LIVELIHOOD DIVERSIFICATION STRATEGIES AND LIVELIHOOD OUTCOMES AMONG AGRO-PASTORAL HOUSEHOLDS IN LAIKIPIA NORTH SUB-COUNTY, KENYA

MARTIN WAITHAKA IRUNGU (BSc)
H60/31117/2015

DEPARTMENT OF POPULATION, REPRODUCTIVE HEALTH, AND COMMUNITY RESOURCE MANAGEMENT

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DECLARATION

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

Signature ……. Date ……30th August 2022…

Martin Waithaka Irungu – H60/31117/2015

Department of Population, Reproductive Health and Community Resource Management &Extension

Supervisors:

This thesis has been submitted for review with our approval as university supervisors:

Signature ……. Date …30th August 2022 …….

Joan Kabaria- Muriithi (Phd)

Department of Population, Reproductive Health and Community Resource Management &Extension

Kenyatta University

Signature ……. Date ……30th August 2022…...

Prof. Jane Rose Njue

Department of Family and Consumer Sciences

Northern Illinois University

DEDICATION

This research work is dedicated to my mom Beth Muthoni for her unwavering support through my education and my wife, Phyllis Kamau, for her continuous encouragement during my studies. Lastly my children Paisley and Wesley who challenges me to set a high bar in the academia space.

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ABSTRACT

Despite the existing efforts by the agro-pastoral communities to seek livelihood alternatives, they still encounter persistent livelihood insecurity. The growing burden of the need to address food scarcity, among other crises, reflects Arid and Semi-Arid Lands communities' inability to survive without external aid. This study aimed to investigate livelihood diversification strategies and the subsequent livelihood outcomes among agro-pastoral households in Laikipia North Sub-County, Kenya. The specific objectives of the study were; to establish the demographic characteristics of the agro-pastoral households; to investigate the livelihood outcomes; to explore the influence of assets on livelihood outcomes; to establish the relationship between livelihood challenges and livelihood outcomes among agro-pastoralists and to establish the relationship between livelihood diversification and livelihood outcomes in Laikipia North Sub-County. The study adopted a cross-sectional survey design where a sample of the population was selected, and from these individuals, data was collected to help answer the research questions. A total of 422 households were systematically sampled. Data was collected from household heads using household questionnaires and key informant interview guide with County Agriculture and Livestock Officer. Analysis of data was done using SPSS (version 20). Pie charts, frequency tables, and bar graphs present study findings. Significant correlations between variables were tested using the Chi-square test and Spearman rank correlation coefficient at a significance level of 0.05. The study realized a response rate of 90.3% of whom 55.9% were household heads. The average years the respondents had lived in the area was 43. The study found that climate change was a major cause of disparity between the past and current livelihood diversification strategies at 40.7%. Assets (physical, financial and social) were found to significantly influence livelihood outcomes. However, the challenges the respondents faced were found to have no significant influence on the livelihood outcomes (χ=1.017, df =1, p=0.313). Finally, there was a significant relationship between the adopted livelihood strategies and livelihood outcomes (χ^2=14.730, df =1, p=0.000, r=-0.197). The study made recommendations to the relevant entities to strengthen extension services, improve infrastructure and provide a conducive business environment.

LIST OF ABBREVIATIONS AND ACRONYMS

ASAL	- Arid and Semi-Arid Lands
CETRAD	- Center for Training and Integrated Research in ASAL Development
CIDP	- County Integrated Development Plan
DFID	- Department for International Development
GOK	-Government of Kenya
FAO	– Food and Agriculture Organization
HH	-Household Head
IPCC	-Intergovernmental Panel on Climate Change
LVD	-Livelihoods
LRA	- Long Rains and Food Security Assessment
NGO	– Non-Governmental Organization
NEMA	- National Environment Management Authority
PSV	- Public Service Vehicle
SDGs	- Sustainable Development Goals
SLF	– Sustainable Livelihood Framework
SPSS	- Statistical Package for Social Sciences
UNDP	- United Nations Development Programmes
UNEP	- United Nations Environment Programmes

OPERATIONAL DEFINITION OF TERMS

Agro-pastoral households –households whose main livelihood income is livestock rearing and/or crop cultivation

Assets – These are physical material acquisitions within a family and can easily be converted or measured in monetary terms

Household – these are people living in the same house for daily food essentials, which could entail; husband, wife, children, or other members of the extended family

Livelihood – activities and assets that create capacity to earn a living

Livelihood diversification strategies – Activities through which individuals and households realize diverse livelihood portfolios to ensure survival based on available assets

Livelihood Challenges

Livelihood Outcomes- the goals that people hope to achieve as they pursue various activities such as increased income, better health, and increased self-reliance

Sustainable livelihood – livelihoods that can withstand shocks over now and in the future without undermining the environment

Livelihood Vulnerability – the inability of particular household livelihood strategies to withstand shocks and seasonality of factors beyond household control eg. Droughts or livestock diseases

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

More than forty percent of the earth's surface is made of Arid and Semi-Arid Lands (ASALs). Its principal inhabitants are pastoral and agro-pastoral communities (United Nations Development Programme, 2013). There are growing poverty rates and depletion of natural resources in ASALs mainly due to climatic extremes attributed to climate change phenomena and human activities (Ning, Ismail, Joshi, Shao, Shreshtha & Jasra, 2014). The phenomenon of climate change has become a significant concern and is one of the leading global crises undermining sustainable development.

Through the agenda 2030, the world is committed to alleviating poverty recognizing that "eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest challenge and an indispensable requirement for sustainable development". Sustainable Development Goal 1 (SDG#1) is explicitly focused on halving the proportion of men, women, and children living in poverty in all its dimensions (UNDP, 2015). The Intergovernmental Panel on Climate Change (IPCC) report (2013) indicates that climate change is rising and remains a real challenge deepening poverty among ASALs inhabitants whose primary livelihood source is agro-pastoralism. The report shows that the livelihoods of the poor, especially in developing countries, are most at risk (IPCC, 2013).

Livelihood diversification is defined as the attempt by rural households to develop a diverse portfolio of activities and assets to survive and improve their living standards (Department for International Development, 1999). Individuals and households devise new means to generate income to overcome environmental risks brought about by ecological extremes (Eneyew, 2012).

In Africa, there is unprecedented vulnerability among agro-pastoral livelihoods with rampant poverty manifested through persistent food insecurity. Poor infrastructure,

scarce resources, conflicts, and environmental degradation make ASAL inhabitants vulnerable due to poor land-use practices. (Ojwang, Agatsiva & Situma, 2010).

Pastoralists and agro-pastoralists inhabiting ASALs in East Africa are characterized by high poverty index and recurrent food insecurity, which have focused on relief aid by governments and humanitarian agencies (Elhadi, Nyauki, Wasonga & Ekaya, 2012). Over 80% of Kenya's landmass is ASAL, with the main activity in the areas being pastoralism, with over 60% of Kenyan livestock being in these areas. Pastoralism is the source of livelihood to approximately 90% of the ASAL population (GoK, 2008). However, there has been a growing trend in agro-pastoralism in the recent past, where traditional pastoralists diversified into crop cultivation on the scarce arable land (Muho & Kosonei, 2013). Pastoralists and agro-pastoralists constitute over 70% of the approximate 18 million Kenyans living below the poverty line, less than $1.25 a day (UNDP, 2013).

A study carried out in 2015 by Kenya Food Security Steering Group (KFSSG) in Laikipia County on livelihood sources found that the county is highly dependent on rainfall with the major livelihood activities being crop production and livestock rearing. The study also highlighted other factors contributing to livelihood vulnerability: poor rains seasons, elevated food prices, crop pests and diseases, livestock diseases, and human-wildlife conflicts in areas bordering game reserves (KFSSG, 2015). These factors have triggered communities in these areas to develop coping and adaptation strategies to counter livelihood vulnerability, including diversifying their livelihood strategies by adopting alternative income-generating activities (Kimani, Ogedi & Makenzi 2014). However, these alternative livelihoods have not adequately addressed their vulnerability (Kimani, Ogedi & Makenzi 2014).

1.2 Problem Statement

The growing burden of the need to address food scarcity, among other crises, reflects ASAL communities' inability to survive without external aid. Despite the existing efforts by the agro-pastoral communities to seek livelihood alternatives, they still encounter persistent livelihood insecurity (Kimani et al., 2014). Such humanitarian organizations is to address food scarcity, among other issues facing this population, reflects the inability of ASAL communities to survive without external aid (Wren & Speranza, 2013); for example, studies indicate that 80% of pastoralists and agro-pastoralists in East Africa ASALs depend on relief either as cash or food to meet their basic needs (Wren & Speranza, 2013). This indicates that livelihood and resource utilization in the dry zones are not sustainable and, therefore cannot fulfill the living standards of the local communities (Kimani et al., 2014). There is a need for intervention to strengthen livelihood diversification options that are more practical and sustainable in the ASAL context.

A study by Eneyew (2012) found that agro-pastoralists bows to the pressure of resource depletion, drought, loss of livestock, diminishing rangelands and cultivation land, loss of traditional governance, lacking market for their agro-pastoral goods, minimal amenities, social services, and water for animal and human consumption (Eneyew, 2012). Loss of vegetation and water resources in the rangelands as a result of droughts have led to loss of livestock and decline in arable land in ASALs. (Coppock, Tezera , Desta & Gebru, 2012). Other factors adding to the pressure include; increasing human and livestock population in the areas and land-use changes. As a result, agro-pastoral communities are pressured to seek alternative livelihood options to maintain their daily living, especially those not dependent on rainfall (Ayantunde, Turner, and Kalilou, 2015).

Even though alternative livelihoods are pursued, they are mostly not sustainable (UNDP, 2013). According to Laikipia County Integrated Development Plan (CIDP), activities such as sand harvesting and charcoal burning have been rising in the county. These activities have been reported to have adverse effects on the environment, increasing the risk of climatic extremes, specifically droughts and further depleting the natural resource base, thus pushing the inhabitants into a further vulnerable state (CIDP, 2013). This study sought to explore livelihood diversification strategies pursued and the subsequent livelihood outcomes among agro-pastoral households in Laikipia County.

1.3 Justification of the Study

Kenya, like other countries in Sub-Saharan Africa (SSA), looks forward to achieving the Sustainable Development Goals (SDGs) and targets aimed at, among others; ending poverty in all its forms everywhere (SDG#1); ending hunger, achieving food security and improved nutrition and promote sustainable agriculture (SDG#2) (UN, 2015). To achieve such goals, pastoral and agro-pastoral communities must be proactive in developing policies and interventions that make their livelihoods more sustainable.

Approximately 43 % of the population in Laikipia County is living below the poverty line, representing 183,663 poor persons (County Integrated Development Plan, 2013). Therefore, there is a need for more localized understanding on exposure to livelihood vulnerability posed by environmental extremes and variability in ASALs, particularly drought, crop and livestock epidemics, and floods (United Nations Environment Programme, 2011). A look at livelihood diversification approaches undertaken by the agro-pastoral households is, therefore, appropriate. An understanding of factors influencing diversification strategies and the subsequent livelihood outcomes among local households and the community at large should also be sought. According to Laikipia Long Rain and Food Security Assessment Report, agro-pastoral households

remain susceptible to livelihood insecurity, most of them in Laikipia North constituency (LRS, 2015). Therefore, it is vital to look at sustainable livelihood options that can be implemented/or strengthened among the agro-pastoral communities, which will be part of this study's recommendations.

This study focuses on various assets within ASAL communities, including natural capital, human capital, social capital, and financial capital. These assets are key elements in livelihood determination, livelihood strategies utilizing the assets and the resulting outcomes. The study is, therefore, timely and essential.

1.4 Purpose of the Study

This study investigated livelihood diversification strategies and livelihood outcomes among agro-pastoral households in Laikipia North Sub-county, Kenya.

1.5 Study Objectives

The specific objectives of the study were to;

1. Investigate the effect of household characteristics on livelihood outcomes among agro-pastoral households in Laikipia North Sub-county
2. Establish the influence of household assets on livelihood outcomes among agro-pastoral households in Laikipia North Sub-county.
3. Establish the relationship between livelihood diversification challenges and livelihood outcomes among agro-pastoralists in Laikipia North Sub-county
4. Determine the relationship between livelihood diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County

1.6 Study Hypotheses

The following hypotheses guided this study;

Ho_1 There is no statistical influence of household assets and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County

Ho_2 There is no statistical relationship between livelihoods diversification challenges and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County

Ho_3 There is no statistical relationship between livelihood diversification strategies and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County

1.7 Significance of the Study

The Cabinet Secretary in the Ministry of Social Development may use the study findings to get more information on agro-pastoral livelihood strategies, challenges, and opportunities in livelihood diversification. The study identifies key livelihood components that can be enhanced to address the agro-pastoral vulnerability. This information is essential, especially to relevant government agencies and NGOs in identifying appropriate interventions that will improve the capacity of agro-pastoral households for the security of their livelihoods. Following this study, the local agro-pastoral communities may obtain necessary information to the to adopt livelihood strategies that are more sustainable and do not deplete the natural resource base. More importantly, vulnerable communities will benefit from the study as it gears support for alleviating poverty among such populations, thus contributing to the more significant policy blueprints, especially achieving the Sustainable Development Goals (SDGs) and Kenya's vision 2030. The academia and literature pool as a whole, the study greatly contributes to information and knowledge on agro-pastoralists livelihood diversification outcomes.

1.8 Limitations and Delimitations of the Study

The study experienced challenges relating to accessibility of some selected households. The area is diverse and settlements too sparse. However, the researcher countered this

with spreading data collection between wider time periods. The researcher also engaged research assistants to collect data as planned. The study focused on a sample of a population within Laikipia North Constituency. Therefore, generalizing study findings to other areas in Kenya should be done inimitably due to differing climatic, socio-economic, and demographic characteristics.

1.9 Assumptions of the Study

The study assumed that household heads are either men or women responsible for household management, production, and subsistence. They make decisions about adapting to the household's changing conditions, and therefore, views, opinions, and suggestions will represent the household.

1.10 Theoretical Framework

The theoretical background in which this study was based was the Department for International Development (DFID) Sustainable Livelihood Framework (SLF), a tool developed to improve understanding on livelihoods. The SLF is built on Chambers Conway's (1992) definition of livelihoods, where a livelihood is said to be sustainable "when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base." (DFID, 2000).

SLF illustrates that individuals and households live in vulnerable contexts with influence and access to various assets in several forms, including social capital, natural capital, physical capital, human and financial capital. No single asset can independently produce satisfying livelihood outcomes people seek, especially among the poor who have limited assets (DFID, 1999).

The interaction with the assets determines the livelihood strategies of individuals and households and consequently influences livelihood outcomes, whether positive or negative (Kollmair et al., 2002; Globalization and Livelihood Options of People Living

in Poverty, GLOPP, 2008). Individuals and households under SLF are given a chance to make choices, seize the current livelihood opportunities and diversify livelihood approaches to achieve livelihood goals. Diversification entails people changing from one form of employment to another and a dynamic approach combination of various activities to meet their needs (DFID, 1999).

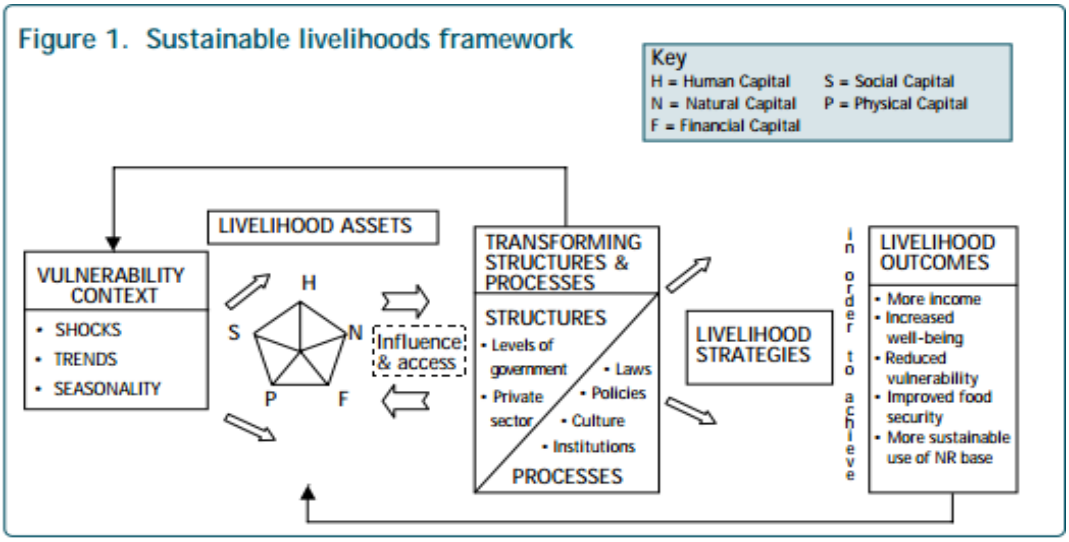

Figure 1.1 Theoretical framework on Sustainable Livelihoods
Source: DFID's Sustainable Livelihoods Guidance Sheets (1999)

1.11 Conceptual Framework

The study variables were conceptualized as shown in Fig 1.1 below to illustrate the interaction of factors that influence livelihood diversification and the resulting outcomes. The model identifies four independent variables: household characteristics, household assets, Livelihood diversification challenges and diversification strategies. The intervening variables are Government role and laws, Private sector and Culture that are pursued by households and interventions put in place by the community and government. The reciprocal arrows within these variables show their close relationship and ability to influence each other. The dependent variable is household livelihood outcomes in the form of Income levels, vulnerability levels, wellbeing status, and food security. The vulnerability levels are conceptualized as having three levels of low

(survival), medium (security), and high (growth) in increasing order, according to McKee, (1989). Livelihood outcomes have a significant positive or negative effect on elements of livelihood diversification strategies and, therefore, the feedback loop.

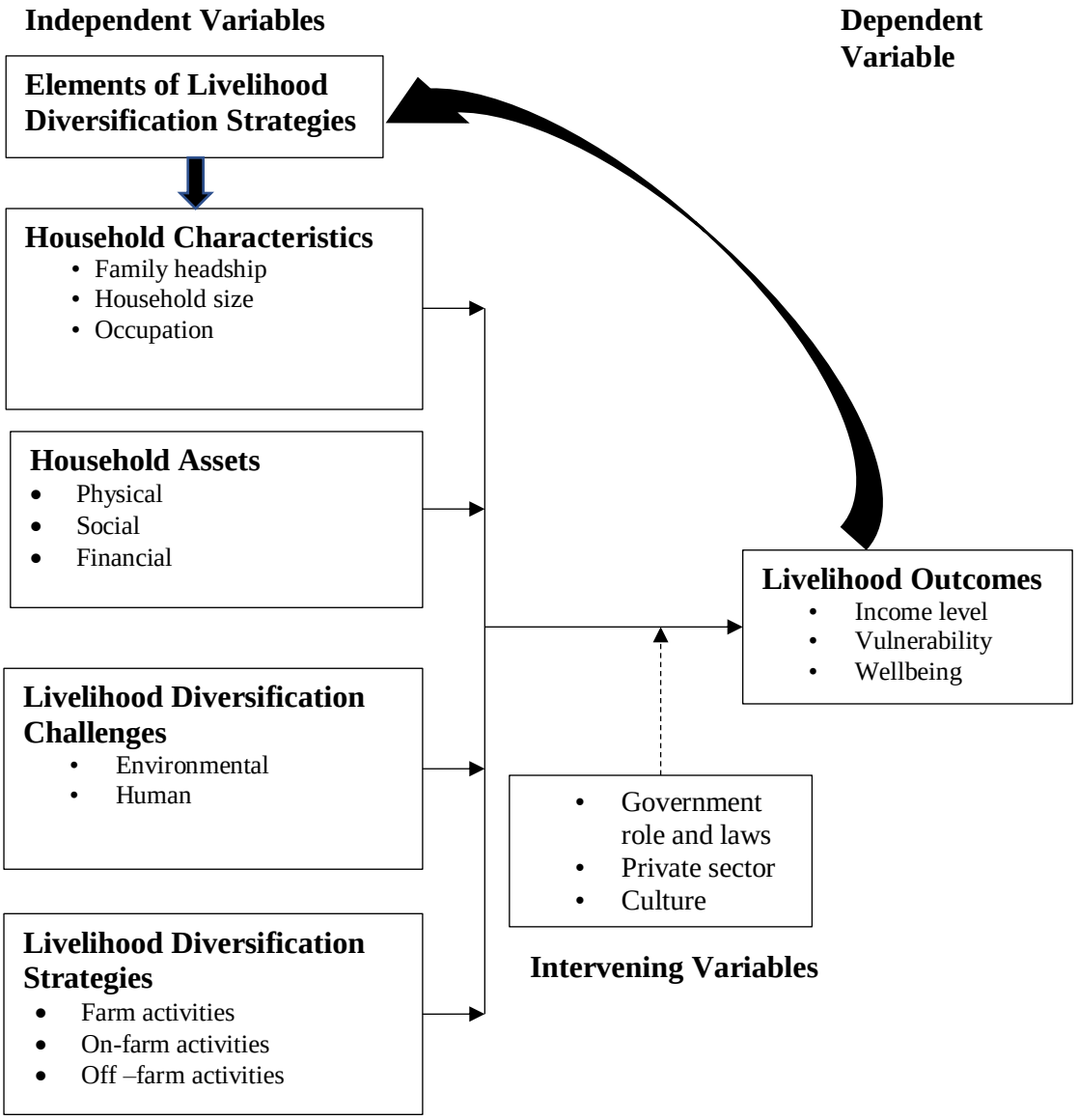

Figure 1.2 Conceptual Framework
Source: Adapted from McKee (1989).

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

In this chapter, the researcher presents the concepts that form the backdrop of this study. These include Sustainable Livelihood Framework, agro-pastoral livelihood challenges, livelihood diversification, and livelihood diversification assessment.

2.1 Sustainable Livelihood

Chambers Conway (1992) defined livelihood as comprising capabilities, assets, and activities required for a means of living. Livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, and provide livelihood opportunities for the next generation without undermining the natural resource base (Chambers, 1992).

2.1.1 The Sustainable Livelihood Framework

This study is guided by the DFID Sustainable Livelihood Framework (SLF), which has the following elements: livelihood assets, transforming structures, vulnerability context, livelihood strategies, and livelihood outcomes.

2.1.1.1 Livelihood Assets

The DFID framework proposes that peoples' strengths in the form of "assets" is converted into positive livelihood outcomes. To achieve a positive outcome, individuals must have a range of assets upon which livelihood is built, including Human capital (e.g., education, skills, knowledge, capacity to work, capacity to adapt, good health), Social Capital (e.g., networks and connections, relations of trust, membership in formal and informal groups, leadership representation), Financial capital (e.g., cash, savings, bank deposits, credit, pensions, wages), Physical capital (e.g., basic infrastructure - means of transport, secure shelter, adequate water supply, and sanitation, affordable energy, access to information, and producer goods - tools, equipment, technology) and

Natural capital (e.g., land and its produce, water and its resources, forest and forest products and wildlife (Kipainoi,2013).

2.1.1.2 Transforming Structures and Processes

According to the SLF (1999), Structures are institutions, organizations, policies, and legislation that affect livelihoods. These structures operate from household to macro levels and in all spheres at public and private arenas. These structures also determine access to various capitals, influence livelihood strategies and decision-making, and significantly affect returns on capitals resulting from any livelihood strategies undertaken by households and individuals (DFID, 1999).

2.1.1.3 Vulnerability Context

The Sustainable Livelihood Framework posits that people live in a context of vulnerability due to limited environmental factors or no control over them. The context entails shocks, seasonality, and trends that greatly influence peoples' livelihoods and the availability of assets (DFID, 1999).

A synthesis paper by the Humanitarian Policy Group HPG in 2009 indicates that when people have inadequate capacity to respond effectively or to withstand the negative impact of shocks, seasonality, and trends, they are vulnerable (HPG, 2009). Although the causes of vulnerability are diverse, the main determinants are widespread poverty, food insecurity, recurrent droughts, land degradation, and overdependence on rain-fed agriculture (Notenbaert et al. 2013; Lo´pez-Carr et al. 2014).

2.1.1.4 Livelihood Strategies

Livelihood strategies entail a dynamic process where people engage in different activities to achieve various needs. The strategies are dependent on the asset base household characteristics, among other factors. According to Kimani et al, (2014) when the traditional livelihood strategies are overwhelmed by the vulnerability context,

households have to develop coping/adaptive strategies to survive (Kimani et al., 2014). Livelihood strategies of one household affect income levels. The focus of this study is to investigate livelihood diversification strategies and their outcomes among agro-pastoral households in the context of their vulnerability to climatic variability and extremes.

2.1.1.5 Livelihood Outcomes

Livelihood outcomes is the intended result of livelihood strategies in relation to interaction with other elements of the SLF. The SLF are mainly household characteristics, assets, households' livelihood strategies and other interventions by the community and government (DFID, 1999). As one of the outcomes of diversification, an increase in income is not independent as it may result from a strategy that depletes the natural resource base. Therefore, localized acceptable measures are required for the agro-pastoral livelihood strategies and diversification approaches they adapt. (Kimani at *al*., 2014). Livelihood outcomes reflect the results of peoples' livelihood strategies in a particular context (Toth, Huzui-Stoiculescu, Toth, & Stoiculescu, 2020).

2.2 Agro-pastoral Livelihood Challenges

Pastoral and agro-pastoral communities inhabit Arid and Semi-Arid Lands in Africa with livestock playing a major role in their livelihoods. In Kenya, livestock contributes to over 12% to GDP and 47% to agricultural GDP (Kabubo-Mariara 2009; Silvestri, Bryan, Ringler, Herrero & Okoba, 2012). These authors state that most livestock production occurs in arid and semi-arid lands (ASALs), which are estimated to support about 25% of the human population. Approximately 70% of Kenyan livestock, worth US$800 million per year, is produced in ASALs (Amwata, Nyariki & Musimba, 2015).

Despite the economic importance of ASALs, they have not received sufficient attention proportionate to their stake in economic development. These zones continue to be

disregarded in terms of infrastructural and technological development, resource allocation, economic transformations, and social services provision, a phenomenon that has continuously threatened the sustainability of their livelihoods (Amwata et al., 2015). Agro-pastoralists have been adopting alternative livelihood strategies to increase resilience to ASALs vulnerability. Such alternatives include sand harvesting, charcoal burning, and small-scale businesses (Silvestri et al., 2012).

Crop cultivation may not achieve livelihood security as dynamic ecological and environmental change models suggest climate change-induced drought may push dryland systems to cross biophysical thresholds, causing a long-term drop in agricultural productivity (Fraser, Dougill, Hubacek, Quinn, Sendzimir & Termansen, 2011). Fraser et al. (2011) suggest the need for studies to explore development strategies and socioeconomic changes that help livelihoods become more resilient and robust at a time of growing climatic risk and uncertainty (Fraser et al., 2011). This study investigated the alternative livelihood strategies adopted by agro-pastoral households and their significance in income level measures.

2.3. Agro-Pastoral Livelihood Diversification

Intergovernmental Panel on Climate Change (IPCC) report 2013 indicates that pastoral and agro-pastoral communities whose livelihoods are dependent on natural resources are the most vulnerable to climatic change in ASALs. Pastoral and agro-pastoral communities have traditionally developed coping and adaptation strategies that have helped them reduce vulnerability (Kimani et al., 2014). A study by Kimani et al (2014) further suggests that community-based and collectively-held knowledge may offer valuable insights to complement scientific knowledge to devise strategies that will go a long way in securing ASALs' livelihoods (Kimani et al., 2014). However, Fraser et al. (2011) highlighted that the combined scientific and indigenous knowledge on coping strategies might not have a lasting solution to livelihood vulnerability among the agro-

pastoralists. According to National Environment Management (NEMA), Laikipia State of Environment Report, the increasingly reducing rangeland and diminishing livestock pastures have rendered traditional migration strategies by pastoralists in search of pastures unviable. The move has recently contributed to conflicts among pastoral communities (NEMA, 2013).

Therefore, income diversification is key to overcoming vulnerability in ASALs as it emerges as the better alternative for pastoral and agro-pastoral livelihood with options such as trade and wage income that minimize over-reliance on agro-pastoral based income. The conclusion is informed by other studies showing that current livelihoods and resource use patterns in the ASALs are insecure and cannot maintain, let alone improve, the living standards of the inhabitants (Ngugi and Nyariki, 2005; Amwata et al., 2015). For instance, Laikipia County Integrated Development Plan (2013-2017) indicates that erratic weather patterns decrease surface and ground water volume and reduce land productivity. This has led to pasture and crop loss resulting in famine, especially in Laikipia North Sub-County, leading to increased conflicts (Human/wildlife, Human/human) in competition for inadequate resources and livelihoods (CIDP, 2013). Livelihood diversification is one of the main viable options to cope with livelihood insecurity in the drylands (Amwata et al., 2015).

Livelihood diversification in multiple interactions with poverty, income distribution, farm productivity, and environmental conservation is sometimes not straightforward, as Ngugi and Nyariki (2005) suggested in Amwata et al. (2015). Therefore, a study on analyzing livelihood diversification strategies and subsequent livelihood outcomes was of great importance.

2.4. Livelihood Diversification Assessment

A household with a higher number of income-generating sources can be more diversified than a household with fewer income-generating sources (Sènakpon, Dedehouanou & McPeak, 2020). Key dimensions of analysis studied include household characteristics, sources of household income, social-economic status, livelihood diversity indices, and coping strategies in assessing livelihood diversification. Livelihood diversity indices is calculated using the Inverse Simpson Index of Diversity formulae;

$$LD=1/S\ Pi^2.$$

According to the index, if there are *n* number of different income sources, then P*1*, P*2*…...P*n* denotes the proportion of household income generated by various activities. The index considers the number of income sources and income distribution among the other sources. Households with higher diversified income will get the highest diversity value. Households with only one source of income will get a value of 1, which is the minimum value possible (Sènakpon, Dedehouanou & McPeak, 2020).

2.5 Summary of the Literature Review

With the view of the SLF, agro-pastoralists live in the context of vulnerability, especially from climatic stresses. These phenomena have contributed to the depletion of the highly depended natural capital. Reviewed studies agree that pastures and cultivation land can no longer independently sustain agro-pastoral livelihoods. While this is evident in several studies, the diversification concerns in missing. Moreover, the methodologies and scope used in the previous studies are common, and none applies to the unique proposed study location of Laikipia North. Therefore, further diversification into other income sources is a prime alternative for the ASALs inhabitants to achieve better livelihood outcomes. Livelihood options undertaken by the households should be

sustainable and not deplete natural resource base leading to further vulnerability. Existing livelihood options resilient to ASAL context should be strengthened while new ones not practiced are introduced. Therefore, a study aimed at investigating livelihood diversification strategies and subsequent livelihood outcomes among agro-pastoral households is timely and necessary.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

In this chapter, research design, target population, sampling procedures, and techniques for the study are discussed. In addition, the research instruments used, and the data analysis procedures are outlined.

3.1 Research Design

This study adopted a descriptive survey design that was cross-sectional in nature. This design was chosen for the advantage that the information gathered would be used to describe the livelihood outcomes as well the underlying determinants of livelihood strategies. This is explained as the relationship between independent, intervening, and dependent variables at a given time (Siedlecki, 2020).

3.2 Measurement of Variables

The independent variables in the study were household characteristics, household assets, livelihood diversification challenges and livelihood diversification strategies. Household characteristics were measured by household size, number of dependents, education level, household income, contribution by household members, and asset ownership (Physical, social and financial). Household assets were measured by the Physical, Social and Financial capabilities. Livelihood diversification challenges ware measured by considering indicators including environmental or human sources. On the other hand, livelihood diversification strategies were measured by farm, on-farm, and off–farm activities. Diversification strategies were also assessed in terms of livelihood portfolio share to calculate livelihood diversity. Diversity count was used to come up with participation and income shares among practiced livelihood activities. Interventions initiated by the community and other stakeholders were analyzed. The dependent variable, livelihood outcomes were measured using McKee's (1989) income

level scale; survival, security, or growth, focusing on income, food availability, and housing ownership.

3.3 Study Area

The study was done in Laikipia North Sub-county (LCDP, 2013). The area has four administrative wards, namely, Sosian, Segera, Mukogodo East, and Mukogodo West, with 5,434.3 km^2. According to CIDP, Laikipia County Poverty Index (HPI) stands at 57.3, far higher than the national average of HPI of 29.1. Laikipia North has the highest poverty rate, with over 50% of its population living below the poverty line (CIDP, 2013). The area is also located in the extreme part of Rift Valley, which experiences low rainfall amount, poor rainfall occurrence, and intensity. This makes the area prone to major natural disasters such as drought. However, the soil fertility and its neighboring of the populated Central region of Kenya puts it at high demand for settlement. This has significantly increased the population in the area in the recent times despite the unfavorable natural conditions for human settlement. This creates room for challenging livelihood in the area. This formed the basis of choice of the area for study.

3.4 Target Population

According to Kenya Bureau of Statistics (2009), Laikipia North Sub-County had a population of 72,280 and approximately 18,010 households. The area has a sparse population density of 13persons/km^2. Agro-pastoralism is the major livelihood source among the households producing over 80% income (CIDP, 2013). The study's target population was pastoral and agro-pastoral households with the respondent being the household head.

3.4.1 Exclusion and Inclusion Criteria

Household heads who had not lived in the area for more than five years were excluded from the study. This was to ensure that the respondents were well-versed with the

livelihood issues in the area. Thus, the study included both pastoral and agro-pastoral households.

3.5 Sampling Techniques

To get the number of households, the researcher used proportionate sample size determination in the four administrative wards in Laikipia North, namely, Sosian, Segera, Mukogodo East, and Mukogodo West. Systematic random sampling was used to acquire the samples studied in every ward. According to Siedlecki (2020), systematic sampling involves selecting subjects directly from the sampling frame that is listed progressively. For this study, a list of households in the selected wards was prepared and randomized to compile a list comprising all the households to ensure even sampling from the population.

Table 3.1: Sampling Distribution

Wards in Laikipia North	**Population size**	**Number of households (N)**	**Percentage Proportion**	**Sample Size of (HH)**
Sosian	26,077	5926	33	139
Segera	16,002	3637	20	84
Mugogodo West	13,715	3117	17	72
Mugogodo East	23,412	5330	30	127
Total	**79,206**	**18010**	**100**	**422**

Average HH size 4.4 (KNBS, 2015)

3.6 Sample Size

The Fisher formula was used to come up with the sample size (Fisher et al., 1983)

$$N = \frac{Z^2pq}{d^2}$$

Where n= desired sample size

z=standard normal deviate at the required confidence interval (95 probability error =1.96)

p= proportion of occurrence of the phenomenon (0.5 since unknown).

q=the proportion of non-occurrence is (1-p) = 0.5

d=the level of statistical significance (0.05 for 95% level of significance)

$n = \frac{1.96^2 * 0.5 * 0.5}{0.05^2}$ = 384 respondents

To cater to the non-response cases, 10% of the sample size was added to develop the final sample size for the study as 422 respondents.

3.7 Research Instruments

The researcher used household questionnaires with the household heads to collect data on household characteristics, assets, livelihood strategies, and coping strategies. A key informant interview guide was used to interview the County Agriculture and Livestock Officer on interventions by the government and other stakeholders. The use of different research instruments was to help in the triangulation of findings. The questionnaires were designed systematically with instructions leading the forehead. The demographic characteristics for the respondents were also indicated. The other items followed suit with the order of study objectives as household characteristics, household assets, livelihood diversification challenges, and livelihood diversification strategies. Similarly, the interview guide for the key informant was arranged in the same order of the study themes. The choice of the County Agriculture and Livestock Officer was guided by their unique role allocated in the County to assess and report on livelihoods of the agro-pastoralist populations.

3.8 Pre-Testing

Household questionnaires were pretested before the study to establish the efficiency in collecting relevant information. The pretesting was conducted in the neighboring Nyandarua County to avoid biases associated with attrition, maturation and history (Flannelly, Flannelly & Jankowski, 2018). The pilot sample entailed 42 (10% of the study sample) households in the same Laikipia North sub county who were not targeted

for the main study. Data collected was checked against the objectives making appropriate adjustments to ascertain relevance.

3.9 Validity and Reliability

The validity of the research instruments was tested to estimate the degree to which the instrument measured intended variables (Mu). Content validity was established by seeking expertise of the study supervisors. Interview guides were pre-tested, and their clarity and simplicity were ascertained. Standardization was done, and recommendations given were included in final questionnaire. Test-retest method also affirmed the reliability of the tools, where the tools were administered to sample respondents twice within two weeks and findings were compared. A correlation coefficient of 0.78 was obtained, which was higher than the recommended threshold of 0.75 (Chen, Yang & Jensen, 2020).

3.10 Data Collection Techniques

Household questionnaires were administered to household heads on household characteristics and livelihood diversification strategies. Respondents were visited in their homes for questionnaire administration and guidance on filling given. The illiterate ones were allocated an assistant who had been inducted on the questionnaire. A team of four research assistants was trained before the survey comprising individuals with diverse knowledge in community livelihoods. The training of research assistants entailed topics on challenges facing households, and opportunities for livelihood diversification strategies were reported using essential to standardize data collection to minimize variations in data collection procedures that may bias the results (Siedlecki, 2020). Appointmentwas booked in advance for key informant interview with the County Agriculture and Livestock Officer and collected data through audio recordings on phone.

3.11 Data Analysis and Presentation

Quantitative data entry and analysis was done using SPSS (version 20) for easy analysis and accuracy. Descriptive statistics of range measured the spread of scores for numerical data. The data was reported as percentages and frequencies and then presented in the form of tables. Inferential statistics such as Chi-square test of significance at $p<0.05$ level of significance was preferred since both the dependent and independent variables were categorical. It was used to establish the relationship between dependent and independent variables. The strength and direction of this relationship were determined using the Spearman rank correlation coefficient. This was to help to draw conclusions and to make recommendations. The findings were presented using tables and figures. The quantitative data was triangulated with qualitative data from the interviews. Qualitative data obtained is organized into distinct categories, patterns and themes identified. The qualitative findings were presented using verbatims and thematically based on the study objective.

3.12 Logical and Ethical Considerations

Ethical clearance was obtained from the Ethical Review Committee from Kenyatta University as well as a clearance from the graduate school. A permit was sought from the National Commission for Science, Technology and Innovation (NACOSTI). A copy of the research authorization from NACOSTI was given to the County Commissioner (Laikipia County) who authorized the study. Informed and signed or thumb-printed consent was sought from the respondents. The researcher assured the respondents of the confidentiality and anonymity of the data and the collected data would only be used for the purpose of the study. The respondents were also informed that being included in the study was voluntary and that no payment or gifts would be offered to those who participated.

CHAPTER FOUR: FINDINGS

4.1 Overview

In this chapter, the researcher presents an analysis of the data collected, results and implications of the findings. This study assessed the outcomes of livelihood diversification among agro-pastoral households in Laikipia North Sub-County, Kenya.

Out of the identified four hundred and twenty-two (422) respondents, three hundred and eighty-one responded. This gave a response rate of 90.3%, which was considered adequate for the study as advanced by Timothy and Wislar (2012), Gatara (2010) and Jwan and Ong'ondo (2011).

Mogogodo East ward had the highest number of participants totaling to 133 (34.9%) participants, followed by Sosian ward with 132 (34.6%) participants. Segera and Mugogodo West wards had 58(15.2%) participants each as shown in table 4.1

Table 4.1 Number of participants per ward

Ward	Frequency	Percent
Sosian	132	34.7
Segera	58	15.2
Mugogodo west	58	15.2
Mugogodo East	133	34.9
Total	381	100

Source: Field Data (2017)

4.2. Household Characteristics and Livelihood Outcomes among agro-pastoral households in Laikipia North Sub-county

The study investigated the effect of household characteristics on livelihood outcomes among the agro-pastoralist communities in Laikipa North through specifying on particular constructs as shown in the following subsections;

4.2.1 Relationship of participant to the Household Head

The study participants were asked to indicate their relationship to the HH. This was to ascertain their participation and ensuring the respondent is a representative of the target audience. This was based on assumption that the household heads either or not involve other family members in decision making. Figure 4.1 presents the findings for this.

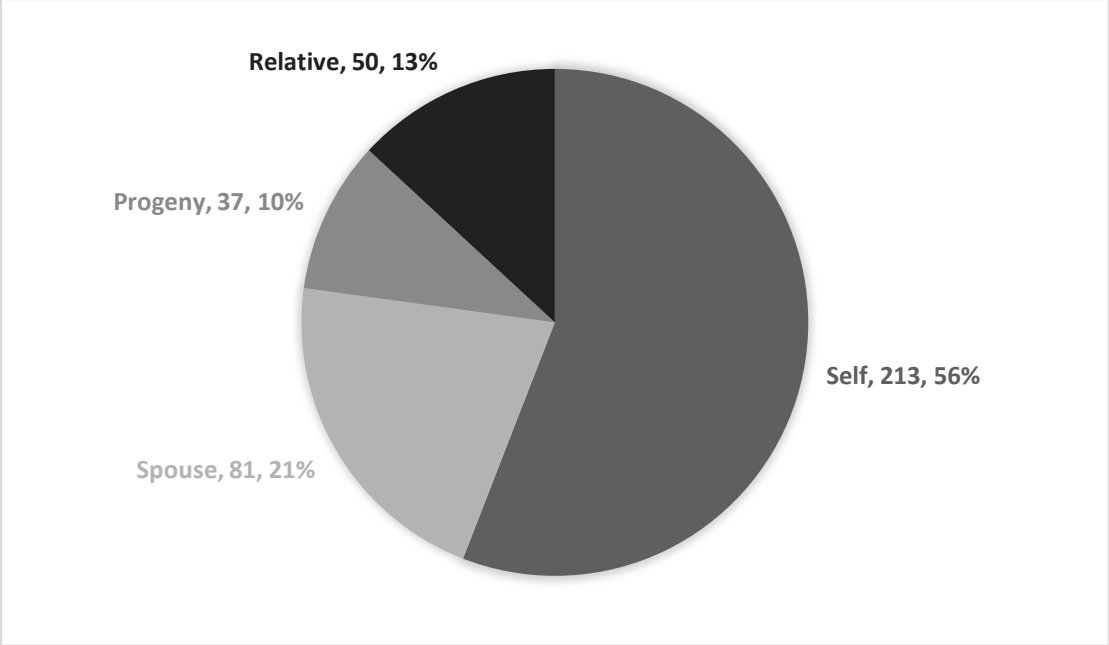

Figure 4.1 Relationship of the respondent to Household Head

Figure 4.1 shows that a majority 213(55.9%) of the participants were household heads. 81(21.3%) were spouses (either wife or husband) to the household head and 37(9.7%) were offspring of the household head. However, some participants, 50(13.1%) were relatives to the household heads.

4.2.2 Years Lived in the Area

The research participants were also requested to indicate the number of years they had lived in the area. This was to inform the interviewer whether the participant fits the study inclusion criteria. The findings are presented in Figure 4.2.

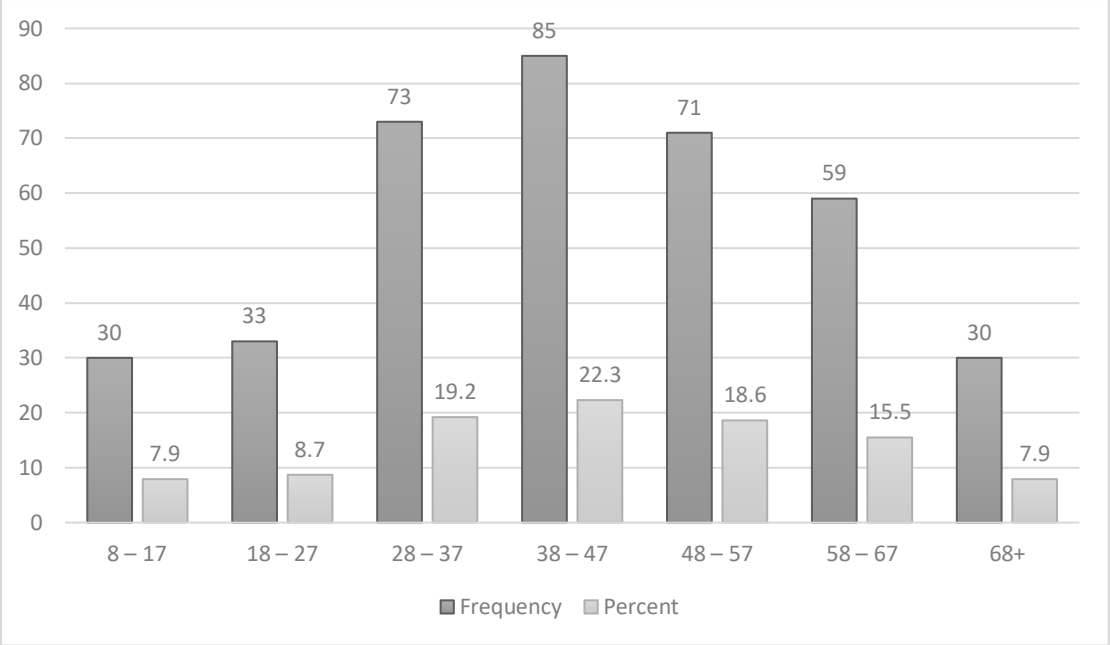

Figure 4.2 Number of years lived in the area (Frequencies)

From Figure 4.2, it can be seen that the least number of years lived by the participants in the area was 8 years while 72 years was the highest number of years lived by the participants in the area. Most of them 85(22.3%) had lived in the area for 38-47 years, 73(19.2%) had lived there for 28-37 years, 71(18.6%) had lived there for 48-57 years, 59(15.5%) had lived there for 58-67years and 33(8.7%) had lived there for 18-27years. Additionally, those who had lived in the area for 8-17years and over 68 years were 30(7.9%) each. The high frequency of participants that had lived longer in the area, adds to the efficacy of the data because they had a more long-term perspective of the responses, they provided to study questions. (see Figure 4.2).

4.2.3 Number of Dependents

The researcher sought for the number of dependents to the HH. Dependents influences the distribution of household livelihood assets which in turn influences the livelihood diversification and thus livelihood outcomes. The results are presented in Table 4.2.

Table 4.2 Number of Dependents

Dependents	Frequency	Percent
1 – 5	233	61.2
6+	148	38.8
Total	381	100

Table 4.2 shows that the least number of dependants the study participants had, was one (1) and the highest number of dependants was ten. Depedency ratio had significant impact on diversification strategies as later revealed by the study. Majority 233 (61.2%) of the participants had 1-5 dependants. Nonetheless 148(38.8%) had 6 and above number of dependants (see Table 4.2)

4.2.4 Household Head Gender

The participants were asked to indicate their gender. This was important to the study as gender determines how social norms and power structures impact the lives and opportunities available to either the male or female household heads. The results are presented in Table 4.3.

Table 4.3 Household head gender

HH Gender	Frequency	Percent
Male	195	51.2
female	186	48.8
Total	381	100

From Table 4.3, frequencies indicate that the gender distribution of the participants was almost equal, with 195 (48.8%) of the participants being female and 186 (51.2%) being male.

4.2.5 Household Head Marital Status

The study participants were asked to indicate their marital status. The findings were as shown in Table 4.4.

Table 4.4 Household head marital status

Marital Status	Frequency	Percent
Married	168	44.1
Single	101	26.5
widow/widower	100	26.2
Other	12	3.1
Total	381	100

The findings in Table 4.4 reveal that many 168 (44.1%) household heads were married; some were single (26.5%) while 26.2% were widows or widowers. However, a small percentage 12(3.1%) were either divorced or separated, or they were cohabiting.

4.2.6 Household Head Family Type

The researcher sought to find out the type of family the household head belonged to. This was to inform the study on household arrangements and how this influenced household livelihood. The findings are presented in Table 4.5.

Table 4.5 Household head type of family

Family Type	Frequency	Percent
Monogamous	267	70.1
Polygamous	114	29.9
Total	381	100

As shown on the table 4.5, 267 (70.1%) of the participants belonged to a monogamous type of family while 114 (29.9%) belonged to a polygamous type of family. Family type informs the sharing of resources including assets which was important to the study.

4.2.7 Household Head Level of Education

The researcher sought for the level of education for the HH. This was to inform the study on whether education level influenced livelihood practices and diversification strategies. Table 4.6 shows the findings.

Table 4.6 Household head education level

Education Level	Frequency	Percent
None	52	13.6
Basic/ Pre-primary (can write and read)	111	29.1
Primary school	120	31.5
Secondary	72	18.9
Tertiary	26	6.8
Total	381	100

The findings in Table 4.6 shows that 120 (31.5%) had up to primary school level of education, 111(29.1%) had attained basic/pre-primary school level of education, 72(18.9%) had up to secondary education and 26(6.8%) had attained tertiary level of education. Even so, 52(13.6%) of the participants had not attended any formal schooling.

4.2.8 Household Head Main Occupation

The study participants were asked to indicate their main occupation. This was to inform the study on their main source of livelihood. Table 4.7 shows the findings.

Table 4.7 Household head main occupation

Occupation	Frequency	Percent
Salaried Employee	39	10.2
Full time farmer	40	10.5
Self-employed/ business	89	23.4
Livestock production	213	55.9
Total	381	100
	Frequency	Percent
Crop production	143	37.5
Charcoal burning	22	5.8
Sand harvesting	77	20.2
Employed/casual laborer	138	36.2
Other	1	0.3
Total	381	100

From the findings in Table 4.11, it is clear that 213 (55.9%) reared livestock, 89(23.4) were self-employed in running business, 40(10.5%) were full-time farmers and 39(10.2%) were salaried employees.

4.2.9 Other key Livelihood Practiced by the Household Head

The researcher sought to find out the other key livelihood activities practiced by the study participants in view of informing the study on livelihood diversification. The findings were as recorded in Figure 4.3.

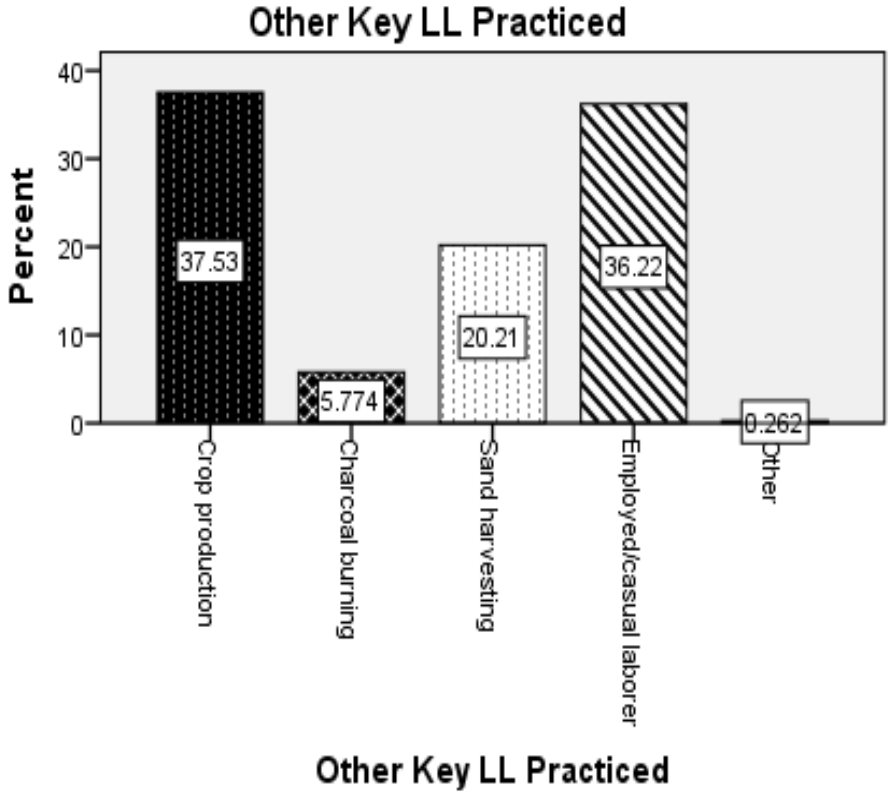

Figure 4.3 Proportion of other LL practiced

Figure 4.3 shows that 143(37.53%) of the participants were involved in crop production apart from their main occupation, 138 (36.22%) were employed as casual laborers and 77(20.21%) were involved in sand harvesting. Charcoal burning was done by 22 (5.77%) of the study participants. In effort to triangulate the results, the study entailed qualitative results through interviews with County agriculture and Livestock Officer. The officer noted;

> *The households in these areas have diversified in taking up a variety of activities. Some even combine farming, charcoal burning, bodaboda riding, fishing during rainy seasons and so on. The state of climate and whether in this area being mostly dry throughout the year makes it difficult for one to have one livelihood activity and stay with it. In fact, most of the activities they engage in are dynamic. So dynamic that you find a household head doing cattle grazing this week, next week they would be on hunting, another one they are trying to do business* [County agriculture and Livestock Officer].

The findings conform to the quantitative results that depicted diversified household characteristics. A household head can have many economic activities so that they keep their households in buoyance.

4.3 Household Assets and Livelihood Outcomes among agro-pastoral households in Laikipia North Sub- County

The researcher sought to find out the household assets available for livelihood outcomes and to what extent the assets influenced the pursuit of their livelihoods. These were categorized as physical livelihood assets, financial livelihood assets and social livelihood assets. The findings are presented in the following sub-sections.

4.3.1 Physical Livelihood Assets

The study assessed the reliance on physical livelihoods among the agro-pastoralists in Laikipia North Sub- County. The results are presented in Table 4.8.

Table 4.8 Reliance on physical livelihood assets

Physical Assets		Not at all	some extent	To a great extent	To very great extent
Land	Count	74	112	195	0
	Row N %	19.4%	29.4%	51.2%	0.0%
Sheep	Count	65	129	187	0
	Row N %	17.1%	33.9%	49.1%	0.0%
Goat	Count	209	35	64	73
	Row N %	54.9%	9.2%	16.8%	19.2%
Cattle	Count	92	87	202	0
	Row N %	24.1%	22.8%	53.0%	0.0%
Rental houses	Count	328	31	8	0
	Row N %	89.4%	8.4%	2.2%	0.0%
Hand sprayer	Count	368	13	0	0
	Row N %	96.6%	3.4%	0.0%	0.0%
Panga	Count	323	58	0	0
	Row N %	84.8%	15.2%	0.0%	0.0%
Axe	Count	361	12	8	0
	Row N %	94.8%	3.1%	2.1%	0.0%
Water tank	Count	342	39	0	0
	Row N %	89.8%	10.2%	0.0%	0.0%
Water well	Count	314	67	0	0
	Row N %	82.4%	17.6%	0.0%	0.0%
Mobile phone	Count	30	161	145	45
	Row N %	7.9%	42.3%	38.1%	11.8%
Ploughing oxen	Count	302	79	0	0
	Row N %	79.3%	20.7%	0.0%	0.0%
Tractor	Count	284	66	14	17
	Row N %	74.5%	17.3%	3.7%	4.5%
Donkey	Count	268	76	37	0
	Row N %	70.3%	19.9%	9.7%	0.0%
Ox plough	Count	285	59	37	0
	Row N %	74.8%	15.5%	9.7%	0.0%
PSV	Count	332	49	0	0
	Row N %	87.1%	12.9%	0.0%	0.0%
Motorcycle	Count	312	69	0	0
	Row N %	81.9%	18.1%	0.0%	0.0%
Beehive	Count	305	76	0	0
	Row N %	80.1%	19.9%	0.0%	0.0%
Others	Count	353	28	0	0
	Row N %	92.7%	7.3%	0.0%	0.0%

Table 4.8 shows that, regarding land as a natural ecological asset, 29.45% said it was available and relied on to some extent, 51.2% said it was very much available and none said it was available to a great extent. However, according to 19.45% of the participants, land as a physical asset was not applicable to them and therefore did not rely on it. Water well as a physical asset was not applicable to 82.4% of the study participants.

Despite this, 17.6% of the participants confirmed that indeed water well was a physical asset they relied on to *some extent.*

Concerning zoological physical resources, 33.9% of the participants affirmed that sheep were available to *some extent* as assets and 49.1% affirmed that indeed sheep were relied upon to a great extent as zoological assets. Nevertheless, 17.1% did not rely on sheep *at all*. For goat, 9.2% of the participants attested to the goat being an asset they relied on to *some extent*, 16.8% agreed that it was to a *great extent* an asset while 19.2% affirmed that the goat was relied upon to a *very great extent.* However, 54.9% said they did not rely on goat *at all*. As for cattle, most of the study participants (53.0%) were in agreement that indeed cattle were available and relied upon to a *great extent* as an asset, 22.8% affirmed that cattle were to *some extent* available as assets while 24.1% said it was not applicable to them. About the ploughing oxen, this was not relied upon by 79.3% of the participants. However, it was relied on to *some extent* by 20.7% of the participants. In connection with the donkey as a zoological asset, it was not relied upon *at all* 70.3% of the participants although 19.9 % of the participants confirmed that they relied on the asset *to some extent* while 9.7% affirmed that they relied on it to a *great extent.*

With regard to equipment and facilities as physical assets, the hand sprayer was not applicable to 96.6% of the participants, while 3.4% of them affirmed that they relied on it to *some extent* an asset. 84.8% of the participants attested that the *panga* was not relied upon at all an asset, but 15.2% of them affirmed that it was an asset they use to *some extent*. The axe was relied upon to a *great extent* by 2.1% of the participants and to *some extent* by 3.1%. However, 94.8% of the participants said they did not rely on the axe *at all*. The water tank was to *some extent* an asset to 10.2% of the participants but not relied upon by 89.8% of the participants. A mobile phone was relied upon to a *very great extent* as by 11.8% of the participants, to a *great extent* by 38.1%, to *some*

extent by 42.3% of them and not applicable to 7.9 % of the study participants. As for the tractor, it was relied upon to a *very great extent* by 4.5% of the study participants, to a *great extent* by 3.7% of them and to *some extent* by 17.3%. Even so, 74.5% of the participants said they did not rely on them at all. An ox plough was to a great extent relied on by 9.7% of the study participants, 15.5% of them said it was to some extent an asset, but 74.8% said it was not applicable to them. The beehive was to *some extent* an asset to 19.9% of the study participants yet it was not relied upon at all by 80.1% of them. Finally, to a bulk of the participants (89.4%) rental houses were not relied upon at all as assets to the participants although 8.4% of them affirmed that rental housed were to *some extent* assets while 2.2% of them relied on rental houses to a very great extent.

With respect to transport assets, 87.1% of the participants said that Public Service Vehicle (PSV) was not applicable asset to them as assets while 12.9% o confirmed that indeed PSV were assets they relied on to *some extent*. For motorcycle, even though 18.9% of the participants attested to the fact that motorcycles were assets they relied on to some extent, a bulk (81.9%) cited no reliance on this asset at all.

In connection with 'other' physical assets, 92.7% participants said that they were not applicable to them while 7.3% agreed that they relied to some extent on assets not listed in the study questionnaire (see Table 4.8).

4.3.2 Financial Assets

The researcher sought to find out the financial assets available to HHs and how they influenced the livelihood outcomes. This was to inform the study the different sources of finances as well as access to the same among the study participants. The results were as follows;

4.3.2.1 Financial credit sources

The participants were asked to indicate the sources of their financial credit, and the results are presented in Table 4.9.

Table 4.9 Asset financial credit sources

Asset Financial Credit	Frequency	Percent
NGO	47	12.3
Banks	22	5.8
Village money lenders	47	12.3
Farmers/traders association	244	64
Family/friends	21	5.5
Total	381	100

As evident in the Table 4.9, 244(64.0%) of the participants obtained their credit from farmers or trade associations, village money lenders and NGOs each providing credit to 47(12.3%) of the participants, banks gave 22(5.8%) participants credits and 21(5.5%) of them got credit from family and friends.

4.3.2.2 Finance Credit Obtained credit within12 months

The participants were requested to indicate the source of their financial credit in the past 12 months. The findings were as shown in Table 4.10.

Table 4.10 Source of financial credit within the last 12 month

Source	Frequency	Percent
NGO	14	3.7
Banks	49	12.9
Micro-Finance institution	51	13.4
Village money lenders	93	24.4
Farmers/traders/association	149	39.1
Family/friends	25	6.6
Total	381	100

From the findings in Table 4.10, it is evident that in the past 12 months, 149 (39.1%) participants obtained credit from associations of farmers and traders; 93(24.4%) got credit from village money lenders; 51(13.4%) obtained credit from micro finance institutions; 49(12.9%) got credit from banks; 25(6.6%) got credit from family and friends and 15(3.7%) got credit from NGOs.

4.3.2.3 Purpose of the Credit

The participants were asked to enumerate the purpose of the credit obtained to inform the study on the utilization of financial credit. The results are presented in Table 4.11.

Table 4.11 Purpose of the credit

Purpose	Frequency	Percent
Financing alternative livelihood strategies	175	45.9
Financing household welfare eg health, education	127	33.3
Others	79	20.7
Total	381	100
Family/friends	25	6.6
Total	381	100

From the findings in table 4.11 it is clear that the majority (45.93%) of the participants obtained credit for the purposes of financing alternative livelihood strategies, 33.33% of them obtain credit to finance household welfare e.g. health and 20.73% of them used the credit obtained for other purposes.

4.3.2.4 Form of Saving

The researcher sought to find out the form of saving used by the study participants to inform the study of various forms of saving schemes adopted. The findings were as revealed in Table 4.12.

Table 4.12 ***Form of saving***

Form of saving	Frequency	Percent
I do not save	111	29.1
Buy Livestock	117	30.7
Buy land	85	22.3
Bank/microfinance	68	17.8
Total	381	100

As shown in table 4.12, 30.7% of the participants bought livestock as a way of saving their financial assets, 22.3% of them bought land and 17.8% of them saved in microfinance institutions or banks. However, 29.13% of them did not save their financial assets at all.

4.3.2.5 Social Capital

The researcher sought to find out the social capital available to participants by establishing the relationship they had with other community members and how this impacted their livelihoods. The participants were also asked to indicate the type of group they belonged to, enabling the researcher to establish the nature of the groups. The findings were recorded in table 4.13.

Table 4.13 Social capital type of group membership

Group Membership	Frequency	Percent
Not a member of any group	93	24.4
Informal group	221	58
Formal Group	67	17.6
Total	381	100

Table 4.13 shows that 93(24.4%) of the participants did not belong to any group, and 221(58.0%) belonged to informal groups. About 67 (17.6%) belonged to formal groups.

The study participants were asked to indicate the benefits accrued from the groups they were members. This was to inform the study on whether groups' benefits influenced the diversification of livelihood strategies. The findings were as shown in Table 4.14.

Table 4.14 Benefits accrued from group

Benefit Accrued	Frequency	Percent
Loan	176	46.2
Network	113	29.7
None	92	24.1
Total	381	100

Table 4.14 shows that 46.19% of the participants obtained a loan as social benefits from the groups and 29.66% accrued social network. However, 24.15% did not cite any benefits accrued from the groups. The participants who did not belong to any group were asked their reason for not belonging to any group. The findings were as shown in Table 4.15.

Table 4.15 Reason for not being a member of a group

Reason for non-membership	Frequency	Percent
Not willing	299	78.5
There are no groups	82	21.5
Total	381	100

Table 4.15 shows that majority (78.5%) of those who were not members in any group cited unwillingness as their reason for not belonging to any group whereas 21.5% cited lack of groups as their justification.

Related to the concept of household assets among Agro-Pastoralists in Laikipia North Sub-County, an interview with the county Agriculture and Livestock officer indicated that there was a need to boost assets as a basis for improving livelihoods. He noted;

> *The bigger part of livelihood in households depends on assets that these houses have. The households that have a reliable and bigger asset base has higher chances of doing well in livelihood. For instance, having a tractor in this area means that you may not only till your land, but also get hired and earn income from it. On the contrary, those who have no assets may need to even pay out to access and use some essential assets like jembes [County Agriculture and Livestock Officer].*

4.4 Livelihood Diversification Challenges and Livelihood Outcomes among Agro-Pastoralists in Laikipia North Sub-County

The participants were asked to indicate the challenges that they faced as they pursue their livelihoods. This was to elucidate whether the challenges faced had a significant impact on the livelihood outcomes. The findings are as shown in Table 4.16.

Table 4.16 Livelihoods challenges

Livelihood challenges	Frequency	Percent
Lack of Capital/Cost of input	71	18.6
Unfavorable Culture	48	12.6
Poor Infrastructure	54	14.2
Adverse Climate change	123	32.3
Conflicts	53	13.9
Market Access	32	8.4
Total	381	100

Concerning the livelihood challenges faced by household heads (HHs), it is clear from table 4.16 that most of the study participants totaling 123(32.3%) faced the challenge of adverse climate change, 71(18.6%) faced the challenge of lack of capital, 54(14.2%) faced the challenge of poor infrastructure, 53(13.9%) faced the challenge of conflicts and 48(12.6%) faced the challenge of unfavorable culture. Additionally, 32(8.4%) faced challenges related to market access.

4.4.1 Desired Livelihood Outcomes

The researcher enquired about livelihood (LVD) outcomes desired by the study participants. This was aimed at establishing some of the participants' goals while pursuing specific LVD practices. The findings were as shown in table 4.17.

Table 4.17 Desired LVD outcome

Desired live LVD Outcome	Frequency	Percent
good life	88	23.1
good family	28	7.3
good health	61	16
good housing	54	14.2
children education	35	9.2
More livestock	37	9.7
Enough food	41	10.8
Become wealthy	37	9.7
Total	381	100

As shown in table 4.17, 23.1% of the participants desired good life, 16.0% desired good health, 14.2% desired good housing, 10.8% desired enough food, 9.7% desired more livestock and to become wealthy each,9.2% desired to educate their children and 7.3 desired to have a good family.

4.4.2 Extent of Attaining Livelihood Outcomes

The researcher sought to establish the extent to which the participants' livelihood strategies enabled them to achieve livelihood outcomes. The study used 9 statements that relate to livelihood outcomes and rated them on 3-Likert scale of 1- not all, 2- To some extent and 3-Very much. The findings were as shown in the Table 4.18.

Table 4.18 Extent of attaining livelihood outcomes

		Not at all	To some extent	Very much
Increased income for HH	f	18	337	26
	%	4.7%	88.5%	6.8%
3 meals in a day	f	14	302	64
	%	3.7%	79.3%	16.8%
Safe drinking water access	f	83	290	8
	%	21.8%	76.1%	2.1%
Better housing	f	0	219	162
	%	0.0%	57.5%	42.5%
Access to health care	f	13	286	82
	%	3.4%	75.1%	21.5%
Access to School	f	0	159	222
	%	0.0%	41.7%	58.3%
Increased Stock of assets	f	0	352	29
	%	0.0%	92.4%	7.6%
Coping with Shocks	f	19	331	31
	%	5.0%	86.9%	8.1%
Diversification of LVD Strategies	F	14	255	112
	%	3.7%	66.9%	29.4%

Table 4.18 shows that regarding increased income for household, 4.7% of the participants indicated low attainment, 6.8% of them had high attainment of this LVD outcome while the majority 88.5% had “To some extent” of increased income.

Concerning food availability, a majority (79.3%) had “To some extent” of this LVD outcome while 3.7% and 16.8% of the participants had low and high attainment respectively. As for access to safe drinking water, 21.8% of the participants had low attainment of this outcome, 2.1% of them had “very much” and 76.1% of the participants had medium attainment. In connection with better housing, none of the participants had low attainment. Rather, 57.5% of them had medium attainment and 42.5% had cited high attainment to better housing due to the LVD strategies they pursue.

With regards to access to health care, 75.1% of the participants had a medium attainment while o 3.4% and 21.5% had low and high attainment, respectively.

As for school, 41.7% of the participants had “to some extent” while more than half (58.3%) agreed that school access was attributed to their LVD strategies. About increased stock of assets,92.4% of the participants had “to some extent” and 7.6 had high attainment of increased assets.

With respect to coping with shocks, 5.0% had “not at all” and 8.1% had “very much”. None the less, 86.9% of the participants expressed “to some extent” of ability to cope with shocks. Regarding diversification of LVD strategies, a majority 66.9% of the participants had “to some extent” while 29,4% highly associated their ability to diversify their LVD strategies with their current LVD activities. However, 3.7% had “not at all” attainment of diversification.

The Likert-scale was aligned to the McKee scale of measuring livelihood outcomes that ranges between 1 – 18. With the spread of 1-6 as survival level, 7-12 being security and 13-18 being Growth levels, the averages were as presented in Table 4.19.

Table 4.19 McKee’s Level of attaining livelihood outcomes

Level	McKee levels	f average	%
Not at all (survival)	1-6	17.9	4.7
To some extent (security)	7-12	281.2	73.8
Very much (growth)	13-18	81.9	21.5

Table 4.19 shows that majority of the respondents (frequency average 281.2, 73.8) were at security level. Fewest (frequency average 17.9, 4.7%) were at survival stage while the rest (frequency average 81.9, 21.5%) were at growth level. This implied that the majority were at an average livelihood level.

Through the interview with the County agriculture and Livestock Officer, the study found that there are diverse challenges affecting diversification of then livelihood among Agro-Pastoralists in Laikipia North Sub-County. He stated;

> *Challenges arising from lack of capital base, drought that ravages even the little gathered plantations and livestock are outstanding challenges to the livelihood of the people in this region. Moreover, other secondary challenges are public issues such as social amenities including; hospitals and schools. Scarce and/or infective social amenities imply costly services to the resident, hence transferring the little resources into paying up for these services* [County Agriculture and Livestock Officer].

4.5 Livelihood Diversification Strategies and Livelihood Outcomes

The researcher intended to find out the livelihood strategies adopted by the household heads both presently and in the past. This was meant to draw a comparison of present and past livelihood strategies and further explore any variations and factors resulting to the same.

4.5.1 Present Livelihoods Strategies

The study participants were asked to indicate their present livelihood strategies and the findings were as shown in the Table 4.20.

Table 4.20 Livelihood strategies in the present

Present LVD Strategies	Frequency	Percent
Livestock/ livestock products sales	89	23.4
Wage labor	75	19.7
Hunting	16	4.2
Crop cultivation	128	33.6
Beekeeping/sale of honey	19	5
Leasing of land	8	2.1
merchandise Sales (shop)	14	3.7
PSV	7	1.8
Bodaboda	12	3.1
Rental houses	1	0.3
Sale of grass for thatching	12	3.1
Total	381	100

Table 4.20 shows that a majority of the study participants 128(33.6%) relied on crop cultivation as a livelihood strategy, these were closely followed by those who adopted

the sales of livestock or livestock products as a livelihood strategy who were 89(23.4%) and 75(19.7%) participants relied on wages since they were casual laborers. However, 19(5.0%) adopted bee keeping and the sale of honey as a strategy while 16(4.2%) adopted hunting as a strategy.

Moreover, 14 (3.7%) households depended on merchandise sales from a shop as a livelihood strategy while those who adopted the use of *bodaboda* and the sale of grass for thatching were 12(3.1%) each. 8 (2.1%) respondents adopted the leasing of land as a strategy, 7(1.8%) used public service vehicle and one participant (0.3%) adopted the renting out of houses as a livelihood strategy.

4.5.2 Past Livelihoods Strategies

The researcher sought to find out the livelihood strategies adopted by the study participants in the past. This was to shed light on any differences between the present and past strategies adopted and illuminate diversification or lack of it. This is presented in Table 4.21.

Table 4.21 Livelihood strategies in the past

Activity	Frequency	Percent
Livestock/ livestock products sales	323	84.8
Hunting	58	15.2
Total	381	100

It is revealed from the findings in Table 4.21 that 323 (84.8%) of the participants had previously adopted the sales of livestock and livestock products as a livelihood strategy. Additionally, 58(15.2%) had adopted hunting as a livelihood strategy.

4.5.3 Reasons for Disparity in Livelihood Strategies Adopted

The participants were asked to enumerate the reasons as to why there existed disparity between their present and past adopted livelihood strategies. The findings, as captured in Table 4.22.

Table 4.22 Reasons for disparity

Reasons for disparity	Frequency	Percent
climate change shocks	155	40.7
Need to increase income	40	10.5
land use changes	72	18.9
increased education levels	81	21.3
increased market access	33	8.7
Total	381	100

Table 4.22 shows that most of the respondents 155(40.7%) sited climate change as a reason, 81(21.3%) cited increased levels of education, 72(18.9%) highlighted changes in land use while 40(10.5%) cited the need to increase income as the justification for the disparity in livelihood strategies adopted. Even so, a few of them 33(8.7%) highlighted increased access to market as the rationale for the existence of the disparity between the present and the past livelihood strategies.

4.5.4 Desired Livelihoods Strategies

The researcher sought to find out the livelihood strategies that the study participants desired to adopt. This was to inform the study some of the livelihood strategies participants would pursue were it not for certain limitations. The findings were as shown in Table 4.23.

Table 4.23 Desired livelihood strategy

Desired LVD Strategy	Frequency	Percent
Wage labor	28	7.3
Wage migration	14	3.7
Hunting	69	18.1
Crop cultivation	61	16
Bee keeping (sale of honey)	21	5.5
Leasing of land	95	24.9
Sale of land	25	6.6
Sand mining and sale	19	5
Burn and sell charcoal	19	5
Sale of wood products	13	3.4
Sale of merchandise (shop)	17	4.5
Total	381	100

From the Table 4.23, it is evident that a good number (24.9%) of the study participants desired to adopt leasing of land, 18.1% desired hunting and 16.0% desired crop cultivation. However, a few (7.3%) desired to adopt wages from labor, 6.6% desired to adopt selling of land, 5.5% desired bee keeping and selling of honey and 5.0% and 5.0% of the participants desired sand mining and sale and burning and selling of charcoal. Furthermore, 4.5% desired to adopt selling of merchandise in a shop, 3.7% desired wage migration and 3.4% desired to adopt the selling of wood products as a livelihood strategy.

4.5.5 Degree of Reliance on the adopted Livelihood Strategies

The researcher asked the HHs to elucidate the degree to which they relied on the adopted livelihood strategies. This was aimed at demystifying the extent participants depended on various livelihood strategies. The findings were as seen in Table 4.24.

Table 4.24 Degree of reliance

Degree of Reliance	Frequency	Percent
Always	247	64.8
Occasional	75	19.7
Only in extreme situations	59	15.5
Total	381	100

As pointed out on the Table 4.24, 59 (15.5%) of the HHs relied on the adopted livelihood strategies only in extreme situations while, 75(19.75) of the study participants relied on the adopted livelihood strategy occasionally. Nonetheless, 247(64.8%) of the study participants always relied on the strategies adopted.

4.7 Hypotheses Testing

Chi-square test of significance at $p<0.05$ level of significance was used to investigate the relationship between the dependent and independent variables. It was preferred because both the dependent and independent variables were categorical and at ordinal scale of measurement. Spearman correlation coefficient was also used to determine the direction and strength of relationship considering that the data was in ordinal scale of measurement, there was presences of outliers and also, the data collected was nonlinear. The findings were as follow;

4.7.1 Household Assets and LVD Outcomes

Ho_1 There is no statistically significant influence of household assets and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County.

The researcher was in pursuit for the presence of any relationship between availability of household assets and the LVD outcomes among agro-pastoralists in Laikipia North Sub-County. The study used three constructs of Household Assets to test hypothesis. The household assets were conceptualized to include physical assets, financial assets

and social capital. To this effect, the hypothesis was tested using chi-square test for independence in order to know if there is any association between household assets and LVD outcomes. The results are presented using Table 4.25.

Table 4.25 Chi-square tests for Household Assets and LVD outcomes

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	18.922[a]	1	.000		
Continuity Correction[b]	17.417	1	.000		
Likelihood Ratio	19.342	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	18.873	1	.000		
N of Valid Cases	381				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.69.

b. Computed only for a 2x2 table

Table 4.25 shows a Chi-Square value of 18.922 at df =1 and significance level of 0.000. The table also shows the Likelihood ration between household assets and LVD outcomes is 19.342 with df =1 and significance level of 0.000. These imply that there is an association between household assets and LVD outcomes among agro-pastoralists in Laikipia North Sub-County. Since the significance levels =.000 are less than the critical p-value of .05, the null hypothesis is rejected. Therefore, there is a statistically significant relationship between household assets and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County.

Using a different measure, correlation analysis, the study conducted a Spearman's Rank correlation analysis and the results presented using Table 4.26.

Table 4.26 Spearman correlations coefficient for physical assets and LVD outcomes

			1	2
Spearman's rho	1. Sum household assets (Binned)	Correlation Coefficient	1.000	.223**
		Sig. (2-tailed)		.000
		N	381	381
	2. Sum of extent of the LVD outcome (Binned)	Correlation Coefficient	.223**	1.000
		Sig. (2-tailed)	.000	
		N	381	381

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

Table 4.26 shows that the Spearman's' Rank correlation between sum household assets and Sum of extent of the LVD outcome is weak positive (r=.223) at significance level of .000. Both variables were binned implying that were collated across unevenly time periods. The correlation is statistically significant which makes the rejection of the hypothesized null hypothesis "There is no statistically significant relationship between household assets and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County." Thus, there is a statistically significant relationship between household assets and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County (r=.223, s.l = .000). This implies an increase in sum of household assets (binned) by a unit would increase sum of extent of the LVD outcome by .223 units. This change would be significant among the agro-pastoralists in Laikipia North Sub-County.

4.7.2. Relationship between Livelihoods Diversification Challenges and Livelihood Outcomes

Ho_2 ***There is no statistically significant relationship between livelihoods diversification challenges and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County.***

The researcher used Chi-square test for independence in order to know if there is any relationship between livelihoods diversification challenges and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County. The results are presented in Table 4.27.

Table 4.27 Chi-Square Tests for the relationship of livelihood challenges and LVD outcomes

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.017[a]	1	.313		
Continuity Correction[b]	.690	1	.406		
Likelihood Ratio	1.040	1	.308		
Fisher's Exact Test				.375	.204
Linear-by-Linear Association	1.015	1	.314		
N of Valid Cases	381				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.83.

b. Computed only for a 2x2 table

Table 4.27 shows that the Pearson Chi-Square vale was χ = 1.017 at df =1 and significance level of .313. Similarly, the likelihood ration between the livelihood challenges and LVD was 1.040, df=1 and significance level = .308. This implies that there exists association between the livelihood challenges and LVD among agro-pastoralists in Laikipia North Sub-County. However, the significance levels of .313 and .308 for the Pearson Chi-Square and Likelihood Ratio respectively were greater than the critical p-value of .05. This means that the null hypothesis, Ho2; There is no statistical relationship between livelihoods diversification challenges and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County, is not rejected. Hence, there was no statistically significant relationship between livelihoods

diversification challenges and livelihood outcomes among agro-pastoralists in Laikipia North Sub-County (χ=1.017, df =1, p=0.313).

4.7.3. Relationship between Livelihood Diversification Strategies and Livelihood Outcomes

Ho_3 ***There is no statistically significant relationship between livelihood diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County***

The hypothesis was tested using chi-square test for independence in order to know if there is any relationship between livelihood diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County. The results are presented using Table 4.28.

Table 4.28 Chi-Square tests for Livelihood Diversification Strategies and Livelihood Outcomes

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.730[a]	1	.000		
Continuity Correction[b]	13.255	1	.000		
Likelihood Ratio	24.056	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	14.691	1	.000		
N of Valid Cases	381				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.73.
b. Computed only for a 2x2 table

Table 4.28 shows that the chi-square test value was X =14.730a at df=1 and significance level of .000. The Likelihood ratio between Likelihood Ratio between Livelihood Diversification Strategies and Livelihood Outcomes is = 24.056 with df= 1 and significance level of .000. This implies that there was association between livelihood

diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County. However, the significance level of .000 in the two cases is less than critical p-value of .05 which makes the null hypothesis, Ho3; There is no relationship between livelihood diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County, rejected. Therefore, the study shows that there is statistically significant relationship between livelihood diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County (X =14.730a, df=1 and s.l= .000).

Using a different statistical approach, the hypothesis, Ho3; There is no relationship between livelihood diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County, was tested through correlation analysis. The correlation employed the Spearman's rank approach, and the results are presented in Table 4.29.

Table 4.29 Spearman's Rank Correlation Coefficient between Livelihood Diversification Strategies and Livelihood Outcomes

			1	2
Spearman's rho	1.Livelihood Diversification strategies	Correlation Coefficient	1.000	.197**
		Sig. (2-tailed)		.000
		N	381	381
	2. Sum of extent of LVD outcome (Binned)	Correlation Coefficient	.197**	1.000
		Sig. (2-tailed)	.000	
		N	381	381

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

Table 4.29 shows a weak positive correlation between Livelihood Diversification Strategies and Livelihood Outcomes (r=0.197 at significance level .000, and N=381). This implies that a unit increase in livelihood diversification strategies would increase

livelihood outcomes among outcomes among the agro-pastoralists in Laikipia North Sub-County by .197 units. This change would be significant at the 0.01 level ((2-tailed). The table also shows that at a significance level of .000, which is less than a threshold p-value of 0.05, the null hypothesis is rejected. Thus, the study shows that there is a statistically significant relationship between livelihood diversification strategies and livelihood outcomes among the agro-pastoralists in Laikipia North Sub-County.

CHAPTER FIVE: DISCUSSION OF THE FINDINGS

5.0 Overview

In this chapter, the researcher outlines the discussion of the main research findings, guided by the objectives of this study as stated earlier in chapter one

5.1 Discussions

5.1.1 Effect of Household Characteristics on Livelihood Outcomes among Agro-pastoral Households in Laikipia North Sub-county

The **first objective** of this study was to investigate the effect of household characteristics on livelihood outcomes among agro-pastoral households in Laikipia North Sub-county. These were categorized as relationship of participant with the household head; number of years lived in the area; number of dependents and household head details.

Concerning the relationship of the study participant to the household head, more than half (55.9%) of the participants were household heads themselves. These were the individuals responsible for decision-making and seeking livelihoods for the households. Some households were women-headed while others were male headed. Some participants (21%) were spouses to the household heads (either their wives or their husbands) for male-headed and female-headed households, respectively. However, a small proportion (9.7%) of the participants were progeny of the household heads. These were the offspring or descendants of the participants over 18 years of age and were included in cases where the household head was incapacitated or absent. Otherwise, if the progeny didn't meet this criterion, a relative was interviewed instead, of which just a few (13.1%) participated in the study. These were either connected by blood or by marriage to the household heads.

The researcher sought the number of years lived in the area by the participant to enlighten on the duration of residency of the participants. Eight years was the least number of years lived by the participants in the area, whereas 72 years was the highest number of years lived by the participants in the area. Most of them (22.3%) had lived in the area for 38-47 years, 19.2% had lived there for 28-37 years, 18.6% of the respondents had lived there for 48-57 years, 15.5% had lived there for 58-67years and 8.7% had lived there for 18-27 years. Additionally, those who had live in the area for 8-17 years and over 68 years were 7.9% each. With high number of participants (92.1%) having lived in that area for more than 18 years, the study was better informed of diversification of livelihood strategies as the participants had significant memory about the area of study and specifically information about livelihood (LVD) strategies. A few (7.9%) of them had lived there for less than 18 years. This could be attributed to the fact that they had a semi nomad lifestyle hence they were mobile as a result of conflicts over ecozonal resources, natural disasters such as drought among others. Some may have lived there for a shorter period because they could have been recently married. This differs with the study of Masanja (2017) on agro-pastoral mobility in Tanzania where he found out that over 53.17% of agro-pastoralists had lived in their homes for less than 15years.

The researcher sought for the number of dependants to the household head. This was to substantiate the extent of responsibility the household head had since he/she was responsible for the upkeep or livelihood of the dependants. The study showed that the least number of dependants for the study participants was one (1) while the highest number of dependants was ten (10). Majority (61.2%) of the participants had fewer (1-5) dependants. Nonetheless, 38.8% had more (6 and above) number of dependants. Masanja (2017) however disputes this in his findings where most agro-pastrolists had

up to 10 dependants believing that more children and wives would work on the farm and graze animals instead of hiring laborers.

Concerning gender, the study showed that 51.18% of the participants were male. This shows that they either were husbands or fathers, over 18 years sons or male relatives. On the other hand, 48.82% (who closely followed the male) were female meaning they were either wives or mothers, over 18 years daughters or female relatives. Therefore, social norms and power structures of male participants had better but not so much impact on the lives and opportunities available to them than their counterparts (female household heads). This collides with the findings of Chibanga, Musimba, Nyangito, Simbaya and Daura (2012) that almost all (95%) agro-pastoralists household heads were male and about 5% were female.

Many (44.1%) households heads were married meaning they had either wives or husbands. However, a small percentage (3.1%) were either divorced or separated or they were just cohabiting. Some (26.5%) were never married (Chibanga, Musimba, Nyangito, Simbaya and Daura, 2012) contradicts this that very few; up to 3% agro-pastoralists are single). These may have been the sons and daughters or relatives who were not yet married either due to age factor, financial constraints, unwillingness or other personal reasons. 26.2% were widows or widowers who had lost either their husbands or wives respectively through conflicts, natural calamities, sickness, old age among other reasons.

With regards to education level, the findings in Table 4.10 stipulates that the majority (31.5%) of participants had up to primary school level of education (had done at least 4 years of lower primary and 4years of upper primary), followed by 29.1% who had however, only attained basic/preprimary school level of education (had done 3 years of early childhood education up to nursery school/pre-unit). Fortunately, 18.9% had up to secondary education for at least four years or had done adult education. Interestingly,

6.8% had attained tertiary level of education meaning they had done artisan, craft or diploma training in a certain area of specialization. Even so, 13.6% of the participants had not attended any formal education.

Regarding their main occupation, it was clear that 55.9% of the study participants were rearing livestock mainly, goat, sheep, cattle, donkey and oxen. These were reared and sold for income, used as food or given out for dowry; their products such as milk were sold for income too. The oxen were used to plough land and the donkey for transportation. Additionally, these livestock were used as savings/reinvestment for their wealth i.e., after earning some income from sales of livestock products; the agro pastoralists could buy more livestock. Moreover, 23.4%of them were self employed by running business such as merchandise shop, or sales of wood products, whereas 10.5% were full time farmers. However, 10.2% of the respondents were salaried employees in the nearby towns or in agro-pastoral homesteads. Nonetheless, the agro pastoralists were also involved in other occupations apart from the ones mentioned above. Figure 4.4 points out that 37.53% of the participants were involved in crop production apart from their main occupation as a diversification strategy, 36.22% were employed as casual laborers and 20.21% were involved in sand harvesting. Even so, charcoal burning, and “others” were pursued by 5.77% and 0.26% of the study participants respectively. This shows that they intended to diversify their livelihoods. All these findings are in agreement with those of Masanja, (2017) in for a study done in Tanzania. Finally, regarding the type of family of the participants, a bulk (70.1%) of the participants belonged to a monogamous type of family whereby there was one man and one woman without children. In this type of family, the family size was small and with a clear structure. Moreover, the duties and responsibilities among members of the family were well distributed. The responsibilities of the household heads in monogamous families were lesser than those of the household head of a polygamous

family and their means of survival were less expensive (Lawson and Uggla, 2014). However, a few (29.9%) belonged to a polygamous type of family, this could be attributed to the ideology that a man with more than one wife was seen as powerful and wealthy and also because of their large agro-pastoral lands so that the wives and children can be used for labor and to care for the lands and livestock. This reconciles with the findings of (Chibanga, Musimba, Nyangito, Simbaya & Daura, 2012) who found out in their study on agro-pastoralists in Zambia that 69% of them were in monogamous while just a few where in polygamous families.

5.1.2 Influence of Household Assets on Livelihood Outcomes among Agro-pastoral Households in Laikipia North Sub-county

The second objective was to establish the influence of household assets on livelihood outcomes among agro-pastoral households in Laikipia North Sub-county. This was the dependent variable in the study. Regarding increased income for household, 4.7% of the participants indicated low outcome, 6.8% of them had high livelihood outcome and most of them 88.5% has medium livelihood outcome. Watete, Makau, Njoka, MacOpiyo and Mureithi (2016) affirms these results in their study in northern Kenya that most agro-pastoral households received the least income from a variety of sources such as livestock and livestock products sale and crops as compared to pastoral households and off-farm households.

Concerning having three meals a day, a bulk (79.0%) had medium attainment of this livelihood outcome, but 3.4% and 17.6% of the participants had low and high livelihood outcome attainment respectively. With respect to food availability, a majority (79.3%) had medium livelihood outcome while 3.7% and 16.8% had low and high livelihood outcome respectively. This could be as a result of not only increasing the yields by use of diversified crop and livestock production strategies but also ensuring stability of

supplies, nutritional diversity and food safety. These therefore results to an assurance that all people at all times, they have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preference for active and healthy lives (Poppy *et al*, 2014). Moreover, Tilahun, Teklu and Hoag (2017) in their study in Ethiopia found out that most agro-pastoral households indicated increased food security by adopting diversified livelihood practices.

As for access to safe drinking water, 21.8% of the participants had low livelihood outcome attainment, 2.1% of them had high livelihood outcome and 76.1% had medium livelihood outcome. This is confirmed by Gorham, Yoo, Garabed, Mouhaman and Jiyoung (2017) in their study in Cameroon that most agro-pastoral households still suffer from water-borne diseases resulting from very minimal access to clean water. This is because they highly rely on water from boreholes, taps and wells, and some treat their water with chlorine, unlike their pastoral counterparts.

In connection with better housing, none of the participants had low livelihood outcome but rather, 57.5% of them had medium Livelihood outcome and 42.5% had high Livelihood outcome. Sewando, Mutabazi and Mdoe (2016) agreed that agro-pastoralists had better quality houses as a result of diversification of their livelihood strategies.

With regard to health care, 75.1% had medium livelihood outcome while about 3.4% and 21.5% have low and high Livelihood outcome respectively. This s disputed by Ringo, Bengesi and Mbago (2018). They in their findings find out that agro-pastoralists even after diversification still have very limited access to healthcare since they still rely on traditional medicine men. They hardly access formal but rather informal health facilities.

As for school, none had low attainment on this livelihood outcome, 41.7% had medium livelihood outcome while most of them (58.3%) had high attainment of desired schools. This would be associated with a high penetration of government learning institutions and programs such as “Free Primary and Secondary Education” championed by the National government as alluded by the District Agriculture and Livestock Officer on measures in place by the government to promote livelihood resilience in the community.

About increased stock of assets, none of the participants had low attainment. Rather, 92.4% of the participants had medium while 7.6% had high attainment of this livelihood outcome. With respect to coping with shocks, 5.0% had low outcome and 8.1% cited attaining high livelihood diversification. Nonetheless, 86.9% had medium livelihood outcome.

5.1.3 Relationship between Livelihood Diversification Challenges and Livelihood Outcomes among Agro-pastoralists in Laikipia North Sub-county

The third objective was to examine the influence of assets on livelihood outcomes. These assets were important factors in determining what LVD strategies they adopted and how the agro-pastoralists coped with their challenges for better LVD outcomes. These assets were categorized as physical assets, financial assets and social capital assets.

The physical assets were analyzed as natural-ecological, zoological, equipment and facilities, transport and other assets. Regarding the natural- ecological assets, it was revealed that most participants (51.2%) relied on land to a great extent while a smaller percentage (29.4%) said they relied on it to some extent. Bearing in mind that land is very essential for crop cultivation and can also be used as pastoral land for grazing livestock, the participants had the resource to carry out their main livelihood strategy;

Agro-pastoralism (which is a mode of production that combines field culture and animal husbandry with the use of pasture areas). This is echoed in a study by Nindi, Maliti, Bakari, Kija and Mwita (2014) who found out that in case land as a resource got depleted or became scarce, conflicts arose due to competition among the Agro pastoralists, which becomes a livelihood challenge. This shows the necessity of land as an asset for the agro-pastoralists. However, none of the participants over-relied on land since none of them indicated reliance to a very great extent. Sadly, according to 19.45% of the participants, land as a physical asset was not applicable to them. This finding in terms of the differences in the availability of land among agro pastoralists is consistent with the findings of Mekasha, Gerard, Tesfaye, Nigatu and Duncan (2014) who found out that land availability varied with time and eco-environments indicating the need for the development of eco-environments and progressive land management strategies. This was also emphasized by the District Agriculture and Livestock Officer who shared some of the policies in place in Laikipia county to prevent depletion of the natural resource base.

Water well was another natural-ecological resource under physical assets that was looked in to by the researcher. Besides water from the well being used for watering livestock, it was also used for domestic purposes, irrigation and development. No matter how crucial water well as a source of water is in agro-pastoralism, 82.4% of the study participants indicated that it was not applicable to them. However, 17.6% of the participants confirmed that indeed water well was an asset they relied on. This was affirmed by the views of Pearson, Zwickle, Namanya, Rzotkiewicz and Mwita (2016) that access to water from water wells may vary due to a number of reasons including seasonal variations in rainfall and water availability (bearing in mind that agro-pastoralists mostly reside in semi-arid areas). Moreover, the availability of water wells in agro-pastoral community may be affected by lack of community involvement at the

time of construction, vandalism of pipes and metals by herders and youth for other purposes like craftsmanship. Where there is lack of an initiative to manage the existing facilities, convergence of various pastoral groups at the water wells creates pressure to the well coupled with direct watering rapidly deteriorates the periphery of the well (Mugerwa, Kayiwa and Egeru, 2014).

Concerning zoological physical resources, goats were highly depended on (19.2% proportionate to all participants) since they were the only ones that the participants indicated to be relied upon to a very great extent. This could be attributed to the fact that they are herbivorous who feed on both herbs and shrubs hence adopted to survive in arid and semi-arid areas. Cattle, sheep, goat and donkey were available to a very great extent to 53.0%, 49.1%, 16.8% and 9.7% of the participants' proportions respectively. However, oxen were not very much relied upon as resources since their main use was ploughing land which may have been done using tractors or manual digging by human. All participants in this study had the indicated to rely on the five zoological assets mentioned to some extent i.e., sheep at 33.9%, cattle at 22.8%, oxen at 20. %, donkey at 19.9% and goat at 9.2% proportionately. Unfortunately, there still existed proportions of participants to whom all the livestock were not applicable to them as assets. The 79.3% of participants indicated that they did not rely on the oxen at all; similarly, 70.3% for donkey, 54.9% for goat, 24.1% for cattle and 17.1% for sheep. The findings concur with those of Gustafson, VanWormer, Kazwala, Makweta, Paul, Smith and Mazet (2015) who found out that goat, sheep and cattle were the predominant livestock species among agro-pastoralists.

Equipment and facility assets were the other physical assets that the researcher looked in to. Interestingly, it was only the tractor and the mobile phone that were indicated to be relied upon to a very great extent. This can be attested to the fact that the mobile phone is very crucial in communication and that it is nowadays available in a variety of

cheap and expensive price ranges. It is also available in local dealers' outlets and the presence of several mobile networks to even remote areas increase its usage. Moreover, social media provides a variety of information, skills and technologies to agro-pastoralist which was crucial to the participants. This reconciles with the findings of Karimurimbo, Batamuzi, Massawe, Silayo, Mgongo, Kimbita and Wambura (2016) in Kilosa and Gairo districts in Tanzania, that mobile phone is very much used to improve delivery of animal health and extension services.

The tractor on the other hand was relied upon to a very large extent, though by a small percentage of participants due its' versatility in use e.g., ploughing hard ground, harrowing, disking and planting and also due to its power and durability because it is designed with powerful engines to work on tough terrain and pull extremely hard loads. Hence where tractors were available, they were preferred over donkeys and oxen. In addition to the tractor and mobile phone being highly relied upon by a section of the participants, the axe, ox-plough and rental houses were too. Even so, all the equipment and facilities looked in to by the researcher were relied upon to some extent in small proportions of participants to each equipment and facility ranging from 3.1% for axe to 42.3% for mobile phone. It was however intriguing to find out that all these equipment and facilities were also not relied upon by large proportions of participants, i.e. to 96.6% of participants, the hand sprayer was not relied upon; 94.8% for axe; 89.8% for water tank; 89.4% for rental house; 84.8% for panga; 80.1% for beehive; 74.8% for ox-plough and 74.5% for tractor. It was only the mobile phone that had the least proportion of participants who indicated anon-reliance on the asset. Yet Akwango, Obaa, Turyahabwe, Baguma and Egeru (2016) puts it clear that these equipment, machinery and facilities ought to be available in order to alleviate the repercussions of drought and the harsh conditions encountered by agro-pastoralist.

The other physical assets were transport resources. Here, both the PSV and the motorcycle were neither relied upon by study participants to a very great extent by the participants. Moreover, they were not applicable to most of the participants since 87.1% indicated not at all for PSV and 81.9% indicated not at all for motorcycle. However, a small proportion indicated that these transport assets were available and relied on to some extent (12.9% for PSV and 18.9% for motorcycle). This could be attributed to the fact that being agro-pastoralists they most likely move by foot and also because of the difficult terrain that tends to make most roads impassable. Furthermore, they may have used donkeys or tractors in transportation of which they possessed or accessible for hire. These findings nonetheless differ with the findings of Karimuribo (2016) in Tanzania that public transport systems were to a very great available to agro-pastoralists to offer opportunities for improving access to rural communities to diagnostic and advisory services from facilities and expertise located in urban areas. The other assets were largely not relied upon at all (92.7%) but available to some extent to 7.3% of the study participants. These findings concur with those of Wang, Yang, Wang and Zhang (2015) that agro-pastoralists have a high overall level of physical, financial and social capitals for assets.

Concerning the influence of physical assets to LVD outcomes, based on the findings (x^2=18.922, df =1, p=0.000, r=-0.223) being statistically significant, the null hypothesis is rejected, and the conclusion is that there is a weak and negative relationship between availability of physical assets and the LVD outcomes among agro-pastoralists in Laikipia North Sub-County. Meaning that, participants with more physical assets had high LVD outcomes as compared to those with less physical assets. These contradicts the findings of Elhadi, Nyariki, Wasonga and Ekaya (2012) in a study on agro-pastoralists in Kenya, that household heads with less physical asset experienced low LVD outcomes.

The second category of LVD assets was financial assets. Regarding their sources of financial credit, a majority of participants (64.0%) obtained their credit from associations of farmers or traders, village money lenders and NGOs each providing credit to some (12.3%) of the participants, banks gave 5.8% of the participants credits and 5.5% of them got credit from family and friends. Getachew, Tilahun and Teshager (2014) contradicts this in their findings on agro-pastoralists adaptation to climate change in Ethiopia, that most agro-pastoralists have no access to credit facilities yet access to credit facilities increases financial resources and their ability to meet transaction costs associated with adaptation strategies moreover, access to credit will reduce cash constraints to households and allow purchase of physical assets.

In the past 12 months, the participants endeavored to mostly use formal credit institutions (collateral based). Majority (39.1%) of the participants obtained credit from associations of farmers and traders; 13.4% of the obtained credit from micro finance institutions; 12.9% got credit from banks; and about 3.7% got credit from NGOs. This could be attributed to the fact that these formal credit institutions are usually regulated by the country's reserve bank, there are no exploitations by the lenders and the cost of borrowing is usually less. Formal credit institutions also provide other services like marketing and processing the products of the participants, they offer affordable insurance services among other benefits. For these reasons, the agro-pastoralists may be compelled to use them as credit institutions despite the fact that the procedure for getting the loan being time consuming, and collateral is often required for security. Fascinatingly, there are those who opted to use informal credit (social relationship based) i.e., some (24.4%) of them got credit from village money lenders; while a few (6.6%) got credit from family and friends. This provided immediate access to capital, it also provided social capital, informal loans had more favorable financial terms than formal loans because they did not need to be compensated for defaulting risk since the

lenders know that the borrower had an incentive to pay back whenever possible in order to avoid losing the social capital, and finally, informal credit can be extended to borrowers with low assets as fronted by Karaivanov and Kessler (2017).

About the purpose of the credit obtained from the findings in Figure 4.5, it is clear that the majority (45.93%) of the participants obtained credit for the purposes of financing alternative livelihood strategies, 33.33% of them obtain credit to finance household welfare e.g. health and 20.73% of them use the credit obtained for other purposes.

With regards to savings, as manifested in Figure 4.6, majority (30.7%) of the participants bought livestock as a way of saving their financial assets, 22.3% of them bought land and 17.8% of the saved in microfinance institutions or banks. However, 29.13% of them did not save their financial assets at all. These findings are in accord with those of Kirwa, Nyangito and Kimitei (2012) and those of Mwambene, Mbwile, Hoeggel, Kimbi, Materu, Mwaiganju and Mdofe (2014) that reinvesting in livestock acts as a reservoir or store for their wealth.

Regarding the influence of financial assets to LVD outcomes, it's intriguing to find out from the chi-square test, that there is significant evidence to show that the type of credit asset finance institution (formal or informal) influenced the LVD outcomes among agro-pastoralists in Laikipia North Sub-County. The researcher then did a spearman correlation coefficient test to find out the strength and direction of the relationship. From the findings; (x^2=8.637, df =1, p=0.003, r=-0.151), the null hypothesis is rejected as a consequence of this value being statistically significant and the conclusion is that there is a weak and negative relationship between the type of credit asset finance institution (formal or informal) used and the LVD outcomes among agro-pastoralists in Laikipia North Sub-County. A study done in Kenya by Shee, Turvey and Woodard (2015) acknowledges that uncertainties such as weather and changes in market price for Kenyan agro-pastoralists' product can be attributed to credit constraints they face.

Lacking credit constrains optimal input use, limits marketing opportunities and contributes to strayed investments and poverty traps. As much as rural banks have grown over the past years, banks are still reluctant to lending in agriculture. Uninsured risks and lack of access to credit forces ago-pastoralists to adopt low-risk, low-return activities resulting to low livelihood outcomes.

With regards to social capital assets as physical assets, although some (24.4%) of the participants failed to belong to any group, most of them citing that they were simply not willing to belong to any group whereas a few claimed the absence of groups as the reason for not being in one. Many (58.0%) however did belong to formal groups and also informal groups (17.6%). This was because they mainly obtained loans as social benefits accrued from the groups and they also benefited from social network. However, a few accrued no benefits from the group in spite of them belonging to one. Mlekwa (2018) affirms this in his findings that agro-pastoralists belong to social groups recruited by friends or relatives without practical consideration of the need to join such groups.

About the influence of social capital on LVD outcomes, from the findings of Chi-square test of significance (chi-square=0.103, df =1, p=0.748), this value being statistically insignificant the null hypothesis is accepted and the conclusion is that the participant's social capital had no significant relationship with their LVD outcomes. Hence the LVD outcomes of the participants were not in any way influenced by their presence or absence in any social group.

5.1.4 Relationship between Livelihood Diversification Strategies and Livelihood Outcomes among the Agro-Pastoralists in Laikipia North Sub-County

The **fourth objective** of the study was to establish the relationship between LVD challenges and livelihood outcomes among agro-pastoralists in Laikipia North Sub-county. The researcher explored the participants' challenges and found out that most

(32.3%) of the study participants faced the challenge of adverse climate change. As the District Agriculture and Livestock Officer highlighted, Laikipia County has had climatic hazards such as drought (increase in temperatures), unreliable moisture patterns leading to moisture stress, and increasing frosts and uncertainty in the onset and duration of seasons. These hazards pose a growing threat to the agricultural sector in Laikipia County and often lead to significant crop and livestock production losses resulting from a shortened growing season, poor yields due to high but ineffective rainfall and irregular planting dates hence food insecurity becomes the consequence of this (Ogalleh, Vogl, Eitzinger & Hauser, 2012) and Bond (2014). For the 18.2% of the participants who faced the challenge of lack of capital, may have not had access to formal or informal credit institutions or may have been unwilling to get one. Moreover, they may have access but were not in a position to acquire credit. This may interfere with the acquisition of physical assets such as high-quality livestock breed, seeds, equipment and facilities, transport assets such as motorbike among others.

Still, 14.2% of them faced the challenge of poor infrastructure. This means that to this proportion of participants, basic physical and organizational structures and also facilities such as buildings, roads, power supplies and means of communication were either inadequate or of poor standards for agropastoralism. This in turn affected the storage of products; delayed transportation of agro-pastoral products to market for sales leading to lots of wastes thus, 8.4% faced challenges in terms of market access. Issues with power supply affected running of some mechanized equipment e.g., electric milking machines and also this may have interfered with the communication between the agro-pastoralists and the agricultural extension officers, especially in times of crisis. For 13.9% of the participants, they faced the challenge of conflicts resulting from competition for natural resources such as land for pasture and crop cultivation, and water wells. Bond J (2014) however, found out that the critical features for conflict

among agro-pastoralists was related to trust, communication, security, governance, marginalization and violence. Furthermore, 12.6% of them faced the challenge of unfavorable culture of semi-nomadic environments. All these findings were in accord with Van Ginkel M et al (2012) in the dry lands of Mashreq and Maghreb.

Regarding whether these challenges faced influenced the LVD outcomes of agro-pastoralists in Laikipia North sub-County, as evidenced in the Table 4.34, these challenges had no significant influence on their LVD outcomes. (Chi-square=1.017, df =1, p=0.313). Consequently, the null hypothesis is accepted because this value is not statistically significant, and the conclusion is that the challenges that the participants faced had no significant influence on their LVD outcomes. Meaning that the livelihood outcomes of the participants had no relationship whatsoever with the challenges that they faced. This collides with the views of Ayantunde, Leeuw, Turner and Said (2011) in Africa that the challenges facing agro-pastoralist constrain their pastoral production and economy and hence shape the sustainability of the agro-pastoral systems and livelihoods. In addition, Boru and Koske (2014) in their study on climate variability and response among agro-pastoralists in Marsabit, found out that these adverse climatic changes caused increased vulnerability of rural livelihoods deterioration hence increased food insecurity, reduce livestock holdings, and increased water shortage.

The diversification strategies were identified by comparing those practiced in the past and those that are currently practiced. The researcher also sought to investigate the reason for disparity between past and current livelihood strategies.

A majority of the study participants (33.6%) relied on crop cultivation as a livelihood diversification strategy, these were closely followed by those who adopted the sales of livestock or livestock products as a livelihood strategy who were 23.4% and 19.7% of the participants relied on wages since they were casual labourers. These may be attributed to the availability of physical assets such as land to be cultivated and wells to

provide water for irrigation of crops in times of drought, farming tools and equipment such as ox-plough, panga and tractors, availability of oxen for plowing land and donkeys for transportation of farm inputs and products. Additionally, the availability of financial assets such as credit facilities from both formal and informal institutions may have to provide capital to buy drought resistant plant seeds and livestock breeds may have led to their diversification to larger scale crop production. This is in addition to the social assets available to them, which provided social networks to agricultural extension officers while in the quest for knowledge and skills for farming apart from the loans provided by the groups in form of social assets. Furthermore, these agro-pastoral lands provided employment to some who worked as casual laborers and these provide wages as a diversification strategy. This is in line with the study of Rufino M.C, PK.Thornton, Ng'ang'a, Mutie, Jones, Van Wijk and Herrero (2013) in east Africa who found out that crop cultivation had been taken up in increasing numbers by most Agro-pastoral homes even in marginalized areas to boost food security and reduce poverty.

However, 5.0% adopted beekeeping and the sale of honey as a strategy while about 4.2% adopted hunting as a strategy. This would be associated with Laikipia being a bushland, hence suitable for beekeeping and wild animals that may have been hunted for food and sales.

Moreover, 3.7% of the household heads depended on merchandise sales from a shop especially household items (such as food supplies among others) as a livelihood strategy while others (3.1%) adopted the use of *bodaboda in* order to get income and also help in the transportation of farm inputs to market places for sales. Similarly, 3.1% relied on the sale of grass for thatching since this was easily grown in the bush lands and was resistant to harsh environmental condition. 2.1% adopted the leasing of land as a strategy; this was mainly practice by those to whom land as an asset was very much available to. The leased land was used for both crop cultivation and as pastoral land.

Furthermore, 1.8% used public service vehicle and about 0.3% adopted the renting out of houses as a livelihood strategy. These may have been their form of reinvestment of their income from agro-pastoralism hence they acquired PSV vehicles and build houses for rental purposes to have more than one source of livelihood. However, Headey, Taffesse & You (2014) collides with these findings in the conclusion of their study in Ethiopia that education should be the central pillar of diversification strategies adapted by agro-pastoralists as opposed to physical re-investment.

The researcher asked the household heads to elucidate the degree to which they relied on the adopted livelihood strategies. As pointed out on the Table 4.17, just 15.5% of the household heads relies on the adopted livelihood strategies only in extreme situations while occasionally, 19.7% of the study participants rely on the adopted livelihood strategy. Nevertheless, 64.8% of the study participants always rely on the strategies adopted. Mugotsi, Nyangito & Nyariki (2011) concur with this finding in their study among agro-pastoral communities in Kalahari that due to the increased frequencies in the adverse climatic changes, most agro-pastoralists always rely on the diversification strategies adopted.

The researcher sought to find out the livelihood strategies that the study participants in the past adopted. This was to shed light on any differences between the present and past strategies adopted. It was revealed from the findings in Table 4.14 that a bulk (84.8%) of the participants had previously adopted the sales of livestock and livestock products as a livelihood strategy, yet this has dropped to 23.4% from the previous 15.2%. Nonetheless, 15.2% had previously adopted hunting as a livelihood strategy but this has again dropped to 4.2%. This drop could be a result of encroachment into the bushlands, hence reducing wildlife for hunting. It could also be as a result of practicing other diversification strategies such as riding bodaboda that is away from the forest environment.

The researcher sought to find out from the participants the reasons as to why their existed disparity between their present and past adopted livelihood strategies. The findings were as revealed that most of them (40.7%) cited climate change as a reason, 21.3% cited increased levels of education, 18.9% highlighted changes in land use while 10.5% cited the need to increase income as the justification for the disparity in livelihood strategies adopted. Even so, few of them (8.7%) mentioned increased access to market as the rationale for the existence of the disparity between the present and the past livelihood strategies. Intriguingly, these reasons for disparity have been disputed by Namgay, Milar, Black and Tashi (2014) who in his study found out that farm labor shortage, alternative livelihood choices, government policies, and climate change were the reasons for the disparity between the present and past livelihood strategies.

The researcher found it to be necessary to explore the desired livelihood strategies for the study participants. The results also showed that a good number (24.9%) of the study participants desired to adopt land leasing yet 6.6% desired to adopt selling of land. This would be because there will be an increase in access to land for those with small pieces of land and will give hire levels of income (De Almeida & Buainain, 2016). Others (18.1%) desired hunting and 16.0% desired crop cultivation. However, few (7.3%) desired to adopt wages from labor, 5.5% desired beekeeping and selling of honey, and 5.0% and 5.0% of the participants desired sand mining and burning and selling of charcoal, respectively. Furthermore, 4.5% desired to adopt selling of merchandise in a shop, 3.7% desired wage migration, and 0nly 3.4% desired to adopt the selling of wood products as a livelihood strategy. According to the conclusions in the study by Wang et al (2015), this is attributed to the fact that agro-pastoralists ought to focus on supporting human capital and natural capital.

CHAPTER SIX: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

In this chapter, the researcher summarizes the findings, conclusions drawn from the objectives, and recommendations that establish the areas that need improvement regarding outcomes of livelihood diversification among agro-pastoral households in Laikipia north sub-county and the suggested areas of further study.

6.1 Summary of the Findings

6.1.1 Household Characteristics

The study was set to identify the demographic characteristics of the household heads among agro-pastoral households in Laikipia North sub-county. More than half of the participants were household heads, the rest were their spouses, offspring or relatives who had lived in the area of study for more than 18 years. Most of the respondents were married, with less than six dependants and in a monogamous family set up. The ratio of male to female participants was almost 1:1 since the male were 51% and female 49% of the participants. The majority of participants had up to primary school, with very few having tertiary level of education, yet some had no formal education. Most of them were either livestock or crop producers.

6.1.2 Household Assets

Regarding physical assets, land was very much available and to a large proportion of participants for crop and livestock production and leasing. Water well was, however, not available to a majority of them despite it being a source of water for domestic use, irrigation, watering animals, and development. Goats were available in excess to a few participants and in addition, sheep, cattle and donkeys were available to some extent. Even so, all the equipment and facilities looked into by the researcher were available to

some extent in small proportions of participants to each equipment and facility ranging from 3.1% for axe to 42.3% for mobile phone.

Furthermore, transport assets did not apply to most of the participants. However, a small proportion indicated that these transport assets were available to some extent; the null hypothesis was rejected since there was a weak and negative relationship between the availability of physical assets and the LVD outcomes among agro-pastoralists in Laikipia North Sub-County. Meaning that, Participants with more physical assets had low LVD outcomes as compared to those with less physical assets. Regarding their sources of financial credit, a majority of participants (64.0%) obtained their credit from associations of farmers or traders, village money lenders and NGOs each providing credit to some (12.3%) of the participants, banks gave 5.8% of the participants credits and 5.5% of them got credit from family and friends.

6.2.3 Livelihood Diversification Challenges

The study showed that most of the study participants totaling 123(32.3%) faced the challenge of adverse climate change, 71(18.6%) faced the challenge of lack of capital, 54(14.2%) faced the challenge of poor infrastructure, 53(13.9%) faced the challenge of conflicts and 48(12.6%) faced the challenge of unfavorable culture. Additionally, 32(8.4%) faced challenges related to market access.

6.1.4 Livelihood Diversification Strategies

The researcher sought to investigate the livelihood outcomes among agro-pastoral households in Laikipia North sub-county. For increased income, increased stock of assets and coping with shock, over 80% of participants indicated having medium livelihood outcomes in each case. However, outcomes for better housing, having three meals per day, food availability, access to safe drinking water and health care were also

indicated to have medium attainment of livelihood outcomes ranging from 50% -79% of the participants.

Majority of the respondents (frequency average 281.2, 73.8) were at security level. Fewest (frequency average 17.9, 4.7%) were at survival stage while the rest (frequency average 81.9, 21.5%) were at growth level. This implied that the majority were at an average livelihood level.

6.2. Conclusions

From the findings of this study as well as the tests of hypotheses, several conclusions regarding the survey population are drawn;

Different households bear different characteristics regarding livelihoods. Similar findings apply for household assets. The small margin of assets makes it the intervention to strengthen livelihood diversification options narrower and less practical. For instance, available assets such as sand few trees inform harvesting for earning income and in turn cause adverse effects on the environment. The effects are glaring the sustainability of the resources thus increasing the risk of climatic extremes, specifically droughts and further depleting the natural resource base.

Adoption of alternative livelihood strategies across Laikipia households varied depending on age of household head, location of the homestead, and asset possession or reliance.

Notably, the study found that by adopting various alternative livelihood strategies, Laikipia North households had diversified their livelihood strategies to ensure survival and meet desired livelihood outcomes.

The study concludes that pursuing alternative livelihood strategies was a struggle against various challenges, which needed households to devise solutions and coping mechanisms to guarantee better livelihood outcomes. There was a significant association between the increased vulnerability of a traditional pastoral livelihood

strategy and the pursuit of alternative livelihood strategies. Similarly, there was a significant association between the practice of alternative livelihood strategies and livelihoods outcomes realized.

6.3 Recommendations to Practice

1. The government should strengthen Cooperative Development and Trade and Industry to the ward level. Such efforts will enhance the formation and effective running of cooperative societies as well as equip local community members with skills of running profitable businesses
2. National and County governments to establish and improve existing infrastructure such as road network as the condition of roads were not favorable. Most of the roads were seasonal and in wet weather, moving people and goods from one area to another was difficult. When roads are improved and bridges are constructed on most of the existing streams and rivers, the movement of goods and people will be easy, affecting prices of commodities positively. This will encourage the expansion of adopted small-scale microenterprises.
3. Ministry of Agriculture, Livestock, Fisheries and Irrigation should focus on constructing water dams and pans in the area of study. Water dams and pans will ensure water availability during drought and help develop the infrastructure for irrigation technology. Water will be available for crops and livestock and will encourage the establishment of tree nurseries for planting softwood trees and expand prospects in the sale of wood products.
4. To facilitate deployment, equipping and funding extension officers in the study area households, county government had adopted small-scale and large-scale farming. The officers will support the communities with knowledge, skills and

augment research through testing contemporary agricultural practices and land preservation.

6.4 Recommendations to Policy

1. Parliament and county assemblies need to formulate land-use policies that empower locals. Policies that protect the activities that involve livelihood diversification strategies such as agroforestry and award of incentives for both use and conservation would create better room for enhancing livelihoods.
2. The National and County governments to implement and/or review policies on provision and maintenance of social capital infrastructures such as road and dams. The cases of vandalism and inadequate maintenance lead to the destruction of resources that are key for livelihood diversification strategies such as mixed farming, agribusiness, etc.

6.5 Recommendations for Further Research

The researcher recommends a similar study for other agro-pastoral areas to compare findings obtained in this study. It would be beneficial to undertake another study to determine households' actual income from alternative livelihood strategies adopted. This study aggregated livelihood strategies undertaken by all household members. However, household members undertake different livelihood strategies depending on age and sex. There is a need for a study to identify alternative livelihood strategies adopted by various household members – husband, wife/wives, grown-up daughters and sons. A study on how other livelihoods assets (human and natural) influence livelihood strategies and ultimately, outcomes is also recommended

A study on the impact of livelihood diversification on other livelihood outcomes in the Sustainable Livelihood Framework has been recommended. This includes a measure of

wellbeing, reduced vulnerability, and utilization of natural resource base after adopting various livelihood practices.

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APPENDICES

APPENDIX A: LETTER OF INFORMED CONSENT

My name is Martin W. Irungu. I am a master's student at Kenyatta University carrying academic research entitled Livelihood diversification and livelihood outcomes among agro-pastoral households in Laikipia County, Kenya.

The purpose of this study is academic, and I wish to interview you on the same. Further, I want to clarify that your information for this interview will be treated with the utmost confidentiality. You have the right to refuse participation in this study. Participation in the study is voluntary, and no payment or gifts will be offered to those who participate in the study.

I am kindly requesting your cooperation during the interview session.

Signed Consent

……..

Name of respondent

…….

APPENDIX B: HOUSEHOLD QUESTIONNAIRE

Questionnaire for Collecting Information on Diversification of Livelihood Strategies and livelihood Outcomes among Agro-pastoral households of Laikipia North Sub-County, Kenya.

SECTION A: GENERAL INFORMATION

Questionnaire Number……Household code …….

Date of interview: Date: …… Month: …… Year: …….....

Interviewed by (Interviewers name):.....

Village/Ranch: .....……Ward……Sub- County ……

SECTION B: HOUSEHOLD INFORMATION

1. Respondent number……
2. Relationship of respondent to household head*:* □ *Self* □ *spouse* □*progeny* □R*elative (Tick where necessary)*
3. Number of years the respondent has lived in the village/vicinity: ……
4. (a) What is the total number of dependants in your household?

Order	Gender **(0=male; 1=female)**	Age (Years)	Education level **Code B**	Main Occupation **Code C**

4.(b) Household head details (*Fill the table below*)

Gender of household head **(0=male; 1=female)**	Marital status **Code A**	Type of family **(0. Monogamous: 1. Polygamous)**	Age **(years)**	Education level **Code B**	Main occupation **Code C**

Codes A	**Code B**	**Codes C**
0 Married 1 Single 2 Divorced/separated 3 Widow/widower 4 Other, specify……...	0 None (illiterate) 1 Basic/ Pre-primary (can write and read) 2 Primary school 3 Secondary 4 Tertiary 5 Other, specify ……..	0 Salaried Employee 1 Full time farmer 2 Casual laborer 3 Self-employed/ business 4 Livestock production 5 Student/Pupil 6 Other, specify ……..

SECTION C: LIVELIHOOD STRATEGIES

5. Apart from livestock, what are the other key livelihood strategies do you practice?

□Crop production □Charcoal burning □Sand harvesting □Employed/casual laborer

□Others (specify) …….

5. What are the various livelihood strategies you practice currently and were practiced in the past E.g. by the parents?

Fill the table below (Tick appropriately)

Livelihood strategy	**Current**	**Past**	**Reason for disparity[1] (***Type N/A if no disparity*)	**Desired Livelihood**	**Degree of reliance[2]**
Livestock sales and sale of livestock products					
Wage labour					
Wage migration					
Hunting					
Crop cultivation					
Remittances					
Bee keeping and sale of honey					
Leasing out of land					
Sale of land					
Sand mining and sale					
Make and sell charcoal					
Local gold mining					
Sale of wood products					
Gathering of local vegetables					
Sale of merchandise (shop)					
Sale of merchandise (jua kali)					
Make and sell traditional ornaments					
Make and sell traditional crafts					
PSV					
Boda boda					
Herbal medicine (self)					

[1] Reasons for disparity could be:

0 climate change shocks, 1 Need to decrease income,2 land use changes, 3 increased education levels,4 increased market access,5 others

Degree of reliance: [2] 1 - Always; 2 – Occasional; 3 – Only in extreme situations; 4 – As last resort

Rental houses					
Sale of grass for thatching					
Hiring out draught animals					
Make and sell bricks					
Other (Specify)					

11. What challenges are you facing in pursuing your livelihood strategies?

What strategies are you putting in place to mitigate against livelihood challenges listed above?

Challenge (s)	**Mitigation Strategies**
Lack of Capital/Cost of input	
Unfavorable Culture	
Poor Infrastructure	
Adverse Climate change	
Conflicts	
Limited kills	
Limited time	
Lack of resources eg land/input	
Market Access	
Others (Specify)	

SECTION D: PHYSICAL ASSETS

12. What livelihood supporting physical assets do you own?

To what extent do you rely on this physical asset to attain desired livelihood outcomes?

0=Not at all 1=To some extent 2=To a great extent 3= to a very great extent

	Yes	No	Reliance on the asset
Land			
Sheep			
Goat			

Cattle			
Rental houses			
Hand sprayer			
Panga			
Axe			
Water tank			
Water well			
Mobile phone			
Oxen for ploughing			
Tractor			
Donkey			
Ox plough			
Public service vehicle			
Motorcycle			
Bee hive			
Others (specify)			

SECTION E: FINANCE AND CREDIT ACCESS

13. What financial/credit sources are you aware of, both formal and informal (*Tick appropriately*)

□ NGOs □Banks □Micro-Finance institutions □Village money lenders. □Farmers/traders/association □ Family/friends □ Other (*specify*) _____

14. Of these sources have you obtained credit from any of them in the last 12 months?

□No □Yes

15. If YES, what was the source of the credit?

_____

16. What was the purpose of the credit?

□ Financing alternative livelihood strategies

□ Financing household welfare eg health, education

□ Others (specify)

17. If NO, why are you not able to access a loan?

---

21. Do you have any savings for your future use?

□No □Yes

22. If yes, in what form do you keep your savings?

□Buy Livestock □Buy land □Bank/microfinance □Build rental house

□Others (specify) _____

SECTION F: SOCIAL CAPITAL

23**.** Are you a member of any group either formal or informal? □No □Yes

24. If yes, please fill the table below.

Name of group	Type of group and geographical spread (local/regional/national/international)	Benefits accrued from the group

25. If no, why?

□Not willing □ There are no groups

SECTION G: LIVELIHOOD OUTCOMES

29. What do you desire to achieve in life?

_____

(*Explain livelihood outcomes as important aspirations that a person seeks to achieve through income generating activities or livelihood strategies)*

30. To what extent are the livelihood strategies that you pursue enabled you to attain livelihood outcomes?

□Not at all (Low) □To some extent (medium) □Very much (high)

i. Income	Not at all	To some extent	Very much
Increasing income for household			
ii. Household Food security			
3 meals a day for everyone (adequacy)			
Food available throughout the year (sustainability)			
iii. Safe drinking water access			
iii. Better Housing			
iv. Access to Healthcare			
v. School			
Others			
Increasing stock of assets			
Improved coping with various shocks and trends (drought, floods, disease, death, job loss)			
Diversification and/or intensification of livelihood strategies/activities			

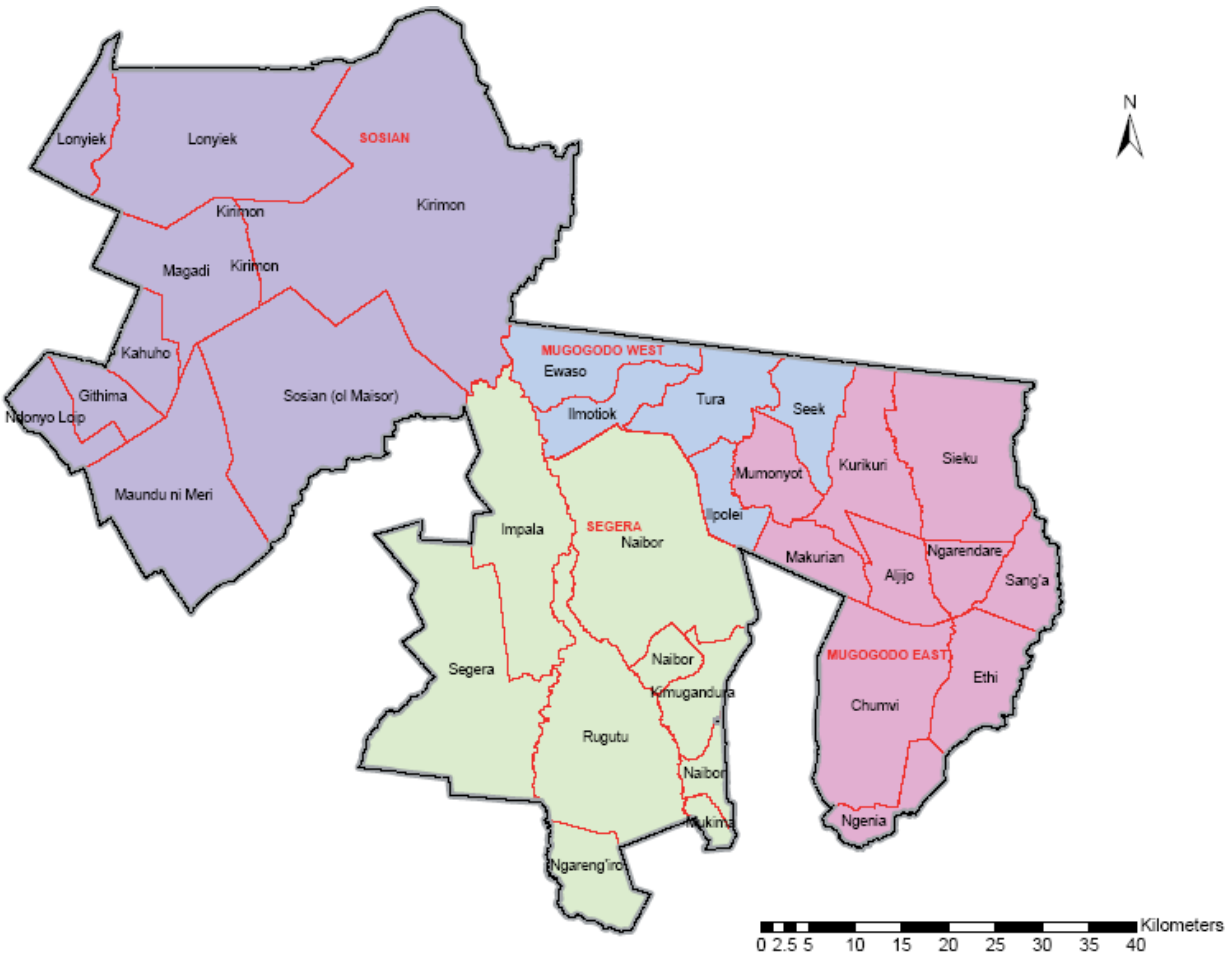
Thank you for your time

APPENDIX C: KEY INFORMANT GUIDE FOR COUNTY AGRICULTURE AND LIVESTOCK OFFICER

Key Informant Interview Guide for the District Agriculture and Livestock Officer for the Study on Livelihood diversification strategies and livelihood outcomes among agro-pastoral households in Laikipia County, Kenya

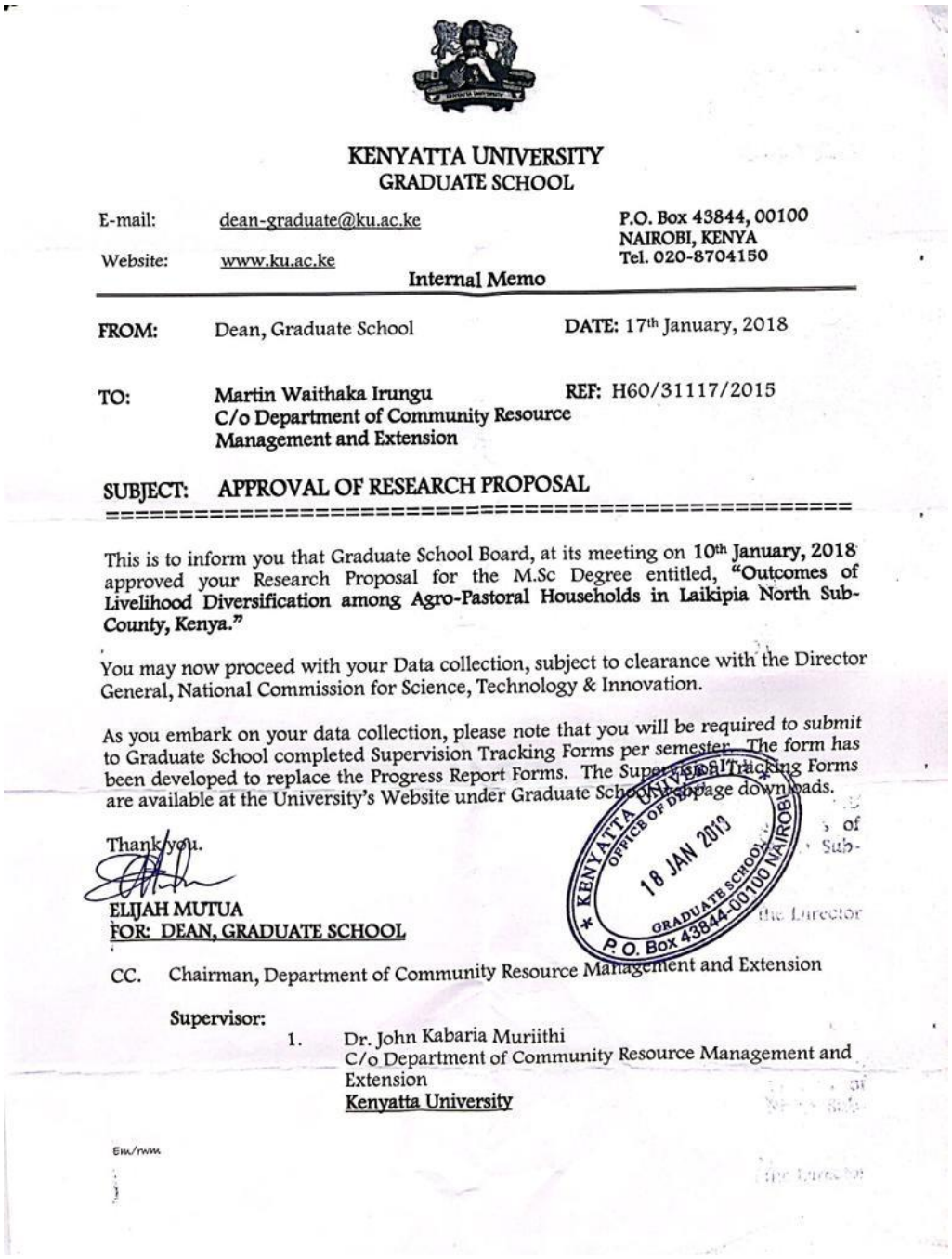
1. What major factors have contributed to livelihood vulnerability in Laikipia north constituency?
2. What organizations in collaboration with your department are involved in helping agro-pastoralists in Laikipia sub-county to achieve livelihood security for their households?
3. What opportunities do you render to the community in terms of alternative livelihood strategies?
4. Have the opportunities presented had positive impacts towards achieving positive livelihood outcomes?
5. What would you recommend as a sustainable solution to livelihood vulnerability among agro-pastoralists in Laikipia North Sub-County?
6. Please mention the policies and measures put in place in regulating livelihood strategies to curb further vulnerability

APPENDIX F: LAIKIPIA NORTH SUB-COUNTY MAP



Source: Google Maps (2017)

APPENDIX G: RESEARCH APPROVAL



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School **DATE:** 17th January, 2018

TO: **Martin Waithaka Irungu**
C/o Department of Community Resource Management and Extension

REF: H60/31117/2015

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting on **10th January, 2018** approved your Research Proposal for the M.Sc Degree entitled, **"Outcomes of Livelihood Diversification among Agro-Pastoral Households in Laikipia North Sub-County, Kenya."**

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School homepage downloads.

Thank you.

ELIJAH MUTUA
FOR: DEAN, GRADUATE SCHOOL

KENYATTA UNIVERSITY OFFICE OF DEPUTY GRADUATE SCHOOL P.O. Box 43844-00100 NAIROBI 18 JAN 2018

CC. Chairman, Department of Community Resource Management and Extension

Supervisor:

1. Dr. John Kabaria Muriithi
C/o Department of Community Resource Management and Extension
Kenyatta University

Em/nwm

APPENDIX H: RESEARCH AUTHORIZATION

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: H60/31117/2015

DATE: 18th January, 2018

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MARTIN WAITHAKA IRUNGU – REG. NO. H60/31117/2015

I write to introduce Mr. Martin Waithaka Irungu who is a Postgraduate Student of this University. He is registered for M.Sc degree programme in the **Department of Community Resource Management and Extension.**

Mr. Martin Waithaka Irungu intends to conduct research for a M.Sc Proposal entitled, **"Outcomes of Livelihood Diversification among Agro-Pastoral Households in Laikipia North Sub-County, Kenya".**

Any assistance given will be highly appreciated.

Yours faithfully,

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

KENYATTA UNIVERSITY * OFFICE OF DEAN * 18 JAN 2018 GRADUATE SCHOOL P. O. Box 43844-00100 NAIROBI

JL/rwm

APPENDIX I: NACOSTI PERMIT

NATIONAL COMMISSION FORSCIENCE, TECHNOLOGY ANDINNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
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/18/66702/21059** Date: **26th January, 2018**

Martin Waithaka Irungu
Kenyatta University
P.O Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Outcomes of livelihood diversification among agro-pastoral households in Laikipia North Sub-County, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Laikipia County** for the period ending **26th January, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Laikipia 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.

GP Kalerwa
GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Laikipia County.

The County Director of Education
Laikipia County.