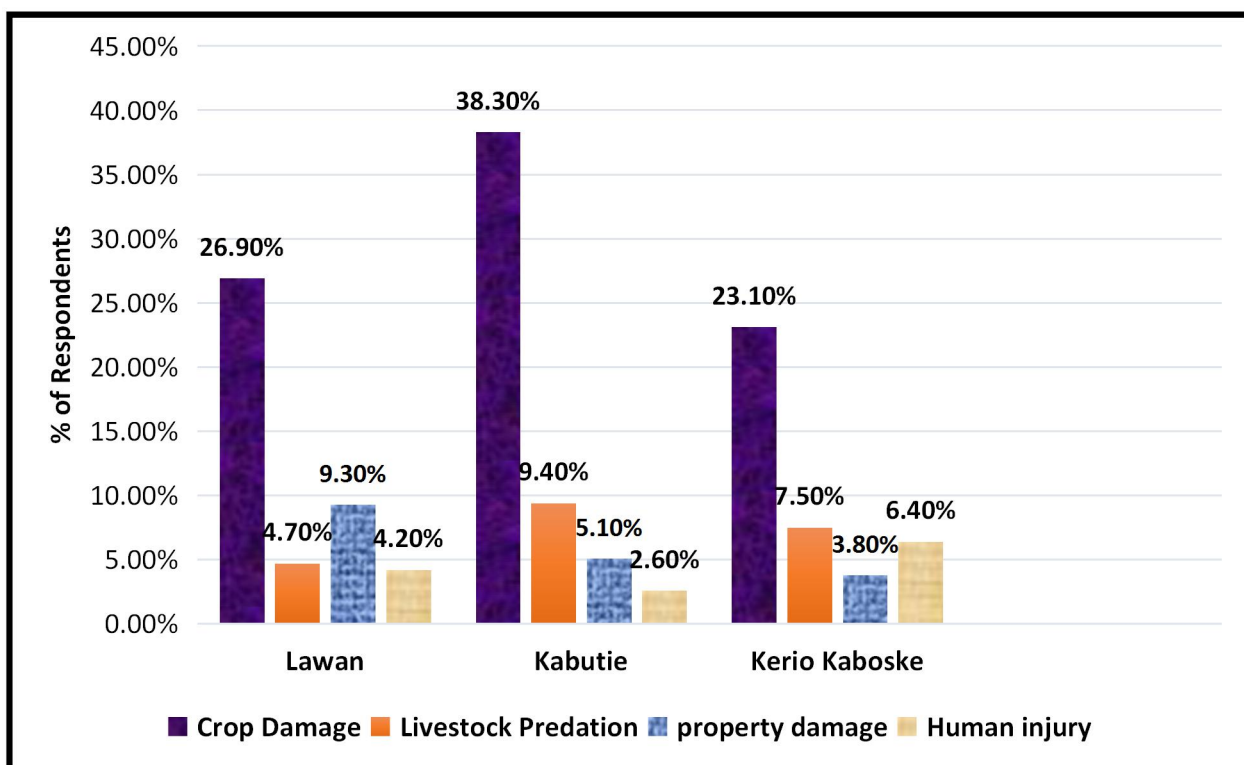


Figure 4.6: Damages associated with Wildlife

Source: *Field Survey, 2017*

The study further sought to establish how household attitudes had contributed to human wildlife conflicts. Respondents were asked to give their affirmative answers on the different levels of attitude influencing HWCs. Their responses were rated as; No=1, Yes =2 (Table 4.10).

Table 4.10: Household attitude towards Kamnarok NR and the Wildlife

Attitude level	Yes		No		Mean	Std. Deviation
	F	%	F	%		
Kamnarok NR adjacent households have positive attitude towards the NR and its wildlife	27*	7.5	333*	92.3	1.0780	.04897
Kamnarok NR adjacent households have negative attitude towards the NR and its wildlife	249*	69.0	111*	31.0	1.1361	.87455
Kamnarok NR adjacent households have moderate attitude towards the NR and its wildlife	120*	33.3	240*	66.3	1.6667	.04615

***Multiple responses**

Source: *Field survey, 2017*

The findings further show that Kamnarok NR adjacent households have negative attitude towards Kamnarok NR and its wildlife as stated by 69% of the respondents compared to 7.5% and 33.3% whose attitudes are positive and moderate respectively towards the national reserve. Further, the findings agrees with findings elsewhere that crop raiding by wild herbivores and livestock depredation by carnivores can reduce the community tolerance towards conservation and particular species of wildlife for example elephants which are already threatened. Baral and Heinen (2007) findings support this fact by citing instances where HWC have negatively influenced local community attitudes towards wildlife and wildlife conservation in general in Western Terai landscapes of Nepal. Mulonga *et al.*, (2003) in their study of rural communities in developing countries established that perception about problems and attitudes towards conservation and wildlife species are likely to be influenced by social interest, experienced damages, benefits and costs where in this study area, respondents receive no legally approved benefits from the NR management authorities.

Coefficients from linear regression were used to determine the relationship between attitude and human wildlife conflicts (Table 4.11).

Table 4.11: Correlation between household attitude and Human Wildlife conflicts

Model	Unstandardized coefficient		Standardized coefficient	T	Sign.
	B	Std. Error	Beta		
(Constant)					
Do households' attitudes of Kamnarok NR adjacent areas influence HWC?	0.643	.186		3.279	.002
	-1.372	.141	.774	10.83	.000
				1	

a) Dependent variable: How often do you experience HWC?

Source: *Field survey, 2017*

The established linear regression equation is $Y=0.643 + 1.372X_1$ where constant 0.643 shows that if general attitude was rated at zero, HWCs would be .643. $-X_11.372$ implies that a unit improvement in attitude would result in reduction of HWC by a factor of -1.372. The results in Table 4.11 shows that household attitude had significant ($P<0.05$) influence on human wildlife conflicts implying that the negative attitudes of the household had contributed to the escalating conflicts. This findings is supported by Dickman (2010) where she argued that peoples attitudes towards wildlife and their conservation are complex with social factors as diverse as religion affiliation, ethnicity, economic benefits and cultural beliefs all shaping conflict intensity.

4.2.6 Human Wildlife Conflicts Reporting

The study sought to establish if and how HWC victims in the study area report human wildlife conflict incidence to wildlife management authorities. The findings indicate that a paltry 26.4% of the respondents report incidences of human wildlife encounters to the wildlife management authorities, while majority of the respondents 73.6% never report because there could be no action by KWS staff nor Baringo County Government Department of Wildlife (Figure 4.7).

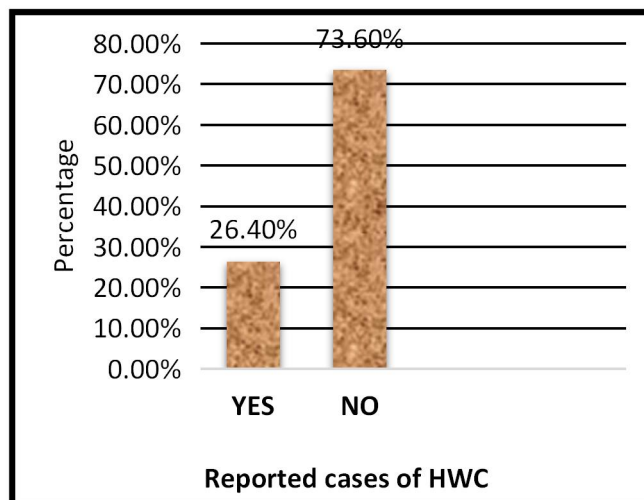


Figure 4.7: Reported cases of Human Wildlife Conflicts incidents
Source: *Field survey, 2017*

4.2.6.1 Reasons for Non Reporting of Human Wildlife Conflict Incidences

In order to assess reasons for household respondents for non-reporting of HWC incidences to wildlife management authorities, respondents were asked to indicate their opinion levels on the same. Their responses were rated as; strongly agree, agree, not sure, strongly disagree and disagree. The study findings showed that 83.8% of the interviewed respondents have never been compensated for the HWC damages and therefore saw no need to report conflicts. There is no compensation programme by the wildlife management authority (KWS) as was indicated by 76.1% of the respondents. Other reasons given for non reporting of conflicts were, Kamnarok NR offices were too far for respondents to walk and report (37%) and 18.6% of the sampled respondents said they have no time to report table (Appendix III).

Although respondents reported of no compensation on the victims of HWCs, from the researchers observation a level of ignorance was being exhibited by Kamnarok NR adjacent community as the Wildlife Conservation and Management Act (2013) provides a framework for the compensation of human wildlife conflicts damages, losses, deaths and injuries through the County Wildlife Conservation and Compensation Committee (CWCCC). Furthermore, HWC has been considered very common because 65% of wildlife lives outside protected areas (Ministry of Tourism and Wildlife, 2018). In addition to government intervention, some NGOs working within Kerio Valley have come up with compensation schemes to alleviate existing situations. These schemes aim to increase tolerance for wildlife by community members who might otherwise choose to harm/injure animals in instances of conflict.

4.2.7 Proposed Household HWC Resolutions

Whereas the majority (62%) of the respondents felt that wild animals should not be killed randomly, 72% of this respondents said that rogue animals especially the elephant and baboons found destroying crops should be shot at sight (Figure 4.8). 15% of the respondents said they should be translocated to other areas since KWS value them very much and 13% said fences should be constructed to keep masquerading animals from their farms. 89% of the respondents indicated that they were willing to accommodate some wild animals in their farms as long as conservation authorities share the cost in some form of compensation for damages and other economic benefits Figure 4.8. The respondents took strong exception to non-compensation and noted that they do not grow crops to aid elephants foraging. However, farmers did not retaliate by harming wild animals found on their farms but 32% of the respondents said they would prefer elimination of elephants from the study area altogether.

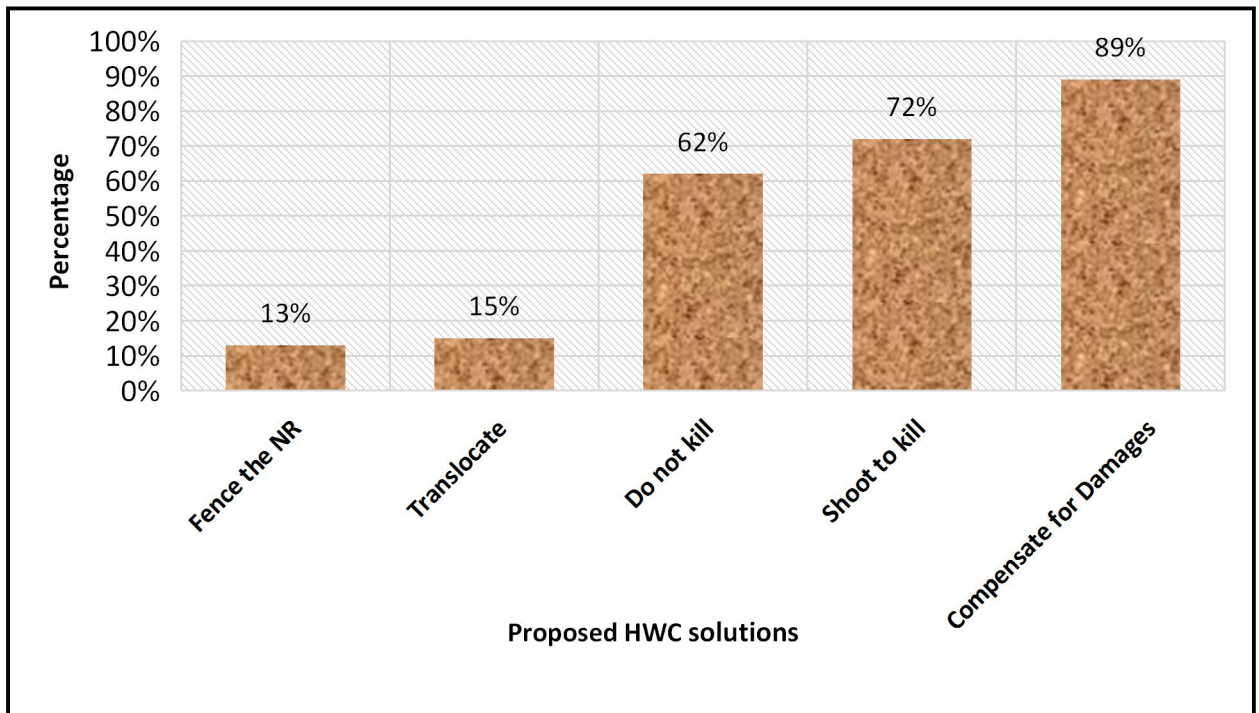


Figure 4.8: Community Proposed Human Wildlife Conflict solutions
Source: *Field survey, 2017*

The findings further revealed that local households are tolerable to some extent on some certain wild animals causing conflicts but were more intolerable to elephants and other rogue wild animals. The households felt more vulnerable to elephants as they can inflict catastrophic damages (Martin *et al.*, 2015). Also households adjacent to Kamnarok NR have resilience to human wildlife conflicts to certain level as they are able to connect with nature in different ways by absorbing and adapting to crises caused by wildlife (Sitati *et al.*, 2005).

4.2.8 Household Distance from Kamnarok National Reserve

The study sought to assess household distances from the Kamnarok NR and HWCs encounters. Distance values were divided into six bands for analysis (0 – 1.0kms, 1.1 – 3.0 kms, 3.1 – 5.0 kms, 5.1 – 7.0 kms, <7.1 kms and 0 -7.0 kms). Of the interviewed household respondents, (33.1%) were within 0 -1.0 kms from the reserve boundary, (15.6%) were between 1.1 -3.0 kms and (19.7%) were located within a distance band of between 3.1- 5.0 kms (Figure 4.9). Household distance from Kamnarok NR was an important aspect that was considered while investigating the degree and levels of HWCs among the adjacent households. A negative and significant relationship ($r = -0.478$, $p < 0.05$) existed between distances from the reserve border and the incidences of HWCs caused by wild animals in the adjacent areas. This implied that conflicts decreases as distances increases from the reserve borders. Percentage of sampled households experiencing HWCs was then calculated for each of the bands. Within 3 kms of the reserve's border, almost 2 in every 5 households claimed to have suffered/encountered HWC in the past ten years. On further extrapolation of the entire population of the study area (all households located within 0 – 5.0 kms band), the study findings indicate that an average mean of 584 households have been affected by HWCs in the past five years. If one consider all household

in the study area, an estimated 974 households has been affected by wild animals in the past ten years (Figure 4.9).

Logistic regression analysis reveal that households that have farm lands extending closer to the periphery of the reserve ($b = 0.237, p < 0.001$) could predict the occurrence of HWCs ($b=0.114, p < 0.001$). Moreover, those who have encountered HWCs were significantly least likely to believe that Kamnarok NR management would offer them compensation for damages and destructions from wildlife ($X^2=6.196, df=2, p < 0.001$) and least to diversify to on farm livelihood activities ($X^2= 8.294, df=2, P < 0.001$).

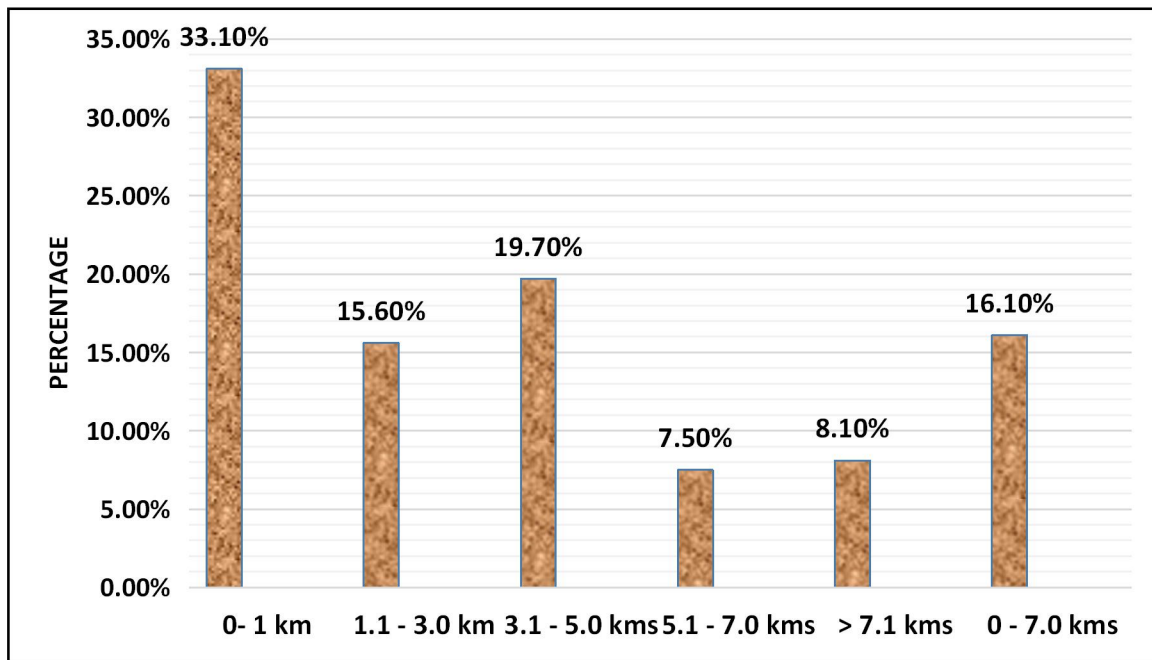


Figure 4.9: Household Distances from Kamnarok NR
Source: *Field survey, 2017*

4.2.9 Human Wildlife Conflicts and Location of Homesteads

The researcher sought to know location of homesteads, their proximity to the national reserve, migratory corridor which connect the reserve to Rimoi and Nasolot National reserves and to any

former wildlife habitat and their influence on human wildlife conflicts. Non – participatory observation was done where the researcher basically observed the study elements and recorded information without being with the residents. It was evident that majority of the homesteads had been built within once former wildlife habitats with some homesteads within the disputed land were both individual owners and Kamnarok National Reserve claim ownership. Some homesteads were observed to be inside the national reserve. Human settlement was accompanied by various livelihood activities including farming (cultivation along Kerio river), grazing of livestock inside and in the adjacent areas of the reserve and fishing in both Lake Kamnarok and along Kerio river hence the increased interactions.

It is revealed that attitudes towards wildlife conservation program was related to the distance where the respondents lived in relations to the reserve boundary and accordingly, Households living further from the reserve boundary favoured conservation than those living closer. It was also observed that HWCs was highest in close proximity to the protected area. Also the distances and the location of household's farms from the reserve boundary influenced human wildlife conflict intensity with decreasing conflict incidences as the distance from the reserve boundary increase (Pant and Hocking, 2013). In the study area, farms located between 2 – 4 kms from the reserve boundary experienced the most of the raids and property damages.

4.2.10 Human Wildlife Conflict incidence Types and their Spatial Distribution

There were clear variations among household respondents in terms of human wildlife conflict incidence types. Of 360 respondents interviewed, 69% acknowledged having experienced conflicts with wildlife. 86% of agro-pastoralist had experienced the worst level of human

wildlife conflict, followed by pastoralist at 76% and small scale subsistence farmers at 44%. Casual labourers and self-employed persons had experienced lower levels of encounters with conflicts at 34.7% and 23.0% respectively. A total of 84 of 102 respondents (82.3%) of both agro-pastoralists and small scale subsistence farmers specifically reported crop loss of which 13.7% were small scale subsistence farmers and 66.7% were agro-pastoralists in the study area. However, the general types of human wildlife conflicts being experienced is as shown in (Figure 4.10).

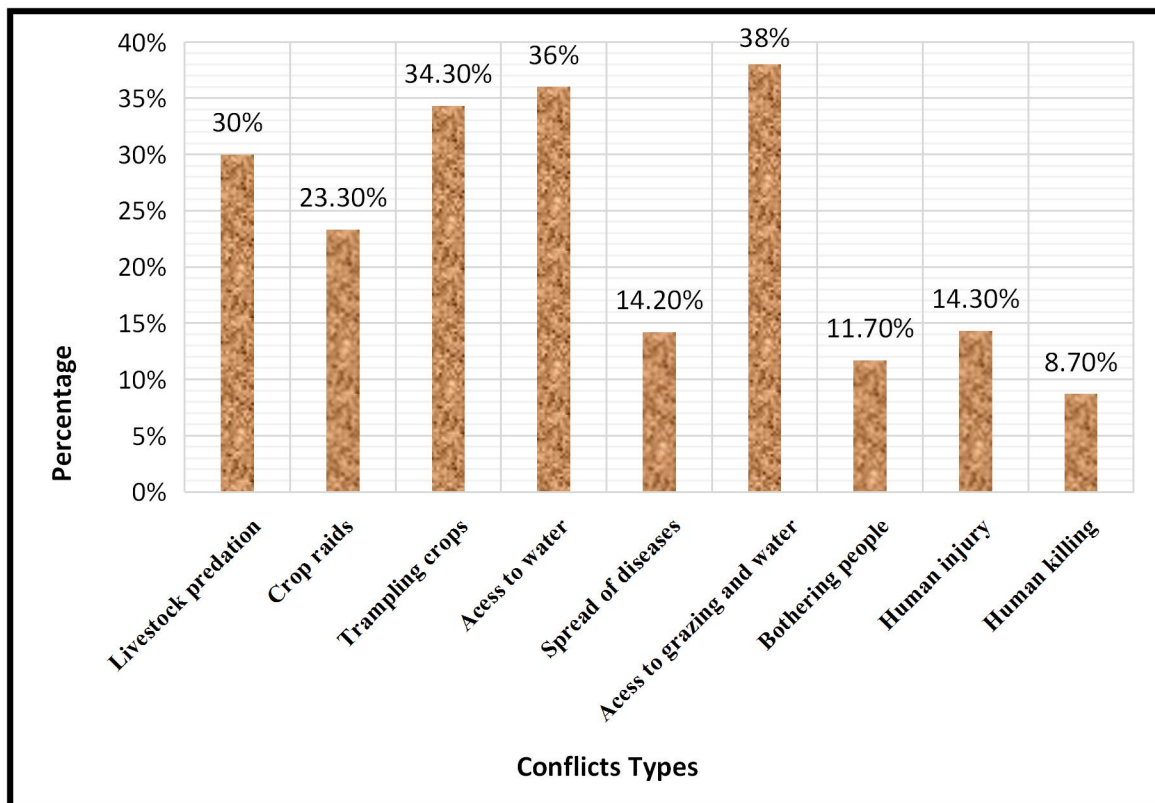


Figure 4.10: Human Wildlife Conflict Types
Source: *Field survey, 2017*

The study sought to establish types and spatial distribution of human wildlife conflicts in Kamnarok NR adjacent environs. Trampling of crops by wild animals was common. Trampling of crops, crop raids and access to water points were most serious forms of conflicts within the

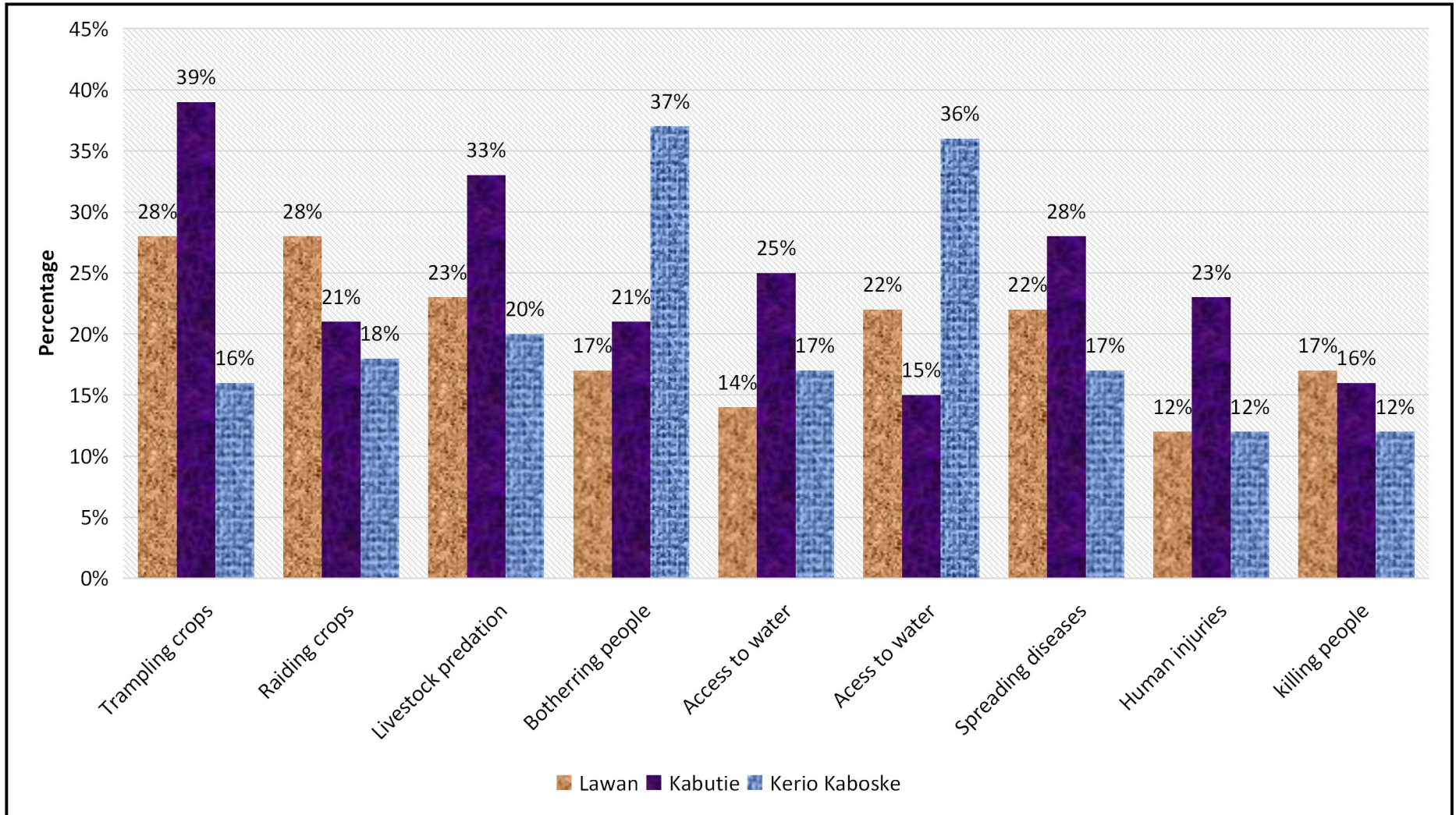
study area (Figure 4.11). These three forms of conflicts differed significantly between the locations ($X^2=62.87$, $df=7$, $P< 0.001$), ($X^2=66.72$, $df=7$, $P=0.001$) and ($X^2=64.15$, $df=7$, $P<0.001$) respectively. Likewise bothering people and livestock predation which followed in severity in the division also differed significantly between the locations ($X^2=58.19$, $df=7$, $P=0.005$), and ($X^2=68.47$, $df=7$, $P=0.001$) respectively. A comparison of all forms of conflicts between the three locations ($X^2=23.109$, $df=46$, $P=0.001$) was also significant. Access to water, grazing fields and disease transmission were experienced inside the reserve, buffer zone areas and lower zone areas of the locations bordering Kerio River.

Access to water was a problem reported in Kabutie and Lawan locations, while access to grazing was experienced in Kerio Kaboske and Lawan locations. These locations are pastoral grazing areas that are also supplied with water from Kerio and Katimok rivers and also Lake Kamnarok which extends across the two locations. Although these conflicts were experienced in the low levels, they have significant effect on human wildlife conflicts as pastoral communities result to retaliatory killings in the face of reduced water availability coupled with increased competition. The two locations are also watering points that livestock predation may take place. Human injuries and killings were reported in all the three locations. It was apparent that human wildlife conflicts were not the same and neither in their uniformity.

Even among households bordering the reserve, the intensity and diversity of the conflicts was not the same. Kamnarok NR and its adjacent areas is largely arid and an ASAL area classified under agro-ecological zone LM5 and LM6 (Sitati, 2003) which is mainly suitable for ranching, livestock production and cultivation of cassava, millet and sorghum (Jaetzold and Schmidt,

2005). One possible factor that could have enhanced HWC is marginal irrigation projects close to Kerio river and land use change. Parts of the reserve adjacent areas are currently under intensive crop cultivation and crop production (maize, millet, vegetables, cassava, pawpaws, cow peas and variety of fruits). Land use changes have been found to have the potential to exacerbate HWC (Sitati, 2003, Kimega, 2003; Kioko and Okello, 2010 and Sitati, 2012). Okello (2005) also observed that wildlife damages were related to land use practices in Baringo area of Kerio Valley conservation area (Figure 4.11).

Figure 4.11: Severity of different types of conflicts experienced in Kamnarok NR adjacent areas



Source: *Field survey, 2017*

4.2.11 Community Knowledge on Wildlife Conservation and Habitats

The study sought to establish Kamnarok NR adjacent household's knowledge on wildlife conservation habitats. 51.6% of the respondents had good knowledge of conservation objectives, whereas 48.4% had no understanding. Majority (47.8%) know the purpose for wildlife conservation and protection. 47.8% of the respondents know that the Kamnarok national reserve was established for the protection of wildlife while 15.0% believe that the reserve creation was for the conservation of natural resources for the future generations. 10.6% knew the reserve as government property while a few (8.6%) believe that Kamnarok National Reserve was established for wildlife conservation and as tourist attraction.

4.2.11.1 Sources of Knowledge Information

Majority (28.7%) of the respondents indicated to have obtained knowledge from reserve management awareness creation programmes and another 58.1% from wildlife rangers (Table 4.12). 13.1% of the interviewed respondents were not interested to know. Some respondents were not willing to respond and others were not happy on the establishment of Kamnarok National Reserve, because due to its establishment they lost their grazing and farmlands without compensation.

Table 4.12: Respondents Knowledge on the purpose of the establishment of Kamnarok NR

Purpose for the establishment of Kamnarok NR	Frequency	%
For wildlife protection	172	47.8
For tourist attraction	35	9.7
for wildlife conservation and tourist attraction	31	8.6
For safe natural resource conservation for future generations	38	15.0
For conservation of nature	12	10.7
For job creation	7	3.3
For wildlife to feed on during drought	11	1.9
Total	360	100.00
Source of Knowledge and information	Frequency	%
Reserve management awareness programmes	104	28.7
Wildlife rangers	209	58.1
Not interested in conservation knowledge	47	13.2
Total	360	100.00

Source: *Field survey, 2017*

4.2.12. Factors Contributing to Human Wildlife Conflicts in Kamnarok NR and Adjacent Areas

The study sought to establish factors contributing to human wildlife conflicts. To quantify this view, respondents were asked to state what they thought may have contributed to HWCs in Kamnarok NR adjacent areas. The study findings show that land rights were 77% of the respondents contest on Kamnarok NR land is major contributing factor of HWC (Figure 4.12). Increase in wildlife populations where successful attempt have been made to conserve wildlife (72%), illegal grazing of livestock in Kamnarok National Reserve (70%), non-compensation for their ancestral land and damages caused by wildlife (69%), increase in human populations of Kamnarok NR adjacent communities (67%), adjacent communities encroachment in to the national reserve for more livelihood resources (65%), high demand for Kamnarok NR resources

(64%), habitat loss and fragmentation as more livelihood resources are extracted from Kamnarok NR (52%) and land use change as more agricultural land is required for food production (44%) were some of the factors highlighted. Climate change effects (34%) and interest for tourism venture (28%) were also cited by respondents as possible contributing factors (Figure 4.12).

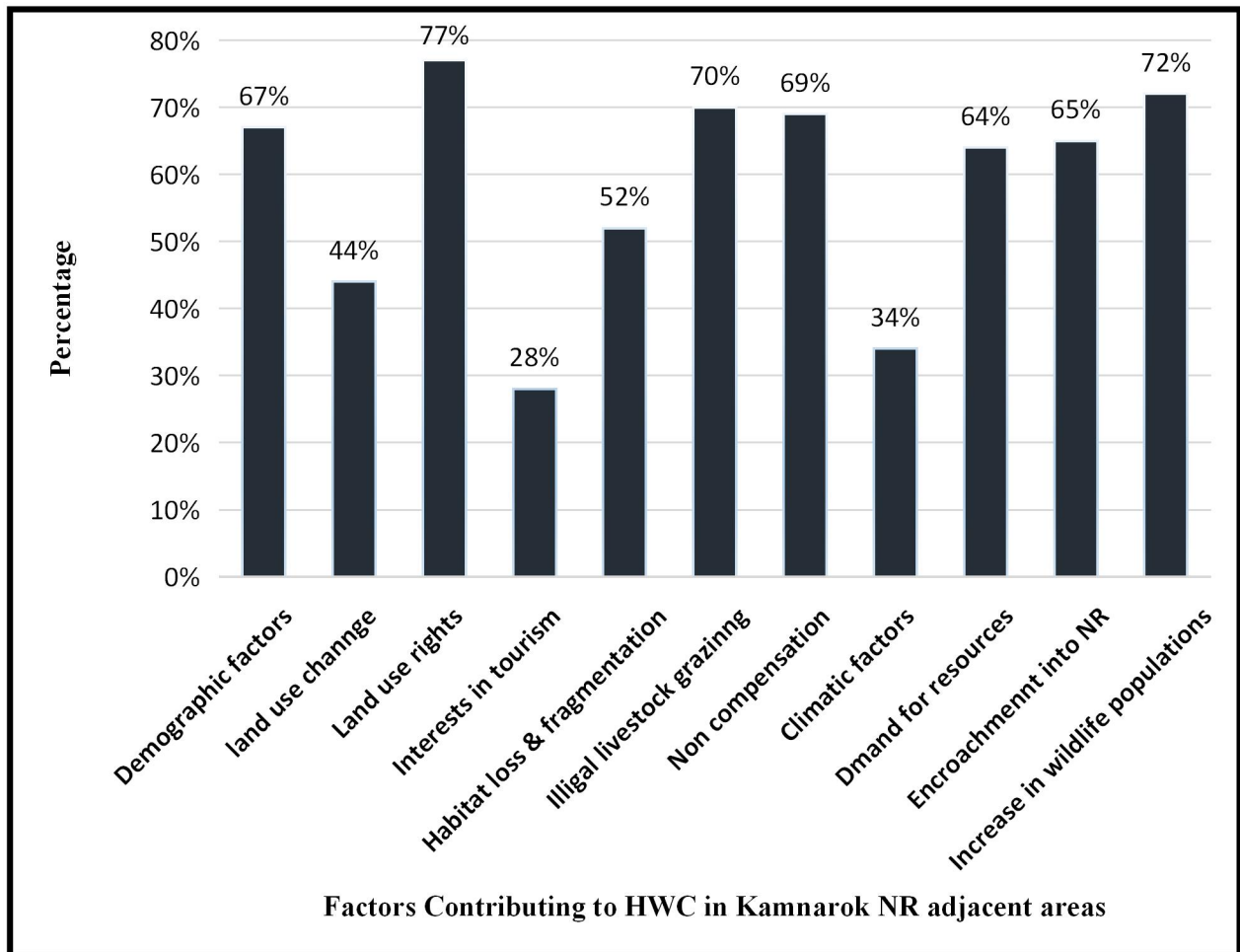


Figure 4.12: factors contributing to HWC in Kamnarok NR adjacent areas
 Source: *Field survey, 2017*

The study findings further reveal that Kamnarok NR adjacent community increasing vulnerability to wildlife conflicts was as a result of extensive land right contestations as was stated by 77% of the respondents (Figure 4.12). Moreover, wildlife conservation in form of protected areas saw the establishment of Kamnarok NR which involved some degree of violent

eviction or suspicious agreements which elders signed without having a clear understanding of the consequences (Anderson and Grove, 1987). While this study did not aggregate types of land conflicts in the study area, the findings point out the pervasive nature of land conflicts. Further, the study observation noted that land contestation was the predominant driver of wider social conflicts. This finding was in line with the finding of Barnes *et al.*, (2013) who found that 73 – 76% of land disputes in Central and East Kalimantan contributed to social conflict in Philippines. Corvalan *et al.*, (2005) further noted in their findings that disputed claims over land and property rights comprising of lack of consent to use land and inadequate compensation for land use to land owners and the community as factors driving social conflicts. These findings also agrees with the existing knowledge which emphasizes that successful attempt to conserve wildlife in protected areas has resulted in an increase in wildlife populations particularly of mammals (Wells, 1992). These conservation efforts has contributed to escalation of conflicts between local communities, wildlife and park management authorities. This finding further is in tandem with the evidence of Gillingman and Lee, (2003) who argued that creation of wildlife protected areas (PAs) are associated with forced evictions with little or no compensation, changes in land tenure and denial or restriction on access to natural resources where the local communities have been using and depended upon since time immemorial.

Nepal and Weber (2012) argued that HWCs are issues which are mainly related to people's livelihoods which are difficult to overcome. 72% of the respondent generally reported that there is an increase in the occurrence of conflict between humans and wildlife as a result of increased wildlife population. The perceived increase is in part a result of more extensive human activities locally as well as perceived increase in wildlife populations due to possible reduction in

poaching and improved wildlife surveillance by both Kenya wildlife service rangers and Baringo county government administration.

Various studies have argued that the human-wildlife conflict and resentment are attributed to local people perceiving insecurity in land tenure and to their historical land experiences. Literature has also acknowledged the existence of land tenure insecurity and land use rights as a human wildlife conflict factor (Kameri, 2002, Kohler, 2007). Issues such as resentment and loss of extraction/use rights and losses from wildlife induced damages and lack of or limited financial compensation has been identified as the root causes of conflict between local communities and conservation programmes in Kamnarok NR adjacent areas. In line with this findings, Baral and Heinnen (2007) in their study of crop protection against wildlife in Chitwan National park in Nepal, noted that illegal livestock grazing inside protected areas and extraction of park forest resources caused imbalance relationship between the local community and park authorities. With an estimated 1500 households and over 16000 inhabitants (Baringo CIDP, 2013 - 2017), majority of the Kamnarok NR adjacent community members mainly engage in land and forest based economic activities which has led to more interactions with wildlife and potentially generating conflicts. Over 54% of the households engage in economic activities that come into conflict with wildlife which include illegal farming, livestock grazing and charcoal burning in the reserve lands.

Okello and Kioko (2010) found out that competition between growing human populations and wildlife for the same declining environmental resources and living space as the main cause of human wildlife conflict. This has been occasioned by the transformation of forests, savanna and other ecosystems into agricultural land, for settlement and urban areas due to increased demand for land for food production. Sitati *et al.*, (2005) in their study of human elephant conflicts (HECs) and livestock predation in Kerio valley ecosystem noted that habitat change often involve clearing forest vegetation and other wildlife habitats which in turn increase human exposure to wildlife by decreasing the extent of wildlife habitats. Furthermore, due to higher demand for land, most of these activities are occurring in areas that have been zoned as wildlife areas within Kerio Valley (Kerio River). The increased demand for land for agricultural purposes and the simultaneous disregard for land use regulations has contributed to an increased human wildlife conflicts in Kamnarok adjacent areas.

FAO (2009) found that human populations have tripled since 1960's globally which has seen the spread of agriculture into semi arid and arid (ASALs) lands leading to encroachment of more marginal lands which have been acting as wildlife habitats (Campbell *et al.*, 2003). Muruthi (2015) noted that the settlement of people into new habitats leads to increased demand for resources that are also necessary for wildlife e.g. water and pasture for livestock and setting permanent residence near water resources preventing wildlife from accessing water thus setting scenarios for conflicts (Fergusson, 2002). 64% of respondents of Kamnarok adjacent areas alluded that that high demand for local natural resources has contributed to conflicts in the study area.

Land use change over time has shown to have a positive significant influence on human wildlife conflicts. Land use change within Kamnarok NR and adjacent areas over time has precipitated conflicts as alluded by 44% of the respondents. This findings is in tandem with the findings of Mbau (2013), who in her study on land use change and HWCs in Taita Taveta observed that land use change was one of the key factors contributing to escalating HWCs. She noted that land use change influences habitat quality and quantity and plays a pull-push effect on the conflicts. Kagiri (2004) found that availability and quality of habitat influences animal foraging behaviours both at temporal and spatial scales. Within Kamnarok NR and adjacent areas which are considered wildlife ranges, habitats have gradually decreased and increasingly become fragmented leaving wildlife confined into smaller pockets of suitable habitats. Due to intensification of human activities (livelihoods) around Kamnarok NR as indicated by 81% of the respondents, HWCs have become prevalent as wildlife stray into adjacent cultivated fields or grazing areas normally considered as wildlife population sinks (Van Aarde *et al.*, 2007). Patterson *et al.*, (2004) in their study on severity of HWCs around Tsavo national park noted that natural and climatic factors such as drought and climate change can lead to a decrease in suitable wildlife habitats, thus influencing the occurrences and extent of HWCs.

4.2.12.1 Wildlife Population Trends

The study sought to determine wildlife population trends of Kamnarok NR. Wildlife population census was obtained from both Iten and Kabarnet wildlife stations. The population census data obtained were census acquired through animal counts from aerial surveys conducted between 1996 and 2016 in Rimo and Kamnarok NRs. Upon analysis, the findings reveal that there is a gradual rapid increase in the African elephants (*Loxodonta africana*), Grant gazelles

(*Gazella granti*), savannah buffalos (*syncerus caffer*), giraffes (*Giraffa camelopardalis*) and spotted hyenas (*Crocuta crocuta*) with some decline in some other wildlife species in Kamnarok NR. Figure 4.13 summarizes population trends of livestock and some of the abundant wildlife species in Kamnarok NR and Kerio valley ecosystem for instance the elephants, buffalos, impalas, crocodiles, common zebra and grant gazelles.

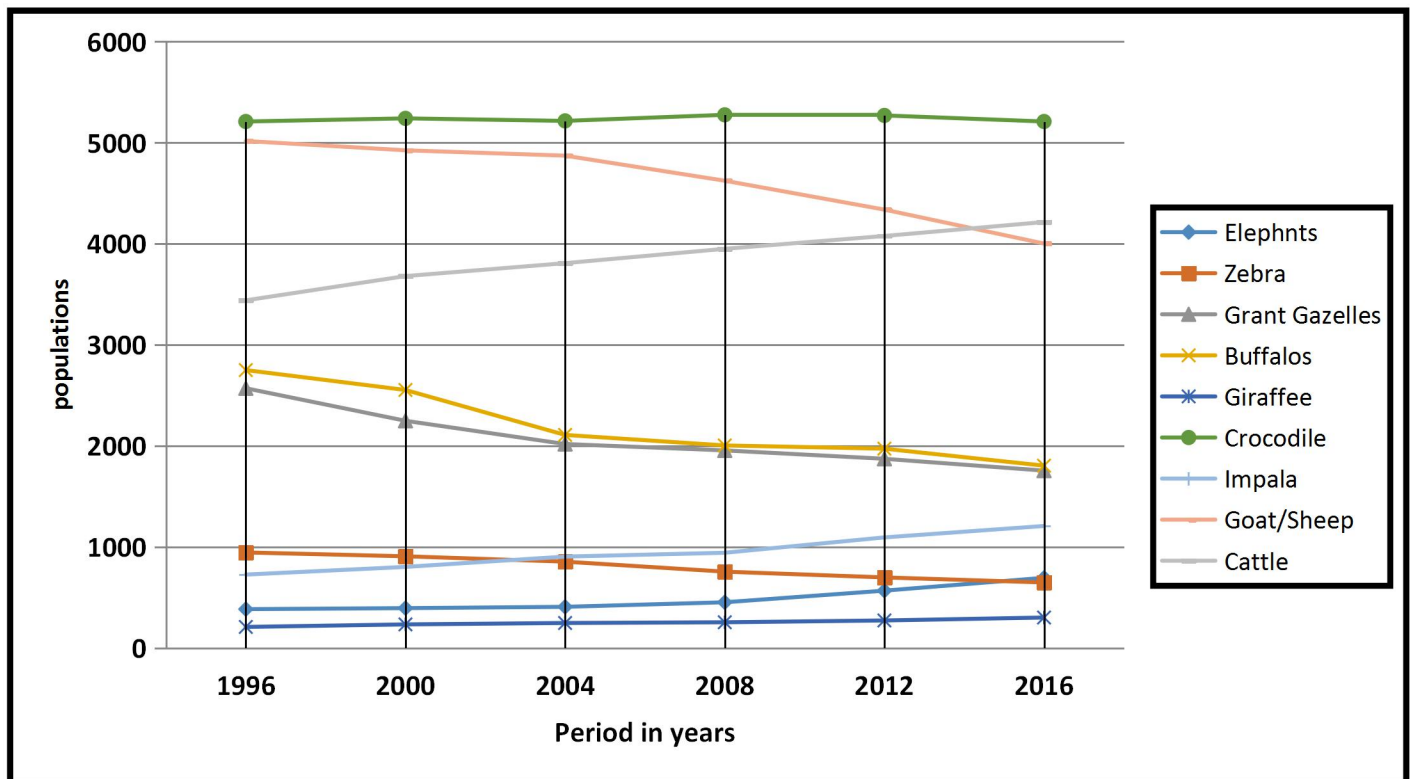


Figure 4.13: Wildlife Species Population trends between 1996 – 2016

Source: *Iten and Kabarnet KWS stations, 2017*

The study findings further indicate that the total non migratory wildlife population in Kamnarok NR and Kerio Valley ecosystem in general increased by 24.6% during the 20 year period (1996 – 2016) (Figure 4.13). Common zebras (*Eguus burchelis*) declined by 31.4% while buffalos (*Syncerus caffer*) and grant gazelles (*gazela granti*) declined by 34.4% and 17.2% respectively. During the same period giraffes, and elephants increased by 40.3% and 81.2%

respectively. Crocodile and impala populations showed no change. Elephant and zebra dominance in Kamnarok NR and the Kerio valley ecosystem and their migratory patterns define the human wildlife conflicts in the study area. Our analysis showed that elephant population increased by close to 40% in the 20 year period and we compared this fluctuations with available HWCs data for the same period and observed a strong correlation with elephant human conflict (EHCs).

The increment in elephant and other wildlife populations is attributed to effective management roles by the local level institutions of Baringo County Government and the Kenya Wildlife Service (KWS). This findings is in agreement with Messmer (2012) findings who argued that good management practices including surveillance in wildlife resources and protection contribute to their populations. Messmer (2012) further indicated that human-wildlife conflict management when applied to situations that involve any negative interactions between humans and wildlife, whether conflicts are real or perceived, economic or aesthetic, social or political will definitely have positive impacts on wildlife populations. This findings is also in line with the study of Stander (2006) who found that better monitoring and increased patrols by government and NGOs assisted the recovery of rhino and elephant populations in the North-West region of Caprivi National reserve in Namibia.

Also many previous studies have found that wildlife management authorities perception of wildlife management play an important role in wildlife populations (Holms, 2003, Ottichilo *et al.*, 2010 and Mbau, 2013). Further analysis complemented by field survey showed that expansion of mechanized and irrigation farming taking place along Kerio River has acerbated the conflicts and

many wildlife managers would concur with this. The actual impact of crop cultivation along the Kerio River on wildlife distribution in the greater ecosystem of Kerio Valley has not been measured and analysis of livestock populations within the same period showed fluctuating patterns with an increasing trend in cattle in the recent years.

4.2.12.2 Food Crops Grown by Households

The study sought to establish crop production livelihoods of Kamnarok NR adjacent households. Respondents were asked to response on the checklist of crops grown in the area as agriculture has multiple purposes were outputs in the area are strongly influenced by human wildlife conflicts and agro-climatic vulnerabilities. Over 80% of the household grow maize, millet, sorghum and cow peas. Other notable food crops grown were vegetables, beans, groundnuts, bananas and fruit trees. Rhode grass is also grown by some households as animal feeds for their animals or for commercial purposes (Figure 4.14).

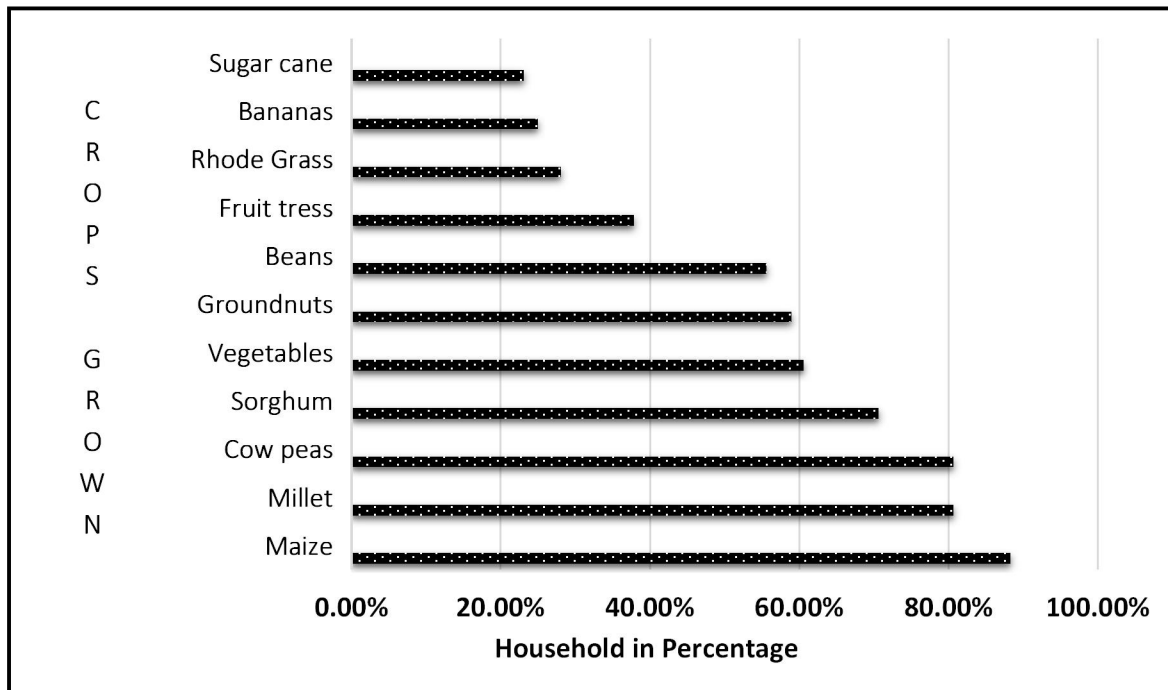


Figure 4.14: Household Food Crops

Source: *Field Survey, 2017*

Further findings indicate that at least more than 20% of the Kamnarok households have increasingly diversify to Rhode grass fodder production in response to forage scarcity associated to climate variabilities and human wildlife conflicts.

4.2.12.3 Crop Raiding Animals

Identification of crop raiding animals is in part addressing issues of human wildlife conflicts in the study area. 25.6% of the respondents considered themselves agro-pastoralist and small scale farmers. Crop raiding was identified as significant problem around Kamnarok National Reserve margins with 73.6% of agro-pastoralists and small scale farmers claiming to have lost crops to wildlife raids in the previous years. Respondents were also asked to identify wild animals that mostly raid and destroy their crops on their gardens and farm lands (Table 4.13). Fourteen species of wild animal were identified as existing in Kamnarok national reserve.

Furthermore, respondents were also asked to rank them in terms of their crop raids and intensity on farm lands, gardens, property damage (buildings) and again based on their past experiences of interactions. The results indicate that elephants were ranked as the most rampant crop raiders in Kamnarok NR adjacent areas followed by primates (Vervet & colobus monkeys and baboons). This findings is in agreement with Muruthi (2015) and Archabald and Naughton – Treves (2001) findings which revealed that African elephants were responsible for up to three – quarters of all crop damages caused by wildlife in AWF Zambesi heartland in Zambia and that crop raiding was a key form of HWC and the most important perceived disadvantage of farming close to protected areas were elephants who are considered disastrous crop raiders.

Table 4.13: Household Opinion on the Extent of Damages by Crop Raiding Wildlife

Wild Animal	Very Small *freq.	Small *freq.	Big	Very big *freq.	Total No. of Responses *Frequency
Elephant	7	15	122	108	252
Vervet monkey	12	27	70	96	207
Colobus monkey	9	19	61	44	133
Buffalo	18	25	11	39	103
Baboon	17	22	32	19	90
Aardvark	7	20	11	9	57
Warthog	30	11	0	4	46
Squirrel	9	14	18	24	43
Eland	13	22	7	0	42
Zebra	9	11	8	12	40
Impala	0	22	11	6	39
Bush pig	3	9	14	10	36
Birds (Quelea Sp.)	8	11	7	6	34
Total	133	217	364	365	1082
%	12.4	20.2	33.7	33.7	100.0

*Frequency based on multiple responses

Source: *Field Survey, 2017*

Surprisingly during the study, it was established that cultivation close to Lake Kamnarok and along Kerio River was more riskier. Substantial crop damages around Lake Kamnarok and those along Kerio River by herds of elephants was observed. Respondents also attributed baboons and Vervet monkeys of being highly skilled crop raiders one key informant alluded.

They could chew on young tobacco, millet stems and sugar cane to extract juices and spit the fibre out, a typical case of human beings.

(KI: Assistant chief, Muchukwa sub location)

Also the finding revealed that buffalos, squirrel and aardvark were among crop raiding species contributing to human wildlife conflicts in the study area. While Eland, Impalas, Bush Pig and Quelea bird species were least crop raiders (Table 4.14).

4.2.13 Livestock Predation

Livestock predation is globally the most common form of human wildlife conflict and can involve a variety of taxa including *canids*, *raptors* and *felids* (Thirgood *et al.*, 2005). The study sought to establish the magnitude of livestock predation by wild carnivores of Kamnarok national reserve. 84.6% of the household respondents knew their livestock were killed by wild predators. They listed that about 2 camels, 8 cows, 19 sheep, 39 goats and 14 donkeys were killed by leopard. 4 camels, 17 cows, 78 sheep, 26 goats and 7 donkeys were preyed by hyenas. 117 cows, 208 sheep and 98 goats were attacked by crocodile in Kerio River. Jackal killed 27 sheep, 34 goats and 4 donkeys in the previous year (2016) (Table 4.14). This findings is in tandem with the findings of Athreya *et al.*, (2016) whose results indicated that conflicts involving carnivore species particularly conflict prone large *felids* have potential catastrophic consequences to local communities' main stay livelihoods especially to households were livestock form part of household diet.

Another, 81.7% of the respondents responded that the livestock were attacked during the night and/or late afternoon while 2.8% responded that their livestock were attacked during the day. Elephant only attacked 8 cows in the last one year. There was no response on livestock attacked by lions implying lions may have gone into extinct in the national reserve. 56.5% of the livestock

of Kamnarok NR adjacent areas has been lost to crocodiles of Kerio River and those of Lake Kamnarok which is located inside the national reserve (Table 4.14).

Table 4.14: Livestock Killed in the last one Year

Livestock	Number attacked by predators							Total
	Leopard	Hyena	Jackals	Baboons	Lions	Elephants	Crocodiles	
Camels	02	4	-	-	-	-	-	6
Cows	08	78	-	-	-	8	117	211
Sheep	19	26	27	13	-	-	218	303
Goats	39	26	34	4	-	-	98	201
Donkeys	14	7	24	-	-	-	-	45
Total	82	141	85	17	-	8	433	766
%	10.7	18.4	11.1	2.2	-	1.04	56.5	100.0
Time of Attack	Locations							
	Lawan		Kabutie		Kerio Kaboske		Total	
	Frq.	%	Frq.	%	Frq.	%	Frq.	%
Night	92	25.6	109	30.3	78	21.6	294	81.7
Day	7	1.9	-	-	5	1.4	10	2.8
Late afternoon	15	4.1	27	7.5	29	8.0	56	15.6

Frq. = frequency

Source: *Field survey, 2017*

The Study findings indicate that livestock are potentially an easy prey for carnivores and therefore are likely to facilitate and accelerate the increase in the number of wild cat prowling on settlement areas and cause havoc (Madhusan and Mishra 2003). Some literature also has attributed the loss of livestock to wildlife living and roaming around settlement areas and proximity of human settlements to protected areas (Ogutu *et al.*, 2015). This has led to an increased human deaths, crop damage and loss of livestock (Sitati *et al.*, 2003). Goldman *et al.*, (2010) in their study findings noted that attack on livestock by wild predators resulted in the loss

of important sources of income for households. The livestock loss is as a result of carnivores straying into Kamnarok NR adjacent areas (Nyuhus and Tilson, 2004, Patterson *et al.*, 2004). The loss of livestock in Kamnarok NR adjacent areas has generated negative attitude towards carnivores and this loss is attributed to illegal grazing of livestock in the reserve areas with even households setting up livestock enclosures (*bomas*) inside the reserve and the movement of carnivores outside the reserve in such for prey. The notorious predators of the study area were crocodiles and hyenas.

These conflicts are more frequent during wet season because of greater availability of water points for wildlife in the adjacent areas, allowing wild animals to venture further from the reserve. Based on the field observation, this is much less the case during the dry season and therefore conflict situations are significantly lower in frequency because many wild animals remain deep in the reserve near the few permanent water sources. Also the wet season is characterized by the presence of a wide variety of crops in the farmers' fields, which attract wildlife due to the typically high nutritional value of the crops. Preference for cultivated crops with high nutritional value is an optimal foraging strategy for wild animals living close to farm land areas, especially elephants which can forage over large and long distances (Sukumar, 1991). Therefore, social, economic and ecological factors operate complementarily leading to the variability of human wildlife conflict impacts in the study area adjacent areas.

4.2.14 Mitigation Measures the Local Employ to Minimize Damages

Human-wildlife conflicts can be managed through a variety of approaches, however, from interviews and field observations, it was observed that local farmers employed variety of

techniques in order to minimize wildlife damages (Figure 4.15). 21.7% of the farmers reported to have fenced their pieces of land as a control measure against wildlife intrusions. Shouting and making noises by beating empty containers and use of repellents such as dogs was done as a cooperative effort among neighboring farmers (15.6%), while 12.4% hired security guards to protect their farms and livestock from wildlife invasion. The farmers noted that these methods were not effective since the elephants quickly got used to the noise. Some farmers (24.2%) lit fires around the farm lands. Fire flames and smoke in the fields also served as a short-term deterrent measures, however respondents highlighted that fire lighting was unsustainable for any length of time without large tracts of forest being cut down or even lit over.

It was also observed that fire flames and their smoke were more effective but had to be kept burning the whole night. 32.8% of the interviewed farmers also mentioned of the habitual raiding elephants attacking even when the fires were burning. This finding support the study conducted by Hillman-Smith *et al.*, (2005), where local communities surrounding Garamba National Park in the Democratic Republic of Congo have been using other materials to increase the deterrent effect of fire. They add capsicum seeds to fires to make it more effective on wildlife, while in Zimbabwe brickettes of elephant dung mixed with ground chillies are used (Hoare, 2001).

Killing the problematic animals has been, and still is, widely used as a quick-fix solution to human wildlife conflicts. In this study 8.6% of the farmers kill small wild animals by trapping them with snares while 3.9% poison them as a mitigation techniques (Figure 4.15). Some farmers stone (4.2%) crop raiding animals. Farmers said that this method worked minimally but in some cases it made some wild animals agitate, charge and attack them. According to Hoare (2001),

killing has the advantage that it does have some effect (even if short-term), it is relatively cheap and quick, and it has good public relations value in the affected community.

Six reported cases of farmers being attacked while trying to stone buffalos were reported. 2.8% of some farmers reported crop raids to KWS officials after the raids. Farmers mentioned that KWS rangers showed up in some nights to scare the buffalos, zebras and elephants by shooting flares or blanks. However, this is not effective since rangers cannot cover a large area and some elephants were used to the shouts and noises. Also, rangers showed up long after the wild animals had raided farms and left. Conversely, interview with KWS field rangers indicated that, lack of demarcated boundary between communal and Kamnarok NR lands has facilitated the movement of not only the wild animals in and out of the reserve, but also of domestic livestock. Kamnarok Game Warden stated that due to the land dispute between the community and Baringo County Government stray and unattended cattle were entering the reserve posing a major risk in terms of disease transfer between domestic and wild animals. In most cases, rangers were chasing cattle out of the reserve on weekly basis.

Hence all these cases seem to suggest that techniques used by the locals, and to some degree KWS, to minimize wildlife damages are largely haphazard and ineffective or the wild animals have become increasingly aggressive. It appears that there is a need for a more pragmatic approach to this issue, such as removal of the known problematic animals including the rogue elephants every year. This may lessen the problem but will in no way reduce the wildlife damage problems to zero.

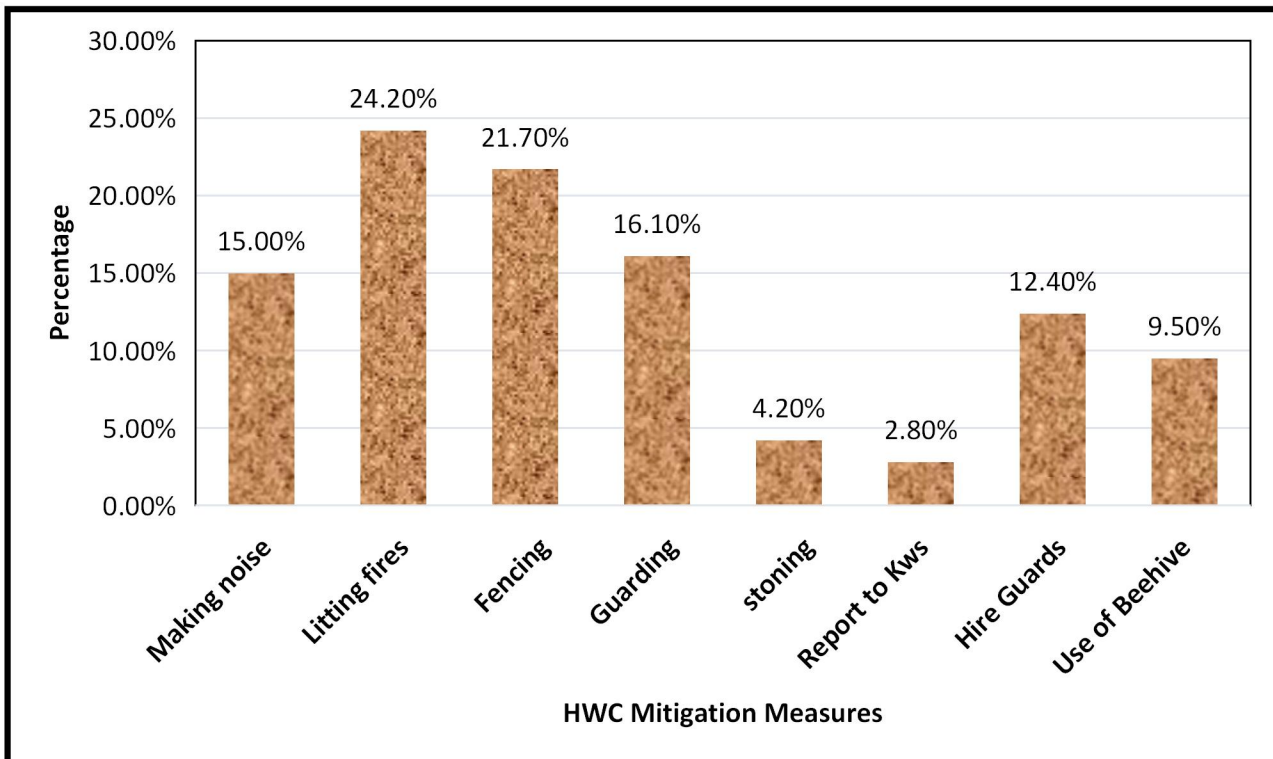


Figure 4.15: Mitigation Measures Used by the Local Community to safeguard crops and livestock

Source: *Field Survey, 2017*

According to Suryawanish *et al.*, (2013) study findings on HWCs mitigation strategies, they found that the diversity of control and mitigation measures on human wildlife conflicts range from physical and vegetation barriers, electric fencing, culling, shooting, translocation to scaring and monetary compensation for losses suffered and damage inflicted from wildlife. As indicated in this study none of the highlighted mitigation and control measures were being applied nor adopted in the study area, therefore this study findings are in contrast to the findings of Suryawanish *et al.*, (2013) as no farmer nor respondents reported using vegetation barrier as an option to human wildlife menace in Kamnarok National Reserve adjacent areas. However, 48% of the respondents interviewed view electric fencing and elephant translocation as the most viable solution in the control and management of human wildlife conflicts.

4.2.15 Challenges Associated with Access to Kamnarok National Reserve Resources

Secure access to Kamnarok NR and its resources is central for the well being of the local community. When asked about their views on challenges associated with access to reserve resources, 13.9% households do not access Kamnarok resources for a number of reasons ranging from expensive permits (2.2%), stringent regulations (1.1%) and access denial by rangers (1.7%) to households distances away from the reserve resources (8.9%) (Table 4.15). But majority (86.1%) of the households in the study area access Kamnarok national reserve resources because of cheap permits (13.3%) while a substantial number of households (46.1%) utilize the reserve resources with a believe that they are a free grazing areas and as part of their ancestral land (Table 4.15).

The greatest beneficiaries of the reserve resources are the rich households (80.3%) while the poor households (19.7%) constitute the remaining users (Table 4.15). In line with this finding, Roe *et al.*, (2006) and Timko *et al.* (2010) in their study findings stated that rural communities world over depend on natural resources such as bush meat, fodder, firewood and wild berries for their livelihoods including sale of such products, and that the greatest resource exploiters are the rich people. Their findings further elaborated that dependency on natural resources increases with an increase in poverty levels among the poor households.

Table 4.15: Challenges associated with access to Kamnarok NR Resources

Accessibility	Reasons	Frq.	%
No	Expensive permits	8	2.2%
	Stringent regulations	4	1.1%
	Household far from Kamnarok NR	32	8.9%
	Chased by wildlife rangers	6	1.7%
	Total	50	13.9%
Yes	Cheap permits	48	13.3%
	It is a free grazing area	166	46.1%
	No control by wildlife rangers	96	26.7%
	Total	310	86.1%
Beneficiaries	young people	93	25.8%
	Average people	195	54.23%
	Old people	72	20.0%
	Rich	289	80.3%
	Poor	71	19.7%

Source: *Field Survey, 2017*

4.2.16 Options of Minimizing Wildlife Damage in Kamnarok NR Adjacent Areas

Some of the potential options for dealing with wildlife damage issues in Kamnarok NR adjacent areas are briefly outlined below;

Translocation: Moving problematic wild animals away from Kamnarok NR could be costly exercise, besides there is nowhere to shift the problems to. Translocation may offer a remedial measure though there are no guarantee the remaining wild animals will not cause further problems

Controlled Shooting: This might be visible since it would target problematic wild animals and rogue elephants outside the reserve. This is inexpensive and easy to implement and can lower conflicts. However, there will be opposition from some stakeholders For example, some

stakeholders such as KWS, AWF, the Convention on International Trade on Endangered species of flora and fauna (C.I.T.Es) argue that protection of signature specie like elephant is important as it is classified as an endangered specie.

Financial Compensation: This can be expensive and provide no guarantee that the problem will be resolved. In fact when poorly managed, financial compensation can have the effect of perpetuating the problem. Assessment and valuation of damages has been very difficult. Compensation can be effective if it is closely monitored and well funded by tourism revues generated from reserve, but Kamnarok NR receive minimum tourists therefore tourism revenue from the reserve is low and financial compensation is unsustainable.

Fencing and other barriers: Fences have shown to be ineffective as barriers. All pilot electric fences around Kiboi Irrigation Scheme is in a state of disrepair. Also it is very expensive to construct and maintain fences. Thouless and Sakwa (2005) evaluated the different types of barriers. Stone wall, 3 and 6 stand electric wire fences used against elephants in Laikipia County. The barriers were judged to be ineffective since elephants broke through all of them. Elephants use their legs to break fence posts or push them over with their tusks or run through them regardless of the electric current (Thouless and Sakwa, 2005). In Malaysia, it was observed that the ability of the habitat to provide adequate food for wildlife was a factor determining effectiveness of electric fences against wild animals especially elephants (Rice, 2000). Hence, in highly seasonal and variable habitat areas such as Kamnarok NR adjacent areas even the best designed fences may not be effective since elephants will break through in search for food. This is true given the fact that Lake Kamnarok which is located inside the reserve dries up during the

dry season and the rest of the watering points outside the reserve are increasingly used including the adjacent riverines which are heavily grazed by livestock. Furthermore, the cost of maintaining fences may be too high and there may be no one to do maintenance for decades to come. Hence, fences should only be used as part of an overall mitigation strategy.

4.2.17 Kamnarok NR Land Use Planning and Zoning

The study sought to establish HWCs trends between Kamnarok NR and the neighbouring Rimoi NR by comparing reported conflicts in the occurrence books for the two PAs. The findings indicate that HWCs in Rimoi NR was declining as compared to Kamnarok NR were the conflicts were in upward trend (Figure 4.16).

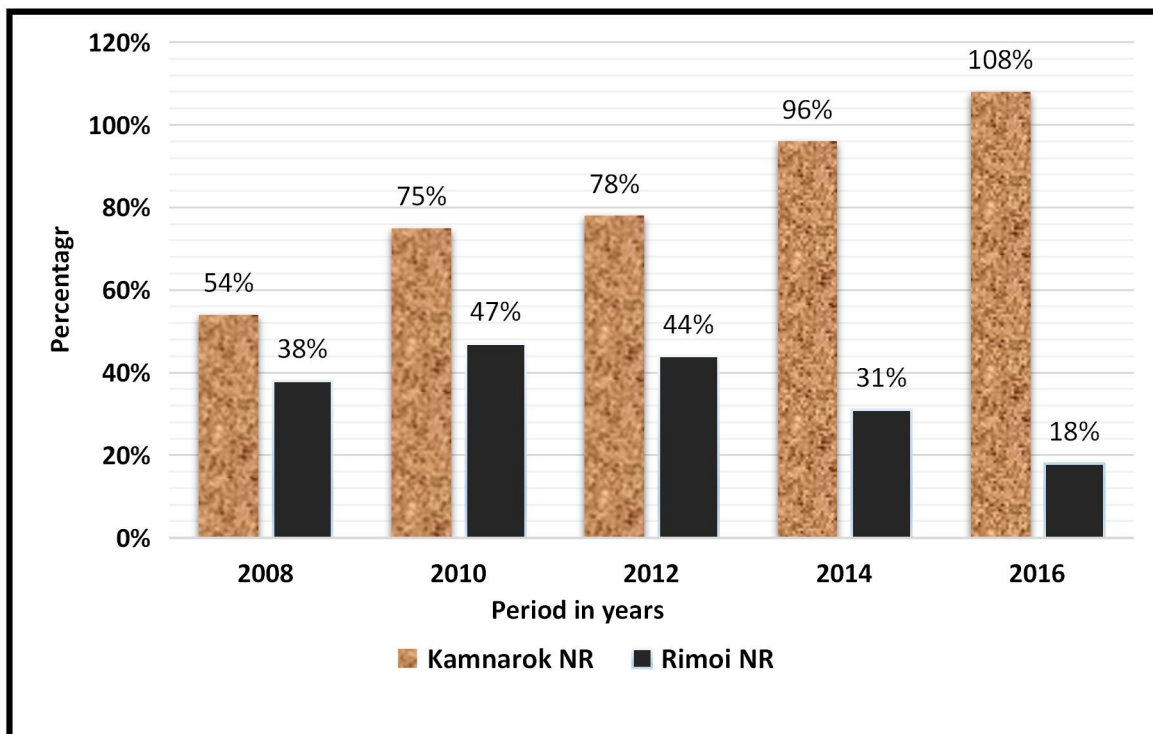


Figure 4.16: Changing Trends in the number of HWCs of Crops and Livestock by Wildlife in the two National Reserves between 2008 and 2016

Source: *KWS Iten & Kabarnet stations, 2017*

Data from KWS Iten station indicated a remarkably declining trends in HWCs in the neighbouring Rimoi NR. According to the Rimoi Senior Warden, decline in HWCs reported cases was probably due to the implementation of electric fences around the western side of the Rimoi NR boundary and zonation plan by the Tourism and Wildlife Department of Elgeyo Marakwet County Government which has led to the relocation of all households around Kerio River adjacent to Rimoi NR. Therefore to address HWCs in Kamnarok NR adjacent areas, the management of the reserve should consider carrying out local level land use planning (LUP) which should partly aim at minimizing HWCs. The findings from Rimoi NR reserve indicate that such planning, if effectively implemented can be effective in reducing the frequency of crop damage caused by elephants and other wild animals.

As mentioned earlier in this study, land use planning in Kamnarok NR and the adjacent areas will be difficult to be achieved as it will be political and hard since people may not agree to have the use of their land legislated without any compensation. Existing research done in Caprivi National Park in Namibia indicate that local community support for wildlife conservation and other conservation efforts only succeed when the local community have seen some benefits (Gupta, 2013). Both the national and Baringo County Government in the past have not shown and demonstrated the interest and commitment in drafting land use policy that affect wildlife areas (Lelenguyah, 2013). If pursued well, this option has the potential of creating access to critical resource areas within and beyond the Kamnarok NR (Heinen, 2006). Also, KWS and Baringo county government could set up zones for compensation around Kamnarok NR for example certain areas could be designated whereby if they fall within a certain distance of the NR, the farmers cultivating in these zones are not eligible for compensation (Hoare, 2016). On

the other hand wildlife damages beyond such designated areas could be assessed for compensation Wishitemi (2008). This may have the effect of limiting intense land activities near the reserve boundary.

4.3 The Extent to Which Human Wildlife Conflicts Affect the Well being and Welfare of the Local Community

4.3.1 Well being and Welfare Perception

The study sought to establish household perception on well being and welfare impacts. 60.3% of the household respondents felt that they are living a poor quality life as a result of wildlife while 29.2% of the households felt that they were living a good quality life irrespective of wildlife impacts while 10.6% were unsure of the status of their living standards (Figure 4.17). While explaining their poor quality of life, 35.4% of households stated that this was due to the presence of wildlife damaging food crops and predating on their livestock, their main stay livelihood base resources and also threatening their safety. While explaining good quality life, households stated that they are not bothered by wildlife as they have adequate resource security (Figure 4.17).

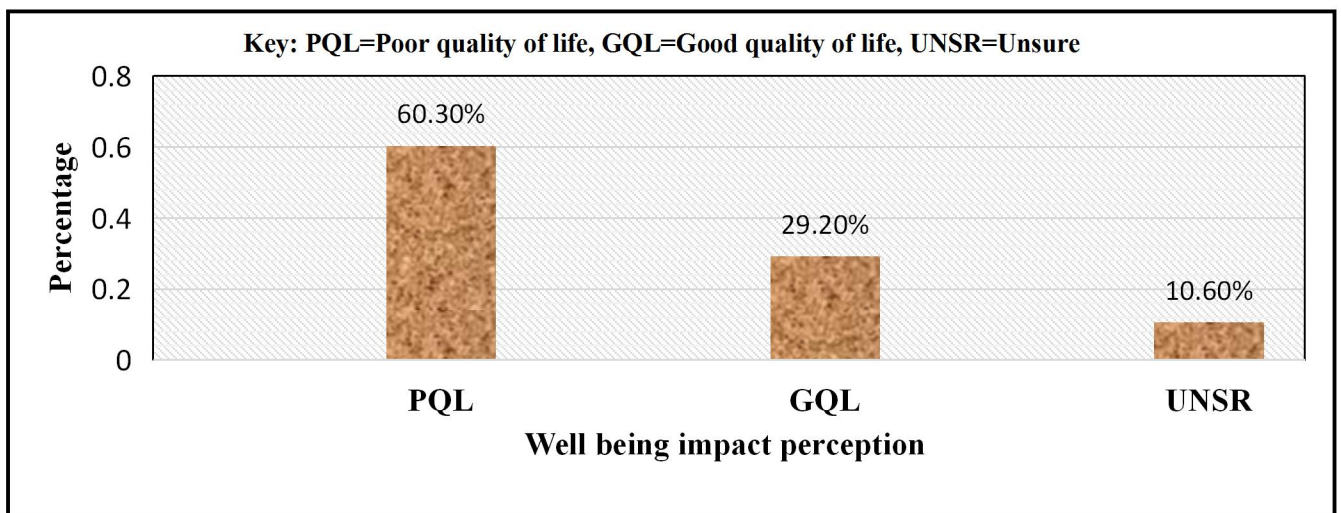


Figure 4.17: Well being impact perception
Source: *Field survey, 2017*

In-depth discussions with villagers from the three locations (Lawan, Kabutie and Kerio Kaboske) revealed existence of hostility towards Kamnarok NR, although this may have been biased by the perception that the researcher was linked to the Reserve management authorities and the adjacent household perception levels of their well being. However, there was greater dislike of Kenya Wildlife Service personnel who had been implicated in numerous arrest of herders including the deaths of some of them and local village men who harvest the reserve natural resources. 59% (n=212) of the adjacent households alluded the persistent existence of disputes over boundary locations and access to grazing areas. Few (1.1%, n=4) households reported receiving any direct benefits from tourist revenue, and local people never linked the presence of wild animals to any benefits emerging from the reserve hence their poor quality of lives. This findings support Dickman (2010) study findings on local people's perception of their well being in Pawaga-Idodi conservation area in Tanzania who attributed their poor quality lives to both human wildlife and human human conflicts over resources.

4.3.2 Well being and Welfare Impacts

The impacts of HWCs were numerous and were divided into two categories: visible and hidden impacts. In literature visible impacts are well known and have been documented and perhaps clearly understood. On the other hand, hidden impacts are not directly noticeable and are more difficult to quantify but are equally borne by the affected communities. Impacts of HWCs in the study area were identified from day to day socio – economic effects of conflicts on the affected people in the community.

The aspects of livelihoods and social activity assessed were malnourishment and poor health as a result of insufficient food, wildlife stress on agricultural livelihood, loss of time due to guarding crops and livestock in the fields, reduced capacity to improve standards of living due to loss of income and restricted social movement and contacts in the villages due to safety concerns. The proportion of household respondents reporting these impacts of HWCs on well being varied across location clusters Figure 4.18. Wildlife stress on agricultural livelihood was highly reported in all the three locations (Kabutie 19.4%, Kerio Kaboske 14.2% and Lawan 11.5% in that order) because of it being the main stay of many household livelihoods. Capacity to improve household standard of living was also reported in all locations, but frequently reported in Kabutie location (18.6%) probably due to its closeness to the reserve boundary and experiences more wildlife presence than other locations. Insufficient foods potentially lead to malnourishment and or poor health was reported frequently in each of the location cluster and was greatest in Kabutie location (11.4%). Restricted social movement contacts in villages was least reported frequently in both Lawan and Kabutie locations (2.8%) and frequently reported in Kerio Kaboske 3.3% (Figure 4.18).

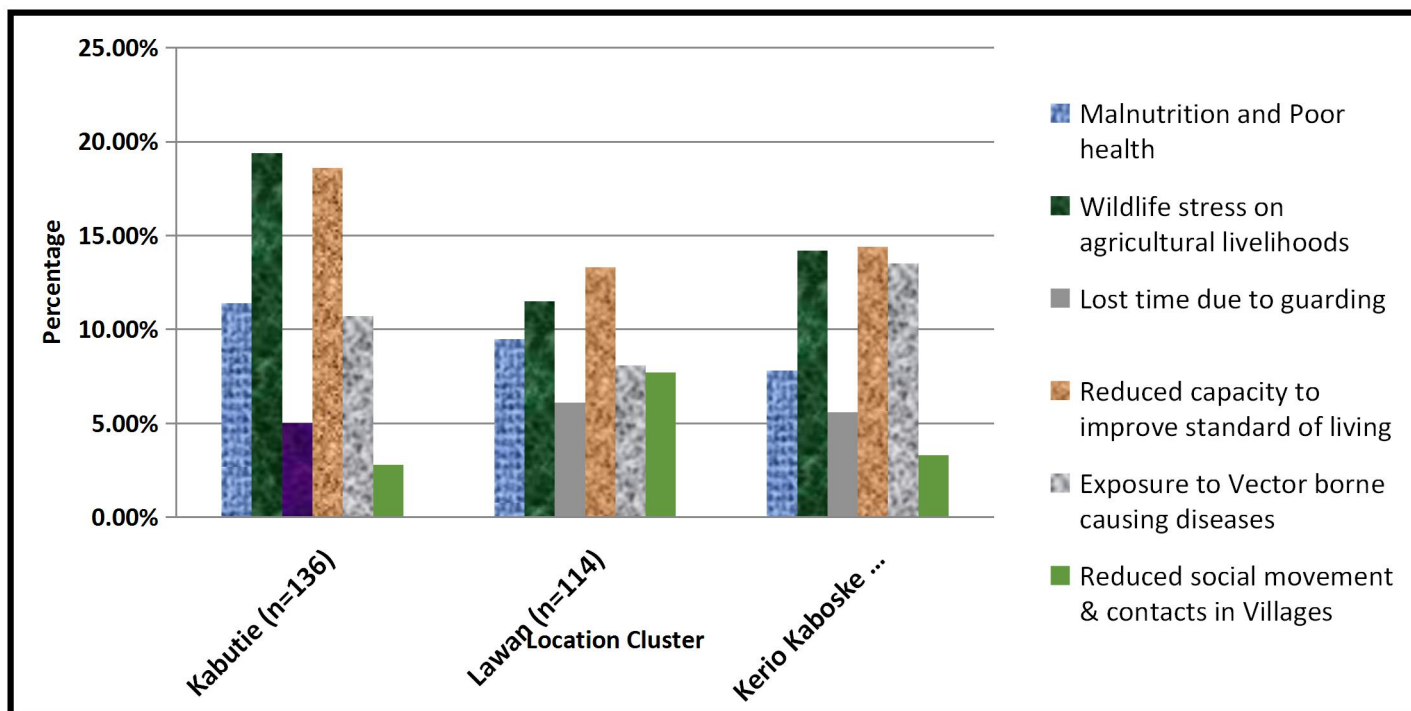


Figure 4.18: Well being and Welfare impacts

Source: *Field Survey, 2017*

4.3.2.1 Malnourishment and Poor Health

Household food insecurity is a major problem among adjacent communities of Kamnarok NR, and crop raids by wildlife often leads to large reduction in harvests. Usually harvests are divided into two portions: one for domestic consumption throughout the year until the maturity of crops in the next season and the remainder to be sold to generate cash income. Reduction in crop harvest as a result of damages from wildlife sometimes means there is insufficient food requirements for household consumption and possibly for sale. Therefore, there may be severe food shortage in the affected households during the dry season persisting into wet season when planting and cultivation is taking place. Most of the respondents, (77.2%) reported food shortages and during the wet season household mostly rely on wild vegetables which are low in nutritional value to supplement their diet. Food insecurity in the adjacent areas of Kamnarok NR

has also prompted affected households to harvest maize before it dries fully so that it can be grounded into maize flour for meals (*ugali*). Food shortages have negatively impacted the well being and welfare of the adjacent communities through malnutrition and poor health especially among the elderly and young children who have stunted growth. This assertion is supported by the statement of a nurse at Barwesa Health Centre.

“.....Some of our outpatients are elderly malnourished people whose main health risk is malnutrition. Some facilities in this division have malnourished babies who are brought here regularly for vitamin D and C’.

(KI: Health Nurse, Barwesa Health Centre).

Correlation of malnutrition in the Kamnarok NR adjacent areas include inadequate food and nutritional intake, food insecurity (i.e. uncertainty to food access), and high burden of infectious or non-infectious diseases (UNICEF, 2014). On-going crop damage by wildlife in Kamnarok adjacent community farms has played a large role in reducing household’s (farmers) harvest over time leading to increased food shortages, persistent food insecurity and compromise the well being and welfare of the community through malnutrition and poor health that flow from it. Maxwell and Smith (2012) described the different shocks that caused food shortages leading to food insecurity in rural marginal areas. Furthermore, the findings also corroborates the findings of Manjur *et al.*, (2014) where they argued that livelihoods and well being of rural poor households in Northern Ethiopia were more vulnerable to the existence of wildlife protected areas (WPAs) in their mist because their livelihoods are dependent mainly on agriculture and on the available natural resources. Also the findings posits that human wildlife conflicts disrupts household social structures and at times leave women and the less endowed households vulnerable to financial security and young children orphaned.

Two shocks that lead to food shortage in Kamnarok adjacent areas are work shocks and output shocks. Work shocks occur when availability of labour changes abruptly often due to illness or sudden unexpected events. In Kamnarok NR adjacent community areas work shocks are mainly malaria and injuries from wild animals that debilitate households particularly farmers and undermine food security in affected households. Outputs compound the problems of work shocks and food insecurity. These occur when crop yields are reduced due to crop damages/destruction either by weather events, diseases, insects or wildlife. In Kamnarok NR adjacent areas destruction of crops by wildlife and failure to implement effective mitigation measures has resulted in reduced yields and continuing food shortages that have compromised nutrition and food reserve for many households (NDMA Nutrition Survey, 2016). These findings were also confirmed by National Disaster Management Authority (NDMA) who conducted Baringo nutrition survey between March – July 2016 in Baringo North and Central sub counties and based its survey in livelihood zones (pastoral, agro-pastoral and marginal mixed farming) of Baringo county and analysis of secondary nutrition information of the county. The main reason attributed for poor and serious malnutrition in both sub counties was inadequate food supply in households (Table 4.16).

Table 4.16: NDMA Baringo Health and Nutrition Survey

Region		Baringo North (Barwesa Division**)				Baringo Central (Kapluk Division)			
		Pastoral/Agro-pastoral		Mixed Farming/irrigated cropping		Pastoral/Agro-pastoral		Mixed Farming/irrigated cropping	
Year		2015	2016	2015	2016	2015	2016	2015	2016
Global Malnutrition (GAM)	Acute	13.4%	17.6%*	10.7%	18.5%*	4.2%	5.1%	4.9%	6.2%
Interpretation		Serious	Critical	Serious	Critical	Normal	Poor	Normal	Alert

GAM (Global Acute malnutrition) interpretation: GAM <5% - Normal, 5-10% Alert, 10-15% Serious and >15% Critical:

* Critical conditions

** Study area (Division)

Source: *Barwesa Health Centre, 2017*

4.3.2.2 Wildlife Threats on Households Livelihoods

According to (Baringo CIDP, 2013-2017), For farmers in Kamnarok NR adjacent areas, the county government prioritization of wildlife conservation means further marginalization of their risky agriculture based livelihoods with few or little benefits in exchange. Land use constraints along with performance of the agricultural sector, due in part to livestock predation and crop damage by wild animals help explain why economic activities in Kamnarok NR adjacent areas are severely affected, and why increased agricultural productivity, one of the goals of the National Development Plan and Rural Development Policy of (2012) has not materialized. Data from the Department of Wildlife in Baringo County Government indicated that notably crop destruction by wild elephants is increasingly a problem as Kerio valley ecosystem elephant populations has increased three fold over the last 10 years to an estimated 642 with 70-80% of the population living outside Kamnarok national reserve.

(KI: *Barwesa Division, Agricultural officer interview, 10th May, 2017*).

Data from Kenya wildlife service (KWS), Kabarnet regional office indicated that the number of elephant conflict reports from Kamnarok NR adjacent community rose dramatically over a period of 10 years. Nine reports were filed in 2007 and consistently increased through 2017 were 38 incident reports were filed.

(KWS Senior Warden interview, 14th June, 2017).

The state land zoning of Kamnarok NR for wildlife conservation and the associated increase in wildlife that freely raid crops have created adverse conditions which, arguably outweigh any of the weather or soil related losses that exist for Kamnarok NR adjacent communities. Like crops, livestock are also subjected to predation by wild animals. Kamnarok NR adjacent resident communities expressed great frustrations at the fact that current conservation laws forbids them from killing problem animals like elephants. Residents agree that as a result, wildlife have become increasingly aggressive and less fearful of human and traditional scare tactics such as beating drums and use of scare crow no longer deter elephants.

Focus group discussion confirmed this finding, as residents of Kamnarok NR adjacent areas repeatedly emphasized that elephants and other wild animals were destroying crops and making farming an increasingly nonviable activity as one male participant explained.

“.....when I was growing up, farming was our main stay of life, so when wild animals attacked we killed them, but now if you kill an elephant you have to answer for that..... we farm but get nothing.... Tomorrow you go early to the field but find nothing because of elephants”.

(Focus Group Discussion1).

Another female resident stated the matter openly

“...the number of wild animals has increased so villagers don't want to farm because when they farm wild animals destroy their crops”.

(Focus Group Discussion 2).

Other studies in Kamnarok NR adjacent areas have also found a similar sentiment amongst Kamnarok NR adjacent villagers. For example in the participatory community action plans, Kamnarok NR adjacent community residents listed increase in wildlife and food problems caused by wildlife menaces as two of their top ten problems. Frustrations towards elephant and other wild animals especially crocodiles that destroy crops and predated on livestock has at least in part affected the well being and welfare of Kamnarok adjacent residents and made them to give up plowing their farms. It was observed that crocodiles pose the biggest problem to the Kamnarok NR adjacent people and their livestock. This was further confirmed by the preliminary of July 2017 survey of Kamnarok NR adjacent community division conducted by National Disaster Management Authority (NDMA) on the status off farmed lands within Barwesa division. The findings indicated that arable farms were gradually declining for the last three (2014-2017) consecutive seasons. The findings indicate that for 2014/2015 season, arable farming declined by an average mean of 12.20%. 2015/2016 and 2016/2017 seasons declined by 7.56% and 4.17% respectively (Table 4.17).

Table 4.17: Size of farm lands farmed between 2014–2017 seasons

Season	2014/2015 Season		2015/2016 Season		2016/2017 Season	
	Location	Hectares farmed	% of arable land farmed	Hectares farmed	% of arable land farmed	Hectares farmed
Lawan	12,690	5.39%	10,244	4.35%	7,094	3.01%
Kabutie	33,474	19.02%	37,517	8.5%	30,026	1.7%
Kerio Kaboske	18,777	12.21%	14,974	9.73%	12,944	7.86%
Mean average	21,647	12.20%	20,912	7.56%	16,688	4.17%

Source: *Barwesa Division Agricultural office, 2017*

4.3.2.3 Lost Time Due to Guarding Crops and Livestock

Due to problems of wildlife in the study area, some respondents reported that they were prevented from engaging in other activities that would help them increase their income or engage in other social cultural events. These activities include employment for wages, traditional brewing, growing of preferred crops such as cassava, reduced ability to travel and inability to enlarge crop fields. In Kamnarok NR adjacent areas crop and livestock guarding is the main intervention mechanism used by households in efforts to protect their livelihoods (livestock and crops) against wildlife. In many cases this has led to household shifting from the village homesteads to stay in crop and grazing fields. Because this require large amount of time, they are unable to take up employment opportunities that may cause for fear of losing their livelihoods to wildlife if crops and livestock are unguarded. Most respondent (n=209), 58.1% reported that they are unable to look for or accept employment because they are too busy guarding livestock or crops. This has increased poverty in the study area. This finding is consistent with the findings of Mackenzie and Ahabyona (2012) who reported that the high labour intensiveness of guarding often restrict rural households from participating in other non agricultural income generating activities.

4.3.2.4 Reduced Capacity to Improve Standards of Living

Like in many rural areas in Kenya, agriculture is a major source of livelihood and income generating ventures for many households in Kamnarok NR adjacent areas. However, losses from crop raids by wild animal have increased and entrench poverty experienced by households to the extent that they are unable to meet their basic needs.

Assessment and valuation of the crop damage was done using direct monetary costs to locals. Using the documented reports and interviews with selected 194 households, wildlife crop damages was evaluated to estimate the financial costs incurred by the locals due to wildlife damages. Assessment and valuation was done using the prevailing market prices of the damaged/destroyed crops. The prevailing (2017) market prices of crops and livestock were provided by Baringo North Sub County Agricultural Officer at Barwesa trading Centre (*Mr. Kiptui from the Department of Agriculture, Baringo County Government*) and was verified by the researcher at the local Barwesa and Turtur market centers. To estimate the total costs in the three study locations, the number of the incidents per category was multiplied by the prevailing market value (shillings) of the commodity.

The findings shows that on average, a household in the study area losses an average of $10.3 \times 90\text{Kg}$ bags of maize, $9.3 \times 90\text{kgs}$ bags of millet and $5.0 \times 90\text{kgs}$ bags of cow-peas each crop growing season. In monetary terms and based on the 2017 cereal market price set by the government at Kes 3000.00, Kes 4500.00 and Kes 6600.00 per bag for maize, millet and cow - peas respectively, the average amount of loss costs to each household (farmer) in the study area is Kes 105,750.00 per harvest season Table 4.19 (Appendix IV). This amount of income loss is

based on maize, millet and cow-peas as they are the major marketable and staple crops grown in the area without accounting for the costs of losses from other crops to wildlife. The average income loss to crop raiding animals per household in each location was Kes 101,400.00 in Lawan, Kes 106,000.00 in Kabutie and 105,750.00 in Kerio Kasboske (Table 4.19, Appendix IV). For households whose livelihoods are dependent on their crop outputs, these amounts of income loss are a major and very significant.

These direct income loss has resulted in a range of impacts on well being and welfare of most households in the study area, which has reduced capacity to improve standards of living and households failing to send their children to school. Majority of the households in Kabutie location who have school going children attend only primary level, largely because it is a government policy (*free primary education*) to provide free basic education. Many children eligible to attend secondary school do not attend or cease attending due to lack of sufficient household incomes. Also high rates of early marriages in the study area was reported to be contributing to the cycle of poverty in affected households and this may be related to lack of sufficient income.

4.3.2.5 Exposure to Vector Borne Causing Diseases (Malaria and Pneumonia)

Like in many other communities co-existing with wildlife, residents of Kamnarok NR adjacent areas usually guard their livestock and crops in an effort to protect them from wildlife. Most households have built temporary make shift structures for use during guarding hours which are typically during the nights. In some cases, households will shift completely from their village to live in their farm field shelter for the large part of the crop growing season until harvest is

complete. These practices increase the exposure of many people to vector borne causing diseases such as cold weather during the night and rainy season and mosquitos causing pneumonia and malaria respectively. This finding agrees with Osborn and Hill, (2005) whose study found out that exposure to bad weather and disease vectors increase the chance of contracting infections. Guarding animals and crops at night not only increase the risk of contracting pneumonia but also the risk of increasing malaria cases locally. Kamnarok NR adjacent environments are mosquito prone areas and especially within Lake Kamnarok and along Kerio river where guarding livelihood resources is a high risky activity in terms of exposure to cold weather and mosquitos.

Records at Katibel and Barwesa Health Centres showed that the highest number of pneumonia and malaria cases was reported among household farmers during the crop growing season particularly from April to July were guarding peaks. Partial health record data for the year 2015 and 2016 indicated a total of 259 and 207 of malaria and pneumonia cases respectively. A clinical officer at Barwesa Health Centre attributed this high incidences of illness cases to patients (farmers) exposing themselves to coldness and/ sleeping without mosquito nets or staying out till late hours of the night guarding crops. This is consistent with responses from (n= 283) 78.6% of the respondents.

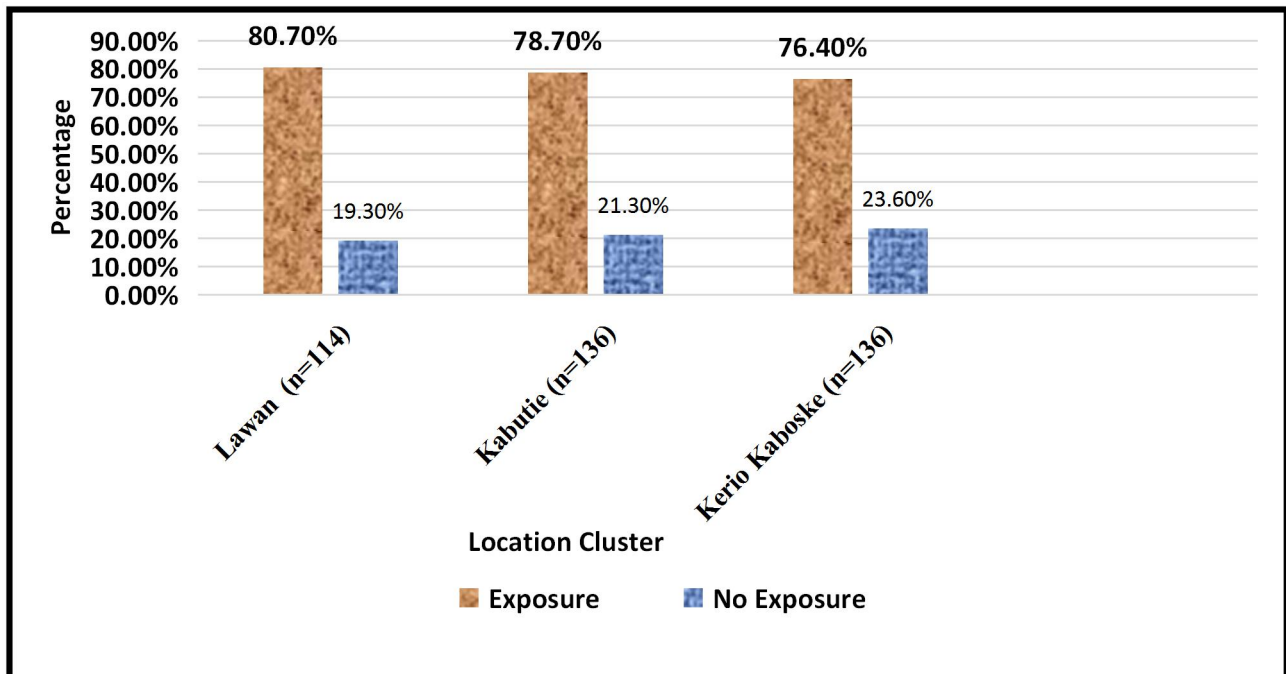


Figure 4.19: Exposure to vector borne causing diseases
 Source: *Field Survey, 2017*

The high prevalence of pneumonia and malaria in the study area may have contributed to the reduced farm productivity leading to poverty experienced by household in Kamnarok NR adjacent areas. Gallup and Sachs (1998) demonstrated that malaria and poverty are intimately connected and at global scale, countries where people are highly susceptible to malaria have low economic growth. This is the case at household level where the impacts of pneumonia and malaria can have direct impact on human well being and welfare. Negative direct impacts on well being are the household cost expenditures related to medical treatment including medicine, transport and or special diets. Other related welfare impacts are mainly in form of loss of productive labour for those suffering from pneumonia and malaria as well as household members taking care of them (Russel, 2007).

4.3.2.6 Livestock Diseases

The study sought to establish whether the spread of wildlife diseases to livestock was an impediment to the welfare and well being of the households in the study area. Focus group participants were asked to state their views on livestock diseases transmitted by wildlife of Kamnarok NR. One male participant had this to say.

‘Grazing livestock in Kamnarok NR land is no longer feasible and makes wildlife diseases spread to livestock easily’. Kamnarok NR land is one big grazing field that has facilitated the mixing of cattle and wild animals, we put a lot of effort in dipping and vaccinating our cattle, while wild animals are not, do you think we can ever win the battle?

This was according to one livestock farmer (FGD 3).

Although wildlife was viewed as being the cause of illness in livestock, 68% of the livestock dependent households spoke about the perceived role of wildlife in transmitting illness to livestock such foot and mouth, black quarter and east coast fever (ECF). Shared use of grazing land between livestock and wildlife, particularly during rainy seasons was mentioned, as was the perception that wildlife carry ticks. The livestock herders’ concern was the mixing of livestock and wildlife together in grazing fields as unsustainable option for them but the dilemma of grazing livestock in Kamnarok NR has led to continuous livestock infection from wildlife diseases causing hardships for households and thereby harm livestock sales and instigate downward spiral in the household’s livelihoods. It was also observed that household economic hardships inflicted from livestock losses had affected local attitudes towards wildlife and so to household livelihoods and economic well being.

4.3.2.7 Restricted Social Movement and Interactions

The study sought to establish personal safety and movements of households in the study area. Focus group participants were asked to comment on their feelings of safety within Kamnarok NR adjacent areas as a whole. Of these, 71% of the participants stated that they feel unsafe when wildlife especially the elephants intrude into their compounds and properties. By contrast, 19% of the participants stated that they feel safe, explaining that they are used to living with wildlife while 10% felt unsure. Also majority of the FGD participants (64%) stated that they feel more safe in their homes and village centres and unsafe in the livestock grazing fields. Participants explained that they feel unsafe at the latter because they can hear elephant activity during the day and worry that they may kill them or invade farm crops. Conversely, participants feel safe in their home villages because wildlife especially the elephants do not come to areas where humans are more densely populated. For example, one participant shared;

“I’ve never experienced an incident where an elephant can just come in the compound, Konoo village. I am always suspicious of the crocodiles, snakes and the scorpions, but not elephants”.

(FGD 2).

Interestingly, a few participants explained that they stay and continue guarding their livestock or staying in their farms despite feelings of insecurity, because it is their livelihoods resources which are more important than anything else. However, in extreme cases where safety threats were enough to influence participants to relocate to nearby villages or next shopping centres, they consider doing so. For example one participant explained;

“Elephants are in this area. If I walk around here and I encounter an elephant, it might kill me or be dangerous for me. Sometimes we do not stay in our homesteads, we are sleeping at Muchukwa Village Centre. We are afraid of those wildlife and particularly elephants. Muchukwa Centre is safe because many people stay there”.

(FGD 3).

These predominant feelings of compromised safety, particularly in the farms and livestock grazing fields influence participants' perceptions of mobility within Kamnarok NR adjacent areas. 68% of the participants made general statements about their inability to walk in the community freely, while an additional 38% of household respondents have mobility connection problems to livestock grazing tasks. For example, the following participant statements reflect trends in participants' perceptions of their abilities to visit relatives, collect water, and fetch firewood, respectively;

“We do not have that freedom of movement. We are not free to visit our relatives. Even if someone is sick in the night, we cannot just go to our neighbour's to tell them that you will come and assist them. Because we are afraid that if we go out, you will meet a dangerous wild animal

(FGD 2).

“Nowadays we don't have that freedom of movement, like when I go to the riverbank to fetch water. I just go checking whether the elephants are around and when they are....it makes us afraid of collecting water”

(FGD 4).

“Here in Barwesa, Kaptiony Village we don't have electricity to do things like cooking, we only use firewood to cook. But when I have to go and collect firewood in the bush and I see them, sometime I can't afford to get the firewood. I have to go fetch firewood almost every day for my use and sale to get money for my family”.

(FGD 3).

The impact of restricted movements on participants' ability to herd livestock, however, is more nuanced. Relative to their statements about restricted movements interrupting collection of water and fuel wood and willingness to visit neighbours, participants expressed greater hesitance to abandon livestock herding efforts.

4.3.3 Consequences of Human Wildlife Conflicts on Household Livelihoods and Welfare

The study sought to determine consequences of HWCs on household's livelihoods and welfare by interviewing key informants within the study area. Table 4.18 presents the consequences of HWCs to rural households surrounding Kamnarok National Reserve.

Table 4.18: Consequences of HWCs on household livelihoods and Welfare of Kamnarok NR Adjacent households

Livestock predation and loss	<ul style="list-style-type: none"> • Food shortage (loss in milk and meat production) • Low/poor school attendance (inability to pay school fees) • Hindrance in households development • Loss of income and livelihoods (Death/loss of livestock)
Crop losses and Damages	<ul style="list-style-type: none"> • No/poor harvest of food crops • Low/poor school attendance (inability to pay school fees) • Hunger (food shortage) • Reduction in household meals • Migration of household members • Loss of livelihoods and incomes • School dropout (guarding crops and inability to pay fees)
Human injury and Death	<ul style="list-style-type: none"> • Huge medication bills • Permanent disability (injuries from crocodiles and wildlife) • Human death • Poor school attendance

Source: *Key informant interviews, 2017*

The challenges and consequences are the outcomes of the human wildlife conflict being experienced by the community members and are being felt differently among the households. The households' interviews indicates that for the past seven years (2010 – 2017), households in the study area used their pieces of land for multiple livelihood needs. For instance crop

cultivation, small urban developments, livestock grazing, intensive irrigation among other uses. Moreover, in 1986, part of the communal land was carved out and designated Kamnarok National Reserve and currently due to land shortage, it's not possible for the local households to expand their portions of land they own amid land dispute between the community, Baringo County Government and Kenya Wildlife Service on the other hand. Among other challenges heightening human wildlife conflicts in the study area is high population growth as an outcome of local immigration.

(KI: Assistant chief, Muchukwa Sub Location interview, 23rd July, 2017).

According to this key informant, local immigration has caused high demand for land for various livelihood activities including livestock keeping, crop farming and the upcoming urban settlements leading to continuation of land use conflicts between Kamnarok National Reserve and local households. This finding confirms to the findings of Sindiga 1995 and Muruthi 2015. According to Sindiga (1995) and Muruthi, (2015) human encroachment on critical biodiversity depository sites in search of agricultural land has been shifting since the 1970's and 1980's to low potential rangelands which coincidentally are the prime wildlife ecosystems thus creating a myriad of problems like competition for water resources, human wildlife conflicts, habitat fragmentation and blocking of wildlife migratory routes and dispersal areas and the negative perception towards conservation of wildlife.

It was also observed that under the current Kamnarok NR conservation measures, it is not legally possible for the local households to encroach into the reserve land for their livelihood activities despite the existence of land dispute among the different parties.

(KI: Chief Warden interview, 15th September, 2017)

Majority of the households under study owned an average of 5-10 acres of land, which according to them is not enough for expansion and intensification of farming operations given the fact that their land situational conditions are those of arid and semi arid characteristic. For the majority of the households, land scarcity was seen as the contributing factor for escalating human wildlife conflicts and declining household income and crop output.

Figure 4.20 shows proportions of the effects of human wildlife conflicts on welfare and well being of households surrounding Kamnarok National Reserve. Among the most significant consequence to households was reduced household meals, food shortages, inability to pay school fees and income losses among others (Figure 4.20).

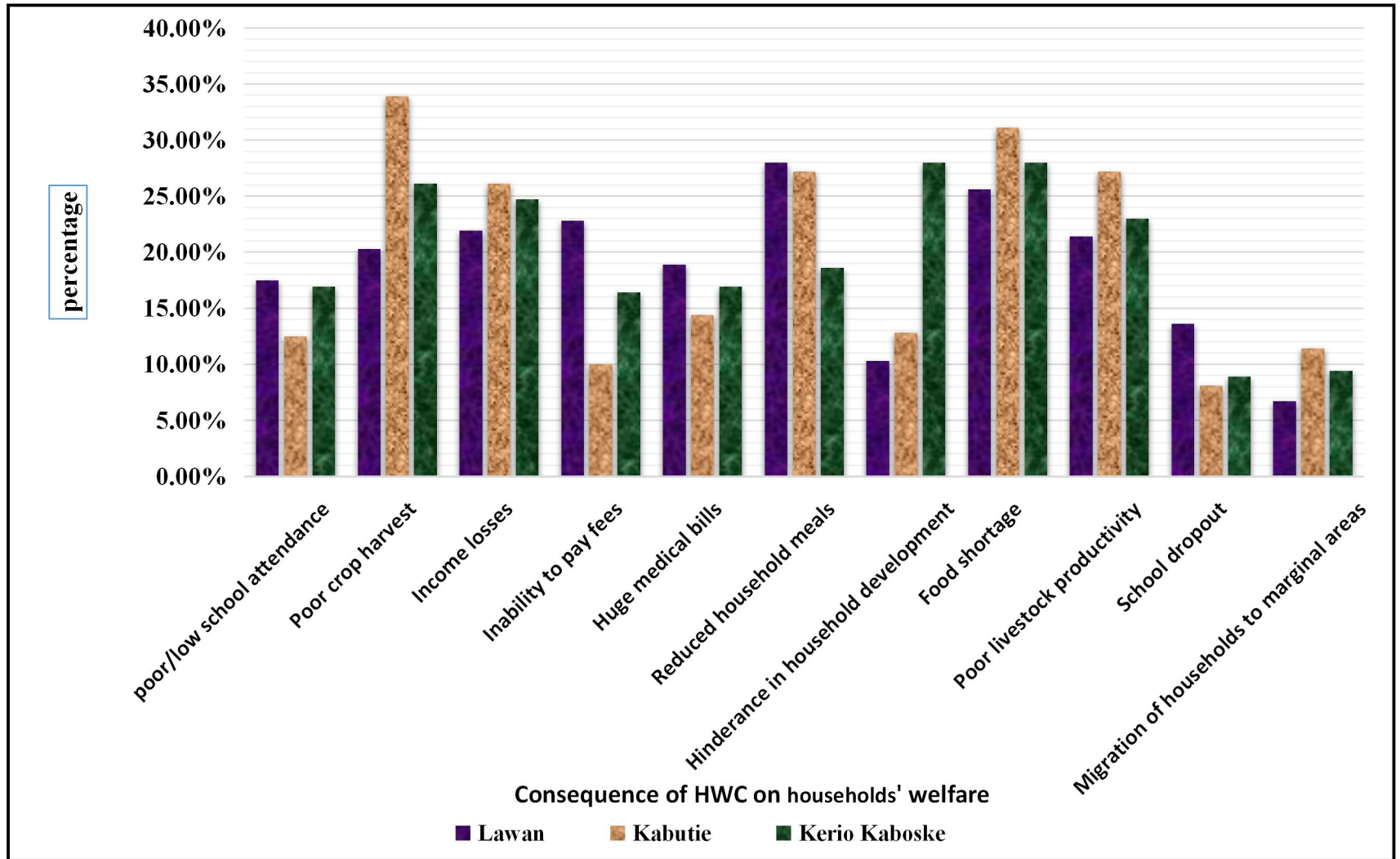


Figure 4.20: Consequences of Human Wildlife Conflicts on Household’s welfare and well being
 Source: *Field Survey, 2017*

It was also notable that as village residents talk about the significance of farming, they simultaneously emphasize the declining role of agriculture as a subsistence or income generating strategy in Kamnarok NR adjacent areas as a result of proximity to the reserve. One respondent summed up the situation aptly:

“The problem with farming is the elephants, because they destroy it. In the past years, it was okay, people were farming, depending on it, eating it, and even our father who was farming took us to school using that money. Nowadays the problem is the animals...but I can’t say I can’t farm because I am a Tugen. I will just try to get them (Elephants) away from my farm”.

(FGD 3).

The desire to farm was expressed frequently and emphatically by most household respondents of all ages, despite a reality in which agriculture provides few material benefits and none agricultural livelihood activities have become increasingly important to household survival. If as one elderly person stated, “life comes from the farming,” conservation planners need to recognize that farmers have to continue farming, despite grim agricultural prospects, as a way to maintain an identity that is tied to engagement with traditional agricultural means of production. This findings was in tandem with the findings of Rao *et al.*, (2002) where in their finding on human elephant conflicts (HECs) argued that economic losses inflicted from human-wildlife conflict are relatively high in developing countries because most affected farmers are poor and are rarely compensated for such losses.

4.3.4 Economic Well being Impacts of Human Wildlife Conflicts

The study sought to establish the costs and benefits of living with wildlife in Kamnarok NR adjacent areas. In terms of costs, it was established that the State has never paid any compensation towards mitigating damages and losses caused by HWC. It was further established

that the direct costs to government (KWS staff) of HWC was not high as it consisted of the person-hours, travel costs and subsistence costs involved in investigation of problem animal complaints, and removing identified problem animals. It was not possible to extract this information from the budgets of the Ministry of Tourism, KWS nor the Baringo County Government Department of Tourism & Wildlife Conservation as in all of them, no budget lines existed specifically for addressing HWC. This findings supports the findings of Akama *et al.*, (2011) who argued that Kenyan Government department do not provide large budgetary allocations in form of agricultural compensation schemes to gather for households affected by elephant and other wildlife damages. Therefore, the main costs as a result of HWC was observed to occur at the household level, though there existed no clear economic and livelihood losses at the household level from HWC.

4.3.4.1 Estimated Magnitude of Loss of Household Livestock to Wildlife Predators

The study estimated the magnitude loss of household livestock livelihood preyed by carnivores. Human carnivore conflict was a contentious issue in this study because it involved questions touching directly on human livelihoods and predations on livelihood sources on the other hand. According to existing literature wildlife associated costs can potentially impact on the socio economic livelihoods of many households. The study attempted to synthesize the available data on livestock predation by wildlife in Kamnarok NR adjacent areas and develop average household values for these costs by using 2017 market prices. The physical livestock losses, and the value of the losses represent the amount by which HWC reduces the gross income of crops and livestock producing households. This represented the first step to understanding HWC costs.

The next step was to see how much HWC damage reduces the net livelihoods of households (Table 4.19).

Table 4.19: Livelihood (livestock) loss to Wildlife Predators

Animal type	Average No. of animals lost	2017 Market price (KES)	Total loss (KES)	Mean average No. of animal loss per hh	Average loss per hh (KES)
Camels	6	55000	330,000	0.02	1,100
Cows	211	27000	569,700	0.59	15,825
Goats	201	4700	944,700	0.56	2,624
Sheep	303	4100	1,242,300	0.84	3,450
Donkey	45	2400	108,000	0.13	300
Total	766		3,194,700	2.12	23,299

Source: *Field survey, 2017*

The study revealed varying effects of HWC damage on the returns to investment (ROI) that households have made in livestock production Table 4.19. The study findings revealed that a household in the study area losses an average of 2.12 animals per year to wildlife with an estimated economic loss of Kes. 23,299.00. The analysis of the impact levels of HWCs on an average household crop production provide an indication of the costs of HWCs at household level. It is clear from the analysis that if current wildlife damages cost are doubled with concerted efforts in improving wildlife conservation in the study area, household crop production will entirely be non viable in terms of meeting household livelihood needs. A further study is necessary to examine how HWC damage affects the net contribution that the household crop or livestock makes to the national economy which was beyond the scope of this study.

4.3.5 Human Wildlife Conflict Impacts on Household Livelihoods

The study sought to determine the magnitude of HWC impacts on the livelihoods of Kamnarok NR adjacent households. The respondents were asked their opinion levels on the impacts of HWCs on their livelihoods. The respondents responses were rated as: No impact = 0, slight impact = 1, moderate impact = 2 and high impact = 3. Each score was converted into percentage score by dividing by four and the means for the various dimensions of HWC impacts analyzed (Table 4.20).

Table 4.20: Human Wildlife Conflict impacts on Household Livelihoods

HWC factors	No impact		Slight impact		Moderate impact		High impact		Mean	Std. Deviation
	F	%	F	%	F	%	F	%		
Crop damages	12	3.3	37	10.3	107	29.7	204	56.7	2.3972	.15131
Livestock Predation	18	5.0	41	11.4	188	52.2	113	31.4	2.1000	.13393
Wildlife hindrance on household socio economic activities	44	12.2	77	21.4	122	33.9	117	32.5	2.2000	.13924
Human injury and deaths	90	25.0	87	24.4	104	28.9	79	21.9	1.4778	.11804

Source: Field Survey, 2017

The survey data in Table 4.20 indicate that household crop livelihoods were slightly, moderately and highly impacted by human wildlife conflicts at 10.3%, 29.7% and 56.7% respectively. Livestock livelihoods were slightly, moderately to highly affected by human wildlife conflicts at 11.4%, 52.2% and 31.4% respectively, while on the other hand HWC hindrances to household socio economic activities was slightly, moderately and highly affected at 21.4%, 33.9% and 32.6% respectively (Table 4.20). In line with this findings, Ligia (2002) in her study on the impacts of HWCs on community well being in India, established that wildlife can exert pressure

on household main livelihoods domains especially key livelihoods resources such as livestock and crops. The study findings is further supported by Nelson (2005) who demonstrated that HWCs lead to loss of protected area adjacent households' main stay livelihoods.

Table 4.21: Relationship between Human Wildlife Conflicts and Household Livelihoods

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(constant)					
Do you think HWC has	.534	.167		3.197	.002
impacts on household livelihoods	1.364	.114	.783	11.813	.00

a) Dependable variable: How often are your livelihoods affected by HWCs

Source: *Author, 2018*

The established regression equation $Y=0.534 - 1.361X_1$, where constant = 0.534, implied that if human wildlife conflict impacts on household livelihoods increase was rated at zero (0), household livelihoods would be 0.534. $X_1= 1.364$ implying that a unit reduction in human wildlife conflict impact on household livelihoods increase would result to a reduction in human wildlife conflict impacts on livelihoods by a factor of 1.364 (Table 4.21).

The results in Table 4.21 also shows that HWCs impacts had significant ($P < 0.05$) impacts on household livelihoods. This indicates the likelihood that as wildlife move out of Kamnarok National Reserve into household farms they prey on livestock and damage crops which are their mainstay survival livelihoods, thus impacting on their livelihoods. The hypothesis “there is no relationship between human wildlife conflicts and community livelihoods” is therefore rejected.

4.3.6 Kamnarok NR Resources Contribution to Community Welfare and Well being

The increased commercial and subsistence demand for Kamnarok NR forest products and other natural resources in meeting the adjacent community livelihood needs continue to generate conflicts between the community, wildlife and the reserve management authorities. Close to 3500 acres of Kamnarok NR forest land have either been converted into farm lands, extracted for timber, fuel woods and poles for construction among other products.

(KI: According to Area Chief of Konoo location, interview on 4th August, 2017).

Kamnarok NR adjacent households were asked to list natural resources including non timber forest products (NTFPs) their household extracts from Kamnarok NR forest. The findings revealed that households inside and those close to the reserve boundary use large amounts of reserve forest products for instance, 42.4% of households living inside the reserve have farmlands while 61.4% of those living within 5 Kms of the edge of the reserve use the reserve forests for firewood. Another 84.6% of the households rely on the NR forest for provision of other wood products (wooden poles and timber), 47.2% use for medicinal purposes, 63.6% rely on it for honey production, 75.3% of households use the reserve for livestock grazing, 69.6% are dependent on the reserve forest for charcoal burning and 39.1% use the reserve for hunting while 56.2% use the reserve waters for fishing Figure 4.24. Similar findings were reported in India, in Uttarakhand (Vijayan *et al.*, 2002) and Gujarat (Sha & Heinen, 2001) and in Namibia (Tjaronda, 2012).

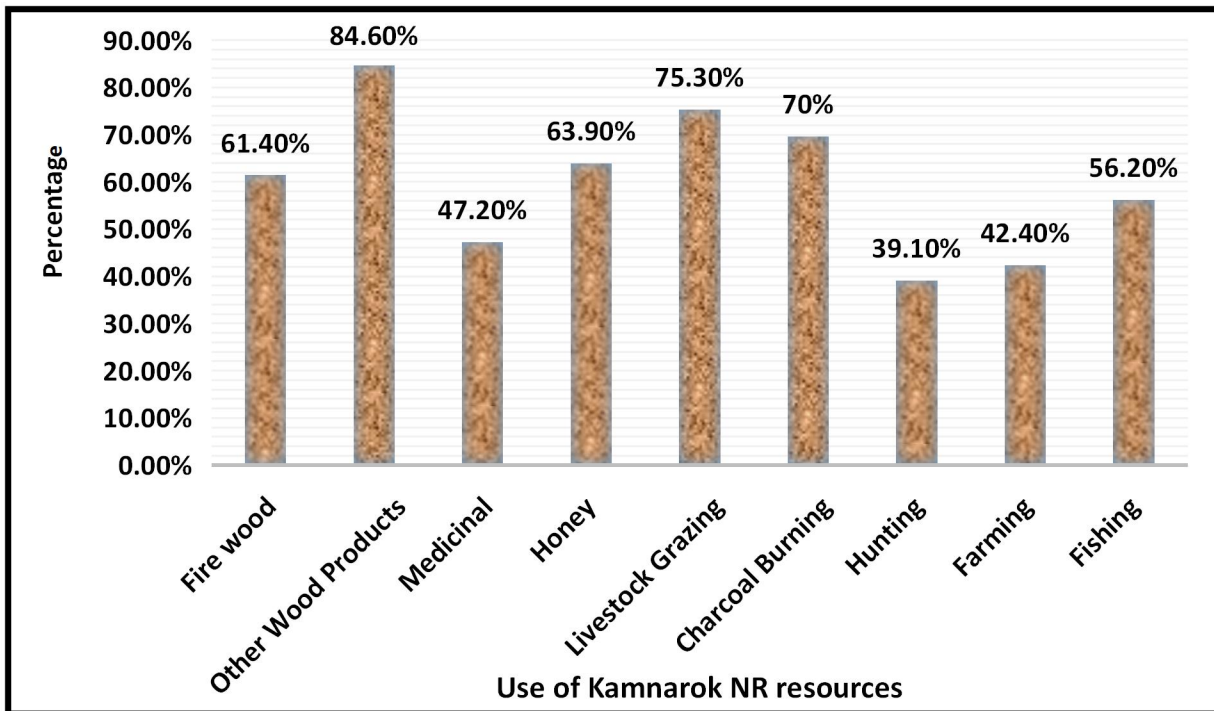


Figure 4.21: Community use of Kamnarok NR Resources

Source: *Field Survey, 2017*

Additionally, through observation, some of these uses are destructive while others are not. Overall, these activities have led to a decline in the reserve habitat quality where wild animals desert the reserve for farmlands in the neighborhoods (Meadow, 2013). Large ungulates such as the Buffalos and Elephants require woody vegetation covers as natural habitats. The study findings also reveal that the declining vegetation cover within Kamnarok NR and adjacent areas explain the increasing trends of household use of environmental resources for livelihoods needs (Kipaino, 2013).

To test the hypothesis “There is no relationship between livelihoods of the local community living inside and adjacent to Kamnarok NR with Kamnarok NR resources”, the household respondents were asked about their opinions on a five point likert scale and to indicate the extent to which they ‘agree’ or ‘disagree’ with statements concerning the contribution of Kamnarok NR

resources to community livelihoods. The points range from 1 for strongly disagree to 5 for strongly agree. Responses to various statements were collapsed and a composite index (means score) were computed for each factor contribution to household livelihood (Table 4.22).

Table 4.22: Kamnarok NR Resources are perceived to contribute to community Livelihoods

Kamnarok NR resource contribution to community livelihoods	MEAN	STD. DEV.
Kamnarok NR has contributed to the livelihoods of the community by offering livestock grazing fields	4.083	.340
Kamnarok NR forest resources are harvested by the adjacent communities for both domestic use and sale for household income generation	4.100	.358
Crops grown and wild fruits obtained from Kamnarok NR fields assist in supplementing adjacent household' s dietary requirements	4.503	.393
Kamnarok NR land is used by the adjacent community to provide shelter and other livelihood needs	4.039	.350
Kamnarok NR wildlife resources (fish) and land provide clay soil for brick making which contribute to household incomes	4.106	.353

Source: *Field survey data, 2017*

Table 4.22 shows that all issues scored a mean of 4.039 and above indicating that household respondents ‘agreed’ that their livelihoods are dependent on Kamnarok NR resources. The average mean was $4.166 \pm .359$, thus indicating that most household respondents either ‘strongly agreed’ or ‘agreed’ to the livelihood contribution statements (Table 4.22). To determine whether there was variation in household responses on Kamnarok NR resources contribution to livelihoods, cross – tabulation was done and significance assessed using Pearson at X^2 , $P > 0.05$. The result indicates a significant difference between households ($X^2= 8.249$, $df =10$, $P> 0.05$). The hypothesis that livelihoods of the local communities living inside and adjacent to Kamnarok NR have no significant relationship with Kamnarok NR resources is rejected.

4.4 Types and Manifestation of Resource Use Conflicts in Kamnarok NR adjacent areas

Settlements within Kamnarok NR adjacent areas are scattered with clusters around productive agricultural areas, trading centres, and water sources, where natural resource conflicts often occur at different scales or levels. However, Kamnarok NR has generated significant local hostility towards its presence over issues such as limited resource access and a lack of tangible returns to the adjacent community. Assessing the types, origin, nature and levels of conflict enables one to better appreciate the root causes and dynamics of conflict, as well as the opportunities for management and planning interventions.

4.4.1 Existence of Resource Conflicts

Majority of the households (77.5%, n=278) acknowledged the existence of resource use conflicts in Kamnarok adjacent areas while 22.3% (n=82) noted nonexistence. Kabutie location had the highest households acknowledging the prevalence of conflicts at 29.7% (n=107) followed by Lawan 25.6% (n=92) (Figure 4.22).

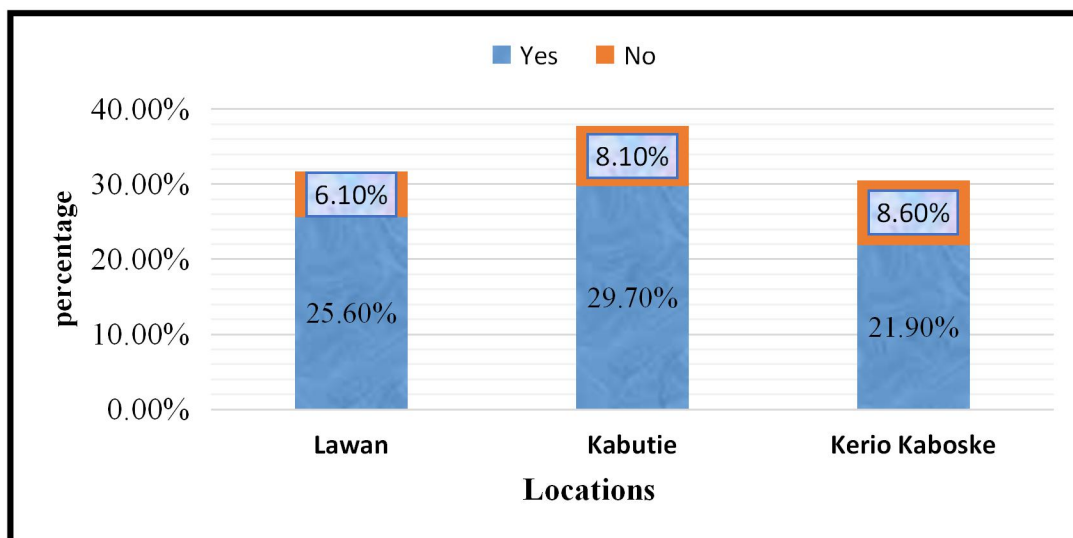


Figure 4.22: Existence of Resource use Conflicts
Source: *Field survey, 2017*

This findings are consistent with the study results of Caitlin *et al.*, (2000) who established that in resource use and management, conflicts can be occasioned by degradation or decline in natural resources ensuing competition over the reduced amounts of the available products and also from the perceived scarcity through competitive use and a failure to negotiate rules and regulations for sharing a resource which are acceptable to all stakeholders. Degradation of natural resources in Kamnarok NR adjacent areas has been witnessed over the recent past and the Wildlife Conservation and Management Act 2013 together with the Forests Act 2005 has been contested for failing to adequately provide for benefit sharing mechanisms (Patterson *et al.*, (2004). However, Ogutu *et al.*, (2015), argued that natural resources are important sources of livelihood security for communities, however the distribution of benefits from these resources is inequitable, where some households who bear the greatest cost of current natural resources management practices reap the least benefits. This contributes to existence of resource use conflicts.

4.4.2 Types of Resource Conflicts in Kamnarok Adjacent Areas

Identifying types of conflicts is useful when the issues of conflicts are centralized in one of the many categories, however, based on the typology of conflicts by Moore (1996) three main types of conflicts were identified namely structural conflict, data information conflict and interest conflicts in Kamnarok NR adjacent areas.

A structural conflict was the main type that characterized the Kamnarok NR adjacent areas. According to Moore (1996) such conflicts arise when there are structural inequalities in control, ownership, power, authority, institutional limitations or geographic separation. Weak enforcement of resource laws, absence of conflict management mechanism, land litigation and demographic changes were identified as the main causes of this structural conflict in the study

area. The improper structures to effectively regulate the operations of Kamnarok NR have been the major triggers of conflicts among the local households and the wildlife conservation and management authorities. There existed lack of harmony and cooperation among these stakeholders to ensure proper utilization and the conservation of Kamnarok NR resources to all parties.

Data information conflict was another type of conflict characterizing Kamnarok NR adjacent areas. This type of conflict arises when information is lacking, differently interpreted or withheld by one party from the other party. Natural resource policies and interventions were formulated without the active and sustained participation of local community members of the study area and other stakeholders such World Vision (WVI), Kenya, Kerio Valley Development Authority (KVDA), local conservation groups and religious institution. Consequently these uninformed stakeholders continued their activities which are illegal according to the Wildlife Conservation and Management Act of 2013, Forest act of 2005 and Environmental Management and Conservation Act (EMCA) of 1999 Cap 387 and hence generating conflicts. For instance Kerio Valley Development Authority (KVDA) in its ignorance has continually supported small scale farmers in the entire Kerio Valley region to expand their farm sizes which eventually encroaches on the Kamnarok NR land. Furthermore, World Vision (WVI) - Kenya has also continually provided and supported on some social amenities such as bore holes, primary schools, and health facilities which are located in the Kamnarok NR land territories. The consequence has been the constant confrontations that are mostly violent especially when the wildlife conservation stakeholders makes attempts to destroy farms of the members of the local community and the investments that the other stakeholders have made in the protected area.

The third conflict observed in the Kamnarok NR adjacent areas was the interest conflict. This occurs when there are actual or perceived scarcity of physical asset resources. This has resulted into competition between different users such as the wildlife conservation and management authorities (*KWS and Baringo County Government*), divisional agricultural extension department, forest agencies and the local people in capturing and protecting specific resources for their various interests or activities. The forceful eviction of the local community especially by the Kenya Wildlife Service personnel and rangers of Baringo County Government has generally resulted into conflicts.

4.4.3 Causes of Conflicts

The study sought to establish the main causes of resource conflicts in Kamnarok NR adjacent areas, and several factors were identified as the main causes of conflicts in the study area. Among these causes, household heads attributed competing interests (90.4%), inadequacy of livelihood sources (78.4%), land litigation/contestation (77.3%) and resource corruption (70.8%) as the immediate causes of conflicts. However, other causes included imposition of policies without effective participation (66.4%), climate change (58.4%), conflict of interest among resource users (56.2%), and culture of cattle rustling (38.1%) (Figure 4.23).

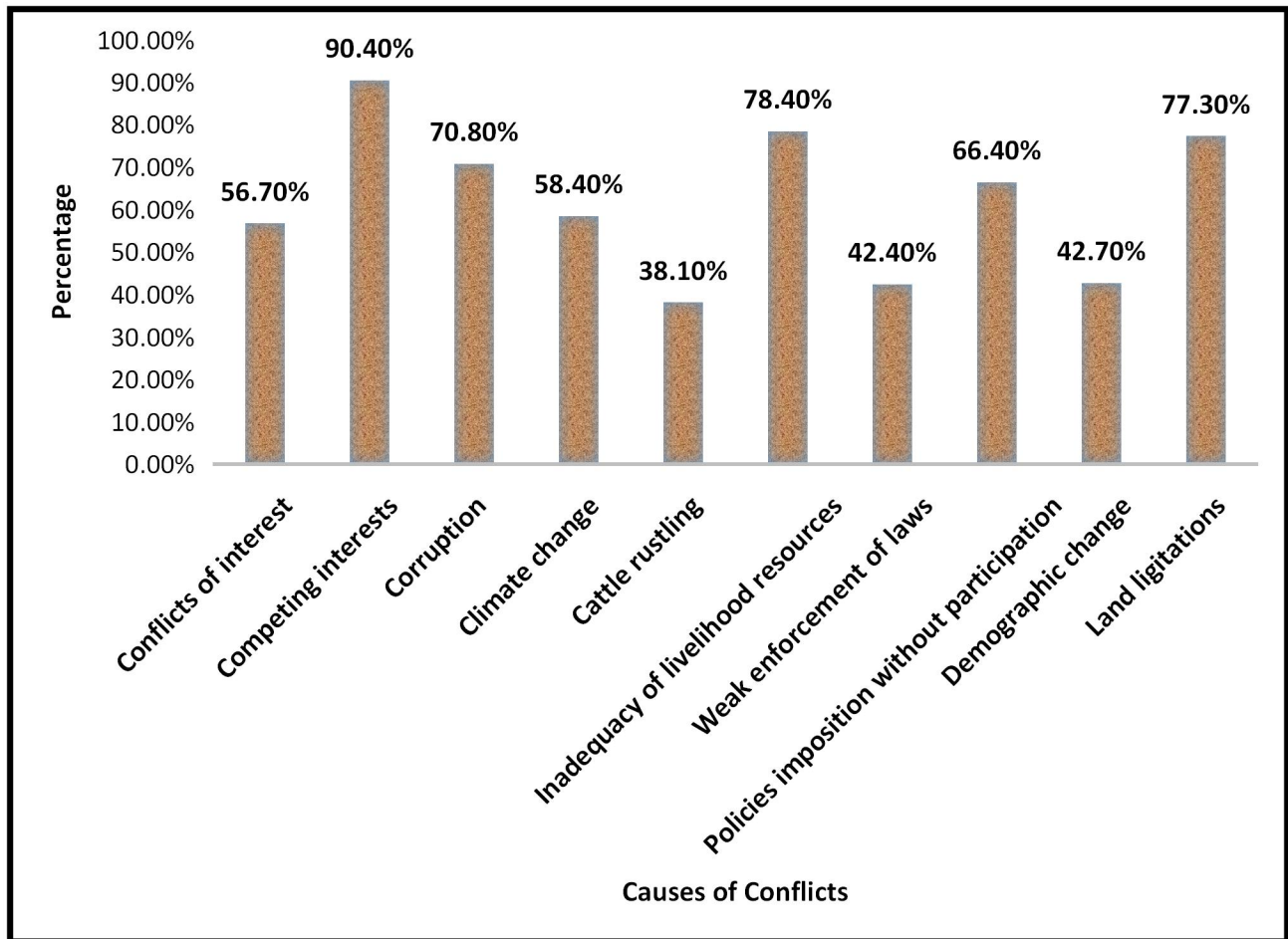


Figure 4.23: Causes of Resource conflicts in Kamnarok Adjacent area

Source: *Field survey, 2017*

Figure 4.23 indicates that 90.4% of the household respondents attributed competing interests among resource users as the main source of conflicts in the Kamnarok NR adjacent areas. The local community around the protected area and other government institutions such as Kerio Valley Development Authority (KVDA) and other development partners such as World Vision (WVI) Kenya, claimed steep competing interests among the many resource stakeholders in the study area as responsible for the numerous conflicts witnessed. However, the support of these institutions on the local community in achieving the desired livelihoods has deepened the indigenous peoples' interests in the protected area land and resources whom efforts made to evict them has perpetuated their stay and engagement in unrestrained livelihoods including farming in

Kamnarok NR. This has resulted into conflicts with wildlife rangers of KWS and those of Baringo County Government. The situation in the study area confirms Njeru (2013) postulation that poor stakeholder analysis in natural resource management is the major causes of conflicts over natural reserves.

Furthermore, 78.4% of the households revealed that the causes of conflict were influenced by inadequacy of livelihood sources. It was evident from the field survey that 72% of the households depended on farming for their livelihood, while 57%, 61%, 47%, 69% and 35% of the households undertook fuel wood collection, hunting and gathering, medicinal plant collection, logging and charcoal making activities respectively to support their livelihood. However, the creation of the Kamnarok NR necessitated for the extension of the original boundaries of the reserve to obtain an ecological unit suitable for the conservation of the wildlife in 1986. These actions, according to the households affected their farmlands as well as some parts of their built environment without any corresponding provision of alternative livelihood support for the affected people.

According to the household respondents, they had no other option than to fall back on the Kamnarok NR for survival. In an interview to find out from the Baringo County Director of Wildlife and Natural Resources why no alternative livelihood support had been provided for the local community, the director claimed that the people did not have both formal and occupational skills that could enable them to compete for available opportunities. From the field survey, it was evident that 28% of the households interviewed did not have any formal education. In addition, the Director also revealed that the local people lacked the needed funds to train and establish

themselves in the alternative livelihood activities that were identified with them. This has resulted in their over dependence on farming, petty trading and other activities in the Kamnarok NR to make a living and construct their livelihood portfolios.

In the absence of adequate and equipped health facilities in the study area, local households have been forced to depend on medicinal plant collection to meet their health care needs. The continuous dependence on these medicinal plants exerts pressure on those plant species and these sometimes generated conflicts between the local community and the wildlife management authorities. In addition to the sources of conflicts, 42.7% of the households associated demographic change as another cause of conflicts in the Kamnarok NR (Figure 4.23). According to the households, the increase in population for the past 15 years has seen resources of Kamnarok NR over exploited from which their livelihood depended. This was evident from the increase in average household size from 3.6 in 1998 to 5.9 in 2015 (Nang *et al.*, 2011, Lelenguyah, 2013). The increase in the population over the period was attributed to the natural increase and the influx of migrants from highland regions and the fortune expectations of Tullow company oil extractions.

It was also observed that the increase in the household size in the study area implies that household whose entire source of livelihood depends on the Kamnarok NR will have much more greater responsibility in ensuring quality education for their children, health and food security thus straining on the resources of Kamnarok NR. According to Baringo CIDP, 2013 -2017 strategic policy document, the rate of unemployment among the youth has increased as most of them cannot find jobs nor parcels of land in the Kamnarok NR adjacent areas to farm.

The unemployment situation in Kerio - Kaboske location however differed since most of their farmlands were not in the Kamnarok NR as compared to the other two locations. The effects of the unemployment situation have resulted into conflicts among the community members in the Kamnarok NR adjacent areas as well as serving as pervasive incentive to encroach on the protected area. This also has resulted in conflict among the wildlife conservation and management authorities with the local community members as the wildlife authorities resists the encroachers in the protected areas. Other factors observed from the households from which conflicts were emanating from included; land litigations between the Arror clan council of elders and Baringo county government over Kamnarok NR and weak enforcement of resources regulations due to low capacity of the Baringo County department of Wildlife and Natural Resource and the local political influences. However, it was observed that the perceptions of local people on the effectiveness of the County government dispute resolution mechanisms on land issues, human-wildlife conflicts and attitude towards problematic wild animals generally varied across the different households studied due to the contextual differences among households and their accessibility to the Kamnarok NR resources and use.

CHAPTER FIVE: LIVELIHOOD DIVERSIFICATION AMONG KAMNNAROK NATIONAL RESERVE ADJACENT COMMUNITIES

5.1 Introduction

This chapter presents the findings on livelihood diversification among the Kamnarok National Reserve adjacent community. It discusses motivational factors for livelihood diversification which comprise of agro-climatic vulnerabilities, poverty alleviation, contextual factors, pull & push factors and human wildlife conflict related factors.

5.2 Motivational Factors for Livelihood Diversification

Livelihood diversification has been explained with different approaches, one of them being the study of motivation. Motivations are considered forces that express and strengthen human behavior (Iso-Ahola, 2012 and Fodness, 2014). Motivational factors for livelihood diversification in Kamnarok NR adjacent areas were assessed as a set of continuum factors directed towards understanding the underlining reasons for community livelihood diversification. The livelihood diversification factors assessed were in terms of testing the alternative livelihood activities and methods of income generation by the local community due to the high risks brought by wild animals from Kamnarok NR.

Diversification lacks common definition as well as a well-established convention on the classification of data on the indicators of observed diversification behaviours. This study adopted six (6) motivation variable drivers for assessing livelihood diversification in Kamnarok NR adjacent areas i.e. i). agro-climatic vulnerabilities, ii) contextual factors, iii) physical assets possession, iv) general push factors, v) general pull factors and vi) wildlife related factors.

Livelihood diversification motivational factors variable data was collected from the households' questionnaire. The household responses to the various motivational variable (factors) were rated as strongly agree = 5, agree = 4, not sure = 3, disagree = 2 and strongly disagree =1 and were used for correlation analysis.

The data collected was analyzed in percentages where the household response percentages based on headline indicators varied on a continuum. Where the household response total percentage for strongly agree and agree to the various aspects of the motivational factor fell within the lowest third of the continuum (below 33%), this meant that such aspect of motivational factor was clearly inadequate for influencing livelihood diversification. Percentage score between 33% and 67% indicate that the motivational factor influence diversification but not a strong motivational factor in influencing livelihood diversification. Generally, a sound and a strong motivational factor would begin at a score of round 67% (two - thirds). Percentages above this level would imply that the motivational factor strongly influence livelihood diversification among community members. These cut off level of assessment accord with the meaning of the most common assessment systems adopted across the world (Fiona *et al.*, 2010). This section therefore, presents the findings of the data collected on the aspect of livelihood diversification motivational factors as outlined above.

5.2.1 Agro – Climatic Vulnerabilities

Kamnarok NR adjacent area household respondents were asked to respond to a set of statements under agro – climatic motivational factor influencing livelihood diversification by indicating the responses that best describe their opinions on the factor statements. The findings were as shown in (Table 5.1).

Table 5.1: Agro – Climatic Vulnerabilities

Factor	Vulnerability	Strongly agree	Agree	Not sure	Disagree	Strongly Disagree	Total
Agro-Climatic Vulnerabilities	Drought	22.7%	58.2%	3.8%	14.0%	1.3%	100.0%
	Floods	17.3%	8.4%	2.9%	23.8%	47.6%	100.0%
	Crop Diseases	11.4%	10.6%	8.4%	44.9%	24.7%	100.0%
	Livestock disease	7.4%	16.8%	4.8%	57.3%	13.7%	100.0%

Source: *Field Survey Data, 2017*

The results in Table 5.1 indicate that agro-climatic vulnerabilities were not a strong motivational factor for livelihood diversification among Kamnarok NR adjacent households. This was due to the fact that more than 67% of the households answered “strongly disagree” and “disagree” to all the statements except drought variable relating to the various aspects of agro-climatic vulnerabilities as livelihood diversification motivational factor (Fiona, 2010). For instance 71.4% of household responded “strongly disagree” and “disagree” on floods, 69.6% on crop diseases and 71.0% on livestock diseases as motivational variable factors influencing livelihood diversification. Drought vulnerability was highly rated at 80.9% by household respondents as a motivational factor influencing livelihood diversification portfolios. This rating is attributed to the fact that Kamnarok NR is within Kerio valley, an arid ecosystem where rainfall is unreliable. These erratic weather patterns within the region affect water key sources, an essential basic commodity determining livelihood sustenance (Gomes, 2011). Moreover, households within

Kamnarok NR adjacent areas since time immemorial have been affected by episodes of dry spells (drought) which has caused loss of crops and livestock which are mainstream livelihoods for the local community. Also drought has been known to cause deaths of livestock as a result of lack of pasture and water. Crop failures caused by drastic variations in climatic factors often forces households to seek alternative livelihoods (diversification) options (Vogel, 2005).

The Baringo County Government Drought Contingency Plan (BCGDCP) report of 2016 indicates that the county has been experiencing recurrent droughts triggering food assistance interventions that targeted affected households. In line with this findings, Porter (2012) in his study on the threats to local African agricultural economy, established that climate variability especially rainfall patterns and droughts negatively influence local farmers livelihoods and therefore a strong motivational element for diversification towards other alternative livelihood portfolios. Graham *et al.*, (2005) and Nasa *et al.*, (2010) further argued that drought and unreliable rainfall motivated local indigenous farmers in Western Africa to diversify livelihoods towards urban cash based livelihoods.

Transmission of diseases to livestock by Kamnarok NR wildlife was dismissed by majority of household (71%) as shown in Table 5.1 however, majority acknowledged to have lost livestock especially cattle to foot and mouth disease. This finding was confirmed elsewhere in this study as it was also contradicted by a veterinary officer (a key informant) at Barwesa Agricultural office who confirmed that the frequent outbreaks of foot and mouth disease in cattle was largely brought by the African Buffalos (*Syncerus caffer*) while grazing together with household livestock in Kamnarok NR grazing fields. This finding agree with the study findings of FAO

(2005) on wildlife – livestock disease transmission in Gaza province of Mozambique were the findings reveal that cows die of *theilriosis* as a result of contracting the disease from buffalos.

Furthermore, it was observed that livestock and crop losses reduces asset holdings of most households under the study, leaving them vulnerable to subsequent uncertainties. This was due to the reduction of households’ ability to cope with further shocks or external disturbances such as agro-climatic stresses. This finding corroborates the findings of Davies and Bennet (2007), Thornton *et al.* (2007) and Mackenzie and Ahabyona (2012) who assert that the decrease in asset levels lowers the coping capacity of individuals or households in coping with life uncertainties. For households who strongly depended on crop and livestock sales in the long-term, it was noted that their household’s livelihoods was negatively severed by the agro-climatic factors.

5.2.2 Contextual Factors

Kamnarok NR adjacent area household responses on contextual variable factors were as shown on Table 5.2

Table 5.2: Contextual Factors

Contextual Variable	Strongly agree	Agree	Not sure	Disagree	Strongly Disagree	Total
Lack of rural livelihood planning policies	43.2%	20.9	8.9%	14.5%	12.5%	100.0%
Socio- political issues	44.7%	22.9%	7.3%	7.7%	17.4%	100.0%
Poor access to markets and fluctuation of livestock and farm produce prices	42.8%	21.8%	12.0%	17.3%	6.1%	100.0%
Poor infrastructure	45.6%	27.0%	7.2%	10.4%	17.0%	100.0%
Lack of land tenureship	47.2%	28.5%	6.1%	10.6%	7.6%	100.0%
Severity of poverty	52.1%	20.7%	1.6%	12.9%	12.7%	100.0%

Source: *Field survey, 2017*

The findings in Table 5.2 indicate that at least 65% of the households responded ‘strongly agree’ and ‘agree’ to the contextual variable statements influencing livelihood diversification, which reflect on issues that bedevil the rural household of Kamnarok NR adjacent communities. At least 64.1% of household responded ‘strongly agree’ and ‘agree’ on lack of rural livelihood planning policies which would have assisted them cope with all forms livelihood risks. Policies and institutions represent an important set of external factors that influence livelihoods of people as it influence access to assets and reduce household’s vulnerability to shocks. The aspect of livelihood policies cannot be seen in isolation, however, it was observed in the study area that many livelihood policies and programmes concerning use of natural resources was not focused and linked to natural resource management policies and attainment of household livelihoods. Thus forcing households to seek alternative livelihood options (diversification). This finding is consistent with the study by Reardon (2014) who argued that livelihood diversification are influenced by a wide range of external forces, both within and outside the locality in which a household lives, and those which are beyond the control of an individual family. These included the social, economic, political, legal, environmental and institutional dynamics of the study area, the wider region, the country and increasingly the world at large.

According to rural households in the study area, ethnic mobilization and inter - ethnic violence as a consequence of marginalization and socio-cultural/political as a result of historical power shifts was observed to be still at play. In this study, 67.6% of the respondents (Table 5.2) mentioned socio-political issues as a motivating element for livelihood diversification. Generally Kerio Valley is an insecure region prone to politically instigated cattle rustling among the pastoral Kalenjin sub tribes. This finding complement the study results of Kagiri (2004) and Kabra (2015)

who noted that communities living adjacent to wildlife rangelands of Laikipia in Kenya and Bhadra wildlife sanctuary in India diversify livelihoods as a result of politically charged transboundary controversies influenced by outdated cultural practices of livestock thefts (cattle rustling).

Poor access to markets and price fluctuations for livestock and farm produce was rated 64.6% (Table 5.2) by respondents, a strong indicator for household to diversify to other livelihood portfolios. This findings contradict Moser (1998) findings who argued that livelihood diversification between and among people and households is linked to their access to a mix of assets functions and capital and not commodity markets. Corbett (2014) attributed livelihood diversification among people and household as a coping strategies in response to seasonality, glut, and famine and on the role of assets and capital in the coping strategies. Corbett further supported his argument that livelihood diversification is an aim to maintain a minimum level of consumption in the face of changes in trends, cycles and shocks and not on an influence from external forces including wildlife aggressions.

Livelihoods of rural households in the third world countries especially those living in remote localities are affected in terms of poor service provision by transport infrastructure. In this study 72.6% (table 5.2) of the interviewed respondents responded 'strongly agree' and 'agree' on poor infrastructure and road network factors as motivational element for livelihood diversification. This finding was further confirmed by the comments of the most of the interviewed key informants whom when asked about the general status of road infrastructure and networks of the

study area. They stated of inadequate basic services and road infrastructure as a major challenge in the entire Barwesa division.

It was also observed that rural roads in Kamnarok NR adjacent areas both paved and the unpaved were defective due to poor designs and also lacked maintainance which had increased the cost of transport services hence burdening the local's livelihoods. It was also observed that time and distance spent travelling and performing chores such as collecting fuel wood was a major challenge related to the lack of developed roads. Furthermore accessing schools, clinics and employment was noted as a limiting factor in some locations especially Kerio Kaboske and Kabutie. Access and mobility are important factors in livelihood diversification and also in the process of alleviating poverty in rural areas and fostering rural development. This finding support the study by Hettige (2006) who argued that lack of access and mobility hinders opportunities to improve and sustain social and economic well being. Similar findings by Porter (2014) stated that infrastructure is important for economic transformation and contributes positively to local livelihoods in terms of diversification and the level and quality of rural development. Booth *et al.*, (2017) also mentioned that a major challenge rural communities face is the cost of transport fare and distance they have to travel to reach essential services, which is a result of poor road conditions.

Economic development and prosperity is a goal sought after by every member in any community. Rural agricultural sector has been playing a greater role in poverty alleviation and poverty in the study area was observed to be dynamic and 72.8% of the respondents attributed livelihood diversification to rampant poverty among households. Poverty was noted to be changing over

time and that people and their households were moving in and out of poverty over time. The different trajectories of poverty changes that household's experience in the study area, and the factors that cause these trajectories within which livelihoods exist were fundamental to the understanding of poverty and livelihoods in Kamnarok NR adjacent areas. This findings lends credence to the findings of Odindi *et al.*, (2010) who argued that the existence of poverty in households depends on the interactions of assets, structures and other vulnerabilities where in their absence poverty deepens and this motivates households to diversify livelihoods. Furthermore, Baringo County, as elsewhere, pastoral areas including Kamnarok NR continue to display wide and deep levels of poverty with respect to international and national rural poverty thresholds. Furthermore, the study of Kaay and Mckenzie (2014) argued that the strongest motivational element among households living adjacent to Saadani National Park in Tanzania was poverty traps and that poverty is dynamic and a relational condition that affects different households and people in different ways and at different times.

Land tenure security in Kamnarok NR adjacent areas is a critical conservation and sustainable use issue and also an important factor in the realization of other substantive rights like food, water, and health. 75% of the household respondents responded 'strongly agree' to 'agree' on the lack of land ownership documents as a motivational factor that has influenced household to diversify livelihoods. Lack of proper land documents infringes on the rights of household to fully utilize land in meeting livelihood needs. This findings underscore the importance of land tenure for regulating land use and related benefits in Kamnarok NR adjacent areas as majority of the household lacked land ownership documents and most lands are still contested including the reserve land (Kameri, 2002). Therefore, land rights contestation is and will be a source of

political debates and conflicts to livelihood sources and wildlife conservation in Kamnarok NR and the adjacent environment. This findings is consistent with the study of Orindi *et al.*, (2007) where in his study established that land tenure laws are crucial in determining entitlements, and access to land for cultivation, which in turn is a critical determinant of the overall structure of livelihoods in rural areas. Further, Sifuna (2006) findings stated that clarity of tenure decreases contestation and conflicts over land and land related resources.

5.2.3 Physical Assets

The study sought to establish whether possession of physical assets among household was a motivating factor for livelihood diversification. The household responses to possessions of physical assets (material wealth) is as shown in (Table 5.3)

Table 5.3: Physical Assets

Physical Asset	Strongly Agree	Agree	Not Sure	Strongly Disagree	Disagree	Total
Land	9.2%	12.4%	14.7%	38.4%	24.8%	100.0%
Livestock	12.9%	14.0%	9.4%	42.3%	22.4%	100.0%
Machinery & buildings structures	28.1%	42.6%	4.2%	18.1%	7.0%	100.0%
Human labour (casual labour)	33.6%	37.4%	13.5%	12.7%	2.8%	100.0%
Possession of adequate money	52.7%	37.4%	1.8%	6.4%	1.6%	100.0%

Source: *Field Survey, 2017*

The percentages in Table 5.3 reveal that possession of physical assets (material wealth) was not an adequate motivating factor among households in Kamnarok NR adjacent areas to diversify livelihoods. This finding is in tandem with the findings of Barret *et al.*, (2012) where in their research on deagrarianization stated that possessions of material wealth (Physical assets) were

not the main factors driving livelihood diversification in sub Sahara Africa. 63.2% and 64.7% of the households responded ‘strongly disagree’ and ‘disagree’ respectively on land and livestock possessions as motivating factors for livelihood diversification. However, 70.7% responded ‘strongly agree’ and ‘agree’ on machinery & building structure possessions and 70.1% on the availability of human labour (casual labourers) as motivating factors for livelihood diversification. Many casual labourers (respondents) work regularly for the same landlord if they like them or when they are treated well, while others reported working for up to fifteen different people in order to spread livelihood risks and the seasonality of their labour. All casual agricultural labourers said that they enjoyed agricultural work, citing reasons such as their skill and knowledge of the work, their enjoyment of the fresh air, being close to nature or being part of a social working group. They explained of knowing all the works of agriculture from childhood. Many also felt that this was easy work although what exactly was meant by easy was not explored. The highest percentage of 90.1% on adequate possession of cash was attributed to accessing and having adequate financial resources enables household to diversify to any kind of livelihood portfolio with ease.

The study findings further reveal that asset category was insignificantly associated with diversification of households’ crop and livestock farming livelihood as was expected. This showed that as the households increased their assets, they diversified into non farm livelihoods. This was explained by the risks brought by wildlife and environmental factors afflicting the households. This finding contradict the findings of Ellis (2000), who found that being asset rich positively influences livelihood diversification activities, however it was also observed that the notion of farming not being part of the rural diversified livelihood portfolio contrasts the

national-level analyses of rural agriculture in Kenya, which suggest that diversified arable agriculture on communal land is of declining economic significance but retains importance particularly for those who have no alternatives, such as the rural elderly (Nunow, 2000).

Furthermore, it was observed that traditional agriculture indeed still serve as a viable safety net within the Kamnarok NR adjacent areas where some local households produce enough surplus to sell to the local markets. However in the Kerio Kaboske location where elephants are particularly problematic, a number of households with access to arable land have chosen not to farm their fields, and therefore receive no contribution of on-farm support to their livelihood portfolio.

5.2.3.1 KAMNAROK NR ADJACENT AREA HOUSEHOLDS PHYSICAL ASSETS

The study sought to assess the physical assets status of households in the study area. Access and ownership of physical assets in terms of machinery and buildings owned by households is indicated in Table 5.4. The findings reveal that machinery owned by households included motor vehicles, water pumps, wheelbarrows, bicycles and motorcycles which most household are in possession. Permanent building structures were also noticeable especially in the emerging urban centers. Livestock keeping was a common phenomenon to several households. There were a number of households owning livestock as assets. Keeping livestock especially shoals and cows in the study area is taken as one way of keeping money in form of assets. Many households rely on these animals for their daily subsistence in form of food (milk and meat). These animals are also sold when money is needed for meeting contingency needs such as school fees, medical bills and other household necessities. The animals kept were chickens, goats, sheep, cows, camels and donkeys. Interestingly, there was no single household that kept camel in Kabutie location.

A close observation of the community physical assets and their dynamics revealed that physical assets has undergone transformation as a result of livelihood diversification as changes in one form of community asset affect other forms. For instance, households have invested more in technology such as mechanized agriculture as a means to meet food production and security. These achievements in turn have posed a challenge to human-wildlife co-existence as it has accentuated conflicts. The mechanization of agriculture means more land is cultivated and restrictions on wildlife movement confined the wildlife to the reserve and buffer zones making it easier for them to have access to community physical property, in the process heightening human-wildlife conflicts. The heightened human-wildlife conflicts have led to increased killings of problem animals as sustainable mitigation measures are difficult to put in place to remedy the problem.

Table 5.4: Number of machinery owned and Animals kept by Households

Location	Mean Averages of animal numbers and machinery possessed								
	Chickens	Goats	Sheep	Cows	Camels	Donkeys	Water pump	Wheel barrow	Bicycle/motorcycle
Lawan	3.74	17.04	17.36	12.08	0.74	0.12	1.21	084	0.72
Kabutie	6.08	24.17	22.82	9.71	0	1.76	0	1.42	0.55
Kerio Kaboske	4.94	18.64	14.71	11.04	1.97	0	0	0.94	1.26

Source: *Field survey, 2017*

5.2.4 General Push Factors

The general push factors taken from Maslow's hierarchy of needs (Mayo and Jarvis, 2011) and which have been described as motivational factors or needs that arise due to a state of disequilibrium or tension in the motivational system (Prayag and Ryan, 2011) for human beings are factors worth consideration in human motivation behaviours. Based on the hierarchy of needs

(Maslow, 1943), basic needs are considered key variables in the study of livelihood diversification behaviors (Pearce, 2012). The findings on Kamnarok NR adjacent area household response to the various dimensions of general push factors of livelihood diversification motivation variables were as shown in Table 5.5.

Table 5.5: General Push Factors

Push Factors	strongly Agree	Agree	Not Sure	Strongly Disagree	Disagree	Total
Rural population growth	32.8%	28.5%	12.6%	16.2%	8.9%	100.0%
Economic hardship	47.3%	33.8%	3.4%	9.2%	5.3%	100.0%
Management regime of Kamnarok NR	42.1%	28.8%	12.8%	9.4%	6.9%	100.0%
Farm fragmentation	34.6%	20.2%	10.6%	19.3%	15.3%	100.0%
Declining agricultural production	38.4%	32.8%	4.6%	19.0%	5.2%	100.0%
Human wildlife conflicts	48.3%	22.1%	1.4%	19.2%	9.0%	100.0%
Policy readjustments which decreases community support for wildlife conservation	37.8%	28.4%	14.2%	5.2%	14.5%	100.0%
Poor agricultural extension services	55.8%	36.8%	5.2%	4.6%	2.2%	100.0%
Expensive farm inputs	49.5%	35.8%	5.2%	6.4%	3.1%	100.0%
None existent benefits from the Kamnarok wildlife protected area	47.3%	37.9%	4.9%	5.6%	4.3%	100.0%
Possession of higher education and technical skills	40.4%	34.4%	7.0%	10.8%	7.6%	100.0%
Insufficient and inefficient compensation mechanism by Kamnarok NR management authorities	47.6%	35.8%	8.1%	3.3%	5.2%	100.0%

Source: *Field survey, 2017*

Push factors are those reasons for household diversification originating out of certain necessities. The findings in Table 5.5 reveal that all the statements related to the general push factors as motivating variables for livelihood diversification by households were highly rated varying from 85.2% for the strongest to 54.8% confirming the factor strength in influencing livelihood diversification. All push factor statements strongly influence livelihood diversification in Kamnarok NR adjacent areas. It is noted here that pastoral communities in Kenya including the Tugen sub ethnic tribe have been known to be rapidly diversifying their livelihoods along side their economies. Also most of the pastoral communities have been known to border and share pastoral resources with wildlife including the Kerio Valley communities and reasons for their livelihood diversification are not well documented, however, Pastoralists within this area have been known to have long standing traditional strategies and strong social institutions for using natural resources and responding to human wildlife conflicts.

In this study 85.2% of the households studied, attributed their livelihood diversification to non-existent community benefits from wildlife from Kamnarok NR. Kamnarok NR management authority together with Kenya Wildlife Service were singled out by Key informants(KI) as entities which had ‘pushed’ the local household to diversify their livelihoods owing to non-existent benefits from the wildlife resources. The reasons advanced by both entities (KWS and Kamnarok management authority) for non responsiveness to the plight of the local community was inadequate funding from the government, unresolved land issues for conservation and low tourism programs within the area. This finding partially contradict the study by Little *et al.*, (2001) and Homewood *et al.*, (2009) who found that Maasai, a pastoral community living adjacent to Masai Mara NR, diversified their livelihood portfolios despite the generous benefits

they receive from Maasai Mara NR wildlife resource. Another 83.4% of the interviewed household respondents also alluded their diversification behaviours to neither sufficient nor efficient compensation schemes for damages caused by wildlife. Moreover, Kamnarok NR has a history where no instance of compensation has ever been given to any of the affected households.

Rural populations' undertake various income activities with different risk profile to cushion them during difficult times or in preparation for a failure in some certain activities as is alluded in the conventional wisdom '*Do not put all your eggs in one basket*'. It was observed in this study that 81.1% of the respondents had diversified livelihoods to avert economic hardships including vagaries of bad weather and wildlife intrusions. Field observation indicated that a majority of the households had been experiencing economic hardships especially in the period 2014 and part of 2016 to early 2017 when most households experienced crop failure as a result of crop disease (*maize lethal disease*) and inadequate rainfall. This finding is consistent with the results of Ellis (2005) who argued that livelihood diversification is relevant in a rural context where unpredictable weather patterns and harvest performance make it difficult to secure a fixed amount of regular income.

Education remains a cornerstone of development literature and plays a very important role in livelihood diversification. Educated household are always better in identifying off-farm opportunities and are more likely to possess the necessary skills to take advantage of the possessed knowledge and skills. Education levels of the members of a household was another determinant factor for livelihood diversification. The results in Table 5.5 indicates that 74.8% of households who had members with higher level of education or in possession of technical skills

had diversified their livelihoods. Though education standards was low in the study area (*this study*), it was also observed that the educated and the skilled people had migrated to urban centres in search for jobs and they were making financial remittance to their kinsmen.

In many poor regions around the world including Kamnarok NR reserve adjacent areas, education is sometimes viewed as a luxury and the education of a child, by default among the poor and the very poor households was assumed to be taking away the additional source of income the child could bring to the family. Therefore, the less educated/skilled from the poor households were left behind with not so many choices to cope with their livelihoods. This study results is in agreement with the findings of Kimhi and Lee (1996), Bezuneh *et al.* (2010) and Barrett *et al.* (2012,) who found that educational level of the Indian farm households had a positive impact on livelihood diversification. Ellis and Freeman (2004) in their theoretical argument expressed that livelihood diversification activities requiring higher skilled labour attract more educated persons while the ones that require lower skilled labour attract less educated household members and concluded that there is a nonlinear relationship between the two variables.

Rural households in Kamnarok NR adjacent areas have to cope with diminished farm productivity. 71.2% of the interviewed household respondents alluded to declining farm production as a motivating factor pushing them into livelihood diversification. According to rural households in the study area, the Baringo county agricultural economic adjustment support programme for agriculture has virtually disappeared particularly subsidies on crucial inputs such as seeds and planting fertilizers. This finding from Kamnarok NR adjacent areas runs counter to

conceptual frameworks from agrarian studies, which explain contemporary rural livelihood strategies in terms of diversification of on-farm and off-farm activities. The findings are line with Timmer (2017) who observed that, diversification among rice farmers in Indonesia at the level of non-farm sector increased immediately after the start of Green Agriculture Revolution (GAR) due to the rapidly increasing prices of farm inputs for rice production and the changes in government policies on agricultural subsidies.

According to the majority of the interviewed key informants (KI) in the study area, there is little evidence that wildlife resources including the management style had benefited the local community. Incomes accruing from the wildlife resources inform of tourism has been typically little. A key informant (*area Chief of Konoo Location*) alluded that the share of tourism revenue proceeds expected by the local household and compensation for damages of farm crops and livestock deaths and predation has never materialized because of nonexistent supporting policies. Also the community participation and involvement in the management of the protected area has been non-existent and for this reason, the community view the management with suspicion and their support is withdrawn. Among the interviewed household respondents, 70.9% attributed their livelihood diversification to the authoritarian management style of the protected area (PA) management. Similar findings were found by Weladji and Tchamba (2003) in their study on conflicts between Benoue Wildlife conservation Area (BWCA) and the adjacent communities in Northern Cameroon.

To investigate community household perspective on the magnitude of human wildlife conflicts in influencing household livelihood diversification practices, 70.4% of the interviewed respondents 'strongly agreed' to 'agreed' on the problem as influencing their diversification behaviours. Even though agriculture is still the backbone of Kenya's economy as many households in the rural areas like Kamnarok NR adjacent area depend directly on agriculture to meet their daily subsistence, wildlife doesn't offer any incentives directly to these people. Therefore they can't see the importance of wildlife rather than just as enemies. In Tanzania, Pettoreli *et al.*, (2010) findings suggest that households bordering Tarangire wildlife ecosystem had diversified livelihoods as a result of wildlife inflicted problems. Similar phenomena has been observed by Ogutu *et al.*, (2012) among communities bordering Amboseli National Park. Another factor observed in the study area to be motivating household to diversify livelihoods was policy readjustments. 66.2% of the respondents attributed livelihood diversification on to wildlife and conservation policies. Wildlife Conservation and Management Act of 2013 maintains that natural resources in wildlife protected areas (WPAs) including those in government forest lands and other areas in the Kenya belong to the state. Wildlife Conservation and Management Act of 2013 and Forest act 2016, both policy instruments mutually agree that both wildlife and forest resources including genetic and biological resources all belong to the state. It is because of these policies that have limited the local community's span of resource ownership and utilization which had motivated them to diversify to other alternative livelihood options.

Over the past three decades, Kamnarok NR adjacent areas has experienced an estimated annual human population growth rate of 2.48 as per the 2009 census (KNBS, 2010). This translated into 42,297 persons with a population density of 17.3 persons /km² in 2009 with Kabutie location

having the highest at 22.4 persons/km² (Baringo CIDP, 2013 - 2017). It is projected that by the year 2025, the total human population in Barwesa division will be 87,254 (Baringo CIDP, 2013 - 2017). The rapid population growth in the area has resulted in increased demand for more land for farming, settlement, and infrastructure development which has led to clearing of large areas of bush land, wetland, forestland, woodland, and grassland that serves as habitats for wildlife. Of the interviewed household's respondents, 61.3% alluded their livelihood diversification to population growth and other demographic factors (Figure 5.1). This finding support the findings of Okello (2009), where in his study on the fragmentation and encroachment of wildlife dispersal areas in Kimana Group ranch near Amboseli National Park, argued that the local households livelihood diversification was as a result of an increasing human population migrants from outside Loitokitok district.

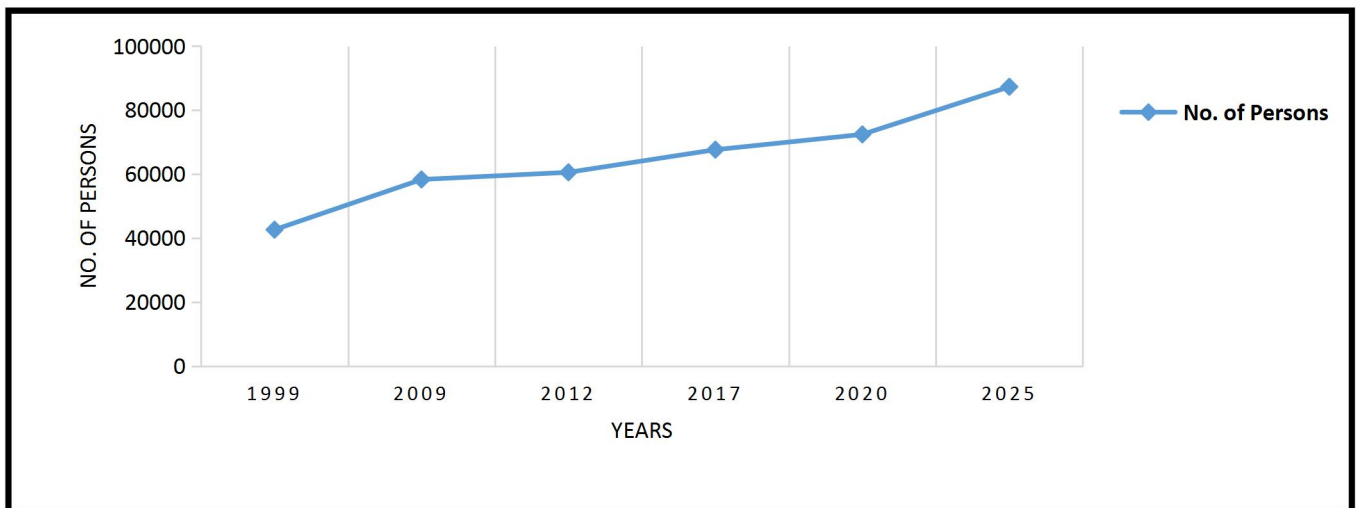


Figure: 5.1: Projected Human Population for Barwesa Division up to the Year 2025
 Source: *GoK, Baringo District Development Plan 2008–2012*

Several factors are responsible for land fragmentation in Kamnarok NR adjacent areas. The main possible observed causes were agricultural expansion, socio economic, human dynamics and political issues surrounding Kamnarok NR conservation land. The increasing subsistence of the

growing population in Kamnarok NR adjacent areas has led to the fragmentation of land resources. 54.8% of the interviewed household alluded their diversification behaviours to farmland fragmentations, though it was the least rated element statement motivating households for livelihood diversification. This findings agrees with Homewood *et al.*, (2009) who argued that land fragmentation constraints pastoral livestock in wildlife rangelands including wildlife protected areas (WPAs) from accessing key pastoral resources, and therefore pastoralist have to increasingly rely on non-livestock (diversify) sources of income for their livelihoods. From this finding human wildlife issue was not the main factor influencing livelihood diversification.

5.2.6 General Pull Factors

Pull factors are based on cognitions and tends to influence individuals toward the specific attributes of a livelihood pattern and outcome (Dann, 2017). Pull factors refer to the attractiveness and specific features of a livelihood portfolio perceived by an individual and gets motivated to undertake the practice (Rittichainuwat 2016). Indeed, pull factors are subjectively conceived as a set of livelihood portfolio features. The Kamnarok NR adjacent area household responses on pull factor element statements were as shown in Table 5.6.

Table 5.6: General Pull Factors

Pull Factors	Strongly Agree	Agree	Not Sure	Strongly Disagree	Disagree	Total
Availability of food aid from food aid agencies	13.7%	12.0%	7.7%	28.2%	38.4%	100.0%
Availability of credits (capital) to engage in small businesses	30.6%	38.2%	14.0%	11.4%	5.8%	100.0%
Employment opportunities in urban areas	45.2%	22.7%	3.9%	19.4%	10.8%	100.0%
Business enterprise opportunities	51.8%	24.6%	4.6%	12.2%	6.8%	100.0%
Incorporation of rural areas into local markets	44.2%	25.6%	8.2%	18.0%	8.0%	100.0%
Traditional liquor sales	37.1%	22.6%	10.4%	15.2%	14.7%	100.0%
Improved infrastructural network	25.8%	14.2%	4.7%	50.7%	4.6%	100.0%
Access to technology and proximity to infrastructure development	27.3%	38.8%	6.1%	17.0%	10.7%	100.0%
Proximity and emergence of urban centres	41.8%	37.6%	4.2%	9.6%	6.8%	100.0%

Source: *Field survey, 2017*

Pull factors are the reasons for household income diversification driven by the desire for capital accumulation. The percentages in Table 5.6 indicate that pull factor elements among households of Kamnarok NR adjacent areas strongly motivate them towards livelihood diversification except improved infrastructural network and availability of food aid schemes. The growth and expansion in urbanization alongside increasing human population enhances the possibility of change in livelihood strategies with diversification as an option in the horizon. 79.4% of the Kamnarok NR adjacent community households interviewed attributed their livelihood diversification to their proximities to urban areas and the emergence of new ones as a factor pulling them to diversify. This finding support Ellis (2000) who found that new and emerging

urban centres near Caprivi National Reserve in Namibia tend to positively influence the living standards of the native inhabitants.

The informal sector has become popular in most third world countries like Kenya as a solution to massive unemployment and rampant poverty. The reality of poor households in Kamnarok NR adjacent areas is that survival and prosperity is depended on the pursuit of diverse and multiple activities by taking advantage of different opportunities and resources at different times. 76.4% of the households interviewed alluded their livelihood diversification to the existence of business opportunities in their respective localities and not wildlife disturbances. It was further observed that the idea and notion of venturing into business had increasingly become popular in the livelihoods and development thinking of many interviewed household heads. It was noticeable among household entrepreneurs that they had ventured and maintained portfolio of different non-farm activities including water vending, fish mongering, vegetable, second hand (mitumba) clothes, firewood and charcoal selling among others. Also a significant number of households (18.6%) was observed to have established retail shops, restaurants and bars within the last couple of years.

Other non-farm enterprises such as bicycle repairs, blacksmith and brick making albeit small in their numbers were observed to have been businesses ventured by some households and was a key secondary sources of income. These results are consistent with findings of Scoones (2009) who stated that in rural Tanzania livelihood diversification has generally occurred as a result of an increased importance of non-farm wage labour in household livelihood portfolios. Similar findings by OPM (2004), in his report showed that the majority of households across all income

strata in Nigeria were involved in several off-farm activities, whose importance has increased over the last 25 years. The findings suggested that non-farm activities accounted for over 36% of adult working hours per annum and 60% of cash income.

Rural developments create and expands market access with a potential of inducing a shift from the production of traditional goods to modern goods for urban and foreign markets thereby stimulating diversification of the rural economy away from farming. 69.8% of the household respondents in this study alluded their livelihood diversification to the incorporation of their rural areas into local (village) markets. Availability and access to loan credits help households to use their human and material potential to improve their well being. 68.8% of the interviewed respondents highlighted availability of credits (loans) as a pull factor that has propelled them to diversify livelihoods. Credit facilities from the formal and their informal groupings such as merry-go-rounds, table banking, micro lending institutions such as Kenya Women, Faulu Kenya and from their co-operative societies and SACCOs has enabled them venture and engage in small businesses. Loans and savings from these diversity of institutions were strong pull elements which have contributed to livelihood diversification among households. Similar findings were reported by John and Wobst (2006) who stated that in rural Tanzania households were diversifying livelihoods through funding from local savings and credit loans from both formal and informal arrangements. Davis *et al.* (2007) supported the above finding that in rural Africa household livelihood diversification are funded by both formal and informal lending organizations.

Alternative employment opportunities in Kamnarok NR adjacent areas and in Baringo County generally have been changing over time. 67.9% of the respondents reported to have diversified livelihoods in form of seeking and taking up the available job opportunities created by the expanding and the emerging urban areas in the study area. Urbanization has been widely associated with the increasing off-farm activities which has been noted to alleviate some of the pressures on the land from the rising population density and unemployment in rural areas in Kenya. However, these urban centers were noted to be absorbing some of the labour force. The low labour productivity and high risk in agriculture associated with human wildlife conflicts has forced members of households especially the young and the skilled to search for more lucrative income generating livelihood options. It was observed that many young men and few women had migrated to larger villages and the nearby urban areas in search of employment opportunities. It was also noted that the off farm incomes allows households to reduce their exposure to agriculture related risks and leverage their income sources towards accessing credit markets.

Access to technology and infrastructure plays a key role in the development process and in the enhancement of people's standards of living. Given that technology and infrastructure are closely linked, it was observable in the study area that Baringo county government had made tremendous efforts in infrastructural and technological developments especially in development of health centres, electricity connections, water connectivity and sinking of bore holes as a way of supplying water resource in some areas. In this study, 66.6% of the respondents (Table 5.6) alluded their household's livelihood diversification to their accessibility to technology and proximity to infrastructural facilities. Increase in the technological applications and infrastructural utilization often increases diversification of livelihood options.

5.2.7 Wildlife Related Factors

Human–wildlife conflict and other related factors have significant consequences on human well being and livelihoods. According to Food and Agricultural Organization (FAO, 2009), efforts to promote livelihood diversification among communities in wildlife range lands as well as support decent employment initiatives in rural areas, are hampered by myriad of wildlife related issues. Very little data exist regarding wildlife social related factors influencing local households in wildlife protected areas engagement in various livelihood diversification portfolios (Rao *et al.*, 2002). The Kamnarok NR adjacent area household responses on wildlife related factor element statements were as shown in Table 5.7.

Table 5.7: Wildlife Related Factors

Wildlife Factors	Strongly Agree	Agree	Not Sure	Strongly Disagree	Disagree	Total
Damaged crops by wildlife	52.9%	38.4%	1.2%	3.6%	3.9%	100.0%
Livestock predation by wildlife	47.3%	36.6%	8.2%	4.6%	3.2%	100.0%
Human injury from wildlife	32.6%	22.4%	18.4%	24.6%	2.0%	100.0%
Human death from wildlife	27.1%	18.6%	10.8%	13.3%	30.2%	100.0%

Source: *Field survey, 2017*

More than half of the household respondents in each case indicated that wildlife related conflict factors have influenced livelihood diversification. Crop damages from wildlife was ranked as the main motivating factor for household livelihood diversification by 91.2% of the respondents compared to 8.8% of those who ‘strongly disagreed’ and ‘disagreed’. Crop destruction was observed to be influencing diversification strategies pursued by different households in Kamnarok NR adjacent areas. Crop losses was the most pronounced negative impact to the local

community. Kamnarok NR is a dry season refuge area for some wildlife mammals including giraffe, plain zebra, buffalos and elephant and therefore most of these animals return inside the reserve during the dry season and in wet season they roam outside the reserve (Wishitemi *et al.* 2008). Thus, during the wet season there are more reported cases of crop destruction by wildlife.

In the study area, households whose main livelihoods was agriculture were observed to be more vulnerable to the overall effect of human wildlife conflicts as they also had limited resources to invest in expensive coping strategies. The risk of losing crops to wild animals may be only the worst of many challenges to farming in Kamnarok NR adjacent areas, but it is enough to push many households to a point of giving up entirely on farming. However, what household respondents did not explicitly state is that access to alternative sources of income provides them with the option to make this kind of decision. Therefore, livelihood diversification was observed as one of the most economically feasible, cost effective and rational way of reducing uncertainties associated with wildlife crop damages. Livelihood diversification brings about a higher income returns, increases household resilience and self-fulfilling in meeting basic livelihood needs and minimizes risks of farming in proximities to wildlife protected areas. This findings is in line with Hillman-Smith *et al.*, (2005) findings. According to a study conducted by Hilman-Smith *et al.*, (2005), local communities surrounding Garamba National Park in the Democratic Republic of Congo (DRC) had diversified their household livelihoods from farm based activities to the selling of Forest Non Timber Products (FNTPs) like wood fuel and charcoal which were less prone to wildlife destruction.

Loss of livestock to wild predators was mostly pronounced in Kabutie and Lawan locations as compared to Kerio Kaboske location. This can be explained by the fact that many villages in Kabutie and Lawan locations border Kamnarok NR and majority of their livestock are grazed inside the reserve, thus the higher probability of their livestock coming into contact with predators such as spotted hyenas, cheetah, wild dogs, leopard and other predators who search for prey inside and outside the reserve. Majority of the household in the study area reported depredation of livestock and was estimated to be losing 766 heads of livestock annually (*this study section 4.3.4.1 and table 4.21*). These losses affect households economically and also spend more time and resources in guarding their livestock against the predators.

A majority of the interviewed household respondents (83.1%), attributed their livelihood diversification practices to their livestock being preyed by felids of Kamnarok NR. cursory observation and intimate interview among some households in the study area revealed that a number of non-pastoral households who had not suffered any loss of livestock from the wildlife had highly diversified their livelihood as compared to pastoral households who had suffered multiple loss of livestock predation from wild animals of Kamnarok NR. A number of scholars for example Scoones (2009), Sunderlin (2005) and Vedeld (2004) argued that pastoral communities neighbouring wildlife protected areas diversify livelihood portfolios out of frustrations from wildlife inflicted predations on their livestock. The findings from this study did not support that argument fully.

In Kamnarok NR adjacent areas, poor rural households have always tended to face relatively high levels of insecurity from wildlife. They have always been vulnerable. Sources of insecurity have in the past been largely wildlife related but also social and political due to the frequency of cattle rustling in the entire Kerio Valley region. Human induced injuries and deaths from wildlife in the study area has been considered the most fatal incidences and also undermines community efforts in achieving communal livelihood needs. Incidences of human injuries and deaths especially the injuries and deaths inflicted by crocodiles and wild dogs have been reported in the study area and their occurrences were acknowledged to have taken place (Lelenguya, 2013).

According to the views of the interviewed respondents (human injuries 53.0% and deaths 45.7%) were some of the reasons which had compelled some households to diversify livelihood in avoidance of livelihoods programs that expose them in conduct with wildlife animals. Findings from the key informants revealed that no compensation for human injuries and deaths had ever been done to any household whose members had fallen victim to HWC menace. A study by Reading *et al.*, (2010) in prairies plains of Canada revealed that household diversification inclination towards non agricultural livelihoods were driven by fatal human injuries and deaths caused by black tailed prairie dog on to the community members. This findings is further supported by Naughton-Treves and Treves (2005) where in their study argued that inherent injuries and deaths from elephants of Chobe –Caprivi National Park in Namibia were key drivers of hostility by the locals towards wildlife and therefore a factor motivating household to livelihood options which are non wildlife risk prone.

5.2.8 Effects of Motivational Factors on Livelihood Diversification

The study sought to establish the influence of household motivational factors in relation to livelihood diversification. The motivational influences were evaluated in terms of households' views on the level of diversification and were rated as follows: Not diversified = 0, slightly diversified = 1, Diversify = 2, and highly diversified = 3. On the other hand responses on the motivational factors were rated as follows; No influence=0, slight influence=1, moderate influence=2 and highly influencing =3. Each of the score was computed into a percentage score by dividing by four and the means for the various dimensions of motivation and livelihood diversification levels were analyzed (Table 5.8).

Table 5.8: Household Reasons for Livelihood Diversification

Reasons for Diversification	N	Means	Std. Deviation
Diversify livelihood to minimize risks from wildlife	360	.8192	.26243
Diversify livelihoods to achieve food security	360	.7496	.25192
Diversify livelihoods to improve household standards of living	360	.7162	.24364
Diversify livelihoods in order to reduce household shocks in difficult times	360	.6648	.23106
Diversify livelihoods to generate wealth	360	.4372	.14367
Diversify livelihoods to supplement farming from business income	360	.3964	.13497
Diversify livelihoods in response to diminishing land constraint due to land fragmentation and population pressure	360	.3874	.13308
Diversify livelihood so as to accumulate assets	360	.2118	.10424

Source: *Field survey, 2017*

The highest mean of .8192 (82%) was realized by households willingness to diversifying livelihoods to minimize livelihood risks brought by wildlife of Kamnarok NR. 0.75 (75%) of household diversify livelihoods as an effort to be food secure while .72 (72%) of the households endeavor to improve their standards of living. Household response to reducing livelihood shocks in difficult times was at .66 (66%). These four dimensions depicted strong reasons why household diversify livelihoods. On the other hand household diversify livelihoods to generate wealth .44 (44%) which imply that wealth generation is within the minds of many adjacent households of Kamnarok NR. The lowest mean of .21 (21%) relate to household diversifying livelihoods for asset accumulation. The means for other motivational influencing factors are as shown in (Table 5.8).

5.2.9 Correlations between Motivational Factors and Livelihood Diversification

To analyze the relationship between variables, a composite score for motivational factors was first computed. Reasons for the livelihood diversification means (Table 5.8) above was used alongside the means for the motivational factors to conduct Pearson product moment correlation (PPMC) to establish whether there were significant relationship between the variables. Basic descriptive statistic and regression coefficients are as shown in (Table 5.9).

Table 5.9: Correlation between Motivational Factors and Reasons for Livelihood Diversification

		LD	AGCV	CTXF	PHA	GPSF	GPLF	WRF
LD	(r)	1						
	P Values							
AGCV	(r)	.432*						
	P Values	.007						
CTXF	(r)	.559**	.019	1				
	P Values	.000	.759					
PHA	(r)	.014	.281*	.609*	1			
	P Values	.871	.008	.000				
GPSF	(r)	.726**	.091	.393*	.081	1		
	P Values	.000	.829	.004	.893			
GPLF	(r)	.628**	.039	.307*	.073	.012	1	
	P Values	.000	.848	0.007	.881	.862		
WRF	(r)	.531**	.477**	.146*	.238*	.491**	.013	1
	P Values	.000	0.002	.631	.019	.001	.846	
Mean		3.741	76.31	89.37	69.72	74.38	66.28	69.39
Std. Deviation	R ² =.583*	.401	4.31	9.17	8.51	6.84	4.43	6.94

**Correlation is significant at 0.01 level (2 tailed)

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

Key: **LD** = Livelihood Diversification, **AGCV** = Agricultural Climatic Vulnerabilities, **CTXF** = Contextual factors, **PHA** = Physical Assets, **GPSF** = General Push factors, **GPLF** = General Pull factors, **WRF** = Wildlife Related factors

Source: *Field Survey data, 2017*

The PPMC analysis reveal that there were significant positive relationship between livelihood diversification (LD) and all dimensions of motivational factors except physical assets (PHA). Each of the predictor variable had a significant ($P < 0.001$) correlation with livelihood diversification (LD) except household physical assets PHA (table 5.9). The variables association was agricultural climatic vulnerabilities (AGCV) ($r = 0.432$, $n=360$, $P < 0.001$), contextual factors (CTXF) ($r=0.556$, $n=360$, $p < 0.001$), General push factors (GPSF) ($r=0.726$, $n=360$, $p < 0.001$), General pull factors (GPLF) ($r=0.618$, $n=360$, $p < 0.001$) and wildlife related factors (WRF) ($r=0.519$, $n=360$, $p < 0.001$). Therefore, the six element predictor model was able to account for ($R^2=.583$) 58.3% of the variance in livelihood diversification portfolios.

5.3 Household Livelihood Patterns and Diversification Outcomes

5.3.1 Livelihood Strategies undertaken by Kamnarok NR Adjacent Households

The majority of the respondents were undertaking different livelihood strategies (Table 5.10) such as mixed farming (78.9%), livestock keeping (56.1%), informal employment (casual labour) (47.8%) and self employment in business (42.2%) and sale of milk (45.6%). However there was an increase in the commercialization of livestock and livestock products as indicated by the proportion of household engaged in the sale of livestock (54.8%) and milk (45.6%). Other traditional livelihood strategies undertaken by Kamnarok NR adjacent households include borrowing food and money (31.2%), employment in formal institutions/organizations (26.4%) and herbal medicine for self-treatment 18.9% (Table 5.10).

Table 5.10: Livelihood Strategies undertaken by Kamnarok NR adjacent Households

Livelihoods	*Frequency	%
Formal employment	95	26.4
Livestock keeping (pastoralism)	202	56.1
Mixed farming	284	78.9
Informal employment (casual labourers)	172	47.8
Herbal medicine	68	18.9
Sale of milk	164	45.6
Borrowing food and money	114	31.2
Livestock business	198	54.8
Others	57	15.8

*Frequencies are out of 360 respondents

Source: *Field survey, 2017*

The findings reveal that only a small segment of Kamnarok NR adjacent community are able to adequately sustain their livelihoods from formal employment (26.7%) and high monthly household incomes (Table 5.10). The majority of the community are either livestock keepers

(pastoralist) 56.1%, mixed farmers 73.9% or casual labourers (informal employment) 47.8% and herbalist 18.9%. Informal employment (casual jobs), livestock keeping and agricultural activities are indicators of dependence of the community on Kamnarok NR resources for their economic livelihoods thus posing potentials of human wildlife conflicts as well as conflicts with the reserve management. Nunow, (2000) argued that populations living around protected areas are generally the poorest section of the rural population and the common belief that natural forest resources in PAs are free for the benefit of everyone which in real terms exacerbate the damaging effect on the protected areas. As the Kamnarok NR adjacent communities seek access to the resources of the reserve in the context of their livelihoods, traditional bee hiving and livestock keeping are common practiced livelihood activities in the area as was observed in many of the respondent's homesteads (*Appendix VI, plate 1a and b*). These practices are vulnerable to wildlife and HWCs risks. Most often, damages to protected areas come from rural population pressure where resource adequacy are required for the maintenance and conservation of the reserve and also in meeting the surrounding community livelihood needs.

5.3.2 Livelihood Diversification Strategies Undertaken by Kamnarok National Reserve Households

Empirical evidence from the three locations of the study area suggest that the households have indeed engaged in multiple activities and rely on diversified income portfolios. The study found that Kamnarok NR adjacent communities had diversified their livelihood strategies into intensification in crop cultivation and agricultural based enterprises such as poultry keeping, lending out draught animals, bee keeping and sale of honey as well as leasing out land for crop production and sale of forest products. Other diversified livelihood strategies included trade and

micro-enterprises such as sale of merchandise at home and in open air local market, formal employment, rental housing, transport businesses and sale of land (Table 5.11).

Table 5.11: Diversified Livelihood Strategies undertaken by Kamnarok NR adjacent Households

Diversified Household Strategy	*Frequency	%
Sale of land	57	15.8
Lease of land	104	28.9
Make & sale of traditional crafts and ornaments	129	35.8
Poultry rearing	147	40.8
Formal and informal employment	153	42.7
Retail shopping	122	38.9
Sale of forest products	278	77.2
Rental housing	107	29.7
Transport businesses	69	19.2
Sale of merchandise	94	26.2
Bee keeping and sale of honey	177	49.2

*Frequency is out 360 household respondents

Source: *Field survey, 2017*

Sale of Land

In Muchukwa, Katibel & Keturwo sections and around Turutur Centre where land has been allocated to individuals, it was common for heads of households to sell part of it to satisfy some household urgent needs. This was a strategy for 15.8% of Kamnarok NR adjacent households.

Lease of Land

The area of study has fairly good arable land suitable for rain fed crop cultivation. Thus about 28.9% of household in Kamnarok NR adjacent areas lease out their land to others for cultivation

of crops. It was observed that demand for farmland especially from highland immigrants was high and households with land that could be cultivated was leased out. Terms of payment is either in cash or in kind. An acre of land was leased at between KES. 3500 -4500. In kind, payment ranged from dividing the crop product at the end of season especially maize equally between lessee cultivating agreed size of land and the lessor.

Making and Sale of Traditional Ornaments

Tugen sub community has an admirable crafts and ornaments. 35.8% of the study area households make use of the opportunity to make and sale beautiful clubs, arrows, shields and walking sticks. The main buyers of these products are foreigners who visit Kamnarok NR for wildlife viewing, however some of the wares are sold in nearby centres and neighbouring towns such Kabarnet, Tambach, Iten and up to Eldoret.

Poultry Rearing

Slightly over a third of Kamnarok NR adjacent households (40.8%) kept both exotic and indigenous hens under modern and free range systems. Poultry plays a very important role in Kamnarok NR adjacent households. Nearly all households kept hens, some of them in large numbers (up to about 300). Their eggs and meat used to meet their dietary requirement while those households who kept large numbers it is a family business were they sell live poultry to obtain money to meet their household modest livelihood needs.

Retail Businesses

Retail business within the upcoming urban centres in the study area was observed to be picking up. 38.9% of Kamnarok NR adjacent households were engaged in retail businesses as an alternative livelihood.

Sale of Forest Products

Majority of the households (77.2%) in the study area participate in the extraction of forest products from Kamnarok NR for domestic use and sale. The forest products extracted include construction poles, fencing poles, timber, rafters, firewood, charcoal and thatch grass.

Rental Housing

29.2% of Kamnarok adjacent households had constructed permanent structures and semi permanent structures for renting. Rental rooms, houses and small shops with internal fitting frameworks made out of round poles and rafters having mud walls and plastered with iron sheets roofs are common in the area of study. Owners of the property rented them out and received payment at end of each month.

Local Transport Business

Because of HWCs, improved road infrastructures and the availability of business opportunities, households has broaden their socio-economic activities to include local transport businesses which has become lucrative with a number of households (19.2%) investing as part of diversifying household incomes.

Informal and Formal employment

Formal and informal employment was an alternative livelihood strategy for 42.7% of Kamnarok NR adjacent households. Educated members of households with professional training and qualifications were employed as teachers, in government ministries, in uniformed forces (Kenya Defence Forces, KWS rangers, police and Kenya Forest Service). Others were engaged in the private sector, NGO organizations and institutions within the study area as drivers, cooks, computer operators, security personnel and as office messengers and cleaners. 15.9% were informally employed within the community as herders, house helps and farm hands and received monthly pay.

Bee Keeping and Sale of Honey

Barwesa Division is within Kerio valley ecosystem and are endowed with indigenous trees where wild bees are collected in hollow trunk trees (bee hives). During peak season, individual household would go out into the Kamnarok NR forest where they have invested in beehive and harvest honey. Other household individual would make or purchase traditional tree log hives and hang them on trees in their farms or in Kamnarok NR forests (Appendix 5, Plate1.b). Slightly less than half (49.2%) of Kamnarok NR household harvest and sale honey.

Sale of Merchandise in open Air Markets

Households of the study area were engaged in trade and micro enterprise activities such sale of merchandise at home, in the open air markets and cottage industry. Many households are located far from market centres and they make purchase of household goods during market days on commonly used items such as tea leaves, table salt, cooking oil, paraffin and washing bar soaps

often getting exhausted before the next market day. This created an opportunity for 26.2% of the households especially women to trade in at home in such items. Other observed merchandise traded items included shoes, clothes, vegetables, maize, rice and tobacco products. Those engaged in the business carried their wares to various sale points on market days using animal drawn carts and motor vehicles such as pick-ups and Lorries and items were sold in different quantities.

5.4 Livelihood Diversification Patterns

Diversification of livelihoods was observed to be essential in Kamnarok NR adjacent areas because of the semi-arid to arid conditions in which the highest rainfall is marginal for rain-fed crop production and drought is a common occurrence. More often than not it was noted that the communities in the study area depend on agricultural and livestock production as part of their livelihoods however, livelihoods are heavily impacted by human wildlife conflicts, climate variability and droughts which threaten the availability of food sources.

A survey was conducted to understand the local context, the general condition and aspects of livelihood diversification patterns among the Kamnarok NR adjacent households. Field evidence revealed variations in the level of diversification patterns among the different income and wealth groups in each location of the study area. Non-farm and off farm income activities emerged as important livelihood diversification activities the local community engage in. The study revealed that most of the households were engaged in multiple activities to meet family needs and to improve standards of living. In addition to assets such as land and livestock, the

availability of non-farm and off farm income received distinguished the poor households from those of average incomes.

5.4.1 Findings from Lawan Location

The proportion of crop income was 70% as compared to 62% in Kabutie and 52% in Kerio Kaboske. In this location farm related earnings provided most households' income because of the terms under which land was accessed. Much of the land in this location was utilized for crop production. The study revealed that diversification within agriculture was more evident. It was observed that non poor households had ventured into high return, high risk and high valued crops like water melon, tomatoes and fruits like mangoes. Crop diversification was observed to be the single most important source of income contributing 72% of total income for poor households compared with 57% for those classified as non-poor who had diversified into other non farm livelihoods.

Furthermore, poor households were observed to diversify mostly within agriculture by changing their crop mix and engaging in off farm activities that did not take them away from their settlement areas to safeguard their farms from the invasion of wildlife. Despite heavy reliance on crop incomes, investment in retail trade, service and the transport sector were identified as common among those venturing outside agriculture in Lawan location. Households classified as "very poor" and "poor" and those whose livelihoods were affected by wildlife diversified differently from the non-poor households. Non poor households in the location displayed a high level of diversity of income sources as compared with the very poor and poor households. In whatever case, livelihood diversification activities in the location was observed to supplement

and complement farming activities. This finding support the observation made by Ellis (2000) in Namibia, where local people perceive livelihood diversification as new activities presenting opportunities for additional household incomes.

Although crop production dominate household incomes, a significant contribution of income come from off-farm and non-farm activities (52.6%) in the location. Poor and very poor households had diversified livelihood portfolios in response to failing livelihoods rather than seizing the available opportunities. Diversification by most poor households in the location was seen as essential for survival. However, households were observed to have diverse needs and this explains why they engaged in multiple activities, an important choice and a crucial strategy in meeting these household needs. This finding of multiple livelihood activities is congruent to the argument raised by Ellis (2000) that rural households construct diverse activities in order to survive and improve their standard of living. It was also noted that such constructs in the study area were also typical of those households not affected by wildlife menaces. Other factors such as lack of farm inputs, poor commodity prices and drought combined, had forced households to look for diverse range of alternative productive livelihood activities.

5.4.2 Findings from Kabutie Location

Households classified as non-poor and whose livelihoods were affected by wildlife had more diverse income sources than the very poor and poor households. They derived 56% of their income from crop farming compared to 74% and 82% earned by the poor and very poor households respectively. Furthermore, non farm activities contributed 69% of incomes for non poor households compared with 11% for the poor and 4% for the very poor household who have

been affected by wildlife conflicts. The low level of earnings from non farm income sources for the poor and very poor households in Kabutie location was explained by the financial barriers to entry into those kinds of activities, limited enterprenurial opportunities compounded by a general lack of essential infrastructures. This situation is consistent with the observation made in Zimbabwe by Goodwin and Roe (2011), where the primary difficulty for local household's participation in non farm and off farm enterprise activities was inaccessibility of markets due to infrastructural challenges. Additionally, Weaver (2001) contends that start-up expenses account for difficulty for local people to engage in non farm activities.

Non farm activities contributed almost four times more incomes in Kabutie than Lawan and Kerio Kaboske locations. Agriculture related but off farm activities such as repair of farm equipment & machinery and trading contributed three times as much income in Kabutie than Kerio Kaboske location and Lawan. Therefore the dominance of crop income at household level in Kabutie was lower as compared with Lawan and Kerio Kaboske. In Kabutie, both economic and environmental marginality significantly limited the scope for pursuing off farm activities for the poor and very poor households. Lack of access to saving and formal credit for the poor and very poor households further constrained their participation in non-farm and off farm activities. In contrast, the non-poor households take advantage of opportunities to diversify livelihoods out of agriculture which are less prone to wildlife (elephant) invasions. Remittance and pension as source of income contribute 12% of the total household's income in Kabutie location.

5.4.3 Findings from Kerio Kaboske Location

Households classified as very poor and poor in Kerio Kaboske location had more diverse income sources than non-poor households. Their income sources (42%) are from livestock, 18% from crops and 36% from non-farm operations as compared to 68% incomes source from livestock for non-poor households. Non-farm activities and crops contributed 9% and 16% respectively of the incomes for non-poor households in Kerio Kaboske. The low level contribution of crop production to incomes of non-poor households was explained of the intensity of elephants (HWCs) invasions on crops and thus discouraged households from farming. Very poor and poor household in Kerio Kaboske had diversified livelihoods in the non-farming and non-pastoralism in response to human wildlife conflicts and the frequency of cattle rustlers risks in the region.

Local NGOs (World Vision and SNV) among others in the Kerio Kaboske location have set up semi-formal micro finance organization supporting non-farm operational activities among the very poor and poor household to enable them venture out of farming activities which are prone to wildlife invasion and cattle rustlers. The above findings confirm research done elsewhere in Kenya and in Kaduna state in Nigeria showing that households construct an increasingly complex portfolio of activities and assets (Ellis, 2000) in order to survive from vagaries of different environmental risks including wildlife conflicts and also towards improvement of their standards of living (Adebayo *et al.*, 2012). Furthermore, the study findings is supported by Swift and Hamilton (2002), in their study on livelihood diversification and Poverty in semi-arid regions in Zimbabwe, they broadly highlighted that non-farm and wage incomes were important income sources for a large proportion of households, and remittances for some. However, in

Kamnarok NR adjacent areas, the main economic activities pursued by severely poor households differed substantially from those pursued by the non poor, as did their major sources of income.

Therefore, poor and severely poor households were much more likely to be solely engaged in farming or in a mix of natural resource-based enterprises, or in activities with low social status including casual labour, traditional beer brewing and construction. From the findings of this study it was also observed that livelihood diversification has potentials of contributing positively to local household livelihood sustainability because it can reduce shocks and stresses attributed to human wildlife conflicts and obviously in the study area, households were found to be diversifying livelihood portfolios as a response which allows them to cope and recover from economic shocks and stress.

5.5 Human Wildlife Conflicts and Livelihood Diversification

5.5.1 Effects of Human Wild Conflicts on Household Livelihoods Diversification

The study sought to determine the extent to which human wildlife conflicts impacts on the Kamnarok NR adjacent household livelihood diversification. Human wildlife conflicts (HWCs) were evaluated in terms of wildlife impacts on household crop livelihood damages, scale of human injuries & deaths and livestock predation caused by wildlife. Transmission of diseases to both livestock and humans beings by wildlife were also evaluated as vector bone causing diseases affect indirect the livelihood outcomes of households. The impacts of HWCs was evaluated in terms of household's views on the increase in threats to the traditional livelihoods by wild animals as well as the livelihood benefits derived by households from Kamnarok NR. The household responses on HWCs impacts were rated as follows: No impact = 0, slight impact

= 1, Moderate impact = 2 and high impact =3. On the other hand, responses on livelihood benefits from derived from Kamnarok national reserve were rated as No = 0, Mostly No =1, Mostly Yes =2 and Yes = 3. Each of the scores were converted into percentage score by dividing by four and the means for the various dimensions of human wildlife conflicts impacts and livelihood benefits analyzed.

The findings on the livelihood diversification with respect to human wildlife conflict threats indicated that the means range from 0.56 (56%) to 0.85 (85%). There was a moderate to high impact of HWCs in respect to household livelihood diversification in situations that had a means of at least two third that is 0.67 (67%). This included wild animal damages on crop livelihoods (0.85) 85% wild animal predation on livestock 0.78 (78%). Transmission of vector bone causing diseases (0.75) and wild animals' hindrance on household social and economic activities (0.66) 67%. The least observed HWC factor influencing livelihood diversification among Kamnarok NR adjacent households was on human injury and deaths (0.56) 56%. Table 5.12 shows the means of the households' respondents' ratings on HWCs impacts on livelihood diversification (table 5.12).

Table 5.12: Human Wildlife Conflict impacts on Livelihood Diversification

Human Wildlife impacts	No.	Means	Std. Deviation
Wildlife damages on crop livelihoods	360	.84722	.23665
Wildlife predation on livestock	360	.78438	.20487
Transmission of vector bone causing diseases	360	.75833	.18067
Wildlife hindrances to household social economic activities	360	.66112	.15638
The scale of human injury and deaths	360	.56389	.11392

Source: *Field survey data, 2017*

Table 5.12 above shows that almost all the human wildlife conflict factors scored a mean of 0.56389 and above indicating that HWC factors influence household livelihood diversification in varying dimensions. The average mean of 0.56389 ± 0.11392 thus indicate that HWC factors either slightly, moderately or highly influence household livelihood diversification on the impact statements (table 5.12). Thus the hypothesis that there is no relationship between livelihood diversification and the rising human wildlife conflict cases in Kamnarok NR adjacent areas is rejected.

5.5.2 Livelihoods Benefits and Community Support for Kamnarok NR

The findings on the livelihood benefits derived from Kamnarok NR revealed that the protected area strongly support the adjacent household livelihoods and well being at .81 (81%). The protected area provide grazing field for adjacent household livestock .77 (77%), essential fuel wood and non timber forest products for both domestic and commercial purposes at .67 (67%). The reserve also minimally contribute and sustain community developments in provision of essential utilities such as health facilities, education bursaries and water for the local community with a mean of .32 (32%). Implying that the perception of the reserve in terms of social responsibility is generally weak though adjacent resident community acknowledge employment in the reserve with a mean of 0.55 (55%). The means and standard deviations of the household respondents' scores are shown in (Table 5.13).

Table 5.13: Livelihoods Benefits and Community support

Livelihood benefits and support from Kamnarok NR	No.	Means	Std. Deviations
Households use the reserve as grazing field for livestock	360	.8122	.38149
The reserve provide essential non timber forest products for both domestic and sale	360	.6742	.33257
Local households derive herbal medication from the reserve natural resources	360	.6305	.29874
The reserve provide employment opportunities for local residents	360	.5472	.24814
Reserve entry fees are used in the provision of education bursaries, essential community services and other social responsibility	360	.3162	.18593

Source: *Field survey data, 2017*

5.5.3 Correlation between Human Wildlife Conflicts, Socio Economic Benefits and Livelihood Diversification

The means of the five human wildlife conflict factors (wildlife damages to crops, livestock predation, human injuries and deaths, disease transmission and wildlife hindrance on socio economic activities) were computed along side the means for the dependent variables (livelihood diversification and socio economic benefits) and used to conduct Pearson Product Moment correlation (PPMC) to determine whether there were significant relationship between the variables. The findings were as shown in (Table 5.14).

Table 5.14: Correlation between Human wildlife conflicts, socio economic benefits and Livelihood Diversification

		LD	SEB	LVP	CD	HID	DTRS	HHSEA
LD	Pearson (r)	1						
	P (Values)							
SEB	Pearson (r)	-.454**	1					
	P (Values)	.004						
LVP	Pearson (r)	.642**	.552**	1				
	P (Values)	.000	.000					
CD	Pearson (r)	.681**	.184	.009	1			
	P (Values)	.000	.379	.739				
HID	Pearson (r)	.153	.048	.108	.384**	1		
	P (Values)	.075	.781	.487	.014			
DTRS	Pearson (r)	.504**	.497**	.621**	.064	.039	1	
	P (Values)	.000	.003	.000	.816	.864		
HHSEA	Pearson (r)	.486**	.007	.349**	.297**	.027	.081	1
	P (Values)	.008	.983	.072	.024	.947	.738	

**correlation is significant at the 0.01 level (2- tailed)

*correlation is significant at the 0.05 level (2 tailed)

Key: **LD**=Livelihood Diversification, **SEB**= Socio Economic Benefits, **LVP**= Livestock Predation, **CD**=Crop Damages, **HID**= Human Death and injury, **DTRS** = Disease Transmission and **HHS&EA**=Hindrancement of Household' s Socio & Economic Activities

Source: *Field survey data, 2017*

The correlation in table 5.14 above indicate that the relationship between livelihood diversification (LD) and all human wildlife conflict factors (LVP, CD, HID, DTRS and HHS & EA) remained significant. There existed a significant positive relationship of moderate strength to strong between livelihood diversification and human wildlife conflicts factors except human injury and deaths. The relationship between livelihood diversification and HWC aspects were LVP (r = 0.642, n=360, P< 0.01), CD (r =0.681, n=360, P< 0.01), HID (r =0.153, n=360), P=0.075) DTRS (r=0.504, n=360, P<0.01) and HHS&EA (r=0.486, n=360, P<0.01).

5.5.4 Households' Income with Diversification

One way to measure rural income diversification is to ascertain the relative share of the different income sources in total household income. The study classified and analyzed household incomes of self employed which is made up of both farm and non farm sources and households incomes of those in waged which is made up of non farm sources (Appendix V). The study revealed that diversified households were those in waged income employment and were located far from Kamnarok NR and close to main roads and other infrastructure with high annual household income of KES. 840,845 as compared with less diversified household whose location were close to Kamnarok NR (Appendix V).

The study further established that diversified households had less land acreage compared with less diversified household with more elderly household heads. The study further established that less diversified households had low education levels and were younger as compared to diversified households who were more educated with small household sizes. Also less diversified households were more likely to have larger household size with more working adults with less accumulated productive assets. These findings affirms the importance for household well being of education and having sufficient labor for farming, collection of forest resources, and other livelihood strategies (IPAR, 2005). More than 57% of households listed farming related activities as their major occupations. Better-off households who were less than 20% in waged employment are more likely to be engaged in more diversified livelihood strategies e.g owned a village shop or provided a service (such as being a carpenter, trader, etc.); or lease larger amounts of land or possess mini-tractors for ploughing. Less diversify households were likely to rent out their labor, perhaps due to lack of other livelihood options. In conclusion households located far from

Kamnarok NR have more diversified livelihoods, in waged employment than those close to the PA. Therefore, the existence of Kamnarok NR as a wildlife protected area exacerbate local poverty.

CHAPTER SIX: SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The purpose of this study was to analyze human wildlife conflicts on livelihood diversification among communities living adjacent to Kamnarok NR. The study was conducted within the administrative locations of Barwesa division (Lawan, Kabutie and Kerio Kaboske) of Baringo County. Primary data was collected using interview questionnaire, focus group discussion and key informant interviews. Study sample was obtained through random sampling (for households) and purposive sampling was utilized for both focus group discussions and the key informants. This chapter therefore present discussion of the findings, a summary of the findings, conclusion and recommendations. The chapter further summarizes the contribution of the study to the body of knowledge and finally gives suggestions for further research.

6.2 Summary Discussion of the Findings

The study utilized responses from 360 household respondent questionnaires as well as information from 6 key informants averaging 87.6% response rate. Generally, 76.7% of the household subjects were male and 23.3% were female. The study established that 34.7% were married, 46.9% were singles. The study further established that a significant (30%) of the population in the study area had no formal education of any kind while 33.8% had primary level of education, 22.8% had secondary level education, 7.5% and 5.8% had tertiary and university level education respectively. Occupation wise, 28.3% were livestock/pastoralists, 23.3% practice mixed farming and 20.0% and 5.2% of households were in informal and self employment respectively and 2.2% were engaged in unspecified activities.

A higher percentage of households (51.1%) had an average monthly income of less than KES. 10,000.00 compared to only 8.3% who earn more than KES. 20,000 per month but the average mean household income per month in the study area was KES. 8945.00 \pm 748.44. Further, the study established that 23.8% of household in the study own land less than 5 acres, 12.1% own less than an acre, while majority 46.5% own more than 15 acres size of land. The study further established that 59.2% of Kamnarok NR adjacent households inherited their current land possession, while 12.8% acquired their current land through buying. It was further established that all land in the study area had been adjudicated way back in 1982, but with no formal land titles or any other formal ownership documentation. Insecure local tenure over land and forest resources provides little incentive for local people to engage in sustainable resource management and this might have been one of the factor contributing to resource degradation in the study area.

With respect to human wildlife conflicts the study established that living in close proximity to protected areas imposes costs such as damage to or loss of crops and livestock, and occasionally injury or death of local people (Deodatus 2000, Woodroffe *et al.*, 2005). These costs increase as conservation efforts lead to the recovery of animal populations, and as human population growth leads to an increase in the proportion of land outside the parks that is used for agriculture (Richardson *et al.*, 2012). Our results show that human-wildlife conflicts were perceived to be prevalent in the study area between 2005 and 2016. Conflicts with wildlife over crops, livestock, and human safety issues were reported in all three locations irrespective of the perceived level of livelihood diversification by 71.1% of the interviewed Kamnarok NR adjacent household dwellers. The main form of HWC manifestation experienced in the study area was crop damage at 72% and livestock predation at 46%. Other HWC infestations were human injuries 11.4% and

human deaths at 2.7% respectively. However, human wildlife conflict incidents significantly differed by gender ($X^2 = 8.265$, $P < 0.001$, $df = 4$) as more male headed household bore the brunt of conflicts. However, 63.3% of the interviewed respondents, despite the conflict menace associated with the wildlife still support the conservation of the reserve and its wildlife as opposed to 9.1% of those who held contrary opinions.

In the study area there was sufficient evidence to suggest that despite the problems caused by elephants and other predators, rural people living adjacent to Kamnarok NR still value wildlife. The reasons advanced varied and for most of them, the decision to tolerate wildlife was not based on financial costs and benefits but aesthetic values, and sense of ownership and empowerment. Similar findings were observed by Jones (2001) in Kunene Wildlife communal lands in Namibia. Further more, the study established that the 57.6% of community were tolerable on the existence of some wildlife animals in their farms but 32% of the respondents could not tolerate elephants.

Whereas the household negative perception on wildlife of Kamnarok NR was significantly high (69%), they use an array of mechanisms to mitigate their effects on their livelihoods including lighting fires (24.2%), fencing their land and homesteads (21.7%), guarding their crops and livestock at night (16.1%) and hire of guards to protect their livelihoods (12.4%). The prevalence and magnitude of HWC incidences significantly differed with household distance from the reserve location ($X^2 = 12.473$, $P < 0.001$, $df = 4$) as households close to the reserve boundary experienced more HWC incidence with catastrophic impacts. Agro pastoralist experienced the worst level of HWCs (80%) followed by pastoralist (76%), small scale farmers (44%) while those in both formal & self employment and casual labourers had suffered minimal levels of

conflicts at 23.0% and 34.7% respectively. However the general HWCs types in the study area were livestock predation (30.0%), crop raids (23.0%), trampling of crops 34.8%), conflicts associated with water (36%), livestock disease transmission (14.0%) and access to grazing fields (38.4%). Other conflict type prevalent in the study area was human injuries (14.3%) and human killing at (8.7%). The study further established that there existed a significant negative relationship between HWCs (animal predation and crop damage) and household distances from the reserve boundary ($r=-0.478$, $P< 0.001$, $n=360$).

As relating to the relationship between HWC impacts and age, education level and occupation of household respondents, the study established that there existed a significant positive relationship between HWCs and age & occupation: age ($r=0.317$, $n=360$, $p<0.001$) occupation ($r=0.237$, $n=360$, $p<0.001$) however, a significant negative relationship existed between HWC and education levels: education ($r=-0.406$, $n=360$, $p<0.001$). Despite a significant proportion of Kamnarok national reserve adjacent households (69%) in support of the reserve conservation, a majority of them have negative attitude towards the wildlife especially the elephant populations and the reserve management authority holding the view that the management had done little to compensate them for their lost land and livelihoods damages nor has the management eliminated problematic animals such as the baboons, elephants and crocodiles. The study further established that elephant populations in the study area had increased by approximately 40% and non migratory animals had also increased by 24.6% in the last 20 years (1996 – 2016) with zebra population increasing by 31.4%, Buffalos 34.4% and grant gazelles by 17.6%.

With regard to major factors influencing HWCs in Kamnarok NR adjacent areas, the study established that land right contestation (77%) by the local community was the main factor contributing to the conflicts. Increase in the local wildlife populations as alluded by 72% of the respondents was another factor, while illegal grazing of livestock in the reserve, demand for the reserve forest resources and encroachment into the reserve land were some of the factors contributing to HWCs in the study area. The study further established that, mechanized and irrigation farming along Kerio River was also observed to be contributing to wildlife conflicts as the farming activities frequently attract wild animals.

The study also revealed that resource conflicts in the Kamnarok NR adjacent areas are responsible for the low standard of living among the majority of local households. Furthermore, the study revealed that structural conflict was the dominant conflict characterizing the Kamnarok NR adjacent areas. The ineffective structures to address litigations over land, effective enforcement of resource regulations, managing conflicts and controlling population growth have been the drivers of conflicts in the study area. Others types of conflicts identified included the data information conflict and interest conflicts. As much as the study tried to relate the sources of the conflicts in the Kamnarok NR adjacent areas, the major causes identified for the resource conflict phenomenon was competing interests (90.4%), inadequacy of livelihood sources (78.4%), land litigation/contestation (77.3%) and resource corruption (70.8%). This constituted about 30% of the causes of conflicts in the Kamnarok NR adjacent areas. It was also identified that state institutions, the local community and development partners were some of the stakeholders who had been lending support to the local communities in achieving the desired livelihoods which deepened their interests in Kamnarok land and associated resources which

resulted into conflicts with wildlife rangers of KWS and those of Baringo county government, a fact also stressed by FAO (2005) and Nang *et al*, (2011).

In regard to household well being and welfare of Kamnarok NR adjacent community, 60.3% of the household felt that they were living poor quality lives as a result of wildlife conflicts compared to 29.2% of those who feel they live just quality lives. The study further established that HWCs had negatively impacted the well being and welfare of the households. HWCs has negatively impacted households' capacity to improve their standards of living as argued by 58.6% of the household respondents while at the same time caused household food decline by 72.2%, thus increasing poor health and undernourishment by 2.8% and 3.5% respectively. The study also established that HWCs had contributed to declining economic incomes of households due to loss of crops and livestock which contribute to their economic well being and use of the sale proceeds from these livelihoods to address their welfare needs. Households also expense a considerable amount of time in guarding crops and livestock where this valuable time could be utilized essentially in productive economic activities which generate economic incomes for the households.

The study further established that as a result household spending more time in guarding crops and livestock up to late in the night or sometimes the whole night has exposed them to health risks such as vector borne causing disease such as mosquitos which cause malaria and coldness which cause pneumonia especially during the rainy seasons. It was also established that grazing of livestock with wildlife expose them to disease transmission from wildlife such Rift Valley Fever (RVF) and foot and Mouth thus harming livestock sales thus instigating a down ward

spiral in households livelihood needs and thus their well being and welfare. The study also observed that HWCs especially elephants hinders social movements and contact among the Kamnarok NR adjacent dwellers, thus impacting on the community's' security, safety, well being and welfare.

Despite the setbacks of HWCs to the households' well being and welfare in the study area, there exist a significant relationship between Kamnarok NR resources and the adjacent households' socio- economic well being and welfare. The study established that the reserve natural resources contribute to the socio-economic well being of the community households. 61.4% of the households derive their firewood from the reserve forests, while 47.2% obtain their medicinal herbs for self treatment from the reserve resources. Livestock grazing (75.3%), honey collection (63.9%), charcoal burning (70%) and fishing (56.2%) are all accessed from the reserve natural resources.

As regard to motivational factors for livelihood diversification among the households, the study established that 67% agro-climatic vulnerability factors influenced household to diversify livelihoods. Majority of the household respondents (80.9%) argued that draught, crops and livestock disease vulnerabilities had influenced them to diversify livelihoods to safeguard them against the vagaries of bad weather and wildlife conflicts. 64.1% of the contextual factors influenced livelihood diversification among household in the study area as majority of the households (64.5%) argued that they diversify livelihoods due to poor access to livestock markets and price fluctuations for both livestock and crops and lack of rural livelihood support policies by the government.

General push factors significantly (79.4%) influenced households behaviours to diversify their livelihoods as majority (54.8%) argued that wildlife conflicts, economic hardships, declining agricultural production, management regime of Kamnarok NR, poor agricultural extension service and expensive farm inputs were some of the factors which have pushed some household to diversify livelihoods. The study further established that general pull factors (83.3%) contributed to household diversifying livelihoods as majority of the respondents (68.6%) argued that the availability of jobs in urban areas, the availability of credits (loans) from a number of institutions & business enterprise opportunities, high level of education and recent incorporation of rural areas into local markets by the county government were some of the factors which have pushed some of the household to diversify livelihoods.

It was also established that wildlife related factors (45.7%) was responsible for household livelihood diversification in the study area as majority of the interviewed households (91.2%) argued that HWCs forms such as crop damages, livestock predation, property destruction, human injury and deaths were some of the factors influencing household livelihood diversification. On the general motivational factors for livelihood diversification and human wildlife conflicts, the study further established that significant positive relationships existed between HWCs and livelihood diversification motivational factors; agro-climatic variabilities ($r=0.432$, $n=360$, $p<0.001$), contextual factors ($r=0.556$, $n=360$, $P<0.001$), general push factors ($r=0.726$, $n=360$, $P<0.001$) general pull factors ($r=0.618$, $n=360$, $p<0.001$) and wildlife related factors ($r= 0.519$, $n=360$, $P<0.001$).

Finally as regard to livelihood diversification strategies undertaken by Kamnarok adjacent households, the study established that the households had diversified into land sales (15.5%), leasing of land (28.9%), poultry farming (29.7%), engagement in both formal & informal employment (42.7%), trading in Kamnarok NR forest resources (38.9%), retail shopping (28.9%), rental housing for income generation (29.7%), local transport businesses (19.2%) collection and sale of honey (49.2%) and sale of merchandise in open air markets (26.2%) by households. Further the study established that the very poor and poor households in the study area had limited options of diversifying livelihoods compared to non-poor who had resource accumulations and diversity of options available for them to diversify. This findings support the findings of Chambers (1997) who argued that poor people world over are resource constrained in enabling them to adopt diversification into different livelihood portfolios in order to survive in risk prone and uncertain periods.

The challenges of building sustainable livelihoods by households living in areas adjacent to Kamnarok NR reflect broader land right contestation and land issues within Kenya and beyond. As in rural Kenya generally, livelihoods in Kamnarok NR adjacent areas are heavily dependent on natural resource utilization through subsistence agriculture and forest product extractions (Cooper et al., 2008). Most household in the study area have suffered from wildlife damages and livestock predation which is strongly associated with negative conservation attitudes (New Marks *et al.*, 1993, Akama *et al.*, 1995, Heinen, 2003 and Irandu, 2003). Benefits accruing from Kamnarok NR are minimal and frequently insufficient and ineffective in offsetting for wildlife damage compensations (Kiringe, 2011). The study findings do support work showing that age, gender, education and occupation are significant predictors of conservation attitudes (Fiallo \$

Jacobson 1995, Shah & Heinen, 2001 and Mehta & Kellert, 2005). In the study area, both the rich and the poor households live under similar circumstances suffer from crop and livestock losses to wildlife. Household income did not explain variations in attitude but contributed towards household livelihood diversification. Level of education significantly influenced variations in attitude towards wildlife and wildlife conservation and also contributed to livelihood diversification (Allison, 2004). Other studies elsewhere has shown that people with high level of education held more favourable conservation attitudes (Mehta & Kellert, 2005).

Crop damages and livestock losses to wildlife were more frequently cited problems by Kamnarok NR adjacent households and at farms located near Kamnarok NR in comparison to other areas. The study area which constitute Lawan, Kabutie and Kerio Kaboske locations share boundaries with Kamnarok NR. Studies conducted in Kenya by Kiringe *et al.*, (2007), Barua *et al.*, (2013) and Foley *et al.*, (2010) argued that proximity of farms and human settlement to protected areas (PAs) increase the chances of crop raiding and livestock predation. In this case Kamnarok NR adjacent community households farms extend to the reserve peripheral, thus their farmlands and household settlements are frequently invaded.

However, these studies did not outline the influence of non-wildlife factors and other confounding and uncontrollable elements that contribute both to crop damages and livestock losses. These include drought and diseases which were observed in the area of study to have caused significant economic losses to household livelihoods. This findings support the findings of Dickman *et al.*, (2014), Lyamuya *et al.*, (2014) and Mbau *et al.*, (2003) who asserted that disease outbreaks played a significant role in crop damages and livestock losses. The pattern of

disease transmission from wildlife affect livestock thus aggravate household livelihood status. However, very poor and poor households were most affected due to lack of effective strategies against the consequences of livestock vector borne diseases transmitted by wildlife.

This study quantified estimate economic losses associated with wildlife livestock predation and crop damages. Livestock (see section 4.3.3) and crop (section 4.3.14) economic losses was quantified and estimated to be KES 23,299 (3.7%) and crop economic loss was KES. 105,750 (9.4%) per household per annum respectively. This finding contradict Sillero-Zaburi and Switzer (2001), who in their findings argued that it was difficult to quantify both in actual yields and economic terms losses attributed to wildlife. In contrast, a study by Dickman *et al.*, (2014) conducted in Tanzania quantified the rate of damage by wildlife, suggesting the rate of livestock loss to disease at 9.1%, 2.7% to wildlife predation and 2.1% to theft. The results of Dickman *et al.*, (2014) demonstrate how strongly disease from wildlife can impact on livestock (livelihoods) losses. The observation of Dickman *et al.*, (2014) could be exaggerated by the study being conducted in areas adjacent to PA, where there is higher probability of livestock and wildlife interaction posing a risk for significant disease transmission such as Rift Valley Fever (FVR), foot & mouth and trypanosomiasis from wildlife to livestock.

Moreover, Maruthi (2015) and Okello *et al.*, (2013) highlighted that livestock predation and crop losses may increase with an increase in wildlife populations escalating conflicts between wildlife, wildlife managers and the local communities. This situation is similar to the findings of this study. Increased conservation effort by the Kamnarok NR management authority has influenced the increasing wildlife populations which has exacerbated human wildlife conflicts in the reserve

adjacent areas. Elephants and other related wildlife in Kamnarok NR are part of a much larger populations that ranges across several national reserves in North Rift and are part of what is seen in Kerio Valley as an increasing problem of overpopulation. According to Kaibos (2015), both human and wildlife populations has increased in the recent past resulting in compressed and fragmented wildlife ranges in the region thus increasing human wildlife conflicts and the escalating elephant increase population problems.

The analysis of this information and findings of this study suggest that crop damages and livestock losses to wildlife had been occurring since time immemorial, but its intensity has been increasing gradually (section 4.2 of this study). The gradual increase has been exacerbated by the establishment of the national reserve in 1986 were the local community were dispossessed of their land without any compensation. The study findings revealed that the major cause of human wildlife conflicts was land right contestation as was alluded by 77% of the household respondents. It was also observed that the reserve management had improved conservation efforts as alluded by 72% of the respondents which has positively transformed wildlife habitats thus the increase in wildlife populations. These wild animals scavenge freely into nearby farms and potentially cause losses, fear, human injuries and deaths. This findings are supported by Lyamuya *et al.*, (2014) and Dickman *et al.*, (2014) who in their study findings elsewhere in Tanzania argued that increased conservation efforts with regard to wildlife resources led to an increase in wildlife populations which pose consequences to rural households living adjacent to protected areas.

Crop damages in the study area was observed to be negatively affecting household livelihoods. This findings support the findings of Mbau (2013) who while conducting a study in Tsavo West-Amboseli agro ecosystem, found that wildlife damaged an average of 0.8 tones of food crop per year per household, equivalent to five months household food loss. However, Mbau (2013) did not account for the contribution of other factors to crop damage and she is consequently not in a position to validate whether wildlife related factors are the main agents for crop damages. It was also observed that very poor and poor households were more prone to food insecurity through this problem compared to non poor households who had other coping option capacities to subdue the vulnerabilities.

Local communities spend valuable time and resources in protecting their crops and livestock (livelihoods). This finding was consistent with Gupta (2013) who argued that household living adjacent to protected areas have experienced both direct and indirect socio and economic costs from wildlife. Hiring of security guards to protected household livelihoods against wildlife was very expensive and occasionally individual household members guarding farms and livestock at night were exposed to ill health by contracting diseases such as malaria and pneumonia which resulted in the continuation of crop and livestock losses

Livelihood diversification by households in the study area was linked to improved surveillance of wildlife resources by the wildlife management authorities. It was further observed that better wildlife administrative polices and management strategies adopted enhanced wildlife populations which was observed to be responsible for the escalation of human wildlife conflicts in Kamnarok NR adjacent areas. This findings is in contrast with the findings of Chambers and Conway (2012)

who argued that livelihood diversification is based on a framework that considers the activities of the rural poor as being determined by their portfolio of assets, including social, human, financial, natural and physical capital.

The potential exit routes from human wildlife conflicts and related vulnerabilities are to some extent revealed by the livelihood patterns of the better off households in the study area. It was widely observed that while diversity of income sources was prevalent across different the income classes, the nature of diversification also differed greatly between better off and poorer households. It was also observed that the better off tend to diversify in the form of non-farm business activities (trade, transport, shop keeping, brick making etc.) while the poor tend to diversify in the form of casual wage work, especially on other farms. Diversification by the poor households was noted to be still highly reliant on agriculture, while those of the non poor households reduced such dependence.

Furthermore, these patterns revealed an interdependence in the achievement of livelihood security between diverse non-farm and farm components, in which the farm component simultaneously diminished in importance within diverse livelihood portfolio. Better off households were distinguished by virtuous spirals of accumulation typically involving diverse livestock ownership, engagement in non-farm operations, self-employment, and diversity of on-farm and non-farm income sources. This findings is consistent with the findings of Ellis & Freeman (2005) in Kwa Zulu Natal National Park, South Africa, who observed that rural households do engage in multiple livelihood activities and mostly rely on diversified income portfolios as mechanisms of smoothening and spreading risks from wildlife conflicts.

The maintainance of diversified livelihood resource base was a prerequisite adaptation mechanism to human wildlife conflict menace as diversified livelihood system allowed vulnerable households in the study area to draw on various sources for food, survival and income. Livelihood diversification was reportedly being undertaken by most households of the study area with non poor households having more livelihood diversification opportunities.

Livelihood diversification which was reportedly observed to be a livelihood strategy (Mazibuko, 2013) was acknowledged to be a strategy of spreading risks among a variety of livelihoods pursuit by different households in Kamnarok NR adjacent areas. This findings was observed to be a strategy which potentially sustain many households in sustaining themselves more effectively when situations like crop failure or loss of livestock occur due to human wildlife conflicts or during prolonged droughts. This findings is consistent with evidences of Roe *et al.*, (2013) which linked community livelihood diversification to an array of forces influencing rural subsistence communities to the utilization of local available natural resources and opportunities in the mitigation of unforeseen livelihood risks. Similar findings were reported by John and Wobst (2006) who stated that in rural Tanzania households were diversifying livelihoods through funding from both formal and informal arrangements. Davis *et al.* (2007) also mentioned that in the rural areas of developing world non-farm income contributing more to total household income and it is also one of the important reasons for household income diversification. Reardon (1997) supported the above findings that in rural Africa the non-farm sector contributing to more household income than the on-farm sector.

Furthermore, majority of the the interviewed households in the study area had slightly diversified their livelihood portfolios to include sale and leasing of land at 15.5% and 28.9% respectively, while others had diversified into rental housing (29.7%), sale of forest products (77.2%), poultry farming (40.2%), local transport business (19.2%) and sale of merchandise (26.2%). This findings is in tandem with a number of studies which have confirmed that the ability of a household to diversify is determined by skills, location, assets, capital, markets and social connections (Warren, 2002 and Mutenje *et al.*, 2010).

6.3 Conclusion

Human wildlife conflicts are present in Kamnarok NR adjacent areas in form of crop raiding, livestock predation and human injuries and is perceived by the local community to be a threat to their livelihoods. Crop raids were found to be predominantly directed to the food crops used by the locals for their subsistence and livestock which are the main stay livelihoods. Crop raids were perceived to be carried by elephants, baboons, zebras and buffalos, while livestock predation were perceived to be carried by leopards, hyenas and jackals. Reported losses, although it was difficult to verify and quantify, it was relatively high particularly when compared with overall household incomes. Household used variety of mitigation measures to protect their livelihoods but active guarding of crops and livestock was found to be the preferred mode of protecting livelihoods around Kamnarok NR adjacent areas.

The study further established that the main factors influencing HWCs was land rights contestation, illegal grazing of livestock inside the reserve, high demand extraction of the reserve resources and an increase in the reserve wildlife populations. Agro-climatic, contextual, physical

asset possession, wildlife related, general push and pull factors were some of the factors influencing livelihood diversification among households.

6.4 Recommendations

In spite of the difficulties people of Kamnarok NR are going through, they still have expectations from the Kamnarok National Reserve and its management authority. The study findings reveal that human wildlife conflicts in the reserve adjacent areas are rampant where it affect both the adjacent household human populations and wildlife negatively. Therefore, the following recommendations are made to improve the situation and address the plight of the local people and to enhance support for conservation.

6.4.1 Recommendation for Policy Makers and Managers

Understanding HWCs can enhance planning and management of the conflicts and help reduce the adverse effects on both wildlife and humans. Our results indicate that land contestation and crop raiding were the main types of HWC in the study area and based on the findings of this study, the management of Kamnarok NR should consider compensating the local community for opportunity costs and rights foregone as a result of loss of their land and restricted access to the natural resources within Kamnarok NR. Unless wildlife contribute a great deal to the local livelihoods, the present forebearances as observed in the study area is likely to disappear. Furthermore, Kamanarok NR management authority need to promote a system where wildlife conservation pay for itself and the local adjacent communities to benefit from revenues accruing from the wildlife and the wildlife protected area resources.

There is no way encroachment into protected areas can be avoided if local communities around Kamnarok NR are left on extreme poverty. Income generating projects should be emphasized that can meet their economic development at the same time conservation objectives hence reducing reliance on natural resources of the protected area. The County Government of Baringo in partnership with KWS should consider developing poverty alleviation strategies in the study area by putting some effort towards supporting agricultural programmes which are compatible with wildlife conservation so as to enable the local people achieve their livelihood goals. Establishment of conservation projects such as wildlife management areas (WMA), apiary projects and wood log forests owned by village members are some of the projects that can provide avenues as livelihood sources and achieve both conservation objectives as well as economic benefits for the local community.

Kamnarok NR as a wildlife protected area cannot sustainably survive unless the management authorities who plan and manage its resources acknowledges the livelihood needs of the local adjacent communities. Therefore, there is need to involve and integrate the locals in the management as the future success of the reserve depends on the local support. Revenue sharing Scheme is another policy area that can be explored by the concern authorities. The management authorities of Kamanrok NR should expedite action on policies supporting revenue sharing or disbursement to the adjacent communities. This should come in form of development needs as identified by the communities. This scheme should also provide for compensation for farm damages or relocation of farmers along the reserve boundary.

The County Government of Baringo jointly or in partnership with Kenya Wildlife Service (KWS) and other conservation and tourism stakeholders should endeavour to develop and promote more sustainable livelihood alternatives for the Kamnarok NR adjacent community such as promotion of wildlife tourism related businesses. Wildlife such as elephants and crocodiles have the potential of generating economic value through wildlife viewing tourism. Development and growth of wildlife tourism in the study area will ease pressure on already strained resources through working with the local community, KWS, wildlife conservation stakeholders and tourism stakeholders among others. Furthermore, The Baringo County Government should consider supporting the Kamnarok NR adjacent community in food relief when their food crops are damaged by wildlife and continue to provide subsidized seeds and fertilizers to the vulnerable households in order to sustain their food security as this enhances community livelihoods and also compensate for crop damages and livestock depredation from wildlife. Also provision of water and animal feeds during droughts will also go along way in minimizing HWCs and also improve the County Government social corporate image and responsibility.

6.4.2 Recommendation for Planners

The Baringo county agricultural department and other stakeholders should consider introducing fish pond farming and encourage fish farming among the Kamnarok NR adjacent households to reduce fishing in Kerio river and Lake Kamnarok in order to minimize human crocodile conflicts. Furthermore, provision of incentives among community households for efforts that contribute to the conservation outcomes such as planting of trees (wood loads) as a livelihood diversification strategy against wildlife conflict risks and introduce other livelihood land uses such pastoral ranching which promote adjacent dwellers livelihoods and wildlife conservation are some of the

programmes which should be considered for implementation to reduce HWCs in the study area. Also provision of assistance to the local households in form of livestock off-take during severe drought seasons will cushion and safeguard local community livelihoods.

A study undertaken by King *et al.*, (2018), in Tsavo West National Park has shown that innovative beehive fences protects farms from crop-raiding elephants and execute livelihood projects for the locals, therefore farmers in this area need to be supported in such innovative projects to reduce human wildlife conflicts. Finally, Kamnarok NR adjacent households should be allowed and be given an opportunity to participate in various income generating activities in both agricultural and off-farm activities adjacent to the WPA in order to improve their standards of living which has been sought after by these vulnerable and marginalized rural households.

6.5 Suggestion for Further Research

There may be other factors that were not covered by this study due to limited scope, yet have potentials to influence conservation of wildlife and minimize HWCs and address adjacent community livelihood needs. It is therefore important that such factors are explored to ensure that any recommendation for implementation should address livelihoods and HWC issues in a holistic manner. Therefore, the following are suggestions for some of the areas where further research may be done. Firstly, understandings of how social costs of crop and livestock guarding against wildlife threats and the labour costs involved was cursory. Therefore, assessment on the scale and extent of these social transaction costs incurred need to be studied. Secondly, Limited studies are available on the improvement of livestock herding practices in wildlife range lands. Free ranging livestock are vulnerable to predation which was partly responsible for the human

wildlife conflict in the study area. Assessment of good herding practices as anti predation measure is hereby recommended.

Rural non-farm economy may become crowded out in the future due to desires for livelihood diversification by many players. Linkages between rural villages and larger market places may be lacking. A potential area of focus for future research could be how access to larger market affects livelihood diversification among the poor and wealthy households. In the study area, it was also observed that cattle rustling (*livestock theft*) was rampant. Though not many households highlighted it as factor influencing livelihood diversification nor affecting wildlife conservation, further studies need to be done on this areas to establish if there is any effect of it on wildlife conservation and community livelihoods and lastly, similar studies be done in other wildlife protected areas so as to enable generalization of the findings to wider scope.

6.6 Contribution of the study

This study showed that despite Kamnarok NR enormous resources and associated benefits, local support for conservation is uncertain because of many factors including prevalence of poverty and subsistence nature of livelihoods by most households which are particularly vulnerable to human wildlife conflicts. These conflicts are meted on households who are least able to economically bear the cost of damages and losses. The study also showed that there were a number of reasons for the general upward trends in wildlife populations especially those of elephants. This was attributed to their immigration from Nasalot and Lake Turkana National Reserves and the increased surveillance and monitoring with improved conservation efforts by the Kenya Wildlife Service and the wildlife department of Baringo county government.

Furthermore, the impacts of HWCs on household welfare and livelihoods were severe and to the extreme situations where some households were most exposed. There were real costs of HWCs boned by the households' for instance inability of households to pay children school fees, medical health related expenses and social hindrances. It was apparent that the economic losses outweigh socio-economic benefits associated with the wildlife conservation in Kamnarok National Reserve.

The findings further showed that Kamnarok NR adjacent households diversify livelihoods as a risk minimization strategy from the effects of wildlife related conflicts and agro-climatic vulnerabilities. The findings lend support to the argument that the main motivation for diversification was likely to be wealth accumulation, but the maintainance of diversified livelihood resource base by households was a prerequisite adaptation mechanism to human wildlife conflict problems as diversified livelihood system allowed vulnerable households to draw on various sources for food, survival and income. Livelihood diversification was observed to be a strategy engaged for meeting various household needs. The strategy of engagement in multiple livelihood activities is congruent to the argument raised by Ellis (2000) that rural households construct diverse activities in order to survive and improve their standard of living.

REFERENCES

- Aadil, H., Ishfaq, N., Mustahson, F., Bilal, A. B. 2015.** Human wildlife Conflict- Causes, Consequences and Mitigation measures with special reference to Kashmir. *Zoology Studies*.
- Abass, A. 2010.** An introduction to protecting human security in Africa, in Abass, A. (Ed.), *Protecting human security in Africa* (166-234) Oxford: Oxford University Press.
- Abila, R. 2005.** Biodiversity and Sustainable Management of a Tropical Wetland lake ecosystem. A case study of Lake Kanyaboli, Kenya. <http://www.oceandoc.net/bitstream/1834/1272/1/RAbila2005-11.pdf> (Accessed on July 9, 2017)
- Adamic, M., Jerina, K. & Jonozovi, M. 2014.** Problems connected with the large carnivore conservation in Slovenia: did we find the right way? *In* P. Chardonnet, F. Lamarque & M. Birkan, eds. *Proceedings of the 6th International Wildlife Ranching Symposium*, Paris, France, 6–9 July 2004. *Game and Wildlife Science*, 21(4): 571– 580.
- Adams, V.M., R.L. Pressey, and R. Naidoo. 2010.** Opportunity costs: Who really pays for conservation? *Biological Conservation* 143: Pp439–448.
- Adebayo, C., O , Akogwu, G. O. and Yisa, E.S. 2012.** Determinants of Income Diversification among Farm Households In Kaduna State: Application of Tobit Regression Model
- Agarwal, C.; Green, G.M.; Grove, J.M.; Evan, T.P.; Schweik, C.M. 2011.** A review and assessment of land use change models: Dynamics of space, time and human choice. *Presented at the Fourth International Conference on Integrating GIS and Environmental Modeling*; Banff, Canada, July 2002.
- Agrawal, A. & Redford, K. 2006.** Poverty, Development and Biodiversity Conservation: Shooting in the Dark? Working Paper No.26, Wildlife Conservation Society, Bronx, NY.
- Akama, J.S., Lant, C.L. & Burnett, G.W. 1995.** Conflicting attitudes toward state wildlife conservation programs in Kenya. *Society and Natural Resources* 8: 133–144.
- Alfa Gambari Imorou, S., Mama, A., Tehou, A. & Sinsin, B. 2014.** The human elephant conflicts in the hunting zone of Djona (Benin) adjacent to the Regional Park of the Waza: the case study of the villages of Alfakoara. *In* P. Chardonnet, F. Lamarque & M. Birkan, eds. *Proceedings of the 6th International Wildlife Ranching Symposium*, Paris, France, 6– 9 July 2004. *Game and Wildlife Science*, 21(4): 553–569.
- Allison, E.H., 2004.** Contribution of the fisheries sector to livelihoods and rural development in Eastern and Southern Africa, In: *Rural Livelihoods and Poverty Reduction Policies* (ed, F. Ellis and H.A. Freeman). London: Routledge.

- Anderson, D., & Grove R. 1997.** *Conservation in Africa: People, policies, and practice.* Cambridge University Press, Cambridge, UK.
- Angelsen, A. and Wunder, S. 2003.** Exploring the Forest-Poverty Link: Key concepts, issues and implications. CIFOR occasional paper no. 40. Bogor: CIFOR.
- Anthony, B.P. 2007.** The dual nature of parks: attitudes of neighbouring communities towards Kruger National Park, South Africa. *Environmental Conservation*, 34:236-245.
- Archabald, K., & Naughton-Treves, L. 2001.** Tourism revenue-sharing around national parks in western Uganda: Early efforts to identify and reward local communities. *Environmental Conservation*, 28, Pp 135–149.
- Arntzen, J., Buzwani, B., Setlhogile, T., Kgathi, D.L. & Motsolapheko, M.K. 2007.** *Community-Based Resource Management, Rural Livelihoods and Environmental Sustainability.* Centre for Applied Research, Gaborone.
- Ashley C and C LaFranci 2007.** Livelihood strategies of rural households in Caprivi: Implications for conservancies and natural resource management. Research Discussion Paper No. 20. Directorate of Environmental Affairs. Ministry of Environment and Tourism.
- Atieno, F. 2014.** Land use land cover change in creater Amboseli Ecosystem. Kajiado District. Kenya between 1998 and 2008. Msc. Thesis university of Nairobi. Kenya.
- Athreya V., Odden M., Linell J. D. C. & Krishnaswamy J. 2016.** A cat among the dogs. Leoard *Panthera Pardus* in human dominated landscapes of India. *Conservation Biology*, 25 (1) Pp 94-139.
- Avci, D., F. Adaman, and B. O " zkaynak. 2010.** Valuation languages in environmental conflicts: How stakeholders oppose or support gold mining at Mount Ida, Turkey. *Ecological Economics* 70: Pp 228–238.
- AWF (African Wildlife Foundation). 2005.** Community owned and run: case study of Santawani Lodge, Botswana. *AWF Working Papers.*
- Baldus, R.D. 2015.** Community in Tanzania to harvest problem crocodiles. *African Indaba e-Newsletter*, 3(3): 20.
- Banerjee, K., Jhala, Y. V, Chaukhan, K. S and Dave C. V. 2013.** Living with Lions: The economics of co-existence in the Gir Forests, India. *Plos ONE* 8 (1): 1-11.
- Baral, N. and Heinen J. T. 2007.** Resource use conservation attitude, management intervention and park people relationship in the western Terai landscapes of Nepal. *Economic Conservation* 34: 64-72.

- Baringo County. 2014.** County Integrated Development Plan (CIDP) for 2013 – 2017.
- Barnes, R.F.W. 1996.** The conflict between humans and elephants in the central African forests. *Mammal Review*, 26(2): 67–80.
- Barnes, R.F.W., Boafo, Y., Nandjui, A., Umaru-Farouk, D., Hema, E.M., Danquah, E. & Manford, M. 2013.** *An overview of crop-raiding by elephants around the Kakum Conservation Area.* Elephant Biology and Management Project, Africa Program. Washington, DC, USA, Conservation International.
- Barrett, C.B., Reardon, T. and P. Webb, 2012,** ‘Nonfarm Income Diversification and Household Livelihood Strategies in Rural Africa: Concepts, Dynamics and Policy Implications’, *Food policy*, Vol.26, No.5.
- Barrett, C. B., Reardon, T., & Webb, P. 2001.** Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy*, 26(4), 315–331.
- Barua, M., Bhagwat, S. A., & Jadhav, S. 2013.** The hidden dimensions of human–wildlife conflict: Health impacts, opportunity and transaction costs. *Biological Conservation*, 157, 309–316.
- Bauer, H. 2003b.** Lion conservation in West and Central Africa – integrating social and Natural science for wildlife conflict resolution around Waza National Park, Cameroon. University of Leiden, Holland. (Ph.D. Thesis).
- Bengis, R.G., Kock, R.A. and Fischer, J. 2012.** Infectious animal diseases: the wildlife/livestock interface. *Revue Scientifique et Technique (International Office of Epizootics)*, 21 (1): Pp 53–65.
- Bennett, A.F. 1999.** *Linkages in the Landscape: The Role of Corridors and Connectivity in Wildlife Conservation.* IUCN, Gland, Switzerland and Cambridge, UK.
- Ben-Shahar, R. 2009.** Elephants and their woodland habitats in northern Botswana. *Pachyderm*, 27: Pp 101–104.
- Berger, L.R. 2009.** Predatory bird damage to the Taung type-skull of Australopithecus Africanus Dart 1925. *American Journal of Physical Anthropology*, 131: 166–168.
- Berger L. R, McGraw W. S. 2007.** Further evidence for eagle predation of, and feeding damage on, the Taung child. *South African Journal of Science* 103: Pp 496-498.
- Bezu, S., Barrett, C., & Holden, S. 2010.** Does the non farm economy offer pathways for upward mobility? Evidence from a panel data study in Ethiopia. MPRA Paper No. 35754. <http://mpra.ub.uni-muenchen.de/35754/>

- Blaikie, P.M. and Soussan, J.G. 2000.** *Understanding Policy Processes*, Internal Project Document.
- Boggs, L.P. 2000.** Community Power, Participation, Conflict and Development Choice: Community Wildlife Conservation in the Okavango Region of Northern Botswana. Discussion Paper No. 17, IIED, Maun, Botswana.
- Bolaane, M. 2014.** The Impact of Game Reserve Policy on the River BaSarwa/Bushmen of Botswana. *Social Policy and Administration*, 38(4):399 – 417.
- Booth, D., Hanmer, L., & Lovell, E. 2017.** Poverty and transport: a report prepared for the World Bank in collaboration with DFID. Final report and Poverty and Transport toolkit.
- Butler, J.R.A. 2000.** The economic costs of wildlife predation on livestock in Gokwe communal land, Zimbabwe. *African Journal of Ecology* 38 (1): Pp 23–30.
- Breitenmoser, U., Angst, C., Landry, J-M., Breitenmoser- Wursten, C., Linnell, J.D.C. & Weber, J-M. 2005.** Nonlethal techniques for reducing depredation. In People and wildlife: conflict or coexistence: Pp 49–61.
- Briggs, S. R., and Check, J. M. 1987.** The Role of factor Analysis in the Development and Analysis of Personality Scales, *Journal of Personality*, 54, Pp106 – 148.
- Butt, B., Shortridge, A. & Winklerprins, A. 2009.** Pastoral herd management, drought coping strategies, and cattle mobility in Southern Kenya. *Ann. Assoc. Amer. Geogr.* 99, 309–334.
- Caitlin E. O'Connell-Rodwell, C. E., T. Rodwell, M. Rice, and Lynette A. Hart. 2000.** Living with the modern conservation paradigm: Can agricultural communities co-exist with elephants? A Five-year case study in East Caprivi, Namibia. *Biological Conservation* 93. 381-391. Elsevier Science Ltd.
- Campbell, D., Lusch, D., Smucker, T. and Wangui, E. 2003.** Root causes of land use changes in the Loitokitok Area, Kajiado District, Kenya. Land use Change Impacts and Dynamics (LUCID) Project Working Paper 19. International Livestock Research Institute, Nairobi, Kenya, 37pp.
- Campbell D.J., H. Gichohi, R. Reid, Mwangi, A. Chege, L. & Sawin, T. 2010.** “Interactions between people and wildlife in Southeast Kajiado District, Kenya”, *The Land Use Change, Impacts and Dynamics (LUCID) Project*, Working Paper Series Number 18, International Livestock Research Institute (ILRI), Nairobi, Kenya, Website: <http://www.Lucid east africa.org>.
- Campbell, D. J. 1993.** Land as ours, Land as mine: economic, Political and Environmental Marginalization in Kajiado District. In: T. Spear and R Weller eds. *Being Maasai*: London. James Currey. p 258 -257.

Carmines, E. G., & Zeller, R. A. 1979. *Reliability and validity assessment*. Thousand Oaks, CA: Sage.

Central Statistic Office, CSO. 2005. *Wildlife Statistics 2004*. Ministry of Finance and Development Planning, Gaborone.

Chartier L., Zimmermann A. and Ladle R. J. 2014. Habitat loss and human – elephant conflict in Assam, India: Does critical threshold exist? *Oryx*, 45(04): 528-533.

Chambers, R. & Conway, R. 2012. Sustainable Rural Livelihoods: Practical Concepts for 21st Century.” IDS Discussion Paper No. 296.

Choudhury, A. 2004. Human–elephant conflicts in Northeast India. *Human Dimensions of Wildlife*, 9, Pp261–270.

Cock, J. & Fig, D. 2000. From colonial to community based conservation: environmental justice and the national parks of South Africa. *Society in Transition*, 31:22-35.

Cordes, K. Y., Johnson, L., & Szoke-Burke, S. 2016. Land Deal Dilemmas: Grievances, Human Rights and Investor Protection. New York: Columbia Center on Sustainable Investment.

Connell-Rodwell, C.E., Rodwell, T., Rice, M., Hart, L.A. 2000. Living with the Modern Conservation Paradigm: Can agricultural Communities Co-exist with Elephants? A five-year case study in East Caprivi, Namibia. In: *Biological Conservation*, Vol. 93, pp. 381-391.

Conway, T., Moser, C., Norton, A., & Farrington, J. 2002. *Rights and livelihoods approaches: Exploring policy dimensions*. London, England: Overseas Development Institute.

Cooper, P. J. M., Dimes, J., Rao, K. P. C., Shapiro, B., Shiferaw, B., & Twomlow, S. (2008). Coping better with current climatic variability in the rain-fed farming systems of sub-Saharan Africa: an essential first step in adapting to future climate change? *Agriculture, Ecosystems & Environment*, 126(1-2), 24–35.

Corbett, J. 2014. "Poverty and sickness: the high cost of ill health." *IDS Bulletin* 20(2): 58-62.

Gordon, A. and C. Craig. 2001. *Rural Non-Farm Activities and Poverty Alleviation in Sub-Saharan Africa*. Policy Series 14: Natural Resources Institute, University of Greenwich.

Corvalan, C., Hales, S., McMichael, A. 2005. Ecosystems and human well-being: Health Synthesis: A report of the Millennium Ecosystem Assessment. World Health Organization, Geneva, Switzerland.

- Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., Danigelis, N.L., Dickinson, J., Elliot, C., Farley, J., Gayer, D.E., Glenn, L.M., Hudspeth, T., Mahoney, D., McCahill, L., McIntosh, B., Reed, B., Rizvi, S.A.T., Rizzo, D.M., Simpatico, T., & Snapp, R. 2007.** Quality of life: an approach integrating opportunities, human needs, and subjective wellbeing. *Ecological Economics*, 61(2-3), 267–276.
- Cotula L., and Toulmin, C. with van Vlaenderen, H., Tall, S.M., Gaye, G., Saunders, J., Hiadeke, C. and Anarfi, J.K. 2004.** International Institute for Environment and Development (IIED), UK. Till to tiller: Linkages between international remittances and access to land in West Africa. FAO LSP WP 14, Access to Natural Resources Sub-Programme.
- Craigie I.D, Baillie J.M, Balmford A, Carbone C, Collen B, Green R. E. 2010.** Large Mammal Population Declines in Africa's Protected Areas. *Biological Conservation* 143: Pp 2221 - 2228.
- Crooks, K.R. and Sanjayan, M. Eds. 2006.** *Connectivity Conservation*. The Cambridge University Press, UK.
- Dann, Graham M. S. 2017.** Anomie, Ego-Enhancement and Tourism, *Annals of Tourism Research* 4 (4): 184–94.
- Davies, T.E., Wilson, S., Hazarika, N., Chakrabarty, J., Das, D., Hodgson, D.J., and A. Zimmerman. 2011.** Effectiveness of intervention methods against crop-raiding elephants. *Conservation Letters* 4(5): 346-354.
- Davies, J., & Bennett, R. 2007.** Livelihood adaptation to risk: Constraints and opportunities for pastoral development in Ethiopia's Afar region. *The Journal of Development Studies*, 43(3), 490-511.
- Davis B., Winters P., Carlletto G., Covarrubias K., Quinones E., Zezza A., Stamoulis K., Bonomi G. and guseppa S. D. 2007.** Rural income generating activities. A cross country comparison. ESA working paper No. 07 – 16. www.fao.org/es/esa.
- Davis, J. R., & Bezemer, D. 2004.** *The development of the rural non-farm economy in developing Countries and transition economies: Key emerging and conceptual issues*. Chatham, UK: Natural Resources Institute. Retrieved from. <http://projects.nri.org/rnfe/pub/papers/keyissues.pdf>
- Davison J., Roper T. J, Wilson C. J., 2011.** Assessing Spatiotemporal Associations in the Occurrence of Badger-Human Conflict in England. *European Journal of Wildlife Research* 57: Pp 67-76.

- Degefa, T. 2005.** *Rural livelihoods, poverty and food insecurity in Ethiopia: A case study at Erenssa and Garbi communities in Oromiya Zone, Amhara National Regional State* (PhD Thesis series 2005:106), Norwegian University of Science and Technology, NTNU, Trondheim.
- De Georges, P.A. & Reilly, B.K. Process. 2008.** *A critical evaluation of conservation and development in Sub-Saharan Africa: last chance Africa.* Lewiston, New York: Edwin Mellen Press. VII books, 3, 572p.
- De Janvry, A., Fafchamps, M., Sadoulet, E., 1991.** Peasant household behaviour with missing markets: some paradoxes explained. *Economic Journal* 101 (409), 1400–1417.
- De Sherbinin, A., VanWey, L. K., McSweeney, K., Aggarwal, R., Barbieri, A., Henry, S. Walker, R. 2008.** Rural household demographics, livelihoods and the environment. *Global Environmental Change*, 18(1), 38–53.
- De Vaus D 2002.** *Surveys in Social Research.* Routledge, Taylor and Francis Group, London and Newyork.
- Deshingkar, P. 2004.** *Livelihood diversification in developing countries.* London: Organization for Economic Cooperation and Development.
- Dickman, A. J. 2010.** Complexities of conflict: the importance of considering social factors for effectively resolving human–wildlife conflict. *Animal Conservation*. Pp 3-9.
- Dickman, A. J., Hazzah, L., Carbone, C., & Durant, S. M. 2014.** Carnivores, culture and ‘contagious conflict’: Multiple factors influence perceived problems with carnivores in Tanzania’s Ruaha landscape. *Biological Conservation*, 178, Pp19-27.
- Division Development Office. 2016.** Division Annual Monitoring and Evaluation Report. Barwesa Division.
- Dube, O., and Vargas, J. 2013.** Commodity price shocks and civil conflict: Evidence from Colombia. *Rev. Econ. Studies* 80, 1384-1421.
- EarthTrends. 2003.** Biodiversity and Protected Areas - Tanzania. World Resources Institute.
- Ebua, V.B., Tsi E. A. and Fonkwo, S.N. 2011.** Attitudes and perceptions as threats to wildlife conservation in the Bakossi area, South West Cameroon. *Biodiversity and Conservation* 3 (12): Pp 631- 636.
- Ekaya, W. N. 2001.** An overview of structural and functional elements of pastoralism in Eastern Africa. In media Handbook for reporting food security and drought in pastoral areas. Indigenous information Network. Nairobi. Kenya.

- Ellis, F. 2009.** ‘The Determinants of Rural Livelihood Diversification in Developing Countries’, *Journal of Agricultural Economics*, 51(2): 289–302.
- Ellis, F. 2000.** Rural livelihoods and diversity in developing countries. Oxford: Oxford University Press, 2000.
- Ellis, F., 1998.** Survey Article: Household Strategies and Rural Livelihood Diversification. *The Journal of Development Studies*, Vol.35, No.1, pp.1-38.
- Ellis, F., & Freeman, H. A. (Eds.). 2005.** *Rural Livelihoods and poverty reduction policies*. London & New York: Routledge.
- Ellis, F., & Freeman, H. A. 2004.** Rural livelihoods and poverty reduction strategies in four African countries. *Journal of Development Studies*, 40, 1–30. <https://doi.org/10.1080/>
- Espinosa, S. and Jacobson, S.K. 2012.** Human-Wildlife Conflict and Environmental Education: Evaluating a Community Program to Protect the Andean Bear in Ecuador. *Journal of environmental education*, 43(1): 55-66.
- Fiallo, E.A. & Jacobson, S.K. 1995.** Local communities and protected areas: attitudes of rural residents towards conservation and Machalilla National Park, Ecuador. *Environmental Conservation* 22(3): 241–249.
- Fiona, L. Katia, L. C., Jose, C., Helena, P., Christoph, N., Melitta, M., Lauren, C., Neil, B., Bastian, B., Hockings, M. 2010.** *Management Effectiveness Evaluation in protected Areas a Global Study. Second Edition 2010.* The University of Queensland, Brisbane AUSTRALIA.
- Fodness, Dale. 2014.** Measuring Tourist Motivation. *Annals of Tourism Research* 21 (3): Pp555– 581.
- Foley, C. A., & Faust, L. J. 2010.** Rapid population growth in an elephant *Loxodonta africana* population recovering from poaching in Tarangire National Park, Tanzania. *Oryx*, 44(2), 205.
- Food and Agriculture Organization. 2015.** *Strategies to mitigate human-wildlife conflict in Mozambique*, by J. Anderson & F. Pariela. Report for the National Directorate of Forests and Wildlife, Mozambique.
- Food and Agriculture Organization (FAO). 2009.** Human- Wildlife conflicts in Africa; Causes, Consequences and management practices in Africa. ISBN 0258-6150. *Food and Agriculture Organization, Rome Italy.*

- Food Agricultural Organization, 2000.** Conflict and Natural Resource Management. Food and Agriculture Organization of the United Nations Available at: <http://www.fao.org/forestry/21572-0d9d4b43a56ac49880557f4ebaa3534e3.pdf> Accessed on: 22-10-2017.
- Fergusson, R.A. 2012.** Living with a wild predator: managing human/crocodile conflict in Africa. A proposal for an IUCN/SSC Crocodile Specialist Group initiative to provide technical support for the investigation and alleviation of human/crocodile conflict in several African countries. *Crocodile Specialist Group Newsletter*, (21)4: Pp 17–21.
- Fraenkel, J. K and Wallen, N. E. 2000.** How to Design and Evaluate Research in education (4th ed). Boston: McGraw-Hill.
- Nelson, F. 2005.** Sustainable Development and Wildlife Conservation in Tanzania. Maasailand: Kluwer Academic Publishers, Netherlands.
- Freeman, E. 1984.** Stakeholders and stakeholders. A new perspective of corporate governance. In Huizinga ed. Corporate governance. UCLA Extension press.
- Frost, P., Campbell, B., Luckert, M., Mutamba, M., Mandondo, A. & Kozanayi, W. 2007.** In Search of Improved Rural Livelihoods in Semi-Arid Regions through Local Management of Natural Resources: Lessons from Case Studies in Zimbabwe. *World Development*, 35, 1961-1974.
- Fourli, M. 2015.** *Compensation for damage caused by bears and wolves in the European Union. Experience from LIFE-Nature projects.* Directorate General XI “Environment, Nuclear Safety and Civil Protection” of the European Commission. Luxembourg, Office for Official Publications of the European Communities.
- Frump, R. 2016.** *The man-eaters of Eden: life and death in Kruger National Park.* Guilford, Connecticut, USA, Lyons Press.
- Gall, M. D., Borg, W. R. ., & Gall, P. G. 2003.** *Educational Research: An Introduction.* New York: Longman.
- Gallup, J.L. and Sachs, J.D. 1998.** *The economic burden of malaria.* Working Paper; Center for International Development at Harvard University.
- Getzner, M., Jungmeier, M. and Lange, S. 2012.** People, Parks and Money, Stakeholder Involvement and Regional Development: A Manual for Protected Areas, Verlag Johannes Heyn, Klagenfurt, 2012, ISBN 978-3-7084-0413-4.
- Gibson, C.K. & Marks, S.A. 2005.** Transforming rural hunters into conservationists: an assessment of community-based wildlife management program in Africa. *World Development* 23(6): 941–957.

- Gill, P. Stewart, E. Treasure, E and Chadwick, B. 2008.** Methods of data collection in qualitative research: interviews and focus groups. *British Dental Journal* 204, 291 – 295.
- Gillingham, S. & Lee, P.C. 2003.** People and protected areas: A study of local perceptions of Wildlife, crop-damage, conflict in an area bordering the Selous Game Reserve Tanzania. *Oryx*, 37:310-325.
- Goldman, M. J., Roque De Pinho, J., & Perry, J. 2010.** Maintaining complex relations with large cats: Maasai and lions in Kenya and Tanzania. *Human Dimensions of Wildlife*, 15(5), 332–346.
- Gomes, N. 2011.** Water and Land Management in the Riverside Regions of Southern Somalia. Nairobi, SWALIM.
- Goodhand, J. 2001.** Violent conflict, poverty and chronic poverty. Chronic Poverty Research Centre (CPRC) Working Paper No. 6. Retrieved from <http://www.chronicpoverty.org/publications/details/violent-conflict-poverty-and-chronicpoverty/ss>.
- Government of Kenya (GoK) 2016.** Kenya forest Act, 2016. Nairobi: Government Press.
- Government of Kenya (GoK) 2013.** Wildlife Conservation and Management Act, Cap 376. Nairobi: Government Press.
- Government of Kenya (GoK) 2008.** *Baringo District Development Plan 2008–2012*, The Government Printer, Nairobi, Kenya, 2008.
- Goodwin, H. and Roe, D. 2011.** ‘Tourism, Livelihoods and Protected Areas: Opportunities for Fair-trade Tourism in and Around National Parks’. *International Journal of Tourism Research* 3: 337-391.
- Graham, K., Beckerman, A. P. & Thirgood, S. 2015.** Human Predator- Prey Conflicts: Ecological correlates, prey losses and patterns of management. *Biological Conservation*, 122, 159–171.
- Creswell J. 2009.** *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. Sage Publications, USA.
- Gupta, R. 2015.** Human wildlife conflicts in Khata Corridor under Terai Arc Landscape (TAL), Nepal. B.Sc. Thesis, School of Environmental Science and Management, Pokhara Univeristy, Kathmandu.
- Gupta, A. C. 2013.** Elephants, safety nets and agrarian culture: understanding human-wildlife conflict and rural livelihoods around Chobe National Park, Botswana. *Journal of Political Ecology*, 20, Pp238-254.

- Gusset, M., M. J. Swarner, L. Mponwane, K. Keletile, and J. W. McNutt. 2009.** Human–Wildlife conflict in northern Botswana: livestock predation by endangered African wild dog *Lycaon pictus* and other carnivores. *Oryx* 43:67–72.
- Gurr, T. (Ed.). 2005.** *Addressing the causes of terrorism: Economic factors. International summit on Democracy, Terrorism and Security, Conference Paper, Volume 1*, (8-11). Retrieved at <http://www.safe-democracy.org/docs/CdM-Series-on-Terrorism-Vol-1.pdf> 16/10/2018.
- Haggblade, S., Hazell, P., & Reardon, T. (2007).** In: Haggblade, S., Hazell, P. and Reardon, T. (eds), *Transforming the Rural Nonfarm Economy*. Johns Hopkins University Press.
- Hamissou, H.M.G. & Di Silvestre, I. 2008.** Conflicts between large carnivores and domestic livestock in the peripheral zone of the W transboundary Park in Niger. In B. Croes, R. Buij, H.H. de Iongh & H. Bauer, eds. *Conservation of large carnivores in West and Central Africa*. Proceedings of an international seminar, Maroua, Cameroon, 15–16 November 2006. Leiden, the Netherlands, Institute of Environmental Sciences.
- Hassan, S.N. 2007.** Impacts of space use by humans on the diversity of large mammals in the Kwakuchinja-mbugwe wildlife corridor, Northern Tanzania. *Tanzania Journal of Forest and Nature Conservation* 76: Pp 134-143.
- Hardin, G. 1968.** The Tragedy of the Commons. *Science*, 162:1243-1248.
- Heifer Project International 2012:** livestock project report. Nairobi. Kenya.
- Heinen, J.T. 2006.** Human behavior, incentives, and protected area management. *Conservation Biology* 10: 681–684.
- Herlocker, D. 1999.** Rangeland resources in Eastern Africa their ecology and development. GTZ. Nairobi. Kenya.
- Hettige, H. 2006.** When do rural roads benefit the poor and how? an in-depth analysis based on case studies.
- Hill, M. C. 2000.** Conflict of interest between people and Baboons. *International Journal of Primatology*, Vol. 21, No. 2.
- Hill, C., F. Osborn, et al. 2002.** Human-Wildlife Conflict: Identifying the problem and possible solutions. Albertine Rift Technical Report Series Vol. 1.
- Hillman-Smith, A.K.K., de Merode, E., Nicholas, A., Buls, B. & Ndey, A. 2005.** Factors affecting elephant distribution at Garamba National Park and surrounding reserves, Zaire, with a focus on human-elephant conflict. *Pachyderm*, 19: 39- 48.

- Hoare, R.E. 2016.** “Vertically integrated” human-elephant conflict management system in Tanzania: background and next steps. Human-Elephant Conflict Working Group, IUCN Species Survival Commission (IUCN/SSC).
- Hoare, R.E. 2001.** A decision support system for managing human-elephant conflict situations in Africa. Pages 1-110. IUCN African Elephant Specialist Group Report.
- Holmern, T., Mkama, S., Muya, J., and RØskaft, E. 2006.** Intraspecific prey choice of bushmeat hunters outside the Serengeti National Park, Tanzania: a preliminary analysis. *African Zoology* 41: Pp 81-87.
- Holms, M. 2003.** The influence of protected area outreach on conservation attitudes and resource use patterns: a case study from western Tanzania, *Oryx*, 37, 305-315.
- Homewood, K.; Patti, K.; Pippa, T., editors. 2009a.** Staying Maasai: Livelihoods, Conservation and Development in East African Rangelands. Springer; New York.
- Homewood, K., Kristjanson, P., & Trench, P. C. 2009b.** Changing land use, livelihoods and wildlife conservation in Maasailand. In Homewood, K., Kristjanson, P., & Trench, P. C. (Eds). (2009). Staying Maasai? Livelihoods, Conservation and Development in East African Rangelands, Springer Science + Business Media, New York. https://doi.org/10.1007/978-0-387-87492-0_1.
- Hussein, K. and Nelson, J. 1998.** Sustainable Livelihoods and Livelihood Diversification. IDS Working Paper, 69. Available at: www.padniger.net/Documents%20and%20Reports/.../sustlivelihood.pdf
- Inamdar, A., H. de Jode, k. Lindsay, and Cobb S. 1999.** Capitalizing Nature protected area management. *Science*. 283. Pp 1856 – 1857.
- Imam, E., Yahya, H. and Malik, I. 2002.** A Successful Mass Translocation of Commensal Rhesus Monkeys *Macaca mulatta* in Vrindaban, India. *Oryx*, 36(1):87-93.
- Inskip C, Fahad Z, Tully R. 2014.** Understanding Carnivore Killing Behaviour: Exploring the Motivations for Tiger Killing in the Sundarbans, Bangladesh. *Biological Conservation* 180: Pp42-50.
- Institute of Policy Analysis & Research (IPAR). 2005.** Policy Dimensions in Human-wildlife Conflicts in Kenya: Evidence from Laikipia and Nyandarua Districts *Policy Brief Volume 11*, Issue 3, 2005.
- International Union for the Conservation of Nature (IUCN). 2005.** *Benefits beyond boundaries: Proceedings of the Vth IUCN World Parks Congress*. Durban, South Africa, 1–17 September 2003. Gland, Switzerland & Cambridge, UK.

- IPCC, 2001.** Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.
- Iso-Ahola, Seppo E. 2012.** Toward a Social Psychological Theory of Tourism Motivation: A Rejoinder. *Annals of Tourism Research* 9 (2): Pp256–62.
- IUCN 2005.** *Benefits beyond Boundaries*. Proceedings of the 5th IUCN World Parks Congress. IUCN. Gland, Switzerland and Cambridge. UK.
- IUCN 1991.** Caring for the Earth: A Strategy for Sustainable Living. Gland, Switzerland, IUCN – The World Conservation Union, UNEP - United Nations Environment Programme, and WWF - World Wide Fund for Nature.
- Jackson, C., Ochieng, J., Fanshawe, J. 2018.** A Checklist of the Birds of Arabuko Sokoke Kenya. A Rocha Kenya. Checklist dataset <https://doi.org/>.
- Jackson R. L., Hillard, D., & Wangchuk, R. 2013.** Encouraging local participation in efforts to reduce livestock depredation by snow leopard and wolf in Ladakh, India. *Carnivore Damage Prevention News*, 4, 2-6.
- Jaetzold R, Schmidt H. 2005.** Farm management Handbook of Kenya Vol II – Natural conditions and farm management information-Vol. II, East Kenya (Eastern and Coast). Ministry of Agriculture, Kenya, Nairobi.
- John K. M., and Wobst P. 2006.** Determinants of rural labour market participation in Tanzania. Centre for Development Research (ZEF) university of Bonn, Germany.
- Johnson, T. P. and Moore, R. W. 1993.** Gender interactions between interviewer and survey respondents: issues of pornography and community standards: in *Sex Roles*: Vol. 28, numbers 5-6/ March 1993.
- Jones, B. 2001.** The Evolution of a Community-based Approach to Wildlife Management at Kunene, Namibia. In: Hulme, D. and Murphree M. W. (eds.) *African Wildlife and African Livelihoods: the promise and performance of community conservation*. James Currey. Oxford.
- Kabra A. 2015.** Conservation-induced displacement: A comparative study of two Indian protected areas. *Conservation and Society*. Vol. 6: 249-267.
- Kagiri, J.W. 2004.** A resource planning strategy for resolving Human-wildlife conflicts: A case study for Laikipia District in Kenya. Unpublished MBA Thesis. University of Leicester, UK.

- Kagiri J. 2002.** Human - Wildlife Conflicts in Kenya: A Conflict Resolution Concept. In: Hill, C., Osborn, F. and Plumpre, A.J. (2002) *Human-Wildlife Conflict: Identifying the problem and possible solutions*. Albertine Rift Technical Report Series Vol. 1. Wildlife Conservation Society.
- Kameri - Mbote, P. 2002.** Property Rights and Biodiversity Management in Kenya: The case of Land Tenure and Wildlife. – African Centre for Technology Studies (ACTS), Nairobi.
- Kamfor 2007.** JICA country environmental profile, JICA, Nairobi.
- Kanagavel A, Parvathy S, Nameer P. O. 2016.** Conservation Implications of Wildlife Utilization by indigenous communities in the Southern Western Ghats of India. *Journal of Asia-Pacific Biodiversity* 9: Pp 271-279.
- Karan K. K. 2003.** Forest use and Human wildlife conflicts in Bhadra Wildlife Sanctuary.Karnataka. India. *Tropical resource bulletin* 22: Pp 48-58.
- Karant, K.K. 2007.** Making resettlement work: The case of India’s Bhadra Wildlife Sanctuary. *Biological Conservation* 139: Pp 315– 324.
- Karant, K.U, Sunguist, M. E, and Chinnoppa K. M 2013.** Patterns of Human Willdife conflicts and Compensation. Insights from Western Ghats Protected Areas. *Biological Conservation*. 166 (17).
- Karidozo, R. 2007.** *Human-Wildlife Co-Existence in a Landscape Mosaic-A landscape Level Approach to Mitigate Human-Elephant Conflicts in Livingstone, Zambia.* www.ruffordsmallgrants.org
- Keane, A., Ramarolahy, A. A., Jones, J.P.G., Milner-Gulland, E.J. 2010.** “Evidence for the Effects of Environmental Engagement and Education on Knowledge of Wildlife Laws in Madagascar.” *Conservation Letters* 4: Pp 55-63.
- Keller, D.R. & Golley, F.B. 2000.** *The philosophy of ecology: from science to synthesis*. London: University of Georgia Press.
- Kenya National Bureau of Statistics. 2010.** *Kenya Facts and Figures 2010*. Nairobi: Kenya National Bureau of Statistics, Ministry of Planning and National Development.
- Kgathi, D.L., Bendson, H., Blaikie, P., Mbaiwa, J.E., Ngwenya, B.N. & Wilk, J. 2014.** *Rural Livelihoods, Indigenous Knowledge Systems, and Political Economy of Access to Natural Resources in the Okavango Delta, Botswana*. Harry Oppenheimer Okavango Research Centre, University of Botswana.
- Kerlinger F. N. 1992.** *Foundations of Behavioural research*, 3rd edition. New York; Holt, Rinehart and Winston.

- Kimega, G.M. 2003.** Unresolved human/wildlife conflict in Kenya – the source of misery and poverty. *Ecofiles*, 16 September. Lusaka, Zambia. Available at: <http://www.ogiek.org/indepth/human-wildlife-conflict>
- Kimhi, A., & Lee, M. J. 1996.** Off-farm work decisions of farm couples: Estimating structural simultaneous equations with ordered categorical dependent variables. *American Journal of Agricultural Economics*, 78, 687–698.
- Kimwele, C. and F. Waweru. 2006.** *Wildlife Conservation Issues in Kenya*. Action Aid International Kenya.
- King, L. Schelhas, J., and Pfeffer, M. J. 2018.** When global conservation meets local livelihoods: People and parks in Central America. *Revista Geografica de America Central* 45:77-101, 45, 77–101.
- Kinsey, B., 2014.** Survival or growth? Temporal dimensions of rural livelihoods in risky environments. *Journal of Southern African Studies* 28 (3), 615–629.
- Kipanoi, S., M. 2013.** Diversification of livelihood strategies among Isiria Maasai of Lolgorien Ward, Narok County, Kenya. Masters thesis, Kenyatta University.
- Kiringe, J. W. and Okello, M. M. 2007.** Threats and their Relative severity to wildlife protected areas of Kenya. *Journal of Applied Ecology and Environmental Research* Vol.5:2 Pp 49-62.
- Kohler, T. 2007.** Land use in transition. Aspects and problems of small-scale farming in a new environment: the example of Laikipia District, Kenya. *Geographica Bernensia*. African Studies Series A.
- Koskey A. J. 2013.** Effects of Variation in Nutrient Content of Wild forage and raided crops in foraging behavior of African Elephant in Rimoi Game Reserve. PhD Thesis, University of Eldoret.
- Kothari J.A. 2004.** *Research Methodology, Methods and Techniques*. 2nd edition. New Agerinten. New Delhi.
- Kpera, G.N., Mensah, G.A. & Sinsin, B. 2007.** Endogenous conservation and the cultural role of Crocodiles in Benin. In Proceedings of the first West African Congress on Crocodile Conservation and Breeding, La Tapoa, the Niger, November 2007.
- Kraay, A., & McKenzie, D. 2014.** Do poverty traps exist? Assessing the evidence. *The Journal of Economic Perspectives*, 28(3), 127–148.
- Kretser, H.E. 2008.** *The exurban frontier: Anticipating human-wildlife interactions where we Live, work and play. PhD thesis Dissertation. Cornell University, Ithaca, New York, USA.*

- Kretser, H.E., Curtis, P.D., Pental, R.J., and Knuth, B.A. 2009.** Factors affecting perceptions of Human-Wildlife interactions in residential areas of Northern New York and implications for conservation. *Human Dimensions of Wildlife* **14**: Pp 102-118.
- KWS. 2018a.** *Elephants moved from Laikipia and Nyeri to Tsavo*. Retrieved December 18, 2018, from:
<http://www.kws.go.ke/sites/default/files/Elephants%20translocation%20from%20Solio.pdf>
- KWS. 2018b.** *Elephant Collaring in Tsavo National Park and Taita Taveta RANCHES*
 Retrieved December 18, 2018, from
<http://www.kws.go.ke/sites/default/files/Tsavo%20collaring%202018%20%2013.2.%202018.pdf>
- KWS. 2013.** Enterprise Data Base.
- KWS. 2012.** Problem Animal Management Unit (PAMU).
http://www.kws.org/parks/community_wildlife_program/PAMU.html.
- KWS. 1998.** Conflict resolution Plan for Samburu, Isialo, Meru, Nyambene, Kora and Mwingi. Nairobi. Kenya.
- KWS. 1996.** **Wildlife-human conflicts, sources, solutions and issues.** Available at:
www.safariweb.com/kwild/wildlife
- KWS. 1994.** Wildlife-human Conflicts in Kenya. – Report of the Five-Person Review Group - Kenya Wildlife Service Report, Nairobi. Accessed 20th August 2018.
- KWS. 1990a.** *Wildlife Human Conflicts in Kenya. Report of the five – Person Review group.* Kenya Wildlife Service, Nairobi.
- KWS. 1990b.** A policy Framework and Development programme. 1991 -1996. Nairobi. Kenya.
- Lay, J., Mahmood, T.O. & M'mukaria, G. M. 2012.** Few opportunities, much desperation: The dichotomy of non-agricultural activities and inequality in Western Kenya. *World Development* 36(12): 2713-2732.
- La Grange, M. 2005.** Problem lion control – methods and general observations related to the control of problem lions. In *Wildlife management*, Vol. II, *Problem animal control*. Report to the International Foundation for the Conservation of Wildlife (Foundation IGF), Harare, Zimbabwe.
- Lahm, S.A. 2016.** A nationwide survey of crop-raiding by elephants and other species in Gabon. *Pachyderm*, 21: 69–77.

- Lanjouw, P., Shariff, A., & Rahut, D. B. 2007.** *Rural non-farm employment in India: Access, Income, farm, poverty impact* (Working Paper No. 81). New Delhi: National Council of Applied Economic Research (NCAER).
Retrieved from <http://ideas.repec.org/p/ess/wpaper/id913.html>
- Lelenguyah G. L. 2013.** Effects of Climate Variability on pastoral livelihoods in Margat District, Baringo County. Unpublished Msc. Thesis, Kenyatta University.
- Lemi, A. 2010.** Determinants of income diversification in rural Ethiopia: Evidence from panel data. *Ethiopian Journal of Economics*, 18(1). doi:10.4314/eje.v18i1.59930.
- Linnell, J.D.C., Nilsen, E.B., Lande, U.S., Herfindal, I., Odden, J., Skogen, K., Andersen, R. & Breitenmoser, U. 2005.** Zoning as a means of mitigating conflicts with large carnivores: principles and reality. In R. Woodroffe, S. Thirgood & A.R. Rabinowitz, eds. *People and wildlife: conflict or coexistence?* pp. 162–175. Cambridge, UK, Cambridge University Press.
- Li, W., and L. Huntsinger. 2011.** China's grassland contract policy and its impacts on herder ability to benefit in Inner Mongolia: tragic feedbacks. *Ecology and Society* 16(2): 1.
- Ligia Natrona, 2002.** Coastal Tourism Environment, and Sustainable Local Development, The Energy Research Institute, New Delhi. India.
- Linkie, M., Dinata, Y., Nofrianto, A. & Leader-Williams, N. 2007.** Patterns and perceptions of wildlife crop raiding in and around Kerinci Seblat National Park, Sumatra. *Anim. Conserv.* 10, Pp 127–135.
- Lipper, L., Cavatassi, R. & Keleman, A. 2010.** The contribution of Plant Genetic Resources for Food and Agriculture to food security and sustainable agricultural development. *The Second State of the World of Plant Genetic Resources for Food and Agriculture*. FAO, Rome.
- Little, P.D., McPeak, J., Barrett, C.B. & Kristjanson, P. 2008.** *Challenging orthodoxies: understanding poverty in pastoral areas of east Africa*. Pastoral Risk Management (PARIMA) Project.
- Little P, Smith K, Cellarius B, Coppock D, Barrett C. 2001.** Avoiding Disaster: Diversification and Risk Management among East African Herders. *Development and Change*. 32: Pp 410–433.
- Liu, J., Ouyang, Z., Miao, H. 2010.** “Environmental Attitudes of Stakeholders and Their Perceptions regarding Protected Area-community Conflicts: A Case Study in China. *Journal of Environmental Management* 91.11: Pp 2254-262.

- Lorot, A. 2001.** Agriculture, Land desertification. A report on civil society review of implementation of agenda 21 in Kenya. Kenya NGO Earth Summit 2002 forum.
- Lucey, T 1996:** Quantitative Techniques, Fifth Edition.
- Maalim, M. 2001.** A media handbook for reporting.
- Mackenzie, C.A and Ahabyona, P. 2012.** Elephants in the garden: Financial and social costs of crop raiding. *Ecological Economics*,75 (1), 72-82.
- MacKenzie, J.M. 1997.** Empire and the ecological apocalypse: historiography of the imperial Environment. Chapter 14. In: *Ecology and empire: environmental history of settler societies*, T. Griffiths and L. Robin (Eds.). Edinburgh: Keele University Press; Pietermaritzburg, South Africa: University of Natal Press.
- Madhusudan, M.D. 2003.** Living amidst large wildlife: livestock and crop depredation by large mammals in the interior villages of Bhadra Tiger Reserve, South India. *Environmental Management*, 31(4): Pp 466–475.
- Madhusudan, M. D., & Mishra, C. 2003.** Why big, fierce animals are threatened: conserving large mammals in densely populated landscapes. In *Battles over nature: science and the politics of conservation*, 31–55. Saberwal, V.and Rangarajan, M. (Eds). New Delhi: Permanent Black.
- Magane, S. 2013.** Unpublished document presented to the thirteenth national meeting on forestry and wildlife, Songo, Mozambique.
- Maes, J., Liqueste, C., Teller, A., Erhard, M., Paracchini, M.L., Barredo, J.I. 2016.** An indicator framework for assessing ecosystem services in support of the EU biodiversity strategy to 2020. *Ecosyst. Serv.* 17, 14–23.
- Maikhuri R. K., Nautiyal S., Rao R. S., and Saxena R. G. 2011.** Conservation Policy –People conflicts: A case study from Nanda Devi Biosphere Reserve, India. *Forest policy and economics* 2 (3): 376-385.
- Magane, S. 2013.** Unpublished document presented to the thirteenth national meeting on forestry and wildlife, Songo, Mozambique.
- Manjur, K., Amare, H., Hailemariam, G., & Tekle, L. 2014.** Livelihood diversification strategies among men and women rural households : Evidence from two watersheds of Northern Ethiopia. *Journal of Agricultural Economics and Development*, 3(April), Pg. 17– 25.
- Marco D, Boitani ML, Mallon D, Hoffmann M, Iacucci A., Meijaard E. 2014.** A Retrospective Evaluation of the Global Decline of Carnivores and Ungulates. *Conservation Biology*, 28: Pp1109-1118.

- Marker, L. 2002.** Aspects of cheetah (*Acinonyx jubatus*) biology, ecology and conservation strategies on Namibian farmlands. Oxford: University of Oxford.
- Markowitz, C. 1952.** Understanding, Selecting, and Integrating a Theoretical Framework in Dissertation Research: Creating the Blueprint for ‘House’. *Administrative Issues Journal*.
- Martin, R.B. 2015.** Relationship between elephant and canopy tree cover. In R.B. Martin, C.G. Craig & V. Booth, eds. *Elephant management in Zimbabwe*. Harare, Zimbabwe, Department of National Parks and Wildlife Management.
- Maslow, Abraham Harold. 1943.** A Theory of Human Motivation. *Psychological Review* 50 (4): Pp370–96.
- Masters, N. A, Francois, J., Owusu, J.G.K., Yeboah, R., Amanor, K.S. and Antwi, L. 2014.** Falling into Place. Policy that works for Forests and People. Series No. 4, London: International Institute for Environment and Development.
- Matiko, N.L. 2000.** Perspective on sustainable utilization of wildlife resources in Kenya. Msc. Thesis. Durrell Institute of conservation and ecology. University of Kent of Canterbury, UK.
- Matson, T. 2005.** Human-Elephant Conflict Research Project: Nyae Nyae conservancy and Khaudum National Park. Project Update 30th October. Namibia Nature Foundation. Windhoek.
- Martino, D. 2001.** Buffer zones around protected areas: A brief literature review. *Electronic Green Journal*, 1(15), Retrieved from <https://escholarship.org/uc/item/02n4v17n>.
- Maxwell, S. 1998.** Saucy with the Gods: Nutrition and food security speak to poverty *Food Policy* 23(3/4): 215-230.
- Maxwell, S., and Smith, M. 2012.** *Household food security: a conceptual review. Household Food Security: concepts, indicators, measurements*. Rome and New York: IFAD and UNICEF.
- Mayo, Edward J., and Lance P. Jarvis. 1981.** *The Psychology of Leisure Travel: Effective Marketing and Selling of Travel Services*. CBI Publishing Company, Inc.
- Mazibuko, S. 2013.** Understanding underdevelopment through the sustainable livelihoods approach. *Community Development*, 44(2), 173–187.
- Mbau, J. S. 2013.** An analysis of Human-Wildlife Conflicts in Tsavo West – Amboseli Agro-ecosystem using an integrated geospatial approach: a case study of Taveta Sub county. PhD Thesis, University of Nairobi.

- Mbaiwa, J.E. 2005.** Wildlife Resource Utilization at Moremi Game Reserve and Khwai Community Area in the Okavango Delta, Botswana. *Journal of Environmental Management*, 77(2): 144-156.
- Mbaiwa, J.E. 2002.** The Sustainable Use of Wildlife Resources among the Basarwa of Khwai and Mababe in Ngamiland District, Botswana: The Past and Present Perspectives. *Pula: Botswana Journal of African Studies*, 16(2): 110-122.
- McClanahan, T.R., Verheij, E., & Maina, J. 2006.** Comparing management effectiveness of a marine park and a multiple-use collaborative management area in East Africa. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 16, 147–165.
- Meadows, R. F. 2013.** Casual linkages between poverty and Environment in Kenya. Natural Resource Institute. Catham, UK.
- Mehta, J.N. & Kellert, S.R. 2008.** Local attitudes toward community-based conservation policy and programmes in Nepal: a case study of the Makalu-Barun Conservation Area. *Environmental Conservation* 25(5): 320–333.
- Messmer, T. A. 2012.** The emergence of human-wildlife conflict management: Turning challenges into opportunities. *International Biodeterioration and Biodegradation* 45 (2012), pp. 97-102. Elsevier Science Ltd.
- Messmer T.A. 2000.** The Emergence of Human– wildlife Conflict Management: turning Challenges into Opportunities. *International Bio deterioration & Biodegradation*, 45(3-4):97-102.
- McIver, J. P., & Carmines, E. G. 1981.** *Unidimensional scaling*. Thousand Oaks, CA: Sage.
- Ministry of lands .2014.** ‘Draft National Land Policy’. Ministry of lands, republic of Kenya, May 2014.
- Mishra, C. 2017.** Livestock depredation by large carnivores in the Indian trans-Himalaya: conflict perceptions and conservation prospects. *Environmental Conservation*, 24(4): Pp 338–343.
- Moore, C. 1996.** Typology of Conflict in the Mediation Process. 2 Ed. San Francisco: Jossey-Bass. Available on <http://www.cios.org/encyclopedia/conflict/source.htm>. Accessed on: 23/12/2017.
- Moser, C. 1998.** The asset vulnerability framework: reassessing urban poverty reduction strategies. *World Development* 26(1): Pp 1-19.
- Mugenda, O.M. and Mugenda, A.G.2003.** *Research Methods Quantitative and Qualitative Approaches*. ACTS PRESS, Nairobi.

- Mulonga, S., Suich, H. & Murphy, C. 2003.** The conflict continues: Human wildlife conflict and livelihoods in Caprivi. Research Discussion Paper No 59, Directorate of Environmental Affairs, Ministry of Environment and Tourism, Windhoek, Namibia. 29pp.
- Mumma, Albert. 2007.** Kenya's New Water Law: An Analysis of the Implications of Kenya's Water Act, 2002, for the Rural Poor. In von Koppen, M. Giordano and J. Butterworth (eds). Community-based Water Law and Water Resource Management Reform in Developing Countries, CAB International.
- Muruthi, P. 2015.** *Human wildlife conflicts: lessons learned from AWF's African heartlands.* AWF Working Papers. Nairobi, Kenya, African Wildlife Foundation.
- Muriithi, P. I. 2008.** Human wildlife conflicts: A case study of peoples' participation in conflict resolution. Master of Arts in Sociology (Rural Sociology and Community Development) Thesis, University of Nairobi.
- Murphy, C. 2017.** Community-based crocodile management. *Travel News Namibia.* Available at: www.travelnews.com.na/index.php?fArticleId=1042
- Musiani, M., Mamo, C., Boitani, L., Callaghan, C., Gates, C., Mattei, L., Visalberghi, E., Breck, S. & Volpi, G. 2003.** Wolf depredation trends and the use of fladry barriers to protect livestock in western North America. *Conservation Biology*, 17(6): Pp 1538–1547.
- Mutenje, M.J, Ortmann, G.F, Ferrer, S.R.D. and Darroch, M.A.G. 2010.** Rural Livelihood Diversity to Manage Economic Shocks: Evidence from South East Zimbabwe. *Agricultural Economics Research. Policy and Practice in Southern Africa* Vol. 49 (3) 2010.
- Mwangi, E. M. 2005.** The Transformation of Property Rights in Kenya's Maasiland: Triggers and Motivations, CAPRI Working Paper No. 35, IFPRI: Washington DC.
- Mwangi E.M. 1995.** Land Use Planning and Co-ordination Study: Protected Area System Coverage. – Final Report to the Kenya Wildlife Service, Nairobi.
- Mwanjala, J. M. 2005.** An overview of wildlife and Tourism management in Kenya: A presentation to the 3rd II African conference on peace through Tourism at the Hotel Intercontinental, Lusaka, Zambia. Feb 6th-11th 2005.
- Nang, P., Khiev, D., Hirsch, P. and Whitehead, I. 2011.** Improving the Governance of Water Resources in Cambodia: A Stakeholder Analysis. CDRI Working Paper Series, no. 54. Phnom Penh: Cambodia Development Resource Institute.
- Nasa D. H. Atala, T. K., Akpoko, J. G. Kudi, T. M. & H. S. 2010.** Analysis Of Factors Influencing Livelihood Diversification among Rural Farmers In Giwa Local Government Area Of Kaduna State, Nigeria. *International Journal of Science and Nature*, 1(2), 161–165.

- National Disaster Management Authority. 2016.** Baringo health and Nutritional Survey Bulletin.
- Naughton-Treves, L. & Treves, A. 2005.** Socio-ecological factors shaping local support for wildlife: crop-raiding by elephants and other wildlife in Africa. In *People and wildlife: conflict or coexistence?: 252–277*. Woodroffe, R., Thirgood, S. & Rabinowitz, A. (Eds). Cambridge: Cambridge University Press.
- Naughton-Treves, L. 1997.** Whose animals? A history of property rights to wildlife in Toro, western Uganda. *Land Degradation and Development*, 10: 311–328.
- Nepal, S.K. and K.E. Weber. 2012.** Prospects for coexistence - wildlife and local people. *Ambio* 24: Pp 238-245.
- Nijman V. 2010.** An overview of International Wildlife Trade from Southeast Asia. *Biodiversity Conservation* 19: Pp 1101-1114.
- Njeru, E. M. 2013.** Crop diversification: a potential strategy to mitigate food insecurity by smallholders in sub-Saharan Africa. *J Agric Food Syst Community Dev* 3:63–69.
- Njogu, J. G. 2003.** Community Based conservation in an entitlement perspective. Wildlife and forest biodiversity conservation in Taita, Kenya. PhD Thesis University of Amsterdam.
- Njonjo, Charles, M.E. Aronson, P.N. Ndungu, Ezekiel Idwasi, F.R.S. Onyango, Benjamin Kubo, Keriako ole Tobiko, Stephen Kipkenda, and Omar Bwana. 2002.** Commission of Inquiry into the and Law System of Kenya on Principles of a National Land Policy Framework, Constitutional Position of Land and New Institutional Framework for Land Administration, Nairobi.
- Norton-Griffiths, M, and M Said. 2010.** The future for wildlife on Kenya's rangelands: an economic perspective. In *Wild Rangelands: Conserving Wildlife While Maintaining Livestock in Semi-arid Ecosystems*, ed. J Deutsch, J Du Toit, and R Kock, 367–392. Chichester: Wiley Blackwell.
- Norton-Griffiths, M, M Said, S Serneels, D Kaelo, M Coughenour, R Lamprey, M Thompson, and R Reid. 2008.** Land-use economics in the Mara area of the Serengeti ecosystem. In *Serengeti III: Human Impacts on Ecosystem Dynamics*, ed. ARE Sinclair, C Packer, S Mduma, and J Fryxell, 379–426. Chicago: Chicago University Press.
- Nunow, Cabdi Arale. 2000.** Pastoralists and the Markets. Livestock Commercialization and Food Security in North Eastern Kenya. Leiden, Ph. D in Human Ecology, Leiden University.
- Nyeki, D. M. 1992.** Wildlife Conservation and Tourism in Kenya. Kenya Wildlife Service. Nairobi. Kenya.

- Nyhus, P., & Tilson, R. 2004.** Characterizing human-tiger conflict in Sumatra, Indonesia: implications for conservation. *Oryx*, 38, 68-74.
- Nyhus, P., H. Fischer, F. Madden. 2015.** Taking the bite out of wildlife damage. The challenges of wildlife compensation schemes. *Conservation in Practice*. Volume 4(2).
- O’Connell-Rodwell, C.E., Rodwell, T., Rice, M. & Hart, L.A. 2014.** Living with the modern conservation paradigm: can agricultural communities co-exist with elephants? A five year case study in East Caprivi, Namibia. *Biological Conservation*, 93(3): Pp 381–391.
- O’Connor, A. 2014.** Poverty and paradox. *The Hedgehog Review* 16(3). Retrieved from http://www.iasc-culture.org/THR/THR_article_2018_Fall_OConnor.php
- Odindi, J. O., & Ayirebi, G. K. 2010.** Communities and conservation: In search for a win-win situation in the Great Fish River Reserve. *Journal of Sustainable Development in Africa*, 12(1), 13–26.
- Ogada, O.O. & Ogada, D.L. 2004.** Factors influencing levels of carnivore-livestock conflicts in Samburu Heartland and proposed mitigation measures. Unpublished consultancy report for African Wildlife Foundation.
- Ogada, M., Woodroffe, R., Oguge, N. and Frank, G. 2003.** Limiting Depredation by African Carnivores: the Role of Livestock Husbandry. *Conservation Biology* 17(6): Pp 521-1530.
- Ogula, P. A. 2005.** Research Methods. Nairobi: CUEA Publications.
- Ogutu, J. O., N. Owen-Smith, H. P. Piepho, B. Kuloba, and J. Edebe. 2012.** Dynamics of ungulates in relation to climatic and land use changes in an insularized African savanna ecosystem. *Biodiversity and Conservation* 21: Pp1033-1053.
- Ogutu, J, N Owen-Smith, H-P Piepho, and M Said. 2011.** Continuing wildlife population declines and range contraction in the Mara region of Kenya during 1977–2009. *Journal of Zoology*. 285: Pp 99–109.
- Ogolla, B. D and Mugabe J. 1996** Land Tenure Systems, In Land We Trust Initiative.
- Okech, R. 2011.** *Wildlife-community conflicts in conservation areas in Kenya*. Sir Wilfred Grenfell College Memorial University. Newfoundland, Canada. Retrieved from: <http://kms1.isn.ethz.ch/serviceengine/Files/ISN/123268/.../Chapt.4.pdf>.
- Okello, M. M., Njumbi, S. J., Kiringe, J. W., & Isiiche, J. 2014.** Prevalence and Severity of Current Human-Elephant Conflicts in Amboseli Ecosystem, Kenya: Insights from the Field and Key Informants. *Natural Resources*, 2014.

- Okello, M. M., B.E.L. Wishitemi, and B. Lagat 2013:** Tourism Potential and achievement of Protected Areas in Kenya: Criteria and Prioritization. – *Tourism Analysis 10(2): Pp 151-164.*
- Okello, M., Seno, S., and Wishtemi, B., 2013.** Masai community wildlife sanctuaries in Tsavo-Amboseli, Kenya. *Parks Vol. 13 No.1 Conservation partnerships in Africa.*
- Okello, M.M., Buthmann, E., Mapinu, B and Kahi, H.C. 2011.** Community opinions on wildlife, resource use, and livelihood competition in Kimana Group Ranch near Amboseli, Kenya. *The Open Conservation Biology Journal 5: Pp 1-12.*
- Okello, M.M. and Kioko, J. 2010.** Contraction of wildlife dispersal area in Olgulului-Olororashi Group Ranch around Amboseli National Park, Kenya. *Open Conservation Biology 4: Pp 28-39.*
- Okello, M. M. 2009.** Contraction of wildlife dispersal area and displacement by human activities in Kimana Group Ranch near Amboseli National Park, Kenya,” *Conservation Biology Journal*, vol. 3, Pp. 49–56.
- Okello M. M. 2005.** Land use changes and Human-Wildlife Conflicts in the Amboseli Area, Kenya. *Human Dimensions of Wildlife 10: Pp 19-28.*
- Okello, M.M. & Kiringe, J.W. 2004:** Threats to biodiversity and the implications in protected and adjacent dispersal areas of Kenya. – *Journal for Sustainable Tourism 12(1): Pp 55-69.*
- Orindi, A.O., Nyong, A., and Herrero, M. 2007.** Pastoral livelihood adaptation to drought and institutional interventions in Kenya. *UNDP Human Development Report 2007/2008.*
- Osborn, F.V. & Parker, G.E. 2012.** Community-based methods to reduce crop loss to elephants: experiments in the communal lands of Zimbabwe. *Pachyderm, 33: Pp 32–38.*
- Osborn, F.V. and Hill, C.M. 2005.** Techniques to reduce crop loss: Human and technical dimensions in Africa. In: Woodroffe, R., Thirdgood, S. and Rabinowitz, A., Eds. *People and wildlife: Conflict or coexistence?* Cambridge: *Cambridge University Press, pp. 72-85.*
- Osemeobo, G.J. 1993:** Impact of land use on biodiversity preservation in Nigerian Natural Ecosystems: A review. – *Natural Resources Journal 33: 1016-1025.*
- Ottichilo, W.K., De Leeuw, J., Skidmore, A.K., Prins, H.H.T., & Said, M.Y. 2010.** Population trends of large non-migratory wild herbivores and livestock in the Masai Mara ecosystem, Kenya, between 1977 and 1997. *African Journal of Ecology, 38, 202–216.*
- Ottichilo, W. 2000:** An Analysis of Change in the Maasai-Mara Ecosystem of Kenya. – Ph.D. thesis, Wageningen University, Netherlands.

- Oso, W. Y, and Onen, D. 2005.** A general Guide to writtting research proposal and report, Kisumu, Kenya.
- Pant, G., & Hockings, M. 2013.** Understanding the Nature and Extent of Human-Elephant Conflict in Central Nepal.
- Parker, G.E. & Osborn, F.V. 2006.** Investigating the potential for chilli *Capsicum* spp. to reduce human–wildlife conflict in Zimbabwe. *Oryx* 40: Pp 343–346.
- Patterson, B.D., Kasiki, S.M., Selempo, E. and Kays, R.W. 2004.** Livestock predation by lions (*Panthera leo*) and other carnivores on ranches neighboring Tsavo National Park, Kenya. *Biological Conservation* 119 (4): Pp 507–516.
- Pearce, Philip L. 2012.** Perceived Changes in Holiday Destinations. *Annals of Tourism Research* 9 (2): Pp145–64.
- Petursson, J.G, et.al 2006.** Transboundary management challenges of protected areas: case of Mt. Elgon in Uganda and Kenya. Local Stakeholders roles in transboundary biodiversity management: challenges from Mt Elgon, Uganda and Kenya. Draft paper No.1.
- Pettorelli, N., A. L. Lobora, M. J. Msuha, C. Foley, and S. M. Durant. 2010.** Carnivore biodiversity in Tanzania: revealing the distribution patterns of secretive mammals using camera traps. *Animal Conservation* 13: Pp 131-139.
- Perez, E. and L. F. Pacheco. 2006.** Damage by large mammals to subsistence crops within protected area in Montane forest of Bolivia. *Crop Protection* 25: Pp 933-939.
- Porter, G. 2014.** Transport services and their impact on poverty and growth in rural Sub-Saharan Africa: a review of recent research and future research needs. *Transport reviews*, 34(1), 25-45.
- Porter, C. 2012.** Shocks, consumption and income diversification in rural Ethiopia. *Journal of Development Studies*, 48(9), 1209–1222.
- Pratt, D. J. & Gwynne, M. D. 1977.** *Rangeland management and ecology in East Africa*, Huntington, New York, Robert E. Krieger Publishing Co., Inc.
- Prayag, Girish, and Chris Ryan. 2011.** The Relationship between the Push and Pull factors of a Tourist Destination: The Role of Nationality – An Analytical Qualitative Research Approach. *Current Issues in Tourism* 14 (2): Pp121–43.
- Pretorius, Y., Willem, F., Cornelis, V., Henjo, J., Rina, C., Nicky, M.K., Emmanuel, M., Bruce, R.P., Mike ,J.S., Andrew, S.K., Rob, S., Sipke, E.V., and Herbart, H.T.P. 2011.** Soil nutrients status determines how elephant utilize trees and shape environments. *Journal of Animal Ecology* 80: Pp 875-883.

- Rao K.S. Maikhuri, R.K., Nautiyal, S and Saxena K.G. 2002.** Crop damage and livestock depredation by wildlife: a case study from Nanda devi Biosphere reserve, India. *J. environ. mgt* 66: Pp317-327.
- Ravitch, S. M. & Carl, N. M. 2016.** Qualitative Research: Bridging the Conceptual, Theoretical and Methodological. Los Angeles, U.S.A.: SAGE Publications, Inc.
- Reading, R.P., McCain, L., Clark, T.W. & Miller, B.J. 2010.** Understanding and resolving the Black-tailed prairie dog conservation challenge. In *People and wildlife: conflict or coexistence?* 209–223. Woodroffe, R., Thirgood, S. & Rabinowitz, A. (Eds). Cambridge: Cambridge University Press.
- Reardon, T. 2014.** "Using evidence of household income diversification to inform study of the rural non-farm labour-market in Africa." *World Development* 25(5): 735-748.
- Reardon, T., J. E. Taylor, K. Stamoulis, P. Lanjouw and A. Balisacan. 2000.** "Effects of non-farm employment on rural income inequality in developing countries: an investment perspective." *Journal of Agricultural Economics* 51(2): Pp 266-288.
- Reed, M.S., Dougill, A.J., Baker, T. 2012.** Participatory indicator development: what can ecologists and local communities learn from each other? *Ecological Applications* 18, Pp 1253–1269.
- Republic of Kenya (RoK). 2007.** Ministry of State for Planning. Kenya Vision 2030. Government printers, Nairobi, Kenya.
- Rice, C. 2000.** Don't forget to pack the trunk. *Wildlife conservation* 93: 53-87.
- Rigg, J. 2006.** Land, farming, livelihoods, and poverty: Rethinking the links in the rural south. *World Dev.* 34, 180–202.
- Rittichainuwat, Bongkosh Ngamsom. 2016.** Tsunami Recovery: A Case Study of Thailand's Tourism. *Cornell Hotel and Restaurant Administration Quarterly* 47 (4): Pp390–404.
- Roe, D., Elliot, J., Sandbrook, C., & Walpole, M. (Eds.). 2013.** Biodiversity conservation and poverty alleviation: exploring the evidence for a link. Hoboken, NJ: Wiley.
- Russell, S. 2004.** The economic burden of illness for households in developing countries: A review of studies focusing on malaria, tuberculosis, and human immunodeficiency virus / acquired immunodeficiency syndrome. *Tropical Medicine and Hygiene*, 71 (2), 147-155.
- Salafsky, N. and Wollenberg, E. 2017.** Linking Livelihoods and Conservation: A Conceptual Framework and Scale for Assessing the Integration of Human Needs and Biodiversity. *World Development* Vol. 28 No. 8 pp 1421-1438.

- Saunders M.; Lewis, P.; Tronhill, A. 2007.** “*Research Methods for Business Students*”, Fourth Edition, Pearson Education Ltd., p. 32.
- Schmidt-Soltau, K., and D. Brockington. 2007.** Protected areas and resettlement: What scope for voluntary relocation? *World Development* 35: Pp 2182–2202.
- Scoones, I. 2009.** Livelihoods perspectives and rural development. *The Journal of Peasant Studies*, 36(1): Pp 171–196.
- Seno, S. K. and Shaw, W. W. 2003.** Land Tenure policies. Masai Traditions and Wildlife Conservation in Kenya. *Soc. Nat.* 2002. (15) Pg 79-88.
- Serneels, S. 2001.** Drivers and impacts of land use land cover change in Serengeti-Mara ecosystem. A spatial modeling approach based on remote sensing data. PHD dissertation universite catholique de Louvain. Belgium.
- Serneels, S., Said, M. Y. & Lambin, E. F. 2011.** Land Cover Changes around Major East-African Wildlife Reserves: The Mara Ecosystem (Kenya). *International Journal of Remote Sensing*, 22: Pp 3397–3420.
- Sifuna, Nixon. 2006.** Using Eminent Domain Powers to Acquire Private Lands for Protected Area. Proceedings of a workshop for the Kwando-Kavango region Organised by Conservation International, June 8-9, 2010, Maun: Botswana.
- Sillero-Zubiri, C., & Switzer, D. 2001.** Crop raiding primates: searching for alternative, humane ways to resolve conflict with farmers in Africa. *Wildlife Conservation Research Unit, Oxford University, Oxford.*
- Singleton, R. A Jr. and Strant, B. C. 2005.** Approaches to Social Research. 4th Edition. Oxford, oxford University Press.
- Sitati N. W, Walpole M. J, Leader-Williams N. 2005.** Factors affecting susceptibility of farms to crop raiding by African elephants: using a predictive model to mitigate conflict. *Journal of Applied Ecology* 42: Pp1175–1182.
- Sha, J.P. & Heinen, J.T. 2001.** Wetland resource use and conservation attitudes among indigenous and migrant peoples in Ghodaghodi Lake area, Nepal. *Environmental Conservation* 28(4): 345–356.
- Shamdasani, P. M. Stewart D. W. 1990.** *Focus groups. Theory and practice.* London: Sage Publications
- Shauri, V. and Hitchcock, L. 1999.** *Wildlife Corridors and Buffer Zones in Tanzania: Political Willpower and Wildlife Management in Tanzania.* Lawyers’ Environment Action Team (LEAT). www.lead.or.tz/publications/wildlife.corrdors

- Shemwetta, D. T. K. and J. R. Kideghesho 2000.** Human wildlife conflicts in Tanzania: What research and extension could offer to conflicts resolution. 1ST University Wide Conference, Morogoro.
- Shipton, P. 2010.** How Gambians save and what their strategies imply for international aid. World Bank. Policy Research and Extension Affairs Working Papers: Agricultural Policies WPS 395.
- Shota, M. and Takuhiko, M. 2011.** Change in habitat selection by Japanese macaques (*Macaca fuscata*) and habitat fragmentation analysis using temporal remotely sensed data in Niigata Prefecture, Japan. *International Journal of Applied Earth Observation and Geo-information: 13 (4): Pp 562-571.*
- Sillero-Zubiri, C. & Laurenson, M.K. 2001.** Interactions between carnivores and local communities: conflict or co-existence? In *Carnivore conservation: 282–312.* Gittleman, J.L., Funk, S.M., Macdonald, D.W. & Wayne, R.K. (Eds). Cambridge: Cambridge University Press.
- Sindiga, I. 1995.** Wildlife-Based tourism in Kenya: Land use conflicts and government compensation policies over protected areas. *Journal of Tourism Studies, 6 (2), pp. 45–55.*
- Smith, M. E., Linnell, J. D. C., Odden, J., & Swenson, J. E. 2012.** Review of methods to reduce livestock depredation II. Aversive conditioning, deterrents and repellents. *Acta Agriculturae Scandinavica, Section A Animal Science, 50, 304–315.*
- Southgate, C. and Hulme, D. 1999.** Environmental management in Kenya's arid and semi arid lands. An overview. Rural resources rural livelihoods working paper series. No. 2. Institute for development policy and management. University of Manchester. Manchester.
- Stander, P.E. 2006.** Conservation of lions and other large carnivores in the Kunene region, Namibia. *African Lion News, 2: 8–9.*
- Start, D. 2015.** The rise and fall of the rural non-farm economy: Poverty impacts and policy options. *Development Policy Review, 19(4), 491–505. doi: 10.1111/1467-7679.00147.*
- Steiner, F. R, Osterman, D. A. 2008.** Landscape planning: a working method applied to a case study of soil conservation. *Landscape Ecol. 1:213-26.*
- Sterret, C. 2011.** SPSS Survival Manual. A step by step guide to SPSS 4th edition. Australia. Allen and Unwin.
- Stifel, D.C. 2010.** The rural non-farm economy, livelihood strategies and household welfare. *Afr. J. Agric. Resour. Econ. 4, 82–109.*

- Sudman, S. and Bradburn 1974.** In **Johnson, T. P. and Moore, R. W. 1993.** Gender interactions between interviewer and survey respondents: issues of pornography and community standards: in *Sex Roles*: Vol. 28, numbers 5-6/ March 1993.
- Sunderlin, W. D., A. 2005.** "Livelihoods, forests, and conservation in developing countries: An overview." *World Development* **33**(9): 1383-1402.
- Suryawanshi K. R, Bhatnagar Y.V and R. S. Mishra C. 2013.** People, predators and perceptions: Patterns of livestock depredation by snow leopards and wolves. *Journal of Applied Ecology* 50: Pp 550–560.
- Swift, J. 1989.** "Why are rural people vulnerable to famine?" *IDS Bulletin* **20**(2): Pp 8-15.
- Swift, K., and Hamilton, K., 2002.** Household food and livelihood security. In Devereux, M. and Maxwell, S., (eds), "Food security in Sub- Saharan Africa". Institute of Development Studies, ITDG Publishers, London, Pp 67 – 92.
- Tamang, B. and N. Baral. 2008.** Livestock Depredation by large cat in Bardia National Park. Nepal. Implication for improving park – people relations. *International journal of Biodiversity science and management* 4: Pp 44-53.
- Taylor, M. 2000.** *Life, Land and Power, Contesting Development in Northern Botswana*, Ph.D. Dissertation, University of Edinburgh, UK.
- Thakadu, O.T. 2005.** Success Factors in Community-Based Natural Resource Management Projects' Mobilization in Northern Botswana: Lessons from Practice. *Natural Resource Forum*, 29 (3): 199-212.
- Thirgood, S., Woodroffe, R., & Rabinowitz, A. 2005.** The impact of human-wildlife conflict on human lives and livelihoods. In R. Woodroffe, S. Thirgood, & A. Rabinowitz (Eds.), *People and wildlife, conflict or coexistence?* (pp. 13-27) New York, U.S.A.: Cambridge University Press.
- Thouless C. R. and J. Sakwa. 2005.** Shocking elephants: Fence and crop raiders in Laikipia District. Kenya. *Biol. Conservation* 74: 99-102.
- Thornton, P. K., Boone, R. B., Galvin, K. A., BurnSilver, S. B., Waithaka, M. M., Kuyiah, J. Herrero, M. 2007.** Coping strategies in livestock-dependent households in east and southern Africa: a synthesis of four case studies. *Human ecology*, 35(4), 461-476.
- Timko, J.A., Waeber, P.O. & Kozak, R.A. 2010.** The Socio-economic contribution of nontimber forest products to rural livelihoods in sub-Saharan Africa: Knowledge gaps and new directions. *International forestry review*, 12 (3):284-294.
- Timmer C.P, 2017.** Farmers and Markets: The Political Economy of New Paradigms, *American Journal of Agricultural Economics*, Vol.79, Pp.621-627.

- Tjaronda W. 2012.** Namibia: conservancies suspend compensation schemes. *New Era* (Windhoek, Namibia), 6 November.
- Togoch H. K., E. M. Irandu and T. Thenya, 2020.** Patterns of Livelihood Diversification among Kamnarok National Reserve adjacent Communities in Baringo County, Kenya. *J. sustain. environ. peace* 3 (2) 55-62.
- Togoch, H. K., Irandu, M. E. and Thenya, T. 2018.** Human Wildlife Conflicts and livelihood diversification among Kamnarok National Reserve adjacent communities in Baringo County, Kenya. *Africa Environmental Review Journal, Vol. 3, No.1 pp 51-64.*
- Treves, A., Andiamampianina, L., Didier, K., Gibson, J., Plumtre, A., Wilkie, D., & Zahler, P. 2006.** A simple, cost-effective method for involving stakeholders in spatial assessments of threats to biodiversity. *Human Dimensions of Wildlife, 11(1), 43–54.*
- Treves, A., Naughton-Treves, L., Harper, E.K., Mladenoff, D J., Rose, R.A., Sickley, T.A. and Wydeven, A.P. 2004.** A spatial model derived from 25 years of data on wolf predation on livestock. *Conservation Biology 18 (1): Pp 144-124.*
- Treves A, Naughton-Treves L. 2005.** Evaluating lethal control in the management of human-wildlife conflict. *People and Wildlife, Conflict or Coexistence?* Pp 86–106. Cambridge University Press, Cambridge, UK.
- Treves A, Wallace RB, Naughton-Treves L, et al. 2006.** Co-managing human–wildlife conflicts: a review. *Human Dimensions of Wildlife 11: 383-396.*
- Tsi, E.A., Ajaga, N. and Wiegler, G. 2008.** The willingness to pay for the conservation of Wildlife animals: case of the Derby Eland (*Taurotragus derbianus gigas*) and the African wild (*Lycan pictus*) in North Cameroon.
- Tweheyo, M., Hill, C.M. & Obua, J. 2005.** Patterns of crop raiding by primates around the Budongo Forest reserve, Uganda. *Wildlife Biol. 11, 237–247.*
- UN (United Nations). 2007.** United Nations declaration on the rights of indigenous peoples. <http://www.un.org/esa/socdev/unpfii/en/declaration.html>. Accessed 12 May 2017.
- UNEP, 2009.** Kerio Valley Conservation Area, Kenya in J.C. Cutler (ed.). *Encyclopedia of Earth, Environmental information Coalition. National Council for science and Environment. Washington DC.*
- UNEP-WCMC. 2008.** State of the world’s protected areas: an annual review of global Conservation progress. UNEP-WCMC, Cambridge, UK.
- United Nations Development Program, UNDP. 2005.** *Human Development Report 2005.* United Nations Development Program: New York, United States.

- UNICEF. 2014.** State of the world children national survey. New York: UNICEF.
- USDA. 2006.** *The facts about Wildlife Services – wildlife damage management.* Washington, DC, USA, United States Department of Agriculture, Animal and Plant Health Inspection Service.
- Van Aarde, R, J. and Jackson, T. P. 2007.** Mega parks for Mega population: Addressing the causes of locally high elephant numbers in southern Africa. *Biological Conservation* 134. Pp 289-297.
- Varkevisser, C. M., Indra, P., & Ann, B. 2003.** Designing and conducting Health Systems Research Projects. Vol. 1: Proposal development and Field work. WHO. International Development Research Centre.
- Vedeld, P., Jumane, A., Wapalila, G., & Songorwa, A. 2012.** Protected areas, poverty and conflicts: A livelihood case study of Mikumi National Park, Tanzania. *Forest Policy and Economics*, 21, 20–31. doi:10.1016/j.forpol.2012.01.008.
- Vedeld, P., A. 2004.** Counting on the environment: forest incomes and the rural poor. Washington, D.C., World Bank.
- Vijayan, S. & Pati, B.P. 2003.** Impact of changing cropping patterns on man-animal conflicts around Gir Protected Area with specific reference to Talala Sub-District, Gujarat, India. *Population and Environment*, 23(6): Pp541–559.
- Vogel, C. 2005.** Seven fat years and seven lean years? Climate change and agriculture in Africa. *IDS Bulletin* 36 (2) 30-35.
- Waiganio, C., and Ngugi, P.E.N. 2001.** The Effects of Existing Land Tenure Systems on Land Use in Kenya Today. International Conference on Spatial Information for Sustainable Development. Nairobi, Kenya.
- Warren P. 2002.** Livelihoods Diversification and Enterprise Development: An initial exploration of Concepts and Issues. FAO, LSP WP 4, Livelihoods diversification and Enterprise Development Sub- Programme.
- Wasonga, V.O., Nyariki, D.M. and Ngugi, R.K. 2011.** Assessing socio-ecological change dynamics using local knowledge in the semi-arid lowlands of Baringo District, Kenya. *Environmental Research Journal* 5(1), 11-17. World Health Organization.
- Webber, A.D., Hill, C.M. & Reynolds, V. 2007.** Assessing the failure of a community-based human–wildlife conflict mitigation project in Budongo Forest Reserve, Uganda. *Oryx* 41: Pp 177–184.
- Weaver, D. 2001.** *Ecotourism.* Melbourne: John Wiley & Sons.

- Wekesa, M. 2011.** Improved livestock production marketing as a strategy for poverty reduction among pastoral communities in Kenya. A media handbook for reporting food security and drought in pastoral areas; indigenous information Network. Nairobi. Kenya.
- Weladji, R.B. and Tchamba, M.N. 2003.** Conflict between people and protected areas within the Bénoué wildlife conservation area, North Cameroon. *Oryx* 37: Pp 72-79.
- Wells, M. 1992.** Biodiversity, Conservation, Affluence and Poverty: Mismatched costs and benefits and efforts to remedy them. *Ambio* 21: Pp 237-243.
- Western, David, Samantha Russell, Kamweti Mutu. 2006.** The Status of Wildlife in Kenya's Protected and Non-Protected Areas. African Conservation Centre, Nairobi.
- Western, D., Groom, R., Worden, J. 2009.** The impact of subdivision and sedenterisation of pastoral lands on wildlife in an African savanna ecosystem. *Biological Conservation* 142, 2538- 2546.
- Wilkinson, D., Smith, G.C., Delahay, R.J. & Cheeseman, C.L. 2014.** A model of bovine tuberculosis in the badger *Meles meles*: an evaluation of different vaccination strategies. *Journal of Applied Ecology*, 41(3): Pp 492–501.
- Williamson, G. and W. J, A. Payne. 1978.** An introduction to animal husbandry in the tropics. Longman. London.
- Wishitemi, B. Kieti, D., Jones E. 2013.** Alternative models of community tourism: Balancing development and the aspirations of the poor. *Tourism Review International (Special Issue) Vol. 12.*
- Wishitemi B. E. L., 2008.** Sustainable Community Based Conservation and Tourism Development Adjacent to Protected Areas in Kenya. Eldoret; Moi University press.
- Wishitemi, B.E.L, Okello, M. M and Lagat, B. 2005.** Tourism potential and achievement of protected areas in Kenya: Criteria and prioritization. *Tourism Analysis*, 10, 1–15.
- Wittemyer, G., Elsen P., Bean, W. T., Coleman, A., Burton O. and Brashares, J. S. 2008.** Accelerated Human Population Growth at Protected Area Edges. *Science* 321: Pp 123-126.
- Woodroffe, R., Frank, L.G., Lindsey, P.A., Ole Ranah, S.M.K. & Romanach, S. 2007.** Livestock husbandry as a tool for carnivore conservation in Africa's community rangelands: a case-control study. *Biodivers. Conserv.* 16: Pp 1245–1260.
- Woodroffe, R., Thirgood, S. and Rabinowitz, A. (Eds.). 2005.** People and wildlife: conflicts or coexistence? Cambridge, UK: Cambridge *University Press.*

- Woodroffe, R. and Grinberg, J.R. 1998.** Edge Effects and the Extinction of Populations inside Protected Areas. *Science* 280(5372): Pp 2126-2128.
- World Wide Fund for Nature (WWF). 2006.** Species and People: Linked Futures. A report with case studies on the contribution of wildlife conservation to rural development and the Millennium Development Goals. WWF Global Species Programme.
- World Bank, 2009.** 'Reshaping Economic Geography', World Development Report 2009. Washington D.C.: The World Bank.
- World Bank Group, 2005.** *Sub-Saharan Africa Selected World Development Indicators*. The World Bank Group. Available from: www.worldbank.org.
- Yamane, T. 1967.** Statistics. An introductory analysis 2nd edition. New York. Harper and Row.
- Young J., Marzon, M., White R. M., Mccracken D. I., Redpath S. M., Carss D. N., Quine C. P. and Watt A. D. 2010.** The emergence of Biodiversity conflicts from biodiversity impacts: Charecteristics and management strategies. *Biodiversity and conservation*, 19 (14) 3976 – 3990.
- Zang, L. & Wang, N. 2013.** An initial study on habitat conservation of Asian elephant (*Elephas maximus*), with a focus on human elephant conflict in Simao, China. *Biological Conservation*, 112(3): Pp 453–459.
- Zickund, W. G 2003:** Business Research Methods. 7th edition. United States of America. Thompsons Publisher.
- Yuro, K.M. Young, T.P., Palmer, T.M., & Gadd, M.E. 2010.** *Pastoral Movements and Movements in Pastoralism: Shifting Traditions and Institutions of Modern Management Strategies in Laikipia, Kenya*. (Master's Thesis). Retrieved from Deep Blue, University of Michigan. <http://hdl.handle.net/2027.42/85796>.

Appendices

Appendix I: Operationalization of Objectives

Objective	Variable	Indicator	Data collection instruments	Analysis Tool
To assess the extent of human wildlife conflicts in Kamnarok NR adjacent areas	Wildlife invasion into local community farms	different types of conflicts (crop damages, human fatalities etc.	Questionnaire and interview guide	Descriptive and inferential statistics
To analyze the extent to which human wildlife conflicts affect the well being of the local community living within and adjacent areas of Kamnarok NR	Nature of standard of living, Food security & Social welfare	Nature of standard of living, Food security & Social welfare	Questionnaire and interview guide	Descriptive and inferential statistics
To analyze community motivation for livelihood diversification	types of livelihoods	Agricultural expansion, new businesses	Questionnaire and interview guide	Descriptive and inferential statistics
To assess the relationship between livelihood diversification and human wildlife conflicts in the Kamnarok NR adjacent areas	livelihood diversification	Reduced HWCs	Questionnaire and interview guide	inferential statistics

Source: *Author, 2017*

Appendix II: Identified Knowledge Gaps

Author & Year	Study Title	Gap Variable investigated	Findings	Knowledge Gap
Brian. T. B., 2006	Human wildlife conflicts, Namibia case study	Root causes of HWCs Opportunities and positive models for preventing and mitigating HWCs	Lack of regional land use planning which considers potentials of HWCs Poor national economic policies Nonexistent local level land use planning Nonexistent of local level HWC management plans	The study focused on causes of HWCs and opportunities for mitigation but overlooked relationship on community livelihoods' diversification impacts on HWCs
Abudalgha. Fur., 2013	the influence of Kenya wildlife conservation on reducing HWC with focus on KWS	Influences of wildlife conservation strategies The influence of community participation in conservation of wildlife The influence of conservation awareness in conservation	Conservation awareness programmes help in reducing HWCs in Kenya to a greater extent	The study focused on the impact of community wildlife strategies in reducing HWCs in Kenya leaving out other factors that influence Conflicts such as livelihood diversifications
Amaja G., 2014	Evaluation of Human Wildlife animal conflict management in Gera District, Ethiopia	Causes of Human Wild animal conflicts The degree of farms and livestock loss caused by wild animals The main human wildlife	Causes of human HWCs were animals Baboons were most frequent crop destroyers & livestock animal predation	The study focused losses caused by wild animals to humans but overlooked the effects of livelihoods diversification and human intrusion

		conflicts management measures in Gera district		
Kabra. A., 2015	Conservation Induced displacement: A comparative study of two Indian protected areas	Viability of displacement as a conservational tool Effects of conservation on the livelihoods of the displaced communities	Displacement caused Household income to fall and poverty intensified Dissatisfaction of the displaced persons manifested in reoccupation of their original village land	The study focused on the impacts of displacement on the displaced people but overlooked the link between conservation and displaced peoples' livelihoods

Source: *Author, 2017*

Appendix III: Reasons for Non reporting of Human Wildlife Conflict Incidences

Reasons for Non Reporting	Strongly Agree		Agree		Not Sure		Strongly disagree		Disagree		Mean	Std. Deviation
	F	%	F	%	F	%	F	%	F	%		
No compensation programme by wildlife authority	88	24.4	186	51.7	7	1.9	32	8.9	47	13.1	2.9583	.15926
No action to be taken by KWS and Baringo county government	168	46.7	131	36.4	12	3.3	20	5.6	29	8.1	1.9194	.21003
Kamnarok NR offices are too far to report complaints	46	12.8	87	24.2	18	5.0	140	38.9	127	35.3	3.6416	.18326
Past experiences of non compensation	218	60.5	84	23.3	42	11.7	6	1.6	10	2.8	3.7027	.18636
No time to report	122	33.9	91	25.3	19	5.3	47	13.1	81	22.7	2.6500	.17193

No=360

Source: *Field survey, 2017*

Appendix IV: Livelihood (Crops) losses to Crop raiding Animals

Crops	Locations									Total		
	Av. hh loss/90kg bag	Market price	income (Kes)	Av. hh loss/90kg bag	Market price	income (Kes)	Av. hh loss/90kg bag	Market price	income (Kes)	Av hh loss/90kg bag	Market Price	income (Kes)
Maize	13	3000	39000	8	3000	24000	10	3000	30000	10.3	3000	30900
Millet	8	4500	36000	11	4500	49500	11	4500	49500	9.3	6600	41850
Cow-peas	4	6600	26400	5	6600	33000	6	6600	39600	5.0	4500	33,000
Total			101,400			106,500			119,100			105,750

Source: *Field Survey, 2017*

Appendix V: Variable Means for Household reporting Wage Income or Employment

Variable Description	With self employment income (both farm & non farm)	With wage income (Non Farm)	No. of both wage and self-employment income
No. of Sample Respondents	252	68	360
Social and institutional asset			
Distance from Kamnarok NR (in Km)	1.19	4.92	3.42
Distance from main Roads (in Km)	5.14	1.54	1.07
Population Density (Km ²)	20.92	7.32	10.08
Infrastructures	1.78	.80	1.97
Human Capital			
No. of male adults	1.61	1.17	0.96
No. of female adults	1.09	0.94	0.73
total household income (in KES p.a)	470,249	840,845	807,149
Age of household head (in years)	38.37	41.08	44.28
Household head highest level of education (in yrs)	7.72	12.88	9.71
No. of children	3.96	1.47	2.42
physical capital			
Cropped land area	0.78	1.72	1.03
Value of productive assets (in Kes)	9,0725	594,764	388,125
Value of consumptive assets (in Kes)	30,720	214,704	168,619
Locational Variable			
Lawan	0.18	0.42	0.37
Kabutie	0.33	0.27	0.19
Kerio Kaboske	0.28	0.34	0.12

Source: Field Survey Data, 2017

Appendix VI: Common Livelihood Practices in Kamnarok NR



Plate 1a: Livestock herding in Kamnarok NR
Source: Field photo by author, 2017



Plate 1b: A traditional log hive for honey harvesting

Appendix VII: Household/Respondent Questionnaire

The purpose of this survey is for the research with the objective “**To analyze *Human Wildlife Conflicts and Livelihood Diversification Amongst Adjacent Communities of Kamnarok National Reserve in Baringo County, Kenya*** and only for the partial fulfillment of the requirements of the Doctor of Philosophy Degree in Environmental Science (Environmental Planning and Management) of the University of Nairobi, Kenya. The survey information will be treated as confidential and the outcome of the study will aid policy makers to improve on sustainable management of both wildlife and community livelihoods around Kamnarok national reserve. I will be very grateful and thankful to you if you give reliable, suitable, and appropriate data and information. Put a tick [] for the correct response or write down the answers in the space provided.

Name of Respondent _____ (Optional) Village

Date of interview _____

Location Name.....Sub Location..... Urban [] Rural [] (Tick one)

Section A: Household/Respondent Demographics

1. a) Gender: Male [] Female []
b) Indicate your ageyrs
c) Ethnic sub group. Tugen [] Marakwet [] Keiyo []
others, Specify.....
2. a) Marital Status. Married [] Single [] Divorced [] Widowed []
b) indicate your household size
3. Educational Level. No formal education [] Primary level [] Secondary level []
Tertiary level [] university []
4. Occupation of the respondents. Formal employment [] informal employment (casual labour)
[] self-employed/Business [] Agricultural mixed farming [] Livestock Keeping []
others, specify
5. How do you meet school fees of your child/ children? (multiple responses)
Sale of Livestock []
Sale of farm produce []
Earnings from business []
Salary []
Government Bursaries []
6. Does management of Kamnarok National Reserve support/ complement you in educational needs? Yes [] No []
7. If yes in Qn. 6, how have you been supported by the management of the Kamnarok national reserve?
Bursaries []
Scholarships []
Others, specify

Section B: Livelihoods Incomes and Costs

8. What are your main sources of income?(Multiple responses)

- Casual labour []
- Agro-pastoralism []
- Employment []
- Agro-pastoralism []
- Agriculture []
- Business []

Others, specify.....

9. What is your approximate annual income? Below Ksh 5,000 [] Ksh5,000 – 10,000 []
 Ksh10,000 – 50,000 [] Ksh50,000 – 100,000 [] Ksh100,000 – 200,000 [] Ksh. 200,000
 and above []

10. Which items do you spend your income on? Food [] Education [] Medical [] Investment in
 agricultural activities [] investment into conservation measures [] Others [],
 Specify.....

11. Which variety of crops do you grow in your farm? Indicate net incomes and associated costs

Crop	Total Yield	Amount Sold	Price/ Unit	Income obtained	Labour Cost	Input Cost	Net Income
Maize							
S/potatoes							
Beans							
Mangoes							
Bananas							
Traditional vegetables							
Sorghum							
Millet							
Tomatoes							
Onions							
Papaws							
Aloe plant sp.							
Water melons							
Groundnuts							
Cassava							
Arrow /Roots							
Boma Rhodes							

12. Which types of livestock do you keep in your farm? Indicate net incomes and associated costs

Animal	Avg. Price on Sale	Food Costs	Labour Cost	Current Price	Net income
Cattle					
Goat					
Sheep					
Chicken Camels					

13. How much net annual income do you raise from the sale of animal products as indicated below?

Product	Amount obtained/month	Amount sold /month	Price per unit	Total amount obtained	Labour cost	Net Income
Meat						
Milk						
Eggs						

14. If you are a business person, indicate annual average income you raise from your business activities

Income Source	Income per consignment	Expense cost	Labour Cost	Net income
Business Vendors				
Charcoal burning/sale				
Sale of traditional liquor				
Brick making				
Mat making				
Shopkeeper				
Retail shop				
Carpentry				
Art and Craft				
Tailoring				
Fishing				
Tour guiding				

15. Which other Non-farm activities do you engage in that sustains your household livelihoods?

Activity	QTY obtained	Market price	Approx. income
Agro– processing			
set up of small businesses			
Non agricultural wage income			
Rural tourism			
Hunting for food			
Collecting fruits			
Food for aid			

16. Do Kamnarok NR Resources to contribute to Community livelihoods

Kamnarok NR resource contribution to community livelihoods	1	2	3	4	5
Kamnarok NR has contributed to the livelihoods of the community by offering livestock grazing fields					
Kamnarok NR forest resources are harvested by the adjacent communities for both domestic use and sale for household income generation					
Crops grown and wild fruits obtained from Kamnarok NR fields assist in supplementing adjacent household’ s dietary requirements					
Kamnarok NR land is used by the adjacent community to provide shelter and other livelihood needs					
Kamnarok NR wildlife resources (fish) and land provide clay soil for brick making which contribute to household incomes					

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

17. Approximately how much income do you generate from Kamanrok National Reserve Resources

Wild resource	Origin of the resource	Amount Gathered	Price/ unit	Total income
Farm land				
Honey				
Fish				
Wild meat				
Timber				
Fuel wood				
Fodder/grass				
Herbal medicine				
Water				

18. What other sources of income do you support your household with? Indicate average annual income?

Source	Amount per month	Months received in a Year	Total income per Year.
Remittances			
Salary			
Occasional labour			

19. Do you consider any valuable livelihood benefit and Community support from Kamnarok NR

Livelihood benefits and support from Kamnarok NR	1	2	3	4	5
Households use the reserve as grazing field for livestock					
The reserve provide essential Non timber forest products for both domestic and sale					
Local households derive herbal medication from the reserve natural resources					
The reserve provide employment opportunities for local residents					
Reserve entry fees are used in the provision of education bursaries, essential community services and other social responsibility					

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

20. Do you access any natural resources in Kamnarok national reserve? Yes [] No []

21. If no in Qn 20 above, why? Expensive permit [] Strict regulations [] household far from Reserve [] permission not allowed [] No business in the park []

22. If yes in QN.20 above, what are the benefits (Cash/ Service) you are getting from using these resources

i.....ii.....
iii.....iv.....

23. Are the benefits in Qn. 20 shared equally to all villagers? Yes [] No []

24. If no in Qn. 20 who benefits more? Rich [] Poor [] Young people [] Old people []

25. Do you have any of this equipment in your home

Equipment type	No .	Current Value (Ksh)	Equipment type	No .	Current value (Ksh)
Ox-plough			TV		
Wheel Barrow			Fridge		
Bicycle			Radio		
Water pump			Computer		
Motor cycle			Phone		
Brick making machine			Sewing machine		
Car /vehicle					
Tractor					

26. What is approximate distance of your household from Kamnarok National reserve
 1-3 Kms [] 3-5Kms [] 5-7 Kms [] 7-10 Kms [] 10-13 Kms [] 13-15 Kms []
 over 15 Kms []

27. How do you rate wildlife of Kamnarok NR in relation to community well being

Wildlife factor	1	2	3	4	5
Damaged crops by wildlife					
Livestock predation by wildlife					
Human injury from wildlife					
Human death from wildlife					

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

28. Do Human Wildlife conflict impacts on household livelihoods

HWC factors	No impact	Slight impact	Moderate impact	High impact
Crop damages				
Human injury and deaths				
Livestock Predation				
Wildlife hindrance on household socio economic activities				

29. Have you diversified your livelihood

Reasons for Diversification	0	1	2	3
Diversify livelihood to minimize risks from wildlife				
Diversify livelihoods to achieve food security				
Diversify livelihoods to improve household standards of living				
Diversify livelihoods in order to reduce household shocks in difficult times				
Diversify livelihoods to generate Wealth				
Diversify livelihoods to supplement farming from business income				
Diversify livelihoods in response to diminishing land constraint due to land fragmentation and population pressure				
Diversify livelihood so as to accumulate assets				

Key: Not diversify =0, Slight Diversify =1, Diversify = 2, highly diversify =3

30. Has human wildlife conflict impact on your livelihood diversification

Human Wildlife impacts	0	1	2	3
Wildlife damages on crop livelihoods				
Wildlife predation on livestock				
Transmission of vector bone causing diseases				
Wildlife hindrances to household social economic activities				
The scale of human injury and deaths				

Key: No impact =0, impact =1, moderate impact =2, high impact =3

31. Has the following theme motivational factors contributed to livelihood diversification?

a) Agro – Climatic Vulnerabilities

Vulnerability factor	1	2	3	4	5
Drought					
Floods					
Crop Diseases					
Livestock disease					

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

b) Contextual Factors

Contextual Variable	1	2	3	4	5
Lack of rural livelihood planning policies					
Socio- political issues					
Poor access to markets and fluctuation of livestock and farm produce					
Poor infrastructure					
Lack of Land tenureship					

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

c) Possession of physical assets

Physical Asset	1	2	3	4	5
Land					
Livestock					
Machinery & buildings structures					
Human labour (casual labour)					
Possession of Adequate money					

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

d) General Push Factors

Push Factors	1	2	3	4	5
Rural population Growth					
Economic hardship					
Management regime of Kamnarok NR					
Farm Fragmentation					
Declining Agricultural production					
Human wildlife conflicts					
Policy readjustments which decreases community support for wildlife conservation					
Poor agricultural extension services					
Expensive farm inputs					
None existent benefits from the Kamnarok wildlife protected area					
Possession of higher Education and Technical skills					

Insufficient and inefficient compensation mechanism by Kamnarok NR management authorities					
---	--	--	--	--	--

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

e) General Pull Factors

Pull Factors	1	2	3	4	5
Availability of food aid from food aid agencies					
Availability of credits (capital) to engage in small businesses					
Employment opportunities in urban areas					
Business enterprise opportunities					
Incorporation of rural areas into local markets					
Traditional liquor sales					
Improved infrastructural network					
Access to technology and proximity to infrastructure development					
Proximity and emergence of urban centers					

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

Section C: LAND TENURE

32. How did you acquire your piece of land? Purchased [] Allocated by clan [] leased [] inherited [] others [], specify.....

33. Who owns this land? Private/mine [] Communal [] Public/trust land []

34. If private in Qn. 33 above, is the land leased? Yes [] No []

35. If private in Qn. 33 above, is the land held on freehold?) Yes [] No []

36. If your clan allocated you land, what were the possible factors/issues which made clans sub-divide land among the clan members?

Variable	
Land disputes among the clan members	
Competition for the land resource	
Differences in the land use activities	
Intrusion by other clans	
Encroachment by other non-clan entities	
Increase in population	

37. Do you support communal land sub-division? Yes [] No []

38. If yes in Qn. 37 above why? i.ii.

39. If no in Qn. 37 above why? i. ii.....

40. How much land do you own? 0-5acres [] 6-10 acres [] 11-20 acres [] over 20 acres []

41. Have you ever sold a piece of your land? Yes No
42. If Yes, in Qn.41 above why? _____
43. How far is your farm from the main road/s? Less than 1 km 2-3 km 3-4 km 4-5 km 5-6km 6-7km 7-8km 8-9 km 9-10km

Section D: Land Use (Crop and Livestock Production)

44. What do you use your land for? Keeping livestock Mixed farming Growing Crops others, specify.....
45. What portion of your land in acres is used for crop growing and keeping livestock?

Size	Crop Growing	Livestock Keeping
> 5 acres		
5 < > 10 acres		
10 < . > 15 acres		
< 15 acres		

46. How can you describe the type of cultivation which was taking place here 10 years ago and now? No difference cultivation has increased cultivation has declined No idea
47. What type of cultivation do you carry out? Rain fed Irrigation
48. If irrigated agriculture, what type of irrigation? Basin/flood irrigation Furrow irrigation Drip irrigation Bucket irrigation others, Specify.....
49. Have you ever changed your land use type? (e.g. from pastoralism to Agriculture) Yes No
50. If yes in Qn. 49 above, From ----- to ----- and why? -----
51. How do you meet your household food? Own production Purchase work for food food aid Borrowing/debts
52. What % of your income is spent on food? Less than 10% 20- 30% 30-40% 40-50% 50-60% 60-70% others, specify,
53. Is your household food adequate enough for your family throughout the year? Yes No
54. In the past 10 years how many times/years have you experienced food shortage?
- ...

55. If no in Qn.53 above, what are the coping strategies used in the period of food shortage? Sell labour to get money for food [] sell livestock [] Sell household asset [] Borrow money to buy food [] others, specify.....

Section E: Human wildlife Conflicts

56. a) Are you concern on Kamnarok NR and its wildlife? Very Concern [] Moderately concern [] Not concern at all []

b) Have you experienced any form of HWC? Yes [] No []

c) If yes in b above, do you report your complaints? Yes [] No []

d) If No in question C above, why?

Reasons for non reporting of HWCs	1	2
No compensation programme by wildlife authority		
No action to be taken by KWS and Baringo county government		
Kamnarok NR offices are too far to report complaints		
Past experiences of non-compensation		
No time to report		

Key: Strongly Agree =1, Agree =2, Not Sure=3, disagree=4 and strongly Disagree = 5

57. Indicate reasons why Kamnarok national reserve was established? Multiple responses

- For wildlife protection []
- For tourist attraction []
- For wildlife conservation and tourist attraction []
- For safe natural resource conservation for future generations []
- To conserve nature []
- For job creation []
- For wildlife to feed on during drought []

58. a) How do you perceive the level HWC in this area? Increased [] Decreased [] No change []

b) Which conflict issues are most experienced here by households? Crop damages [] livestock predation [] property damage [] human injury [] human death []

c) Has community attitude contributed to the escalating HWCs? Yes [] No []

59. Which breeds of livestock do you keep in your farm? Local / Traditional [] Hybrid []

60. Where do you graze your livestock?

- Communal land []
- Kamnarok NR land []
- My land []
- Government forest []
- Others, specify.....

61. How do you describe the herds of livestock you had in the following periods/years?

Periods	Livestock							
	Cows		Camels		Shoals		Chicken	
	More	Less	more	Less	more	less	more	Less
Now								
2010s								
2000s								
1990s								
1980s								

62. What challenges have you been experiencing in raising livestock as a livelihood means for your household?

	1980s	1990s	2000s	2010s	Now
Drought					
Diseases					
Wildlife predators					
Cattle rustlers					
Others					

63. What are the problems/experiences you have encountered by having a national reserve near your village

- i. ii.
 iii. iv.

64. Do you tolerate the proximity/ presence of wildlife in your farm? Yes [] No []

65. If yes in Qn. 64 above, why? Social-cultural values [] livelihood (food) needs []
 economic (meat for sale) needs []
 Others, specify.....

66. How do you control wildlife from invading your crops, property and attack on your livestock

- Changing livestock route []
- Planting unpalatable crops []
- Use repellants (dogs, drums, shouting) []
- Killing by trapping the animal with a snare []
- Bait/poisoning the animal []
- Digging Trenches []
- Fencing []
- Avoid watering livestock in rivers and lakes []
- Guarding in the night []
- Report to wildlife authorities []
- Nothing []

67. Are you aware of any wildlife migratory routes/dispersal near your piece of land?

- Yes [] No []

68. If yes in Qn. 67 above are they still being used by wildlife? Yes [] No []

69. Which wildlife predator kills most livestock in your village?

- Hyena []
- Elephant []
- Crocodile []
- Wild dog []
- Leopard []
- Snake bites []
- Jackal []

Others, specify.....

70. What time due livestock predation occur? Multiple responses

- Early morning []
- Night []
- Late afternoon []

71. Which livestock diseases are attributed as being transmitted by wildlife animals from Kamnarok reserve?

- Blackquater []
- Lumpy skin disease []
- Tick borne Diseases (ECF) []
- Rinderpest []
- Heart water []

Others, specify.....

72. Via which mode are diseases transmitted to your livestock? Multiple responses

- Contaminated water that domestic animals drink []
- Contaminated grass that livestock consume []
- Graze with or come in close contact with livestock []
- Wildlife carrying ticks []
- Common use/sharing of tress for scratching []

73. Which wildlife animals do you attribute with transmission of diseases to livestock in your household?

- Elephants []
- Buffalos []
- Crocodile []
- Wild dog []
- Leopard []
- Snake []
- Hyena []
- Giraffe []
- Gazelle []

Others, specify.....

74. In your opinion can your livestock transmit diseases to wildlife?

- Yes []
- No []
- No Idea []

75. How can you describe wildlife populations in Kamnarok national reserve?

- No change []
- increasing []
- Declining []
- No idea []

76. Which wildlife specie population has significantly increased over the last 10 year?
 Elephants [] Buffalos [] Crocodile [] Wild dog [] Leopard [] Snake []
 Spotted Hyena [] Giraffe [] Gazelle []
 Others specify _____
77. Which wildlife specie has consistently declined over the years in this area?
 Elephants [] Buffalos [] Crocodile [] Wild dog [] Leopard [] Snake []
 Spotted Hyena [] Giraffe [] Gazelle [] No idea []
78. What do you attribute to the declining populations of wildlife in this region to?
 Cultural practices [] Poaching and hunting [] limited conservation area []
79. Which crops are most damaged by wild animals? Maize [] Millet [] Sorghum []
 Cassava [] Vegetables [] Tomatoes [] Water melon [] Banana []
80. Which wildlife animal(s) causes damage to crops?
 Elephant [] Monkeys [] Buffalo [] Baboon [] Gazelles []
 Others specify.....
81. Conflict costs

Costs	Quantity lost	Cost incurred	Value of lost assets	Compensation	Total amount lost
Livestock lost					
Crop damaged					
Human injury					
Human loss					

82. Over the years, what would you say of human wildlife conflicts? Increased [] Decreased []
 Not changed [] No idea []
83. When do you have/experience conflicts with wildlife? In dry seasons [] Wet season []
 Daily [] Weekly [] Monthly [] Yearly [] Not at all []
84. Which is the most common type of conflict with the wild animals? Crop-raiding []
 Human injuries/death [] Predation of livestock [] Damage to House/Building []
 Others, Specify _____
85. How do you prevent wildlife from damaging your property? Mechanical fences []
 Metaphorical fences (chili peppers, beehives, etc.) [] Fires [] scare [] Guarding []
 Others, specify _____
86. When a wildlife animal enters your property, what to you do? Kill the animal [] Non-lethal aggression [] Chase [] Make Loud noises [] Alert KWS [] Do Nothing []
87. Do you ask for any outside help when dealing with wildlife conflicts? Yes [] No []

88. If yes in Qn. 87 whom? Community/ neighbours [] KWS [] Community game scouts []
Others, specify _____
89. Have you/any of your family member(s) been engaged in conflict with the Kamnarok National Reserve management/authority? Yes [] No []
90. If Yes in Qn.89 above, what was the main cause of the conflict?
91. Do you think the conflict cause negative impacts on wildlife condition, If Yes what were/ are the impact(s) i. _____
ii. _____
92. What has been the impact of conflicts to your daily life? _____
93. Have you ever benefited from wildlife conservation in Kamnarok NR in any form?
Yes [] No []
94. If yes in Qn. 93 above, in which form? Employment [] food Aid by KWS []
Educational bursaries wildlife related business [] Wild Meat []
95. Is there any office near your village for reporting and resolving human wildlife conflicts?
Yes [] No []
96. If no in Qn. 95 above, how do you resolve conflicts?
97. Do you receive any consolation/compensation for damaged property? Yes [] No []
98. What is your overall opinion on conservation of wildlife in Kamnarok national reserve?
Strongly Support [] I do not support [] will support if I benefit from Wildlife [] wildlife should be removed from Kamnarok []
99. What suggestions do you have for minimizing human wildlife conflicts

100. Have you been involved/participated in any wildlife conservation and awareness programmes (meetings, workshops and training) aimed towards wildlife conservation in Kamnarok national reserve? Yes [] No []
101. As there been community involvement in the decision making process towards conflict resolutions and wildlife conservation within your community? Yes [] No []

Thank you for your time

Appendix VIII: Focus Group Discussion Guide

Livelihoods

1. What are your main sources of livelihoods?
2. What do you spend your income on?
3. Do you think your livelihood practices affect wildlife in one way or the other?
4. Are you allowed to access and harvest natural resources from Kamnarok national reserve for your daily livelihoods?
5. Is Kamnarok national reserve of any importance to you and your community?
6. In which ways has Kamnarok National reserve contributed to your livelihood opportunities and how do you access these livelihood opportunities?
7. Which breeds of livestock do household keep?
8. Are your livestock allowed to graze in the reserve? If No, why?
9. How have you benefited from wildlife of Kamnarok national reserve?
10. Do you graze your livestock in the reserve?
11. How do you describe the herds of livestock households had in the following periods/years?

Periods	Livestock							
	Cows		Camels		Shoals		Chicken	
	More	less	more	Less	more	less	more	less
1980s								
1990s								
2000s								
2010s								
Now								

Appendix IX: Key Informant Schedule

Your name

Organization/institution working for.....

1. Is Kamnarok national reserve important to the local community? And if yes why and how?
2. How important is Kamnarok National Reserve to the livelihoods of the local community?
3. The land under which Kamnarok National reserve is situated/established is being disputed between the local community and the county government of Baringo. What is the official position of the issue?
4. In which ways has Kamnarok National reserve contributed to the livelihood opportunities for the local community, and how do the local community access these livelihood opportunities?
5. How frequent are the local people permitted to access and harvest natural resources from the reserve for their livelihoods?
6. Are the livestock of the local community allowed to graze in the reserve? If No, why?
7. There exist diversification of community livelihoods (*cultivation, urbanization, land subdivision etc*) and encroachment towards the Kamnarok reserve by the local community. How has it affected wildlife?
8. From the revenue generated from the national reserve, as part of it been spent on the community and community projects?
9. Are there community projects/developments which were funded from proceeds from wildlife?
10. How do you describe the state of HWC in this area now compared to 10 years ago?
11. How has HWCs in this area affected the social and economic livelihoods of the local community?
12. Are their village committees charged on behalf of community in resolving HWCs issues with the management of Kamnarok National reserve?
13. How does the community deal with problematic game animals destroying their crops and properties?
14. Has the village leadership affected/influenced resolution to wildlife in anyway?
15. Has the community livelihoods encroached on the wildlife territories and therefore contributed to the escalating HWCs?

16. How has the management of the reserve been handling human wildlife conflicts?
17. What are the challenges faced by the management of the reserve in protecting wildlife?
18. In your considered opinion, which wildlife /conservation can the community pursue to improve their livelihoods, minimize conflicts and promote conservation of wildlife?
19. Is the community satisfied with the benefits they receive from the reserve and the Management?
20. In your opinion, what can be done to win community support towards wildlife conservation without compromising their livelihood means?
21. What can you say of the attitude of the community towards wildlife of Kamnarok in general?
22. Do you support development of wildlife conservation to county government and local communities?

Appendix X: Letter of Transmittal

Department of Geography
and Environmental Studies
Faculty of Arts
University of Nairobi
P.O Box 30197
Nairobi
0773541566 / 0721447050
17/6/2016

The Chief Warden
Kamnarok National Reserve
P.O Box 23
Kabarnet

Dear Sir/Madam,

RE: **RESEARCH STUDY**

I am a student in the department of Geography and Environmental studies, University of Nairobi pursuing a Doctor of Philosophy (PhD) in Environmental Planning and Management programme. Currently I am in the process of undertaking research on '*Analysis of Human Wildlife Conflicts and livelihood diversification among communities living adjacent to Kamnarok National Reserve in Baringo, Kenya*'

The purpose of this letter, therefore is to request your office to grant me permission to carry out the proposed research study

Yours, Sincerely
Togoch Kemboi Henry

Appendix XI: Letter of Authorization by NACOSTI



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: 020 400 7000,
0713 788787,0735404245
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/18/46863/21290**

Date: **21st February, 2018**

Henry Kemboi Togocho
University of Nairobi
P.O. Box 30197 - 00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “*Analysis of human wildlife conflicts on livelihood diversification among communities living adjacent to Kamnarok National Reserve.*” I am pleased to inform you that you have been authorized to undertake research in **Baringo County** for the period ending **20th February, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Baringo County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.


GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Baringo County.

The County Director of Education
Baringo County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

Appendix XII: Letter of Introduction from the Department of Geography and Environmental Studies, University of Nairobi



UNIVERSITY OF NAIROBI
Department of Geography and Environmental Studies

Tel: 318262 Ext. 28016
FAX: 254-2-245566
Telex 22095 Varsity Ke Nairobi Kenya

P.o. Box 30197
Nairobi
Kenya


14 December 2017

TO WHOM IT MAY CONCERN

This is to confirm that **Henry Kemboi Togocho (C80/79561/2015)** is a PhD student at the Department of Geography and Environmental Studies, University of Nairobi. He is pursuing his PhD in Environmental Planning and Management and is currently undertaking a research project on: **“Analysis of Human Wildlife Conflicts on Livelihood Diversification among Communities Living Adjacent to Kamnarok National Reserve in Baringo”**.

This letter is to facilitate in the application for a research permit.

Any assistance accorded to him will be highly appreciated.


Dr. Boniface Wambua
Chairman,
Department of Geography
&
Environmental Studies


/mkm

Appendix XIII: Research Permit


THIS IS TO CERTIFY THAT:
MR. HENRY KEMBOI TOGOCH
of UNIVERSITY OF NAIROBI, 0-30100
ELDORET, has been permitted to conduct
research in Baringo County

on the topic: ANALYSIS OF HUMAN
WILDLIFE CONFLICTS ON LIVELIHOOD
DIVERSIFICATION AMONG COMMUNITIES
LIVING ADJACENT TO KAMNAROK
NATIONAL RESERVE

for the period ending:
20th February, 2019



Applicant's
Signature


Permit No : NACOSTI/P/18/46863/21290
Date Of Issue : 21st February, 2018
Fee Recieved :Ksh 2000


Director General
National Commission for Science,
Technology & Innovation

CONDITIONS

1. The License is valid for the proposed research, research site specified period.
2. Both the Licence and any rights thereunder are non-transferable.
3. Upon request of the Commission, the Licensee shall submit a progress report.
4. The Licensee shall report to the County Director of Education and County Governor in the area of research before commencement of the research.
5. Excavation, filming and collection of specimens are subject to further permissions from relevant Government agencies.
6. This Licence does not give authority to transfer research materials.
7. The Licensee shall submit two (2) hard copies and upload a soft copy of their final report.
8. The Commission reserves the right to modify the conditions of this Licence including its cancellation without prior notice.


REPUBLIC OF KENYA


National Commission for Science,
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RESEARCH CLEARANCE
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Serial No.A 17575

CONDITIONS: see back page

Appendix XIV: Similarity Index Report

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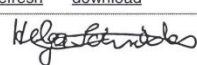

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**ANALYSIS OF HUMAN WILLDLIFE
 CONFLICTS ON LIVE... By Henry
 Togoch**

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