

**EFFECTS OF DROUGHT ON HOUSEHOLD LIVELIHOODS IN NGOMENI WARD,  
MWINGI NORTH SUB COUNTY, KITUI COUNTY**

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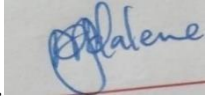
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**@2021**


## DECLARATION

This research project is my original work and has not been presented for a masters degree or any other award in any other institution of higher learning.

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## **DEDICATION**

To my parents, thank you for believing in me. You have been committed to my wellbeing ever since. Thanks for always reminding me that I needed to give it my best.

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Special gratitude to my family for praying for me, your support was felt all through my studies. Above all else, to God be the Glory for health, strength, and His grace that has been sufficient.

## **ABSTRACT**

Drought is one of the commonest disasters affecting Kenya today. About 80% of the landmass in Kenya is categorized as arid and semi-arid lands. These areas are prone to droughts. Over the years, the intensity, duration and frequency of droughts have increased causing great risks and disruptions to household livelihoods. The disruptions in household livelihood sources that are climate-sensitive are likely to exacerbate households' dependence on the immediate environment to meet their basic needs. This research, therefore, sought to examine the impacts of droughts on household livelihoods in Ngomeni ward, Mwingi North Sub County, Kitui County. The researcher applied both qualitative and quantitative approaches with a sample size of 283 households and five key informants. The sampling methods used were simple probability sampling for households and purposive sampling for the key informants. Questionnaires, in-depth interviews, observation, and pictorials were used for data collection. Data was analysed through inferential analysis, descriptive and inferential analysis, while SPSS was used to generate tables, graphs, and frequencies. Cross tabulation for chi-square was used to test the hypotheses at a 0.05 rejection level for all inferences

The major findings of the study are that most households in Ngomeni had more than one livelihood source. Sources of livelihoods included crop production, livestock keeping, off-farm casual labour, on-farm casual labour, business, formal employment, remittances, assistance and transfers, and credit. Most households depended on crop production that was highly affected by drought. Most households could not diversify their livelihood sources and that reduced the households' ability to cope with droughts. Droughts impacted the level of engagement and dependency on different livelihood sources. The study concluded that there was a significant difference between spatial-temporal characteristics of drought and its effects on household' livelihoods in Ngomeni Ward. The study also concluded that droughts significantly aggravated environmental degradation in Ngomeni Ward by increasing the likelihood of household's dependence on the immediate environment through engaging in destructive activities such as charcoal burning, small-scale stone quarrying, and wood logging. The study recommended community training and support to diversify sources of income without degrading the immediate environment.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

ASAL	-	Arid and Semi-Arid Areas
FAO	-	Food and Agriculture Organization of United Nations
IFAS	-	Institute for Food and Agricultural Standards
IPCC	-	International Panel Climate Change
NDMA	-	National Growth Management Authority
SDG	-	Sustainable Development Goals
SLA	-	Sustainable Livelihood Approach
UN	-	United Nations
USAID	-	United States Agency for International Development
WFP	-	World Food Programme

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the Study

Among the different climatic events globally, drought hazard is the major threat to rural livelihood systems (Spinoni et al., 2014). This is a form of environmental strain that develops from a shortage of rainfall over a lengthy period enough to cause shortage of soil moisture, crop failure, loss of plants and animals as well as cause general hardship on human (Huho et al., 2010). The percentage of the globe affected by drought in the last 40 years, has more than doubled in the same period, affecting more people worldwide. The agricultural sector bears much of the drought effects and is the most affected in developing countries, with numerous effects on the availability of water, agricultural yields, and pasture among other rural livelihoods (Ding et al., 2011). Approximately 40% of the world's population depends on agriculture as the main livelihood source and drought is putting risks to the livelihoods of many. This risk halts and reverses gains in poverty reduction and food security and therefore obstructing efforts to achieving SDG1 and SDG2 (Parry et al., 2012). This study, therefore, seeks to examine the risks that drought has posed to the livelihood of rural households in Mwingi North Sub County, and particularly targeting Ngomeni ward, which is among the worst hit by drought for over a decade.

Previous studies on drought effects on Arid and Semiarid livelihoods show some similarities especially across the agricultural and pastoral sectors that are predominant in these areas. These impacts include water scarcity, increased temperatures that have dire impacts on livelihood sources and environment. Previous droughts have been associated with massive famine and migration, increased environmental degradation, and fragile economic performance (Ionita et al., 2016). Majority of rural households' who are primarily dependent on agriculture for their livelihood have had their agricultural systems affected extensively through reduced productivity, food shortage with a combination of inadequate agriculture-economic entitlements. The changes in water availability affect the total households' income and consumption patterns among rural households and this, in turn, triggers resource use and fluctuates the livelihoods (Ionita et al., 2016). Africa is among the continents that are worst hit by drought in the world. This is because rural livelihoods across Africa largely depend on rain-fed agriculture. Approximately 70% of the continent entirely

depend on small-scale farming as the primary livelihood source (Muthui, 2007). The drought effects on rural livelihoods are intensified by the increased frequencies that affect rural communities lack the opportunity to recover from the effects.

In Kenya, climate-related hazards have been a serious peril to development. This is because Kenya's economy, like most African countries, is highly dependent on climate-sensitive sectors such as tourism, production of energy and agriculture (Parry et al., 2012). The mainstay of the Kenyan economy is agriculture contributing about 25 % of gross domestic product (World Bank, 2019). The sector is predominantly rain-fed, and over the last decades, it has been largely affected by climate and rainfall variability leading to decreased outputs in rural parts of the country (USAID, 2016). According to Ngaira (2004), droughts are the commonest disasters affecting Kenya today. About 80% of the landmass is under ASALs that prone to frequent droughts with an average of 30% of Kenya's population residing in these areas. Drought in Kenya can be traced back to 19<sup>th</sup> century. During this time the frequency was less with an average of 10 years. Recent studies show that the drought frequencies have increased and particularly in the ASAL's. These areas are experiencing drought averagely on an annual basis and this has worsened drought effects on rural communities because before the households recover from one drought effects they face another drought. Consequently, about two million people in Kenya are constantly on relief and the numbers rise to about 5 million during severe droughts (Mude et al., 2007). Frequent droughts are associated with major food crises: studies done in other areas with similar climatic conditions have shown that drought can tamper with the ability of households to meet their basic needs. For instance, Muthui (2007) and Huho et al., (2010) noted that recurrent and prolonged periods of drought cause loss of rural livelihood sources leading to high dependency on relief food.

Kitui County is characterized as ASAL area. Thus, the county is prone to frequent and prolonged droughts. Consequently, poor crop yields and a shortage of livestock pastures threaten food security efforts. Increased frequencies of drought in the county have been caused by deforestation, poor soil conservation as well as degradation of water catchment areas. Mwingi Sub- County is a drought-prone region as it falls in volatile and vulnerable ASALs zone. 90% of the residents depend on rain-fed small-scale farming. On a time scale, this has been notable in crop failures, diminishing water resources, enhanced mortality in livestock, fallen livestock prices, recognizable out-



migration, and general declining livelihood systems (County Government of Kitui, 2013). As drought sets in, foods become rather scarce leading to the escalation prices of cereals.

Abraham (2006) Sivakumar et al., (2014) recommended region-specific and local level analysis of the effects of drought on rural communities as a way of finding effective measures of preparedness and resilience building. In Kenya, there is no adequate research on drought effects at the micro level point of view i.e. local communities. Studies on drought and livelihoods have not adequately evaluated effects of drought on all rural livelihood sources, for instance, drought impacts on unskilled employment (on-farm and off-farm casual labours) are often ignored while they are a crucial component of livelihoods in a rural setting. Currently, the available literature on drought in Mwingi North Sub County has mainly focused on the assessment of drought preparedness in households as well as the strengthening of rural resilience and few have looked into the relationship between the recurrent droughts and livelihood sources of the people. Some of the interventions such as the provision of relief food, as well as other hunger safety net programs are short-term and never yield much. Accordingly, most of the households may have turned to environment degrading activities such as charcoal burning, unsustainable sand harvesting and wood logging. Therefore, this study was deemed necessary to document findings for future action by researchers, policymakers, planners, and County government officials. According to Wilhite, (2000), there are five approaches to the study of drought; namely Meteorological, hydrological agricultural, socioeconomic and ecological droughts. In this research, the main focus is socio economic. We also touch on the effects of ecological and agricultural droughts to household livelihoods. The effects of Socio economic drought are experienced at longer time after the end of drought.

## **1.2 Statement of the Research Problem**

Drought has become more severe and frequent in most ASALs of Kenya for close to two decades due to climate variability (Ondiko & Karanja, 2021). Disruptions of livelihood sources and assets during successive droughts have been experienced, rendering most rural communities prone to increased vulnerability to food insecurity (Musimba et al., 2012). Ngomeni is a ward within Mwingi North sub-county, Kitui County and it is located in a semiarid area. Most households depend on rain-fed small-scale farming as the central household livelihood source. Rainfall trends in this area have been very unpredictable, exposing the rural community to persistent drought and

famine. The ward is amongst the most hit by drought and with high food insecurity in Kitui County (County Government of Kitui, 2013). Most households hardly get any harvest during droughts and keep on over-relying on scarce assets like livestock that eventually run out leaving most households in a desperate situation. The recurrence of the droughts may have aggravated the problem because the rural households lack an opportunity to recover from previous socio economic effects of drought and no longer rely on fluctuating livelihood sources but turn to environment degrading activities such as charcoal burning. Therefore, this study aimed at exploring the effects of droughts on the household livelihood sources in Ngomeni Ward, Mwingi North Sub County. The research mainly focuses is socioeconomic drought but also touches on ecological and agricultural droughts.

Currently, there is inadequate research on effect of socio economic drought on household's livelihood in Mwingi North Sub- County. Therefore, this study aims at contributing to the existing literature on drought and rural livelihoods.

### **1.3 Research Questions**

- i. What are the sources of household livelihoods in Ngomeni Ward?
- ii. How has drought affected the households' livelihood sources in Ngomeni Ward?
- iii. How has drought contributed to environmental degradation in Ngomeni ward?

### **1.4 Research Objectives**

1. To examine the sources of livelihoods in Ngomeni Ward.
2. To explore the effects of drought on households' livelihood sources in Ngomeni ward.
3. To examine how drought has contributed to environmental degradation in Ngomeni ward.

### **1.5 Research Hypotheses**

1.  $H_0$ : There is no significant difference between drought characteristics and household livelihoods in Ngomeni Ward.
2.  $H_0$ : There is no significant difference between drought and environmental degradation in Ngomeni Ward.

## **1.6 Justification of the Study**

The second sustainable development goal (SDG 2) is to achieve zero hunger by 2030 (UN Assembly, 2015). This will be achieved by enhancing local communities' livelihoods to minimize their vulnerability to hunger. Paragraph 205 to 209 of the *future we want* report raises concerns on the challenges posed by drought along with desertification to achieving sustainable development in the African continent (Rio UN, 2012). Several researchers such as (Parry et al., 2012 and Huhó et al., 2010) have particularly pointed out that climate variability has made drought a threat to the Kenyan economy. Accordingly, drought impacts on the limited households' livelihood sources of in rural communities cannot be ignored.

Paragraph 208 of the *future we want* by Rio UN, (2012) acknowledges the relevancy of continuous drought monitoring and research in strengthening the scientific base of activities to address drought. Abraham (2006) Sivakumar et al., (2014) recommended region-specific and local level analysis of the effects of drought on rural communities as a way of finding effective measures of preparedness and resilience building. In Kenya, there is no adequate research on drought effects at the micro level point of view i.e. local communities. Studies on drought and livelihoods have not adequately evaluated effects of drought on all rural livelihood sources, for instance, drought impacts on unskilled employment (on-farm and off-farm casual labours) are often ignored while they are a crucial component of households livelihood in rural areas. This study is therefore deemed necessary, both as a contribution to the existing literature on Drought in Kitui County as well as openly discusses how frequent droughts have affected rural communities in Mwingi North while recommending future focus areas to researchers. The conclusion of this research is also of great significance to development actors, the county government of Kitui as well as other organizations in developing proactive drought management systems and preparedness in Mwingi North sub-county.

## **1.7 Scope and Limitations of the Study**

This research aimed at exploring the effects of droughts on the livelihood of the people in Ngomeni ward, Mwingi North Sub County, Kitui County. Due to the vastness of the areas as well as the sparse population, the study didn't cover the whole of Mwingi North Sub County but we concentrated on Ngomeni ward which is among the worst hit in the sub-county. Designed

questionnaires were administered to the household heads to acquire data on the types of livelihood sources, the impacts of droughts on households' livelihood sources as well as linkages between droughts and environmental degradation. Secondary data such as the rainfall trends were obtained from the meteorological department. This study focused on the last 10 years.

### **1.8 Definition of Operational Terms/Concepts**

*Household:* This is a group of people or a person living in the same compound, eating from the same pot and with the same person household head.

*Household livelihoods:* This is the means of how households meet their basic needs. This includes the various income generating activities and sources including crop & livestock production, all formal and informal income sources the household depend on to secure necessities of life. In this study we focus on the effects to crop and livestock, the level of engagement to on farm and off farm casual labour, business and non-farm enterprises as well as the level of dependency on remittances, assistance and transfers and credit

*Drought:* Generally, is a form of ecological straining that comes after a shortage in rain over a timeline enough to cause deficiency of soil moisture, poor crop yields, loss of flora and fauna as well cause general hardship on humans. In this research, the main focus is socioeconomic drought which covers the social and economic effects of drought to households.

*Drought characteristics:* In this research, drought characteristics means the frequency, duration and intensity of droughts. In this study we look at drought events between 2009 to 2019 with a focus on 2009 drought.

*Recurrent drought:* This refers to the increased frequencies of occurrence of drought events, mostly occurring in less than two years.

*Semi-arid:* These are areas characterized by high temperatures (30-45°C) and where precipitation is less than potential evaporation. The mean annual precipitation in semiarid areas ranges between 200 MM to 700MM

*Sustainability:* Supporting natural resources to maintain an ecological balance and ensure that the present generations enjoy maximum benefit without conceding the capability of coming generations to meet their needs.

*Drought coping strategies:* Mechanisms applied by rural households to manage, cope, and minimize the adverse effects of drought on livelihoods.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter looks at reviewed literature on the effects of drought on the livelihood sources in ASALS. It further provides a discussion of the global overview and types of droughts and how they progress to effects on socioeconomic and environmental aspects of household livelihoods. In this chapter we provide a critical analysis of existing empirical research. This helps in the identification of research gaps, important concepts that are useful to this study as well as future comparison of the research findings with other scholars.

#### **2.2 Types of Drought**

Currently, there is no universal meaning of drought but the definitions given by most authors have a common concept of drought. There is a broad consensus that drought results from shortage in precipitation amount (Sivakumar et al., 2014; Rathore, 2004). Drought can be categorized into Socioeconomic, meteorological, Ecological, hydrological, and agricultural droughts (Wilhite, 2000).

##### **2.2.1 Meteorological Drought**

This is defined based on precipitation amounts. This kind of drought occurs when the amount of precipitation is lower than mean precipitation amount observed for a longer period. Scholars such as Missimer & Maliva (2012), EPA (2014) and NDMC, 2006 perceive meteorological drought as precipitation shortages in absolute amounts for a given time. The definition of drought is normally region specific because of different climatic conditions in different places (Monacelli et al., 2005).

##### **2.2.2 Hydrological Drought**

This drought occurs when there is prolonged periods of shortage of water availability than normal in lakes, ground water bodies, rivers and streams (Van Lanen, et al., 2013). Previous studies have noted that there is a difference between the indicators of hydrological drought and indicators of both agricultural and meteorological droughts (Peters et al., 2006; Tallaksen, 2009). This type of drought results from persistent periods of less precipitation.

### **2.2.3 Agricultural Drought**

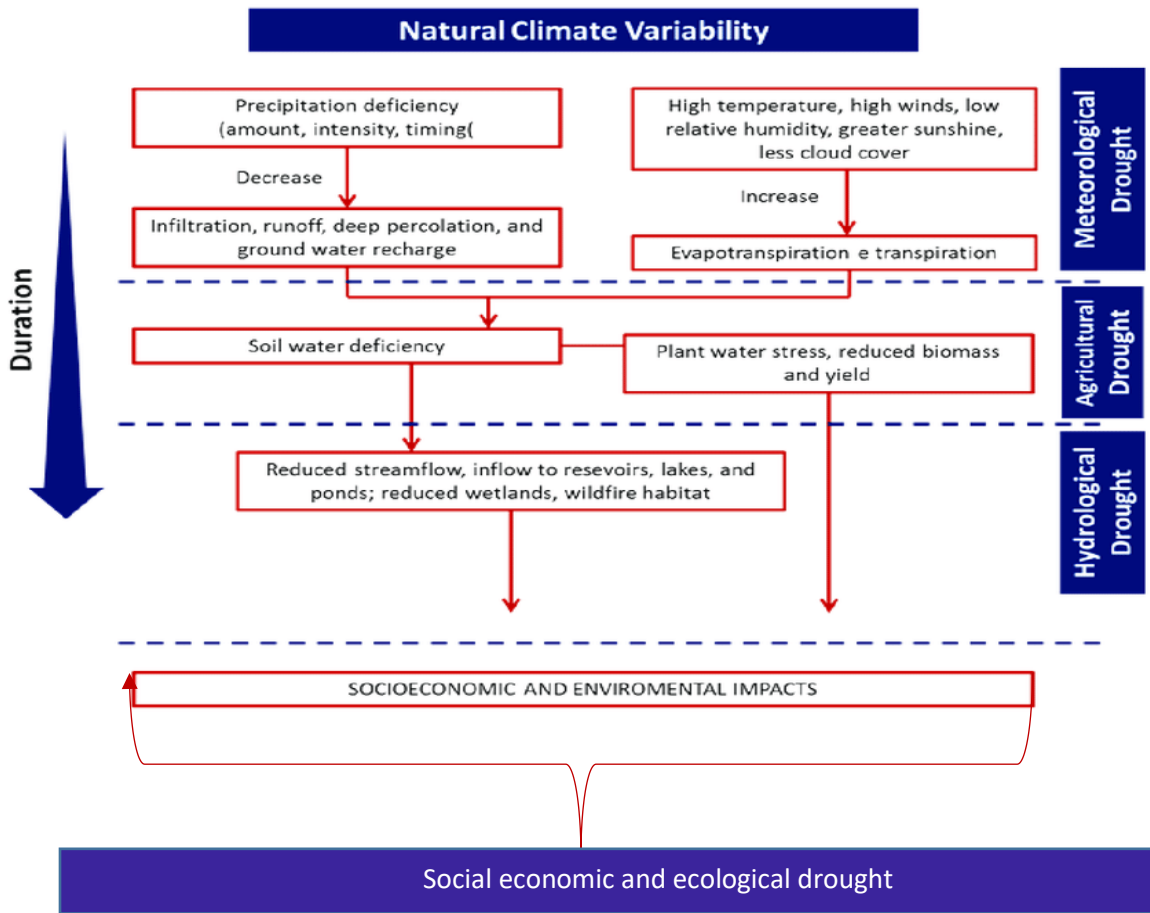
This drought results from the effects of reduced amount of precipitation on agricultural production I.e. Crop and Livestock production. It refers to a shortage in soil moistness that causes increased plant stress (NDMC, 2006). When the agricultural drought is extreme causing food shortages and malnourishment it is termed as famine drought. (IFAS, 1998)

### **2.2.4 Socioeconomic drought**

Socioeconomic drought occurs when deficit in water supply causes an imbalance between demand and supply of economic goods. This study is mainly focusing on this type of drought (effects on livelihood sources). Socio economic drought is closely related to effects of drought on human life (Wilhite, 2000)

### **2.2.5 Ecological Drought**

This drought occurs when shortage in water availability drives ecosystem beyond thresholds of vulnerability affecting the ecosystem services. Ecological drought furthers affects social systems (Crausbay et al, 2017)



**Figure 2.1 Summary of the types of drought and how they progress (Wilhite, 2000).**

### 2.3 Global Perspectives on Drought

Drought is arguably among the worst threats from climate change. Its impacts are wide and the future of this natural hazard as climate variability takes hold remains uncertain. Drought is defined according to its effects on different natural parameters such as hydrology, agriculture, meteorology among others. Recently, this natural hazard has become an ordinary part of climate all over the world, in regions regardless of how arid or humid they are. However, as years go by and with the rise of climate variability, this ubiquitous hazard has become more common and recurrent mostly affecting the ASAL's regions (Gamage et al., 2009).

In 2007, the IPCC concluded that drought has become more common since the 1970s. In its fourth assessment report, IPCC further mentioned the likelihood of changes in the duration, intensity and frequency of drought in Africa & Asia in the 21<sup>st</sup> century. According to the report, there is a high



likelihood of frequent droughts adversely affecting agriculture, forestry, and ecosystem causing increased wild fires, lower crop yields, increases livestock deaths, and land degradation). Previous IPCC reports noted that unindustrialized countries were more vulnerable to drought compared to industrialized countries (Parry et al., 2007).

### **2.3.1 Drought in Europe**

In Europe, droughts have been a recurrent feature and have not been restricted to the Mediterranean region, but have been occurring in high and low precipitation areas. Most people in this region still consider drought phenomena to be a rare phenomenon probably because it has had adverse effects in other regions of the world than in European countries. However, current research shows that this hazard is becoming more regular and large areas have been affected in the 20<sup>th</sup> century (European Commission, 2010).

According to the European Commission (2010), the number of European drought has increased since the 1980s. The droughts have also turn out to be more intense costing an average amount of €100 billion. The 2003 drought is among the worst droughts that affected about a third of European territory with an estimated number of over 100 million affected. According to European Commission, (2010), major areas affected by the European drought since the 1970s are the agriculture sector and water resources (Stahl et al., 2015). The latest 2018 drought across many Northern, Eastern, and Central Europe led to a decrease in crop yields as well as increased wildfires. Vegetation was also stressed in parts of England, Netherlands, Belgium, and Sweden among others (Liberto, 2018).

In Sweden, only 12% of the normal rains were received in 2018 and this led to droughts that largely affected the agricultural sectors with about 91% fall in the estimated agricultural production. The country was also hit by environmental hazards through wildfires that led to massive loss of vegetation cover. Water scarcity also became more problematic and this increased the costs of living for rural communities. Similarly, the European Drought Impact assessment (EDIA) noted that Agriculture and public water supply are major cross-cutting sectors that are affected by drought in Europe, with severe impacts being reported in southern Europe (EDII, 2018)

**Table 2.1 Key European droughts**

<b>YEAR</b>	<b>LOCATION</b>	<b>DURATION</b>
1991 – 1995	Mediterranean region	02/1992 to 10/1994
1996-1997	Northern Europe	04/1995 to 08/1996
2001	East and South East Europe	03/2001 to 03/2001
2003	Europe	04/2003 to 11/2003
2004-2007	Iberian Peninsula	07/2004 to 06/2007
2007	Eastern Europe	02/2007 to 08/2007

Source (European Commission, 2010)

### **2.3.2 Drought in Asia**

In Asia and Pacific region, drought disasters remain to be a serious problem because of human actions and global warming. The south western and central Asian countries are the worst affected. These countries also experience prolonged droughts and have challenges on mitigation plans coupled with social and political disturbances (Liu, 2007). Different kinds of natural disasters are common in China and this results to economic losses. Among the natural disaster drought effects have been most severe (Zhou & Zhang, 2014). The water levels are way low compared to the regional average. Other than the rainfall scarcity in these areas the rivers levels have greatly reduced, its varied levels cause difficulties in management. Ground water is also exploited at an worrying rate and water pollution is reducing the safe water resources.

### **2.3.3 Drought in Africa**

Developing countries are particularly the most affected by drought due to their topography and high reliance on rain-fed small scale agriculture unlike the economies of western countries that are highly diversified to mitigate the effects of drought. However, these economies do not fully eliminate human strain and major economic loss associated with a prolonged drought. According to the UN report (2007), droughts and desertification are core and serious threats to sustainable development in Africa, particularly because most of the population is dependent on rain fed subsistence agriculture agriculture that is vulnerable to climate variability. Available records depict different drought occurrences across Africa and notably 1972-1973, and 1991- 1992 drought that affected all regions with the Sahel region worst hit (Maish, 2014).

In East Africa, the 1991-1992 drought is recorded as the worst in about 60 years and severely affected Kenya, Somalia, and Ethiopia affecting more than 13.3 million people. In Kenya, droughts have been experienced since the 19<sup>th</sup> century. Drought occurrence has increased in the 20<sup>th</sup> century. Although droughts are experienced almost in every part of Kenya, the arid and semiarid areas are most affected. The livelihoods of rural communities in these areas have been under threat due to drought-related factors (Mbogo et al., 2014).

### ***Previous droughts in Kenya***

1. In 1997 the livelihood of about two million people was threatened by severe drought
2. In 2000, 4 million people needed urgent food Assistance due to crop failures. This was listed as the worst in over 37 years
3. In 2004 failure of March to June rains left about 2.3 million people food insecure due to poor crop yields.
4. In 2009/2011, 13.3 million people were affected across East African countries including Kenya, Somalia, and Ethiopia. This was among the major droughts in 60 years (Mbogo et al., 2014).

### **2.4 Effects of Drought on Livelihoods**

Prolonged and adverse drought may spell doom to most rural livelihood resources. Research shows that the climate sensitive livelihoods such livestock and crop productions are majorly affected. These livelihood sources are central sources of livelihood in rural areas. Drought hazard also put pressure on environmental resources (Srezepek & Smith, 1995).

The effects of drought on livelihoods vary with each drought type and among the livelihood sources. The extent of the effects is based on the development level of the affected, the population density and structure that determines demands on water and other natural resources, the national institutional and policies government as well as their capacities. In most cases, drought effects are mainly looked from agricultural point of view, but it seriously affects other sectors (Gamage et al., 2009). It occurs as a result of a lower than expected amount of precipitation (Keith and Petley, 2009).

### **2.4.1 Social-economic and Environmental Impacts**

According to Nosrati and Kazemi (2011), drought is a very dangerous natural hazard compared to other natural disasters. It can cause adverse effects to the economy as well as serious damages to the environment and the social aspects of communities either directly or indirectly. Sharifikia (2013) characterizes drought in to three categories namely social, environmental and economic impacts. Drought comes along with many indirect effects on the economy, not only to the directly affected community but also at the national level. To develop efficient and sustainable drought management and mitigation measures, it's very important to evaluate the economic impacts of drought. This is because in most cases the economic impacts can be quantified unlike in the social and environmental effects (Bauman et al., 2013). The common economic drought effects originate from losses that result from failed livelihood sources that are highly dependent on weather. This includes income losses from poor agricultural yields, a decline in agriculture-dependent industries, increased unemployment (on-farm, off-farm, and non-Farm), and loss of livestock among others. A study done by Karanja, 2018 on drought effects on household livelihoods noted a decrease in crop yields and income from the livestock production. Financial strains also come in as a result of increased costs of living through escalation of food prices, increased expenses on the water including many hours spend on getting water. Drought deteriorates the growth rate of a nation's economy. For instance, since the 19<sup>th</sup> century, most African countries have seen their economic downturn due to successive droughts. In 1984, the drought that hit Sub-Saharan African countries led to the fall of the economy of Ethiopia and Niger by 7% and 18% respectively (Benson & Clay, 1994).

#### ***Environmental impacts***

Drought affects the quality of soil in that it causes a decline in soil moisture that is essential for plants. Decrease in moisture content also lessens organic activity which in turn increases wind erosion affecting soil organisms (Smith & Owen, 2013). Also, hydrological drought greatly affects both surface and underground water resources drying them up. This destroyed the natural habitat hence forced migration and death of wildlife. Drought causes desertification, a term that is commonly associated with severe droughts and deteriorated land. Loss of vegetation increased wind erosion, and bare lands mainly as a result of deforestation, overgrazing and forest fires lead to desertification (Onwunyi, & Anekwe 2020).

### ***Social impacts***

The effects of drought on a social dimension are probably experienced more severely because they directly involve human beings (Wilhite, 2007). The rural communities whose livelihoods are highly dependent on climate-sensitive sectors are the most affected by drought. Lack of food, loss of household income, unemployment, migration, school dropout, serious health, and wellbeing problems are common during extreme droughts (Aston & Kent, 2004). The Health of people is directly related with the quality of water. In the event of drought, water shortage causes people to use unclean water causing an increase in diseases. Poor eating habits escalate the problem leading to diseases such as malnutrition and anemia increasing loss of lives. Other social problems such as conflicts over resources, theft increases fear, stress, and anxiety among rural households.

### ***Key studies and their findings***

Most of the previous studies done on drought and livelihoods conclude that drought affects the main sources of livelihoods i.e. crop and livestock farming. Due to a decline in these sources, the purchasing abilities of poor households where livelihood options are few is seriously affected. Thus, the struggle to buy enough basic needs such as healthy food is advanced. According to Rapid Drought Assessment by FAO in Timor Estate, drought can cause disruptions to the livelihood of rural communities. The erratic rains observed in 2015, greatly affected the agricultural sector which is a major source of livelihood exposing households to food insecurity and malnutrition. The effects of drought included delayed planting, poor growth of crops that translated to poor yields. The livestock had recurrent diseases that increased animal deaths due to lack of pasture and water (FAO, 2015). Similar findings were found by WFP in a joint evaluation of drought effects on livelihoods and food security in Sri Lanka, where rural households lost more than three-quarters of their livelihood sources, with crop production being the most affected income source (WFP, 2017).

A study done by Mutekwa (2016), on droughts risks to livelihoods of communities in rural areas of Chipinge South, Zimbabwe displays some of the common effects of drought to agro-pastoralists in semi-arid areas. In his study, a case study approach was used incorporating mixed-method (qualitative and quantitative kinds of data) to exhaust all the possible views from the selected community. According to Mutekwa (2016), drought has continually affected rural households of Zimbabwe. Livestock mortality, poor crop yields, and longer times on looking for water were the

most direct effects of droughts and this translated to increased cases of school dropouts, increased social problems as well security levels. The author resolved that there was a noteworthy association relationship between drought and the well-being of households which in turn increased the poverty levels within the affected communities. While farming was the most affected source of livelihood, the author noted progressive effects on other sources of livelihood and recommended further research on the indirect impacts of drought. Lack varied consistent forms of livelihoods was also a major threat for the Chipinge south communities. This is also the case for Ngomeni communities where recurrent drought has slowly seen households replenish the available livelihood sources.

Huho et al., (2010) concurs with most of the findings of the above authors. Recurrent drought-affected pastoral livelihoods in Laikipia County and made the county in need of emergency food aid. Most households in return turned to the dependence on environment degrading activities to sustain themselves such as charcoal burning and wood logging.

#### **2.4.2 Research Gaps**

1. Most drought studies mainly focus on a regional scale and document losses in the gross domestic product, with less focus on the drought impacts to rural communities at the micro-level, yet drought impacts may vary from one community to another. The drought management policies need to incorporate local insights to make the approaches more adoptable.
2. Most research work has dwelt on crop and livestock livelihood sources giving minimal attention to drought impacts on all household livelihood sources like the non-farm sources and off-farm sources that are also very common sources of livelihoods in rural communities.

#### **2.5 Theoretical Framework**

While relief food is considered useful during drought emergencies within Mwingi North Sub County, it's strongly argued that this could be a top-down method that considers that sustaining livelihoods can only come from external sources and not within the affected communities. There is a need to study the livelihood practices of people within Ngomeni ward and their approaches during drought. Thus this section discusses Symbolic interactions theory that is viewed to best explain the livelihoods and drought approaches within Ngomeni ward.

### **2.5.1 Symbolic Interactions Theory and Adjustments**

Most small-scale farmers, in drought-prone areas, depend on symbolic relationships when faced with livelihood crises. Scholars who have studied rural adjustments and behaviors during drought have extended livelihood analysis and concepts in the field of social psychology. Households' response to drought and other natural shocks depend on how they have managed such droughts in the past. Difficulties are realized when they can no longer employ the mechanisms, they know and have to make adjustments. For a rural setting where hazards are recurrent, then revisions and reconstructions are done within the society and this is usually in the center of changes to the environment as well socially and in economic terms.

The basic tenet of Symbolic Interactions Theory and Adjustments is that human beings act on things based on the meaning their meaning in the course of interaction. The meanings undergo revisions and reconstructions in repeated interactions. Similarly, drought and other natural hazards have different meanings to different societies to some drought is more of lack of water and pasture, to others, it's more of poor crop productivity and loss of on-farm and off-farm jobs, and so on. Rural communities will, therefore, react to natural hazards the way it affects them and based on previous knowledge during similar hazards. This theory is best placed to explain the effects of drought on households, and the adjustments the rural households make to meet their basic needs and this requires an in-depth examination of the available livelihoods. The effects of drought on rural households are better understood by first looking at the available livelihoods. This theory is also relevance because it explains the revisions and reconstructions that household livelihoods make in the event of drought. For instance, the research discusses on changes in level of dependence and engagement on different livelihood sources. This theory has also been used in similar studies like Juma (2009) who looked at the effects of drought on livestock production.

## 2.6 Conceptual Framework

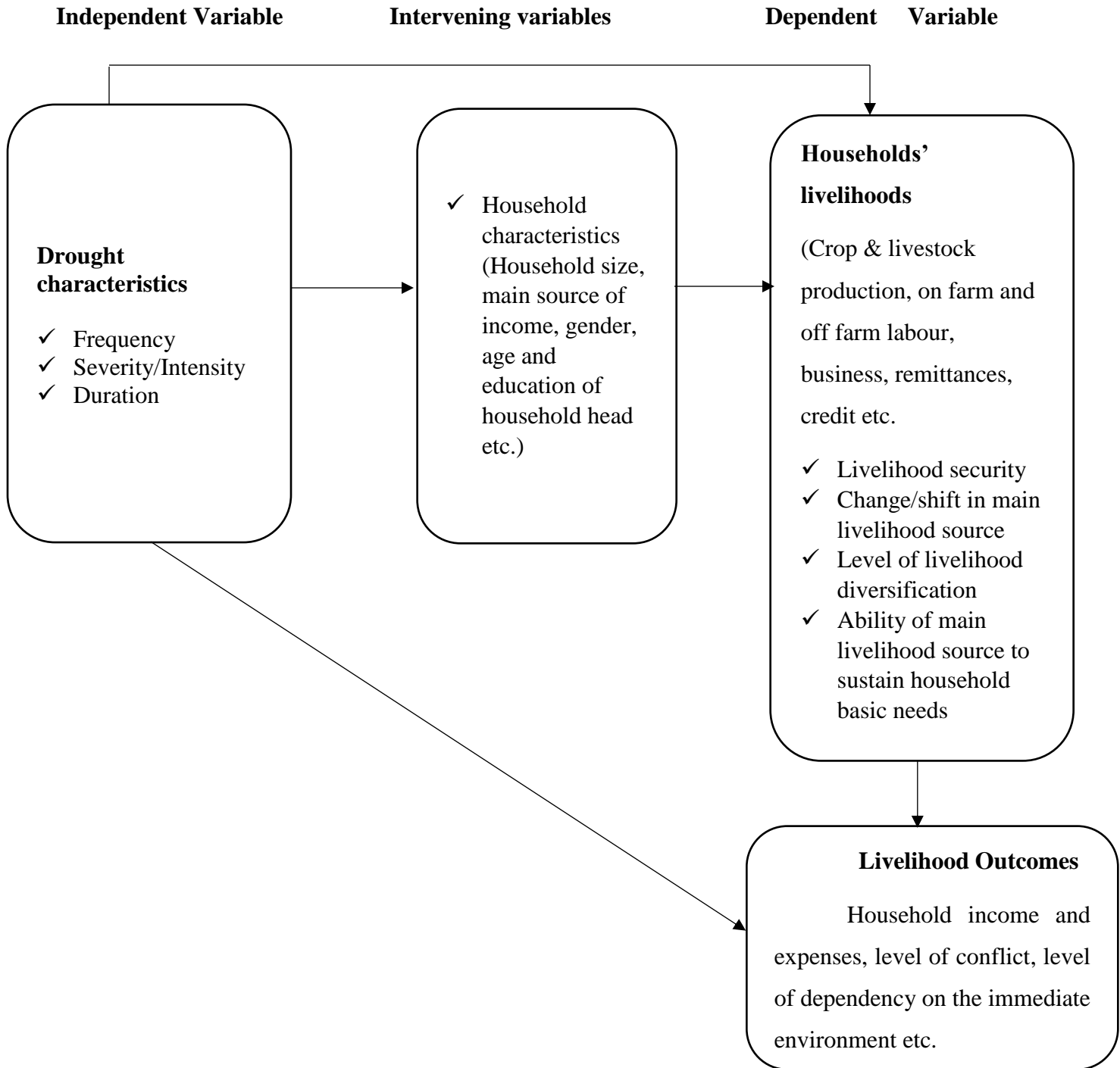


Figure 2.2: Conceptual Framework (Source: Researcher, 2020)



The arrow on top shows that drought events can affect household livelihoods directly without the intervening variables. Effects of drought on livelihoods will determine the livelihood outcomes witnessed such as conflict and declining household income sources. Drought can also directly impact livelihood outcomes. That is explained by the 2 bottom arrows. Dependency on the immediate environment is a livelihood outcome that leads to environmental degradation.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter describes Ngomeni Ward which is the area of study. It also captures the methods used to obtain secondary and primary data required to achieve the research objectives.

#### **3.2 Study Area**

##### **3.2.1 Study Area Location**

Kitui County is situated in the previously eastern region with Kitui town being the county headquarters. The county has an area of 30496 km<sup>2</sup>. The sub counties within Kitui County are Mwingi North, Kitui East, Kitui Central, Kitui West, Kitui South, Mwingi West, and Mwingi East. The area of study was Ngomeni Ward within Mwingi North sub-county. It is found in the northern area of Kitui county and borders Tharaka Nithi county. It comprises five administrative wards namely Kyuso, Ngomeni, Tseikuru, Muumoni, and Tharaka. This research was confined to Ngomeni ward only.

##### **3.2.2 Population of the study area**

According to KNBS, (2010), the population of Kitui County has 1147200 people with an average of 20 people per square kilometer and the average distribution OF AGE being; 0-14 years (46.6 %), 15-64 years (48.2 %) and 65+ years (5.2). While population growth is recorded regularly, a larger population especially the youth are migrating to major towns in the country in search of a better life. Devolution triggered a higher number of people moving to the county headquarters to take up the newly created opportunities. Recurrent drought effects have also forced many people to vacate their home to towns. Drought has caused changes in the socioeconomic behaviours of the people. That led to a lot of pressure inserted on natural sources without placing proper regulations to tame environmental damages. Mwingi ward where Ngomeni is located is sparsely populated and with fewer people as matched with the other sub counties. The Sub County is prone to severe droughts and resource related conflicts.

#### **Table 3.1 Population Density and distribution**

<b>Sub-County</b>	<b>Population (2009)</b>	<b>Population (2018)</b>	<b>Population (2019)</b>	<b>Population (2020)</b>
Mwingi North	139,911	155,278	158,804	161,629
Mwingi West	103,839	115,147	117,923	120,563
Mwingi Central	141,161	156,641	160,311	164,057
Kitui West	102,268	113,497	116,155	128,846
Kitui Rural	104,365	115,859	118,573	121,351
Kitui Central	131,453	146,112	149,535	153,038
Kitui East	123,181	136,718	139,910	143,188
Kitui South	165,982	184,351	188,917	192,942

**Source: Kitui County Annual Development plan (2021-2022)**

The educational levels of the people vary depending on their age and location within the county. People in the rural areas have low levels of education as compared to those residing in major towns such as Kitui town and Mwingi. High illiteracy levels are associated with a lower ability of households to cope with catastrophes like drought. In Ngomeni ward, households have a challenge in interpreting instructions on early warning messages and inputs of farming. Also, they may have fewer options when it comes to diversification of livelihood sources as a resilience factor to drought because of lack of education.

### **3.2.3 Relief and Drainage**

Kitui County is lies at an elevation of 967 meters above the sea level. Ngomeni ward which is the study area is generally flat with some areas being hilly and gently sloping. Most of the areas are covered with shrubs and others lay bare.

### **3.2.4 Geology and Soils**

Mwingi North Sub County is generally characterized by metamorphosed and granitised sedimentary rocks. Owing to comparatively low rainfall most households practice indigenous shifting cultivation and overgrazing. The lack of a good cover of vegetation, as is especially noticeable in abandoned cultivated patches, has led to serious gullying and soil-wash, and some areas in the northwest are severely eroded. The soil now covering most of the area is a red-brown

sandy type and very deep in parts, but of poor fertility. It consists mainly of quartz and iron oxides, with a darker biotitic facies near biotite-rich rocks.

### **3.2.3 Climate**

Mwingi North Sub County is classified as Arid and Semi-arid (ASAL). Some of its common characteristics include periodic crop failure as a result of limited and unreliable rainfall. There are two rain seasons, the “long rains” which are unreliable, and the “short rains” which are considered more reliable. The mean annual precipitation lies between 500 mm and 750 mm, decreasing towards the north and the east. Temperatures and evaporation rates are generally high in February and September. September is the hottest month with minimum temperatures varying between 18<sup>0</sup>C and 22<sup>0</sup>C and maximum temperatures ranging between 26<sup>0</sup>C and 34<sup>0</sup>C, with resultant high evaporation rates. The water resources in Ngomeni such as rivers, streams and swallow wells have significantly low amounts of water throughout the year and sometimes dry up completely when the precipitation amounts for the year are low.

### **3.2.4 Socio-economic Characteristics**

The economy of Kitui County is primarily supported by natural resources. Majority of the people resides in the rural areas and develop their livelihoods from natural resources. The dependence of the environmental resources to meet basic needs have caused threat to the available livelihood resources. Kitui County is among the ASAL counties with high levels of poverty. According to the 2009 census report, poverty level in Kitui is estimated to be at 47.5% as compared to the countrywide average of 36.1%. The increasing population growth, high poverty level in Kitui aggravates the problem of overdependence on fragile ecosystems. This further threatens future livelihood opportunities for most of the poor. The marginal areas of the county have been associated with conflicts over resources especially water, forest resources and pasture. According to Mwingi District Development Plan (2008-2012), the poverty levels with the sub county are high with majority of the people depending on less than one US dollar daily. Over the recent past, droughts have been recurrent in this area. Recent severe droughts were experienced in 2014, 2016, 2017, and 2019 according to NDMA records.



Source: Researcher, 2020

**Figure 3.1: A Map of the Study Area**

### 3.3 Research Design

This study used mixed method approach, where both qualitative and quantitative research methods were incorporated.

### 3.4 Target Population

The research targeted households within Ngomeni ward. According to the KNBS, (2009), Ngomeni ward has approximately 1067 households respectively. The households are sparsely populated with an estimation of 3 households per square Kilometer. The ward has 7 sub-locations namely Kimela, Kalwa, Ndatani, Mitamisiyi, Kavaani, Ikime, and Ngomeni. A total of 283 households were interviewed. The study also involved 5 officers from the Meteorological Department (KMD), (NDMA), CARITAS, and Ministry of Agriculture officials, and NEMA who have been working to increase household's resilience to drought in the entire Mwingi North Sub County.

### 3.5 Sampling Procedure and Sample Size

Probability sampling technique and particularly simple random sampling was used. The unit of population was households within Ngomeni ward. The ward has approximately 1067 households. The sample size was determined using Cochran's equation developed in 1963 and 75. Cochran developed the equation below to achieve a representative sample of a larger population. The households were selected randomly whether female-headed or male-headed.

$$n_0 = \frac{Z^2 pq}{e^2}$$

(Cochran, 1963)

Where:

$n_0$  is the sample size

$p$  is the (projected) ratio of the population that has the attribute in question

$q$  is  $1-p$

Z is found in the arithmetical tables which is basically the area normal curve for the selected confidence level

e is the chosen level of precision

Key informants were selected based on availability, sectors, and advice. If a preferred sample size of households was to be determined from a larger population, we assumed  $p=0.5$ ; 95% confidence level and a 5% precision.

$$n_0 = (1.96)^2 (0.5)(0.5) / (0.05)^2 = 385 \text{ Households}$$

The study adopted the proposed correction formula suggested by Cochran to suit smaller populations which is;

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Thus; n is the desired sample size;  $n_0$  is already calculated 385; N is the number of households which is 1067

$n=385 / \{1 + (385-1)/1067\} = 283$  households. The sample size was 283 households across 7 sub-locations. Each sub-location had a proportional percentage of the population being interviewed according to % of the total population.

Simple random sampling method was used to choose the households to be visited from every sub-location. Random numbers were derived from a calculator and we walked along a transect and randomly selecting households with the help of derived numbers.

**Table 3.2: Sample size**

<b>NGOMENI WARD</b>		
<b>Name of sub-location</b>	<b>No of Households</b>	<b>Sample Size per sub location= No Of HH/ Sum Of Households* Total Samples size</b>
Ngomeni	221	59
Kavaani	159	42
Ikime	132	35
Kimela	151	40
Mitamisiyi	172	46
Ndatani	118	31
Kalwa	114	30
<b>Total (Households)</b>	1067	<b>283(Household sample size)</b>

<b>Key informants:-</b>	
1. National Drought Management Authority (NDMA)	1
2. Kenya Meteorological department (Mwingi Sub-county)	1
2. Ministry of Agriculture and Livestock (Mwingi Sub-county)	1
3. CARITAS KITUI	1
5. National Environment Management Authority( NDMA)	1
<b>Total</b>	<b>5 (Key informants)</b>

### **3.6 Data Collection Methods**

The researcher used both secondary and primary data sources. Primary data was collected using questionnaires, photos, and key informant interviews with selected non-government and government officials. A standard questionnaire was designed to gather data from the selected households including forms of livelihoods and the effects of drought on livelihood sources. The information to be collected included (1) the demographic and socio-economic characteristics of individual households, (2) sources/ forms of Livelihoods, drought impacts to these sources, and (4) changes witnessed in the environment due to drought. The key informant interviews were



collected to reinforce the information obtained from households and looked on to some of the external interventions from government and other development actors, as well as the challenges. Officers interviewed were from the Kitui County Ministry of Agriculture and Livestock production, Caritas Kitui, KMD, and NEMA. Observation of notable and visible impacts on the environment was done through the taking of photos.

Secondary data was obtained desk study review of the existing literature. Annual Precipitation data was also gotten from the Kenya Meteorological Department (KMD) that provided an outline of the rainfall trends in the study area. Data on the drought trends between 2010 and 2019 were obtained from the National Drought Management Authority including the corresponding % loss in crop production and general effects on the environment. Other government and private local development actors such as CARITAS- Kitui that have been working with the rural communities to strengthen resilience were approached to grasp the livelihoods forms, drought impacts, common coping strategies, and other challenges experienced in the rural livelihoods in the areas of study.

### **3.7 Data Analysis and presentation**

Content analysis was used for the analysis of qualitative data which was presented through narratives. Statistical tests were used to analyze quantitative data. Descriptive statistics were used to describe the features of the collected data. The study used a nonparametric statistical test, specifically Chi-square, to validate the formulated hypotheses.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where O is the observed frequencies and E is the expected frequencies. The significance of the Chi-Square relationship was assessed using the probability values (the critical probability value in this study was 0.05). An associate p-value less than 0.00 led to the dismissal of our null hypotheses that *there is no significant difference between drought characteristics and the household livelihoods sources in Ngomeni Ward.*

### **3.8 Ethical Considerations**

According to Trochim, Donnelly & Arora, (2016), observing research ethics an important part of a research to ensure good research is obtained. This study ensured that it conformed to the ethical guidelines like the respect, privacy and secrecy of the respondents and upheld integrity. The researcher ensured that the responded understood the purposes of the research sought informed permission from the respondents. Persons under 18years of age and those considered vulnerable or of special needs will not participate in the study. The researcher sought letters of authorization to collect data in Ngomeni ward from National Commission for Science, Technology (NACOSTI), department of earth and climate sciences and also the local administration within the study area.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSION.**

#### **4.1 Introduction**

This division provides the outcomes of the research after data analysis. The chapter also provides comparisons of the results with similar works reviewed and the researcher's opinions.

#### **4.2 Response rate**

The participants of this study included household heads and Officers from selected government and non-government agencies. The sample size was 283, however some respondents were impatient and that led to substitute eight of them. Out of the 291 administered questionnaires at the household level, 283 were complete and properly filled. Out of the five targeted key informants we managed to interview four because one of them was not available on the appointed date. This represented a response rate of 97.3% and 80% respectively. Based on Kothari (2013) arguments the response rate is adequate for analysis and presentation because it is above 50%.

#### **4.3 Demographic and Socioeconomic Characteristics**

The demographic characteristics represent the general picture of the study population. The household socio-economic characteristics were key to this study because it provides an outline of understanding drought effects on household livelihood sources. Also, the household's decision-making ability and impact judgment during catastrophes such as drought is subjective to the socio-economic characteristics

##### **4.3.1 Gender of the respondents**

Figure 4.1 shows that 52.7% of the respondents were females while 47.3% were male. The finding that majority of the respondents were female could be explained by the observation that, at the time the questionnaires were being administered, only women were left at home to take care of children and attend to other households chores.

**Table 4.1: Gender of the respondents (N=283)**

<b>Gender</b>	<b>Frequency</b>	<b>Percentage</b>
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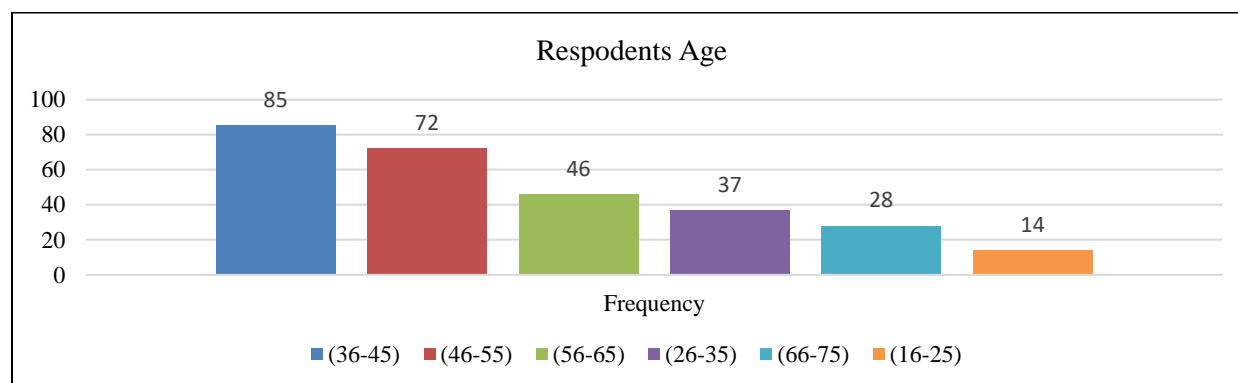
Female	149	52.7
Male	134	47.3
<b>Total</b>	<b>283</b>	<b>100</b>

Source: Field Data (2020)

### 4.3.2 Respondents Age

Respondent's age was grouped into 6 categories including 25 years and below, 26-35, 36-45, 46-55, and 56-75 years. Age groups with higher percentages of respondents were 36-45 years, 46-55 years, and 56-65 years with 30%, 25.4 and 16.2 % respectively. Most of the respondents were 36 years and above constituting 81.6%. Only 18.4% of those interviewed were less than 35 years. This is an indication the household interviewees were well distributed in terms of age which was an advantage to this study as it provided a wide range of views from all age groups.

**Figure 4.1: respondents Age (Grouped)**



Source: Field Data (2020)

The likely reason for a low percentage of respondents being less than 35 years (18.4%) can be explained by increased migration to urban areas. Migration is predominated by youth. In Kenya, youths are described as individuals aged 18 to 35 years, who are mobile as they travel mostly travel to attend schools and look for work. On the other hand, rural home set up in a rural setting increases with an increase in age. This finding supports the finding of Mutekwa (2016) in Zimbabwe who argued that aged people are usually settled and own families and therefore the likelihood to participate in the survey.

### 4.3.3 Type of Household

A majority (71.4%) of the households were male-headed and this is an advantage since in the African setup men are considered to be the breadwinners. However, there were high percentages of female-headed households consisting of 28.6%. Household heads are key decision makers in the household levels and therefore the type of household is an important determinant of the ability of a household to cope with drought. Households headed by men are likely to be involved in the diversification of livelihood sources in the event of drought because they can look for alternative sources of livelihoods such as off-farm casual labour (Sujakhu et al., 2019). Female-headed households are most disadvantaged because they have to attend to household chores and look for younger ones.

**Table 4.2: Type of Household (N=283)**

Type of household	Frequency	Percentage
Male-headed	202	71.4
Female-headed	81	28.6
<b>Total</b>	<b>283</b>	<b>100</b>

*Source: Field Data (2020)*

### 4.3.4 Household size

The household size is associated with living costs. It describes the sum of people who need to be fed, educated, and clothed. Most of the households had a household size of 5, with a mean value of 6.38, the maximum household size being 18 and the minimum 1. This shows that generally, Ngomeni ward has big households compared to the county household size of 4 (KNBS, 2013). Big households have challenges with coping with drought because the households spend more to feed the family. The size of the household could be a factor that has led to the ward being ranked as the worst hit by drought in the county.

**Table 4.3: Household size**

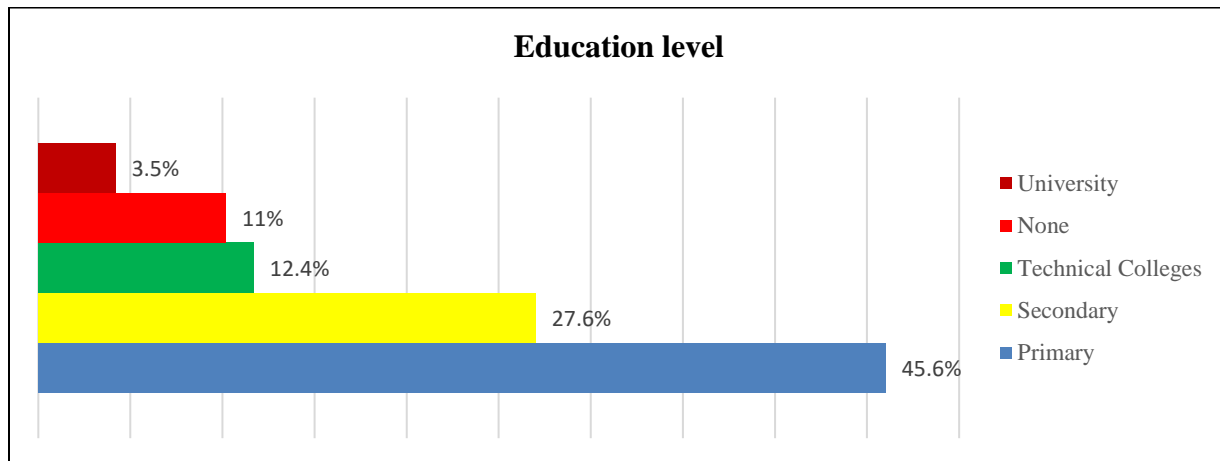
	N	Minimum	Maximum	Mean	Mode	Std. Deviation
Household size	283	1	18	6.39	5	3.451

Source: Field Data (2020)

#### 4.3.5 Respondent's Education Level

The education level of the households was found as follows: No education 11%, Primary Level 45.6%, Secondary level 27.6%, College 12.4% and University level 3.5%. This shows that quite a number of the population in Ngomeni are illiterate. This corresponds with the county illiteracy level of 23.6% according to the 2009 census (KNBS, 2013). High illiteracy levels are associated with a lower ability of households to cope with catastrophes like drought. Households in Ngomeni may have a challenge in interpreting instructions on early warning messages and inputs of farming. Also, they may have fewer options when comes to diversification of livelihood sources as a resilience factor to drought because of lack of education.

**Figure 4. 2: Respondents highest level of Education**



Source: Field Data (2020)

To assess the differences in respondent's level of education based on gender, the variable (education level of the household head) was cross-tabulated with gender. The study found that men dominated in percentages for higher qualifications (university level) while women dominated in the lower qualifications (Primary level) with 68% and 72% respectively. 77% of the women had no education as compared with 23% for men. The high percentage of females with no education portrays that females in Ngomeni ward are less educated than men. This study corresponds to the 2009 national statistics on Kitui County where illiteracy levels were high among females (KNBS,

2013). During drought, girls are more likely to leave school due to early pregnancies and this increases the illiteracy levels among the females.

**Table 4.4: Cross Tabulation of the Highest Level of Education with gender (N=283)**

Gender	Education (Frequency)				
	No education	Primary	Secondary	Technical	University
Male	13	33	41	22	7
Female	18	96	37	13	3

*Source: Field Data (2020)*

The high number of respondents (of either gender) with lower level of education in Ngomeni ward may negatively affect household heads when it comes to daily decisions during drought including the coping strategies adopted during drought. This finding corresponds to the earlier work of Lama, (2010) who concluded people in rural areas of Nepal had low levels of education. Formal education expands the knowledge of rural farmer’s in-terms of innovations and the ability to cope with rainfall variability. Educated household heads make better decisions on the coping strategies and since they understand the linkages between environmental degradation and climate variability and they are likely to take options that do not degrade the environment.

#### **4.4 Drought occurrences**

To determine the drought occurrences, the researcher explored rainfall data for the past 10 years as well as obtained respondents' perceptions on the frequency, intensity, and duration of the droughts within Ngomeni ward. The rainfall trends were obtained from the Kenya Meteorological department Kitui County office from 2009 to 2019.

##### **4.4.1 Rainfall trends in Mwingi North Sub County (2009- 2019)**

Rainfall data collected covered the whole of Mwingi North Sub County because there were no records for individual wards. The data is still considered viable because the Sub County has similar climatic characteristics. Rainfall data collected is a graphical indication of the observed drought

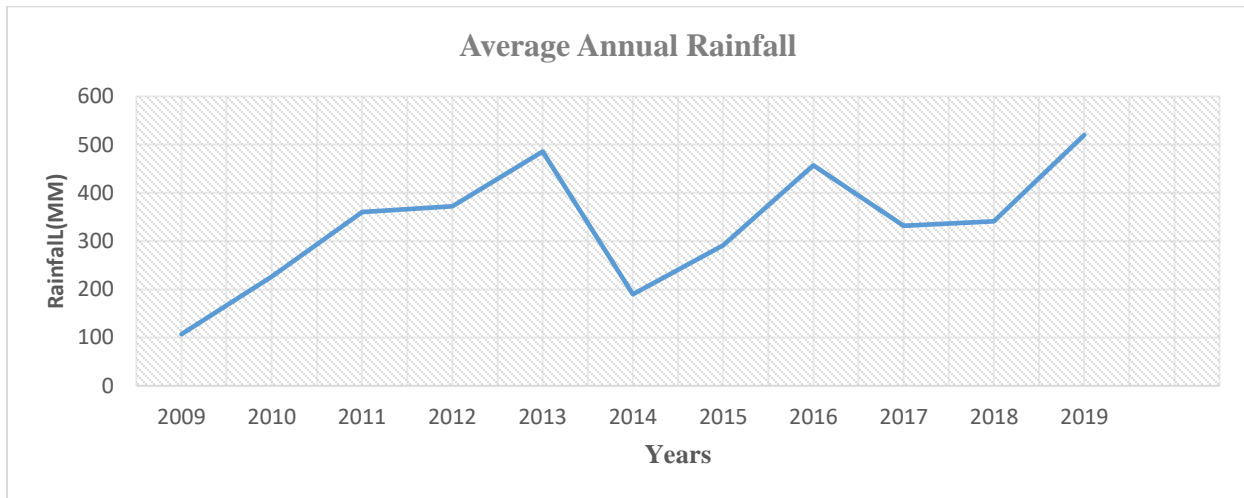
years from 2009 to 2019. The Rainfall data obtained included both annual and seasonal trends. The area of study has two rainfall seasons namely long rains season and short rains season. Results represented in Figures 4.4 and 4.5 show that Mwingi North Sub County has been receiving relatively low amounts of rainfall both annually and within the rainfall seasons. According to NDMA (2014), the annual rainfall for Kitui County ranges between 300MM to 800 MM. This differs from the findings of this study that found that Mwingi has relatively lower annual rainfall ranging between 107 MM to 750MM. The difference could be of the reason that Mwingi North Sub County belongs to the marginal mixed farming livelihood zone which is characterized by erratic low rainfall amounts. Through an interview, an officer from NDMA said that:

*“Ngomeni and other parts of Mwingi North are generally dry. These areas receive relatively low amounts of rainfall to support the households’ main sources of income. The other problem is that the little rains they get are poorly distributed in that mostly we receive heavy downpours followed by a prolonged time of no rains. Since I started working in this County I have not heard a good season in this area, maybe in Mwingi Central which is hilly but for the other wards rainfalls are unreliable”.*

The 2009 low rainfall coincides with the 2009 to 2010 country-wide drought that put more than 11,000,000 people at risk of famine due to unsuccessful harvests. This drought also affected other East African countries like Somalia and Ethiopia and was recorded as the worst in East Africa (Mbogo et al., 2014).



**Figure 4.3 Annual Rainfall Trends (2009-2019)**

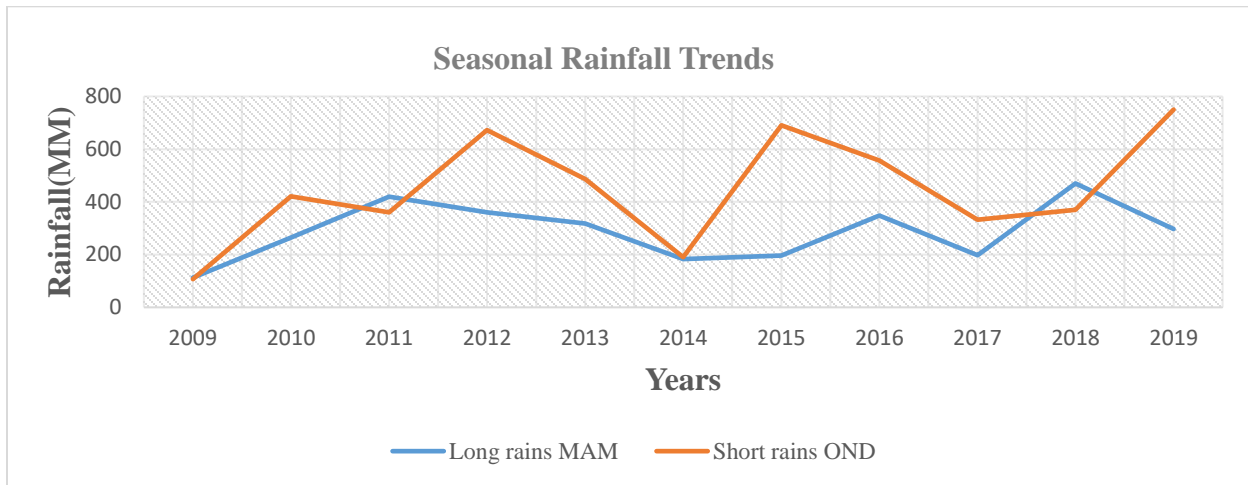


*Source: Field Data (2020)*

Figure 4.3 is a graphical comparison of seasonal rainfall amounts. This gives an understanding of the disparities of rainfall amounts across the two rainfall seasons within the study periods. Generally, the results show that the short rains in Mwingi North Sub County perform better than long rains. The average (March April May) MAM precipitation in a period of 10 years was 316 Millimeters. The highest amount of rainfall of MAM was received in 2018 with 470 MM and the lowest was in 2009 with 182 MM. On the other hand, the highest amounts in OND were received in 2019 and the lowest in 2009. This finding coincides with the findings of Cassim, (2018) concluded that long rains in Mwingi were less reliable for food production as compared to the short rains. The temporal analysis of the drought index between 1961 and 2011 using the Standard Precipitation Index (SPI) between 1961 showed that the OND season in Mwingi Sub County was less prone to drought (Cassim, 2018).

The yearly seasonal precipitation amounts for the period under study shows that if rainfall failed in one season then chances were the other season would have above-average rainfall. This shows the importance of seasonal climate forecast in predicting how the season will be. The information is of help to farmers in decision making of the types of crops to plant and also for a prior building of resilience to climatic extremes like drought.

**Figure 4.4: Seasonal Rainfall Trends (2009-2019)**



Source: Field Data (2020)

#### **4.4.2 Household's understanding Perceptions on Drought.**

To assess the respondents' understanding of drought, the respondents described in their own opinions. Most of the respondents had an adequate understanding of drought with most of them defining drought in terms of low rainfall amounts during the cropping seasons that causes crop failures and lack of water. 11% of the respondents mentioned that drought is associated with loss of vegetation and pasture.

One of the respondents said:

*“Drought comes in when the expected onset of rains delays or there is low rains. I know there is a drought when this area has drying vegetation during a rainy season, have no crops in our farms and river Kituki completely dries and we have to walk for more than 8 kilometres to the water source.”(Mwende Maingi, Kalwa sub-location)*

Results showed that the households within Ngomeni describe drought based on how it affected them. This supports the finding of Pandey& Upadhyay, (1979) who argued that in a rural setting individuals would mostly describe any climate extremes like droughts in terms of the abnormalities associated with them. All the respondents said that they had been affected by drought in the last 10 years.

**Table 4.5: Respondents knowledge and experience on drought in the last 10 years (N=283)**

Has your household been affected by drought?	Frequency	Percentage
Yes	283	100
No	0	0
<b>Total</b>	<b>283</b>	<b>100</b>

*Source: Field Data (2020)*

#### 4.4.3 Drought Frequencies in Ngomeni in the last 10 years

The frequency and duration of drought are important determinants of its impacts on the households' livelihood sources. Table 4.6 shows that 39.2% of the respondents said that drought occurred yearly, 44.5% said that drought occurred in 1 to 2 years, 7.8% said it occurred within 3 to 4 years while 8.5% of the respondent said that they experienced drought after 5 years. The frequency of drought determines a household's capacity to survive during drought. If households are faced with successive droughts then their ability to cope reduces because they lack an opportunity to recover from previous drought events. According to Mutekwa (2016), the occurrence of drought in two subsequent agricultural seasons meant that the source of livelihoods for rural households is severely compromised that they become susceptible to falling to poverty.

**Table 4.6: Frequency of droughts in the last 10 years (N=283)**

Duration after which drought occur	Frequency	%
Yearly	111	39.2
1-2 Years	126	44.5
3-4 Years	22	7.8
5 years and above	24	8.5
<b>Total</b>	<b>283</b>	<b>100</b>

*Source: Field Data (2020)*

This finding is in consensus with the area ward Administrator said that:

*“In the mid 19 century, we experienced drought after about 8 years. It was not that severe because we would still scoop the sand in the rivers and get water. Nowadays, things are tough because when we have one good season then we experience poor rains for the next season. Even the*

vegetation cover has lessened compared with how it looked in 1960's" (*Muthui Peter, Ngomeni ward administrator*)

#### 4.4.4 Intensity of drought in Ngomeni in the last 10 years

According to the research results, intensity of drought has been increasing since 2009. Five percent of the respondents said that droughts have been mild, 13.1% said that most droughts have been moderate, 43.5% of the respondents said that droughts have been severe with 41.7% said that they mostly experienced extreme droughts. Findings of a temporal drought analysis in Mwingi North Sub County agree with the results of this study. The drought severity increased from the year 1961 with several years having moderate to severe drought (Cassim, 2018). In their study, Kaithos and Gatrara (2006) argued that droughts have become more frequent than they used to be. Kaithos and Gatrara (2006) attributed the increased severity and frequency to changes in climate that has become a common global problem in the recent past. The increased frequencies pose a high risk of falling into poverty to smallholder farming households who derive their livelihood on rain-fed agriculture.

**Table 4.7: Intensity of 2019 drought in Ngomeni (N=283)**

Intensity of Drought	Frequency	Percent	Valid Percent	Cumulative Percent
Mild	5	1.8	1.8	1.8
Moderate	37	13.1	13.1	14.8
Severe	123	43.5	43.5	58.3
Extreme	118	41.7	41.7	<b>100</b>
<b>Total</b>	<b>283</b>	<b>100</b>	<b>100</b>	

*Source: Field Data (2020)*

#### 4.4.5 Average duration of droughts in Ngomeni in the last 10 years

Households' perceptions on the duration of droughts, supported by local knowledge have been key in understanding drought occurrences and their impacts on rural livelihood (Twongyirwe et

al., 2019). The duration of drought is a key determinant of its impacts on the affected livelihoods. Results in Table 4.8 shows that the majority (48.1%) of the respondents said that the droughts they could remember lasted for several months, 32.2% said that drought lasted for a year and 16.6% and 3.2% said that droughts mostly lasted for more than a year and a few months respectively. All the respondents noted that the duration of droughts has been increasing in the last 10 years and this had restrained their livelihood sources.

**Table 4.8: Duration of droughts in Ngomeni for the last 10 years (N=283)**

	Frequency	%	Valid Percent	Cumulative Percent
A few months	9	3.2	3.2	3.2
Several months	136	48.1	48.1	51.2
A year	91	32.2	32.2	83.4
More than a year	47	16.6	16.6	100
<b>Total</b>	<b>283</b>	<b>283</b>	<b>283</b>	

*Source: Field Data (2020)*

#### **4.5 Forms/Sources of Livelihood for Households in Ngomeni Ward.**

Results show that most households in Ngomeni had more than one livelihood source. Crop farming and livestock keeping are the livelihood sources for most households constituting 82.3% and 71.7% of the interviewed respondents respectively. This is because livestock keeping and crop farming are the main sources of livelihoods rural areas of Kenya. These livelihoods are climate-sensitive and they are most affected by droughts. 58.7% of the respondents also mentioned off-farm casual labour as a livelihood source. The high percentage of respondents who mentioned casual labour is because when a drought affects crop and livestock production, most rural households turn to casual labour which is an unreliable source of livelihood. Few households mentioned business, formal employment, assistance, and transfers as a source of livelihood with 22.3%, 10.6%, and 6.0% respectively.

**Table 4.9: Sources of livelihood for households in Ngomeni Ward (N=283)**

Livelihood Source	Count	Percent
-------------------	-------	---------

Crop farming	233	82.3
Livestock keeping	203	71.7
On-farm casual labour	52	18.4
Off-farm casual labour	166	58.7
Formal employment	30	10.6
Business	63	22.3
Remittances	104	36.7
Assistance and transfers	17	6.0
Credit	135	47.7
Other	34	12.0

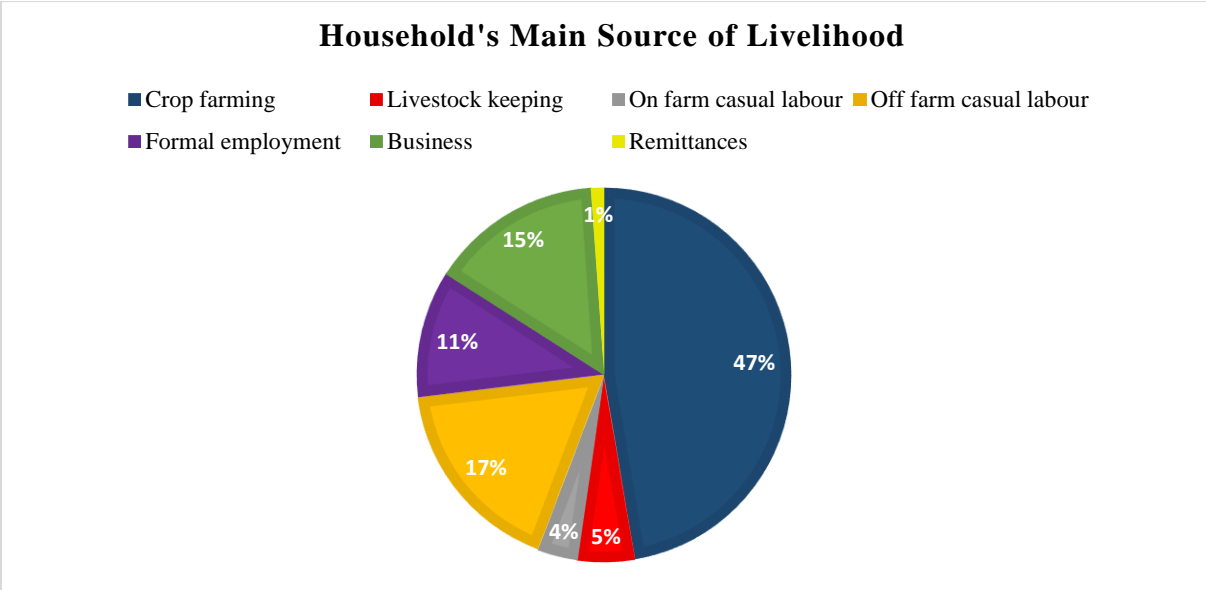
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*Source: Field Data (2020)*

#### **4.5.1 Main livelihood source.**

Majority of the households depended on farming representing 47.3 % of the respondents. 17.3% of the respondents said that casual labour was their main source of livelihood while 11% depended on formal employment, 14.8% on business, 3.5% on on-farm casual labour, and 1.1% were self-employed. 99.6% of the respondents who had their main livelihood source as farming, depended entirely on rain, with 0.4% of the respondents doing rainwater harvesting using farm ponds. Although rain-fed agriculture is most affected by drought, it remained a source of hope for households in Ngomeni. However, most of the households argued that crop farming had failed them and could no longer be depended on because the rainfall had become unpredictable and unreliable, only that they were limited to moving to other sources of earning a living. This concurs with the findings of Mutekwa, (2016) who argued that rural households in Zimbabwe had limited ability to diversify during drought and this increased their vulnerability.

When drought sets in, most households move to informal jobs such as off-farm casual labour, which is unreliable. These off-farm and non-farm kinds of jobs are equally affected by drought in the long term and cannot be relied on in the event of drought. 98% of the households argued that they could not diversify because they lacked the money to engage in business.



**Figure 4.5: Main livelihood sources for the household.**

*Source: Field Data (2020)*

**4.5.2 Average Annual income for the Households**

Income level is a factor that could limit/ support a household’s resilience to drought. In this study, the household income levels were estimated by asking the respondents to indicate their annual income bracket. Results in Table 4.5 show that 81% of the households earn below KSH 120,000 which translates to KSH 10,000 monthly. 15% of the households earn between KSH 120,000 and 600,000 annually with 5% earning over KSH 600,000. The high percentage of households earning below KSH 10,000 monthly portrays difficulties they households face in times of drought (Jaetzold et al., (2009). The Kenya economic survey (2017) categorizes families with monthly expenditures below KSH 23, 670 as low income, Households with monthly expenditures between KSH 23,670, and KSH 120,000 as middle income, and those whose monthly expenditures are above KSH 120,000 as high income. Therefore, most households in Ngomeni ward lie in the low-income group. In times of drought, the cost of living goes high as food prices hike, extra expenses such as buying water and treatment as health deteriorates among members of households. This strains the budget of the low-income household leaving them not in a position to meet basic needs.

**Table 4.10: Estimated household annual income in Ngomeni ward (N=283)**

Annual Household income(KSH)	Frequency	Percentage
Below 120,000	228	81
120,000- 600,000	42	15
Over 600,000	13	4
<b>Total</b>	<b>283</b>	<b>100</b>

*Source: Field Data (2020)*

The mean percentage estimates of income sources for the past year showed that despite that farming is the main source of livelihood, it only contributed to 8% of the aggregate annual income for the households. This could mean that most of the farming is done for human consumption, and the households lack a surplus for sale. Off-farm casual labour form of jobs contributed to 33% of the annual household income in the year 2019, sale of livestock at 17% and credit 15%. The sale of crops, on-farm labour, and remittances each contributed 8% to the aggregate annual income. Other income sources included assistance and transfers. This study finding contradicts the findings of (Karanja, 2018) who noted that crop farming and pastoralism were chief income sources in Laikipia West Sub County. This contradiction may be attributed to the fact that Laikipia west rainfall amounts have been higher than Ngomeni with estimated annual rainfall being over 700mm compared to 547mm in Ngomeni. Also, the households in Laikipia west grow wheat as a cash crop but this is not the case in Ngomeni where crop farming is done mainly for human consumption.

#### **4.6 Drought effects on households' livelihoods Sources in Ngomeni Ward.**

Existing research suggests that effects of different droughts contrast based the frequency duration and intensity. This study focused on all drought events from the year 2009 to 2019. This is because due to increased frequencies of occurrences, the households could not remember the specific droughts. The effects of droughts on the households' livelihoods in Ngomeni ward was analyzed for each livelihood source

##### **4.6.1 Effects of drought on crop production in Ngomeni ward**

Crop production is among the major livelihood sources in Ngomeni that are highly affected by drought. The researcher focused on all drought events in the last 10 years. The researcher sought



to understand how droughts impacted crop production as well as the percentage of crops lost due to drought in the last 10 years. The respondents were asked to describe how drought-affected crop yields in the last 10 years. All the respondents noted that crop yields had decreased. 42.4% rated crop yields loss to be between 81 and 100 %, 41.7 said reduction ranged between 61-80%, 14.1% said that reduction ranged between 41-60% and 1.5% of the respondents said that their crop yields had reduced by 21 to 40%.

**Table 4.11: Percentage of crop yield reduction as a result of drought (N=283)**

By how much has crop production reduced in (%)?	Frequency	Percent	Valid Percent	Cumulative Percentage
21-40	5	1.8	1.8	1.8
41-60	40	14.1	14.1	15.9
61-80	118	41.7	41.7	57.6
81-100	120	42.4	42.4	<b>100</b>
<b>Total</b>	<b>283</b>	<b>100</b>	<b>100</b>	

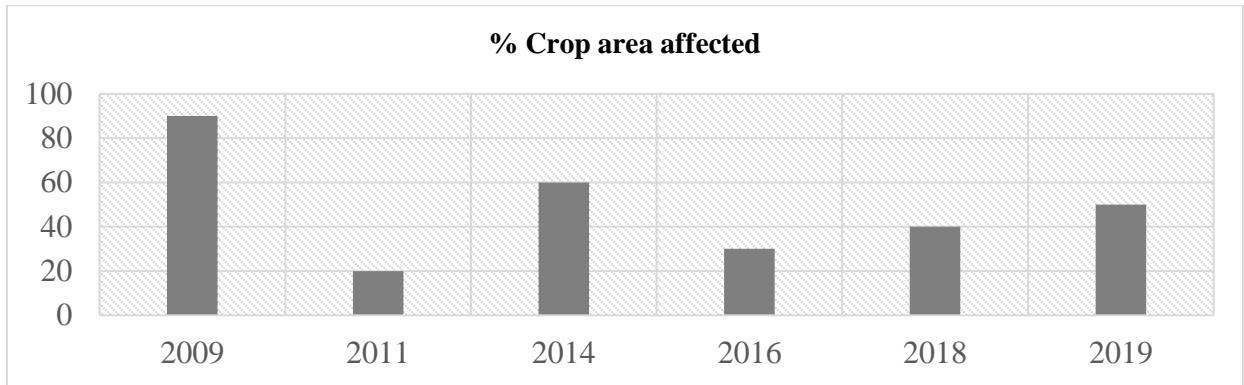
*Source: Field Data (2020)*



**Figure 4.6: A farm with dried Sorghum, Cowpeas, and millet crops**

*Source: Field Data (2020)*

The secondary data on the % of crop area affected by drought concur with that of the household heads opinions. Figure 4.6 shows that 90% of crop area was affected by drought in Mwingi North Sub County in 2009, 20% of the crop area was affected in 2011, 60% of crop area was affected in 2014 and recently in 2019 the MAM season drought even affected 50% of the crop area. The high percentage of the affected crop area in 2009 coincides with the nationwide drought that led to massive crop failure in most parts of the country leaving more than 5 million people vulnerable.



**Figure 4.7: Crop area affected by drought** *Source: Field Data (2020)*

Results in Figure 4.7 correspond to the observation of a livelihood officer in Caritas Kitui who said that *“The Recent drought in this area was experienced during long rains in 2019 that led to massive crop failure and food shortages. The prices of food almost doubled; when there are no droughts one kilogram of Maize costs 30 shillings, but during this time a kilogram went for 57 shillings. There have been also declined prices on the livestock because the pasture has reduced. Generally, the cost of living has gone up. As an organization, we had a project that supported the community to implement water harvesting mechanisms but that didn’t help much because the rains were very little”*



**Figure 4.8: Farm rainwater harvesting.** (Source: Field Data, 2020)

Previous studies have noted similar effects. For instance, Olaoye (1999) argued that that recurrent droughts reduced the capability of increased crop production in Nigeria. Mutekwa (2016) also noted increased drought risks effects in crop yields in Chipinge South Zimbabwe due to poorly distributed rainfall during most cropping seasons. A study conducted in Laikipia County also

noted a severe reduction in the maize yield during drought events that depended on the intensity and period of drought (Karanja 2018).

#### 4.6.2 Effects of drought on livestock in Ngomeni ward.

To understand how drought affected the livestock in Ngomeni Ward, the study sought to understand the changes livestock numbers owned, different kinds of livestock kept, changes in the value of livestock kept, and drought impacts of livestock

##### 4.6.2.1 Changes in the number of livestock kept due to drought

Results in Table 4.12 show that 89.4% of the house noted a decrease in the number of livestock kept by households, 4.6% said that their livestock increased and 6% said that the livestock remained the same. The decrease in livestock was noted because most households turn to sell their livestock both to avoid deaths during drought and also to meet their basic needs when crop production fails. Some households who reported an increase in livestock numbers explained that they had to sell high value livestock that couldn't survive drought-like milking cows and replaced them with low-value animals and birds like goats and poultry.

**Table 4.12: Changes in the number of livestock owned in the last 10 years (N=283)**

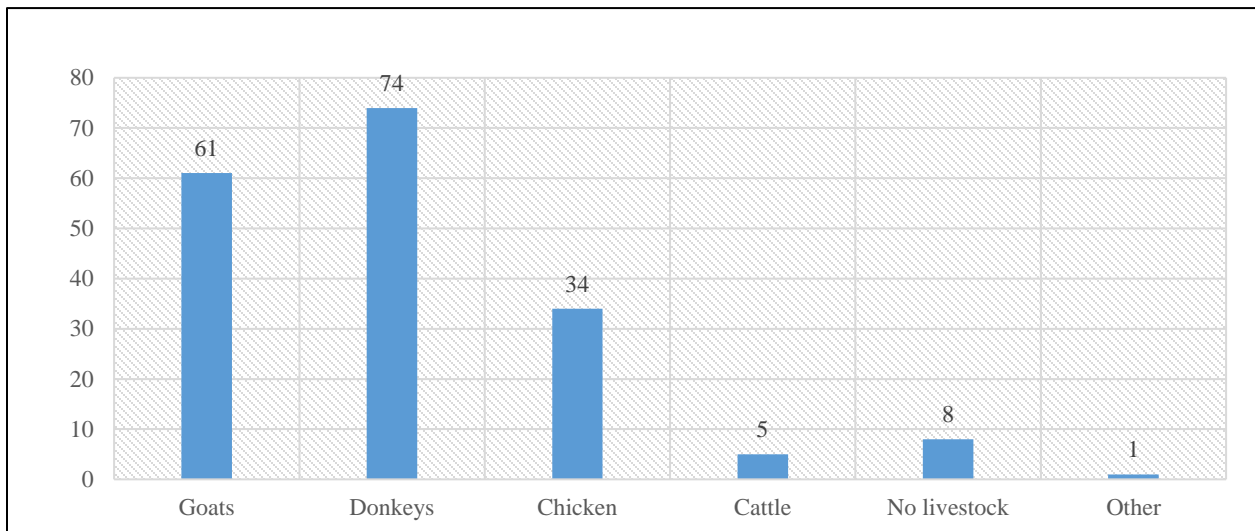
How has the number of livestock owned changed in the last 10 years	Frequency	Percent	Valid Percent	Cumulative Percent
Increased	13	4.6	4.6	4.6
Reduced	253	89.4	89.4	94
No change	17	6	6	100
<b>Total</b>	<b>283</b>	<b>100</b>	<b>100</b>	

*Source: Field Data (2020)*

##### 4.6.2.2 Changes in the type/ value of livestock kept

75.4% of the respondents said that drought made them change the type of livestock kept. Figure 4.7 shows that 61% of the respondents owned goats, 34% owned poultry, 74% owned donkeys,

5% owned cattle, and 8% of the household did not own livestock. 1% owned pigs and 6% owned other livestock like rabbits. Generally, a large portion of the population owned livestock that has a lower value with some households having no livestock. Previous researchers such as (Mutekwa, (2016) & Kagunyu, (2014) suggested that households that owned livestock are more likely to cope with drought because they can sell to acquire income in cases of reduced crop production. Therefore, having most households keeping low-value livestock and some households owning no livestock increased the household's vulnerability to drought-related effects. Most households own goats and donkeys because of their increased resilience to drought. The donkeys were a major means of transport and was a necessity to most household especially for the fetching of water, and helping for carrying goods.

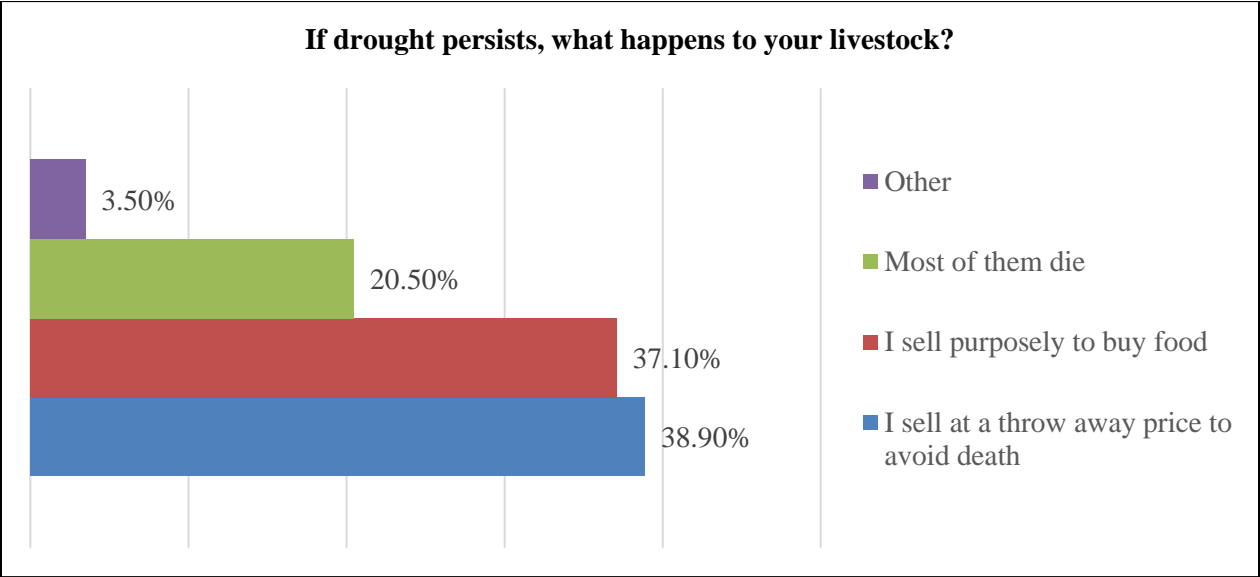


**Figure 4.9: Type of livestock kept**

*Source: Field Data (2020)*

#### ***4.6.2.3 Drought impacts on livestock keeping activities***

All the respondents noted that recurrent drought in the last 10 years had affected livestock production, the types, the number of livestock owned as well as the livestock prices. Results in Figure 4.8 shows that 38.90% sold their livestock at a low price to avoid death during droughts, 37.10% of the respondents sold purposely to buy food, and 20.5% said their livestock died and 3.50% gave other reasons such as they migrated to find pasture for their livestock. The high number of livestock deaths could be explained by the fact that drought reduces forage and clean water available and therefore puts pressure on livestock.



**Figure 4.10: Impacts of drought on livestock keeping activities**

*Source: Field Data (2020)*

**4.6.3 Effects of drought on off-farm casual labour, on-farm casual labour, and business as sources of livelihood.**

On-farm, off-farm casual jobs and businesses are common jobs among households in any rural setting. To understand the changes in these livelihood sources, the researcher sought to understand the changes in the level of engagement for business, on-farm, and off-farm casual labour. Results in Table 4.13 show that the level of households’ engagement in on-farm casual labour was low while the level of engagement in off-farm casual labour was high. The level of engagement in business remained relatively similar, and therefore drought had low effects on the level of engagement on business. This could be for the reason that when drought sets in and crops get to a poor state, on-farm Casual labour jobs reduce, and households who depend on agricultural wage labour are put at high risks of losing their livelihood source. They move to off-farm casual labour (like stone quarrying, sand harvesting, and selling water) which are low-paying and more unreliable.

**Table 4.13: Level of engagement in off-farm and on-farm casual labour and business to meet daily basic needs over the past 10 years**

	Low		Moderate		High		Total	
	Row N		Row N		Row N			
	Count	%	Count	%	Count	%	Count	Row N %
Level of engagement in on-farm casual labour during droughts over the past 10 years	211	74.60%	65	23.00%	7	2.50%	283	100.00%
Level of engagement in off farm casual labour during droughts over the past 10 years	0	0.00%	81	28.60%	202	71.40%	283	100.00%
Level of engagement business/non-farm enterprises over the past 10 years	95	33.60%	111	39.20%	77	27.20%	283	100.00%

*Source: Field Data (2020)*

Further analysis shows that 69% of the respondents said that drought had high effects on on-farm and off-farm jobs, 29.30% said the impact was moderate while 1.7% said that the impact was low. The loss of jobs translates to social problems such as lack of food, school dropouts, and increased theft.

**Table 4.14: Rate how droughts in the last 10 years have affected on-farm and off-farm casual labour (N=283)**

Rate of impact	Frequency	Percentage
High	195	69
Moderate	83	29.20
Low	5	1.8
<b>Sum</b>	<b>283</b>	<b>100</b>

*Source: Field Data (2020)*

#### 4.6.4 Level of dependency on Remittances, Assistance and transfers, and credit to sustain household

Results in Table 4.15 show the level of dependency on non-climate sensitive sectors had increased due to drought. There was a high level of dependency on credit, remittances and assistance, and transfers at 68.9%, 61.10%, and 56.20% respectively. The high level of dependency on credit and assistance shows a low ability of households to cope with drought, and failure for external support increases the impacts of drought on the households. Most residents noted that assistance and transfers have reduced and they have not received any assistance during droughts since 2017 and this has increased households' vulnerability to drought. Dependence on remittances and formal employment can be explained by the increased migration of rural people to towns to look for jobs to support their jobs. Previous research such as (Moniruzzaman, (2020) and Sodokin & Nyatefe (2021)) shows that remittances reduce a household's vulnerability during natural disasters by reducing uncertainties and providing strategies for households to counter food-related shocks. This increases the household's probability of being food secure. The reoccurrence of drought in Ngomeni has forced households to turn to look for skills and more non-climatic sensitive sources of livelihood. However, this comes along with social-related repercussions such as school dropouts and early pregnancies.

**Table 4.15: Level of dependency on non-climate sensitive sources of livelihoods**

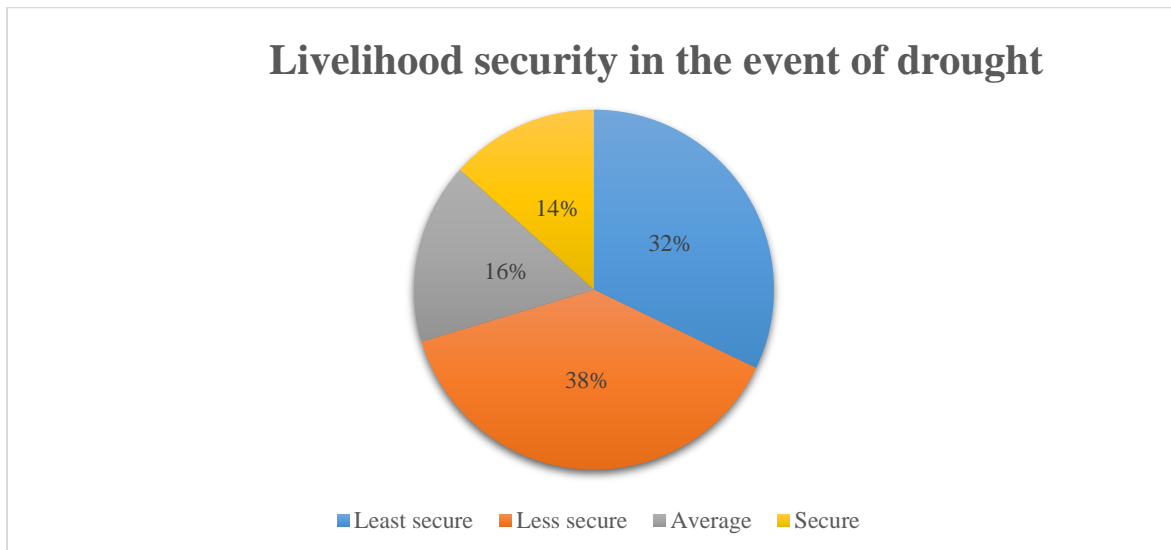
	Low		Moderate		High		Total	
	Row N		Row N		Row N			
	Count	%	Count	%	Count	%	Count	Row N %
Level of dependency on formal employment	87	30.70%	91	32.20%	105	37.10%	283	100.00%
Level of dependency on remittances	33	11.70%	77	27.20%	173	61.10%	283	100.00%
Level of dependency on assistance and transfers from e.g. government, NGOs	25	8.80%	99	35.00%	159	56.20%	283	100.00%
Level of dependency on credit	12	4.20%	76	26.90%	195	68.90%	283	100.00%



Source: Field Data (2020)

#### 4.6.5 Effects of drought on livelihood security

The livelihood security of households in Ngomeni has been highly affected by droughts. Most respondents said that their sources of livelihood were insecure during drought events with 32% rating their livelihoods as least secure, and 38% as less secure. 16% and 14% of the respondents said that their livelihoods were averagely secure. The disparities in livelihood security could be explained by the fact that most of the livelihoods sources in Ngomeni were crop production and livestock keeping that are directly impacted by droughts. Respondents who reported fewer impacts on the security of their livelihoods had a non-climatic sensitive livelihood source and others could diversify their income sources.



**Figure 4.11: Livelihood security in the event of drought**

The disparities in livelihood security could be explained by the fact that most of the livelihoods sources in Ngomeni were crop production and livestock keeping that are directly impacted by droughts. Respondents who reported fewer impacts on the security of their livelihoods had a non-climatic sensitive livelihood source and others could diversify their income sources. Further analysis showed that 86.9% of the respondents had found a need to switch from their main source of livelihood to others and only 13% didn't find a need to change their main sources of livelihoods.

Most households had diversified their sources of income, however, they noted that as drought became more frequent, and their ability to diversify decreased.

#### **4.7 Drought and Environmental Degradation in Ngomeni ward**

Results shows that drought had both direct and indirect effects on the environment in Ngomeni ward. Drying of water resources and loss in vegetation were two major effects mentioned by the respondents. This was said to affect the socio-economic aspect of livelihood people walking for a long time to get to the water points. This also increased as well as increased water prices. Loss of vegetation reduced wood fuel available to the households and reduced pasture available for livestock. Some of the households left their homes to other areas like towns.



**Figure 4.12: A Photo of bare land, dried trees, and vacated homes in Kavaani sub-location.**

*Source: Fieldwork 2020*

Analysis of key informant views showed that recurrent drought caused environmental degradation by increasing soil erosion and land degradation. When droughts come in and crops fail and livestock are out of stock, most households turn to environment degrading activities like charcoal burning, wood logging, and sand harvesting among others. These views correspond to the

respondent's views where 65.4% said that they were very likely to depend on the immediate environment in the event of drought, 26.5% said that drought somehow increased their dependence on immediate environment while 8.1% were not likely to depend on immediate environment

**Table 4.16: Likelihood of depending on the immediate environment to meet basic needs in the event of drought.**

Likelihood of depending on the immediate environment to meet your basic needs when drought occurs?	Frequency	Percent	Valid Percent	CumulativePercent
Not likely	23	8.1	8.1	8.1
Somehow likely	75	26.5	26.5	34.6
Very likely	185	65.4	65.4	100
<b>Total</b>	<b>283</b>	<b>100</b>		

*Source: Field Data (2020)*

Table 4.17 shows that 71% of the respondents depended on charcoal burning/ wood logging during drought events in the last 10 years. This is an environment degrading coping strategy that has been very common in the area due to the availability of market. 49.5% of the household engaged in small-scale stone quarrying, 22.6% engaged in sand harvesting while 3.5 engaged in hunting during droughts.

**Table 4.17: Environment degrading activities used in the event of drought.**

Have you used the following activities as livelihood coping strategies in the event of drought?	Yes		No		Total	
	Count	Percent	Count	Percent	Count	Percent
Hunting	10	3.5	273	96.5	283	100.0
Charcoal burning/ wood logging/selling firewood	201	71.0	82	29.0	283	100.0
Small scale stone quarrying	140	49.5	143	50.5	283	100.0

Sand harvesting	64	22.6	219	77.4	283	100.0
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Source: Field Data (2020)

#### 4.8 Other indirect social effects of drought

The increased distances to water point was the major social effect with a ranking of 61% with 94% of them noting that they walked more than 7 km and waited for more than one hour to get water. It was noteworthy that school dropout (9%), conflicts over resources (20%) theft (8%) and increased health problems (0.7%) and migration to other areas (0.3%) were also mentioned to be consequences of drought in Ngomeni ward.

**Table 4.18: Indirect Social effects of drought in Ngomeni Ward (N=283)**

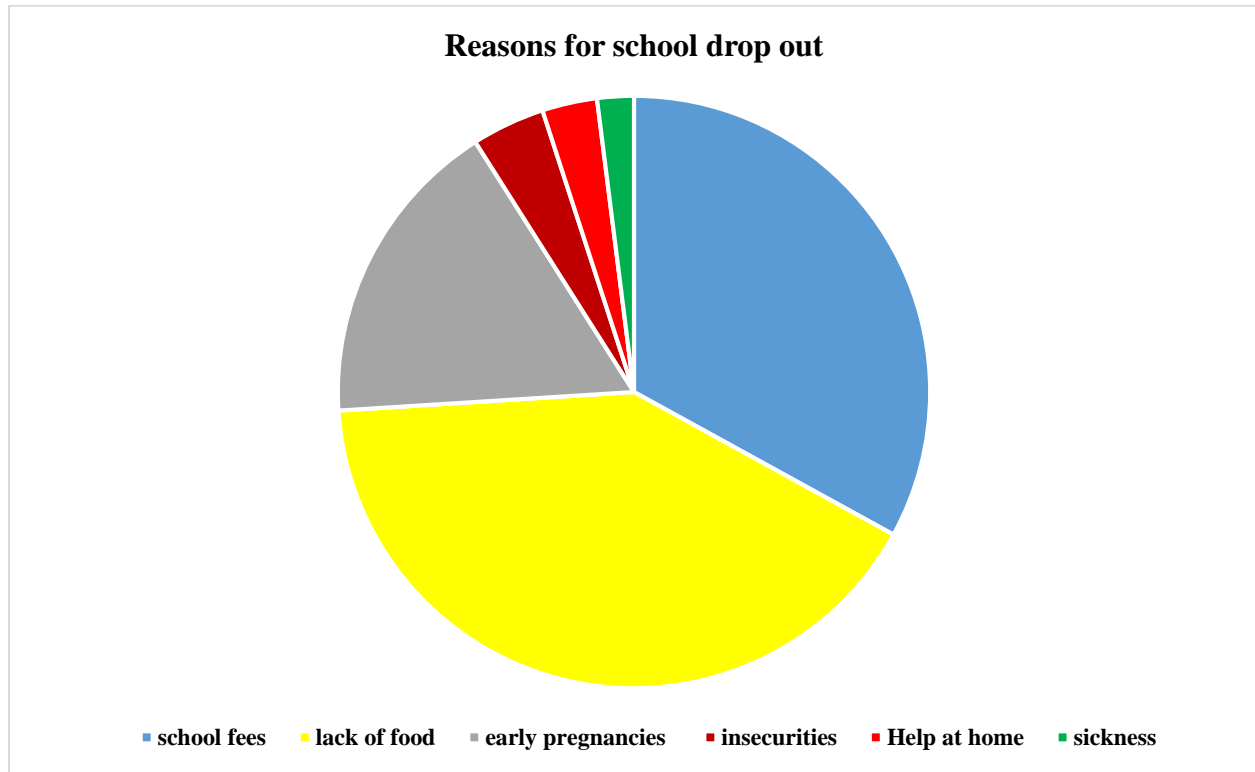
	Frequency	Percentage
Increased distances to water points	172	61
Conflicts over water and pasture	57	20
School dropouts	26	9
Theft	22	8
Poor human health	2	0.7
Migration	1	0.3
Other	3	1
<b>Total</b>	<b>283</b>	<b>100</b>

Source: Field Data (2020)

Drought causes pasture and water scarcity and this increases the conflicts over these resources (World Bank, 2013). Most conflicts in Ngomeni ward were noted at Kavaani and Kimela sub locations that borders Tana River County, where most people are pastoralists. This finding supports earlier work of Thébaud & Batterby (2001) Mutekwa, (2013) & Kagunyu, (2014) who noted that loss of pasture and water scarcity increased incidences conflicts over these resources.

The respondents attributed school dropouts in Ngomeni to migration (3%), lack of school fees(32%), lack of food(41%), early pregnancies (17%), increased insecurities(4%), health problems (23) as well as added work load (4%) where the children for go school to help in

household chores as their parents migrate to look for jobs in nearby towns. Education is a sector that is highly affected by drought, with effects such as high rates of absenteeism poor, poor performance and school drop outs (Hyland & Russ (2019).



**Figure 4.13: Reasons for school dropouts.**

*Source: Field Data (2020)*

The impacts of drought on health corresponds with a key informant views who said that:

*“During droughts we have less food and less water. “Impacts of drought on health in Ngomeni were mostly caused by water scarcity. During droughts getting clean water required sacrifice of time and due to desperation household opt to take dirty water that increases water borne diseases. Poor eating habits resulting from lack of food increases diseases such as malnutrition among children. During droughts people are stressed, because they don’t know their fate. Crop failure” (Livelihoods officer, Caritas Kitui)*

Previous studies such as Ding *et al.* (2011); Karanja, (2018) and Mutekwa, (2008), who reported increased health problem during drought. Further, Parmeshar (2014) suggested that hazards caused

abnormally high rates of household. He argued that lack of hope and depression were adverse effects of drought in Maharashtra state in India.

## 4.9 Hypothesis Testing

### 4.9.1 Drought and Households' Livelihoods in Ngomeni Ward

The research sought to establish if there was a significant difference between drought characteristics and the households' livelihood sources in Ngomeni Ward, Mwingi North Sub County, Kitui County. The study tested the following null hypothesis;

*H0<sub>1</sub>: There is no significant difference in drought characteristics and households' livelihoods in Ngomeni Ward.*

The various drought characteristics based on the respondents' experiences/perceptions were cross-tabulated against various aspects of the livelihoods of people in Ngomeni Ward. To determine the associations between these variables, Chi-square statistics were computed for each case, and inferences were made at the 0.05 level of significance.

**Table 4.19: Drought and the Average Percentage of Harvest Lost**

		% of harvest that has reduced in the last 10 years on average					$\chi^2$	p value
		21-40	41-60	61-80	81-100	Total		
		n; %	n; %	n; %	n; %	n; %		
Severity/ the intensity of drought events	Mild	3; 60.0	2; 40.0	0; 0.00	0; 0.00	5; 1.8	371.102a	0.000
	Moderate	14; 37.8	23; 62.2	0; 0.00	0; 0.00	37; 13.1		
	Severe	0; 0.00	23; 18.7	98; 79.7	2; 1.60	123; 43.5		
	Extreme	0; 0.00	4; 3.40	16; 13.6	98; 83.1	118; 41.7		
	Total	17; 6.00	52; 18.4	114; 40.3	100; 35.3	283; 100.0		

Table 4.19 presents the results drawn from the cross-tabulation analysis between drought and the average percentage of harvest/crop yields lost in the past 10 years. The results showed that the severity of drought occurrences in Ngomeni Ward was significantly associated with the average percentage of crop yields lost over the past 10 years given ( $\chi^2=371.102a$ ,  $p=0.000$ ,  $p<0.05$ ). The proportion of people who lost a higher percentage of harvest over the past 10 years on average was

higher when the drought occurrences were severe or extreme compared to when such events were mild.

**Table 4.20: Drought and Number of Livestock kept by Households over the Past 10 years**

		Number of livestock kept on average over the past 10 years					
		Increased	Reduced	No change	Total		
		n; %	n; %	n; %	n; %	$\chi^2$	p value
Duration of drought events	A few months	0; 0.00	3; 33.3	6; 66.7	9; 3.2	71.235a	0.000
	Several months	5; 3.70	120; 88.2	11; 8.10	136; 48.1		
	A year	7; 7.70	84; 92.3	0; 0.00	91; 32.2		
	More than a year	1; 2.10	46; 97.9	0; 0.00	47; 16.6		
	Total	13; 4.60	253; 89.4	17; 6.00	283; 100.0		

Table 4.20 indicate that the association between the duration of drought events and the number of livestock kept by households in Ngomeni Ward over the past 10 years on average, was significant, as shown by ( $\chi^2=71.235a$ ,  $p=0.000$ ,  $p<0.05$ ). This demonstrated that with prolonged drought events, the number of households that reduced the number of livestock they kept was higher compared to cases where the drought events lasted for a few months.

**Table 4.21: Drought and Level of Engagement in On-farm Casual Labour as Source of Livelihood**

		Level of engagement in on-farm casual labour over the past 10 years					
		Low	Moderate	High	Total		
		n; %	n; %	n; %	n; %	$\chi^2$	p value
Severity/ intensity of the drought occurrences	Mild	1; 20.0	1; 20.0	3; 60.0	5; 1.8	83.581a	0.000
	Moderate	21; 56.8	14; 37.8	2; 5.40	37; 13.1		
	Severe	92; 74.8	30; 24.4	1; 0.80	123; 43.5		
	Extreme	100; 84.7	17; 14.4	1; 0.80	118; 41.7		
	Total	214; 75.6	62; 21.9	7; 2.50	283; 100.0		

It was also established, as shown in Table 4.20, that drought and the level of people’s engagement in on-farm casual labour as a source of livelihood in Ngomeni Ward were significantly associated as reinforced by ( $\chi^2=83.581a$ ,  $p=0.000$ ,  $p<0.05$ ). These results indicated that increased drought intensity, that is severe to extreme drought occurrences in this ward were associated with lower levels of engagement in on-farm casual labour over the past 10 years.

**Table 4.22: Drought and Level of Commitment in Off-Farm Casual Labour as Source of Livelihood**

		Level of engagement in off-farm casual labour over the past 10 years			$\chi^2$	p value
		Moderate	High	Total		
		n; %	n; %	n; %		
Severity/ intensity of the drought occurrences	Mild	4; 80.0	1; 20.0	5; 1.8	17.344a	0.001
	Moderate	16; 43.2	21; 56.8	37; 13.1		
	Severe	34; 27.6	89; 72.4	123; 43.5		
	Extreme	21; 17.8	97; 82.2	118; 41.7		
	Total	75; 26.5	208; 73.5	283; 100.0		

Similarly, the association between drought and the level of engagement in off-farm casual labour in Ngomeni Ward over the past 10 years was significant given ( $\chi^2=17.344a$ ,  $p=0.001$ ,  $p<0.05$ ) as in Table 4.22. These conclusions revealed that the percentage of respondents who reported a high level of engagement in off-farm casual labour in the ward was higher where severe or extreme drought events were witnessed compared to cases where the drought events were mild.

**Table 4.23: Drought and Level of Dependency on Credit as a Source of Livelihood**

		Level of dependency on credit				$\chi^2$	p value
		Low	Moderate	High	Total		
		n; %	n; %	n; %	n; %		



Severity/ intensity of the drought occurrences	Mild	2; 40.0	3; 60.0	0; 0.00	5; 1.8	38.087a	0.000
	Moderate	3; 8.10	14; 37.8	20; 54.1	37; 13.1		
	Severe	3; 2.40	27; 22.0	93; 75.6	123; 43.5		
	Extreme	1; 0.80	26; 22.0	91; 77.1	118; 41.7		
	Total	9; 3.20	70; 24.7	204; 72.1	283; 100.0		

Results shows a significant association between the severity of drought occurrences in Ngomeni Ward and the level of dependency on credit as a source of livelihood by people in the ward. This finding is supported by ( $\chi^2=38.087a$ ,  $p=0.000$ ,  $p<0.05$ ) as given in Table 4.23. This study noted that the level of dependency on credit as a livelihood source was high where drought occurrences in the ward were severe or extreme compared to when such events were mild.

**Table 4.24: Drought and Livelihood Security**

		Livelihood security in the face of drought in this area						
		Least secure	Less secure	Average	Secure	Total		p
		n; %	n; %	n; %	n; %	n; %	$\chi^2$	value
Severity/ intensity of the drought occurrences	Mild	0; 0.00	0; 0.00	0; 0.00	5; 100.0	5; 1.8	279.605a	0.000
	Moderate	0; 0.00	0; 0.00	25; 67.6	12; 32.4	37; 13.1		
	Severe	9; 7.30	74; 60.2	35; 28.5	5; 4.10	123; 43.5		
	Extreme	83; 70.3	34; 28.8	0; 0.00	1; 0.80	118; 41.7		
	<b>Total</b>	<b>92; 32.5</b>	<b>108; 38.2</b>	<b>60; 21.2</b>	<b>23; 8.10</b>	<b>283; 100.0</b>		
	A few months	0; 0.00	0; 0.00	1; 11.1	8; 88.9	9; 3.2	167.702a	0.000
	Several months	20; 14.7	48; 35.3	56; 41.2	12; 8.80	136; 48.1		
	A year	46; 50.5	42; 46.2	3; 3.30	0; 0.00	91; 32.2		
Duration of drought events	More than a year	26; 55.3	18; 38.3	0; 0.00	3; 6.40	47; 16.6		
	<b>Total</b>	<b>92; 32.5</b>	<b>108; 38.2</b>	<b>60; 21.2</b>	<b>23; 8.10</b>	<b>283; 100.0</b>		

Table 4.24 indicate that the intensity of drought events and the security of livelihoods of people in Ngomeni Ward were significantly associated. This is demonstrated by ( $\chi^2=279.605a$ ,  $p=0.000$ ,  $p<0.05$ ) that was yielded. The study also noted that drought duration in the ward and the people's

livelihood security were also significantly associated given ( $\chi^2=167.702a$ ,  $p=0.000$ ,  $p<0.05$ ). The results showed that increased intensity of drought events and also prolonged droughts were associated with increased livelihood insecurity among a larger percentage of people in this ward.

**Table 4.25: Drought and Ability of Main Source of Livelihood to Sustain Household Basic Needs**

		The ability of the main source of livelihood to sustain household basic needs			$\chi^2$	p value
		No	Yes	Total		
		n; %	n; %	n; %		
Severity/ intensity of the drought occurrences	Mild	0; 0.00	5; 100.0	5; 1.8	267.412a	0.000
	Moderate	2; 5.40	35; 94.6	37; 13.1		
	Severe	123; 100.0	0; 0.00	123; 43.5		
	Extreme	118; 100.0	0; 0.00	118; 41.7		
	<b>Total</b>	<b>243; 85.9</b>	<b>40; 14.1</b>	<b>283; 100.0</b>		
Duration of drought events	A few months	2; 22.2	7; 77.8	9; 3.2	64.253a	0.000
	Several months	103; 75.7	33; 24.3	136; 48.1		
	A year	91; 100.0	0; 0.00	91; 32.2		
	More than a year	47; 100.0	0; 0.00	47; 16.6		
	<b>Total</b>	<b>243; 85.9</b>	<b>40; 14.1</b>	<b>283; 100.0</b>		

Table 4.24, portray a significant association between the severity of drought occurrences in Ngomeni Ward and the ability of the people's main sources of livelihood to sustain household basic needs as supported by  $\chi^2=267.412a$  and associated p-value of 0.000. With severe or extreme drought events, the proportion of people whose main sources of livelihood could not sustain their household basic needs was high compared to when the droughts were mild. The study also found that the duration of drought events in Ngomeni Ward and the ability of people's main sources of livelihood to sustain household basic needs were also significantly associated as indicated by  $\chi^2=64.253a$  and the corresponding p-value of 0.000. Prolonged droughts events meant that the main source of livelihood for a larger proportion of people in Ngomeni Ward could not sustain their households' basic needs.

**Table 4.26: Drought and Need to Change to Alternative Sources of Livelihood (Livelihood Diversification)**

		Need to change to alternative sources of livelihood			$\chi^2$	p value
		No	Yes	Total		
		n; %	n; %	n; %		
Severity/ intensity of the drought occurrences	Mild	4; 80.0	1; 20.0	5; 1.8	244.570a	0.000
	Moderate	33; 89.2	4; 10.8	37; 13.1		
	Severe	0; 0.00	123; 100.0	123; 43.5		
	Extreme	0; 0.00	118; 100.0	118; 41.7		
	<b>Total</b>	<b>37; 13.1</b>	<b>246; 86.9</b>	<b>283; 100.0</b>		
Duration of drought events	A few months	6; 66.7	3; 33.3	9; 3.2	54.807a	0.000
	Several months	31; 22.8	105; 77.2	136; 48.1		
	A year	0; 0.00	91; 100.0	91; 32.2		
	More than a year	0; 0.00	47; 100.0	47; 16.6		
	<b>Total</b>	<b>37; 13.1</b>	<b>246; 86.9</b>	<b>283; 100.0</b>		

The cross-tabulation results between drought and the need to change to alternative sources of livelihood are illustrated in Table 4.26. The computed Chi-square value,  $\chi^2$  of 244.570, and associated p-value of 0.000 were an indication that the severity of drought occurrences in Ngomeni Ward and the need to change to alternative sources of livelihood were significantly associated. As the severity of drought events in the ward increased, the percentage of people who found a need to diversify their livelihood sources increased. The findings also showed that the association between the duration of drought events and the need for livelihood diversification was significant as supported by ( $\chi^2=54.807a, p=0.000, p<0.05$ ). Prolonged droughts were associated with a higher percentage of people who found the need to diversify their livelihood sources for the past 10 years. Therefore, based on the above findings, it can be inferred that there was a statistical difference between drought and the livelihoods of people in Ngomeni Ward. Based on the above analysis, the null hypothesis that there was no significant difference between spatial-temporal characteristics of drought and household livelihoods in Ngomeni Ward was rejected as a demonstration that drought occurrences within this ward considerably affected households' livelihoods.

#### 4.9.2 Drought and Environmental Degradation in Ngomeni Ward

The study also examined whether drought had contributed to environmental degradation in Ngomeni Ward. The study tested the below null hypothesis

*H<sub>02</sub>: There is no statistical difference in droughts and environmental degradation in Ngomeni Ward*

We tested the likelihood of depending on environment in the event of drought. This was by engaging in activities such as charcoal burning, wood logging, sand harvesting, and small-scale stone quarrying.

**Table 4.27: Drought and Likelihood of Depending on the Immediate Environment to Meet Basic Needs**

		Likelihood of depending on the immediate environment to meet basic needs				$\chi^2$	p value
		Not likely	Somewhat likely	Very likely	Total		
		n; %	n; %	n; %	n; %		
Severity/ intensity of the drought occurrences	Mild	5; 100.0	0; 0.00	0; 0.00	5; 1.8	220.653a	0.000
	Moderate	21; 56.8	14; 37.8	2; 5.4	37; 13.1		
	Severe	1; 0.80	46; 37.4	76; 61.8	123; 43.5		
	Extreme	0; 0.00	6; 5.10	112; 94.9	118; 41.7		
	<b>Total</b>	<b>27; 9.5</b>	<b>66; 23.3</b>	<b>190; 67.1</b>	<b>283; 100.0</b>		
Duration of drought events	A few months	9; 100.0	0; 0.00	0; 0.00	9; 3.2	161.621a	0.000
	Several months	18; 13.2	57; 41.9	61; 44.9	136; 48.1		
	A year	0; 0.00	6; 6.60	85; 93.4	91; 32.2		
	More than a year	0; 0.00	3; 6.40	44; 93.6	47; 16.6		
	<b>Total</b>	<b>27; 9.50</b>	<b>66; 23.3</b>	<b>190; 67.1</b>	<b>283; 100.0</b>		

From the findings presented in Table 4.26, it can be seen that there was a noteworthy association between the severity of drought and the likelihood of households depending on the immediate environment to meet their basic needs given  $\chi^2=220.653a$  and corresponding  $p=0.000$  which was less than 0.05. Duration of drought events and households' likelihood of depending on the immediate environment to meet basic needs were also significantly associated as shown by ( $\chi^2=161.621a$ ,  $p=0.000$  where  $p<0.05$ ). The findings showed that a higher percentage of the

households were very likely to depend on the immediate environment to meet their basic needs when the drought intensity was severe or extreme or when droughts events were prolonged compared to cases where droughts were mild or occurred for a few months. Based on these findings, it can be inferred that had droughts had significantly contributed to environmental degradation in Ngomeni Ward by increasing the likelihood of households depending on the immediate environment through engaging in destructive activities such as charcoal burning and sand harvesting. Thus, the null hypothesis that there was no statistical difference in drought and its effects on environmental degradation in Ngomeni Ward was rejected.

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATION**

#### **5.1 Introduction**

The study results are summarized, the conclusions drawn highlighted, and recommendations are provided for practice. This is carried out per the specific objectives of the study.

#### **5.2 Summary of Findings**

The major objective was to determine the sources of livelihoods and how the drought had impacted the livelihood sources in Ngomeni ward, Mwingi North Sub County in Kitui County.

##### **5.2.1 Forms/ sources households livelihood in Ngomeni Ward**

The study found out that households depended on more than one livelihood source, however, most of the sources were unreliable. Most households depended on climate-sensitive sources of livelihood i.e. crop and livestock production. Other sources of livelihood included off-farm casual labour, on-farm casual labour, formal employment, businesses, remittances, assistance and transfers, and credit. Crop production was still the main source of livelihood in most households despite the poor produce resulting from erratic rains. Households mostly turned to depend on off-farm casual labour when droughts disrupted crop production. Off-farm casual labour was unreliable because it was not certain to get it. Most households however had off-farm casual labour as their alternative source to crop and livestock production because they could not diversify their income sources.

The inability to diversify was exacerbated by low education levels. Majority of the respondents had attained primary school education and below and that limited the household's knowledge and skills for diversification. The recurrence nature of the droughts had also affected the household's ability to recover from previous. Results show that droughts had become more frequent, severe, and prolonged since 2009 and the households had sold most of their assets to cope with droughts. The overall income level for the respondents as the breadwinners of the household was low. About 80% of the respondents were low-income earners earning KSH 10,000 and below per month and this limited their ability to diversify their sources of income.

### **5.2.2 Impacts of drought on crop production**

Crop production was the most household livelihood source that was highly affected by drought. The household had experienced a reduction in crop yields since 2009. The results showed that the severity of drought occurrences in Ngomeni Ward was associated with the average percentage of crop yields lost over the past 10 years given ( $\chi^2=371.102a$ ,  $p=0.000$ ,  $p<0.05$ ). The proportion of people who lost a higher percentage of harvest over the past 10 years on average was higher when the drought occurrences were severe or extreme compared to when such events were mild. The recurrence of droughts in Ngomeni caused delayed seed germinations where households were severally exposed to the expense of planting more than twice, Lack of water also caused stagnated growth and drying of crops and overall reduction of yields.

### **5.2.3 Impacts of drought on livestock production**

Livestock keeping was also a common livelihood source that was affected by drought in Ngomeni. Drought impacts to livestock as a household livelihood source involved a decrease in the number of livestock owned by households, changes in the kinds/ types of livestock kept as well the value of livestock. The findings demonstrate that with prolonged drought events, the number of households that reduced the number of livestock they kept was higher compared to cases where the drought events lasted for a few months. During droughts, livestock were sold to help the households meet their basic needs and this majorly caused a decrease in livestock numbers. Reduction in the livestock numbers was also caused by increased deaths from diseases and lack of forage. Some households who had noted an increase in livestock said that they had sold the high-value livestock such as cattle and bought low-value livestock which could easily survive during drought. Some of the households had no livestock at all and this increased their vulnerability to drought.

### **5.2.4 Impacts of drought on households level of engagement to off-farm casual labour, on-farm casual labour, and business**

Droughts in Ngomeni affected the level of household engagement to off-farm casual labour, on-farm casual labour, and business as livelihood sources. Results showed that the level of households' engagement in on-farm casual labour was low while the level of engagement in off-

farm casual labour was high during droughts. The level of engagement in business remained relatively similar, and therefore drought had low effects on the level of engagement on business. The level of people's engagement in on-farm casual labour as a source of livelihood in Ngomeni Ward and drought were significantly associated as supported by ( $\chi^2=83.581a$ ,  $p=0.000$ ,  $p<0.05$ ). The findings indicated that increased drought intensity, that is severe to extreme drought occurrences in this ward were associated with lower levels of engagement in on-farm casual labour over the past 10 years. When drought sets in and crops get to a poor state, on-farm casual labour jobs are few, and households who depend on agricultural wage labour are put at high risks of losing their livelihood source. They shifted to off-farm casual labour (stone quarrying, sand harvesting, and fetching water) which are low-paying and more unreliable.

#### **5.2.5 Impacts of drought on Level of dependency on Remittances, Assistance and transfers, and credit to sustain households.**

Drought in Ngomeni increased households' dependency on external non-climate sensitive sectors. There was a high level of dependency on credit, remittances and assistance, and transfers at 68.9%, 61.10%, and 56.20% respectively. The study noted that the level of dependency on credit as a livelihood source was high where drought occurrences in the ward were severe or extreme compared to when such events were mild. The high level of dependency on credit and assistance portrayed the low ability of households to cope with drought, and failure for external support increases the impacts of drought on the households. Most residents noted that assistance and transfer had reduced and they have not received any assistance during droughts since 2017 and this has increased households vulnerability to drought.

#### **5.2.6 Impacts of drought on Livelihood security/need for change to change from main livelihood source to others**

Drought duration in the ward and the people's livelihood security were also significantly associated given ( $\chi^2=167.702a$ ,  $p=0.000$ ,  $p<0.05$ ). The findings indicated that increased intensity of drought events and also prolonged droughts were associated with increased livelihood insecurity among a larger percentage of people in this ward.



### **5.2.7 Drought on Livelihood security/need for change to change from main livelihood source to others**

This study also sought to establish whether droughts had effects on the environment. The findings showed that a higher percentage of the households were very likely to depend on the immediate environment to meet their basic needs when the drought intensity was severe or extreme or when droughts events were prolonged compared to cases where droughts were mild or occurred for a few months.

### **5.2.8 Drought and environmental degradation**

Drought had both direct and indirect effects on the natural environment. Drying of water resources and loss of vegetation cover were two main effects that were mentioned by most of households. A large percentage of families were very likely to depend on the immediate environment to meet their basic needs when the drought intensity was severe or extreme or when droughts events were prolonged compared to cases where droughts were mild or occurred for a few months.

## **5.3 Conclusions**

The study concluded that households in Ngomeni had more than one livelihood source. Sources of livelihoods included crop production, livestock keeping, off-farm casual labour, on-farm casual labour, business, formal employment, remittances, assistance and transfers, and credit. The main livelihood source in Ngomeni was crop production, and it was highly affected by drought. Off-farm casual labour was also common as an alternative during drought, though it was unreliable. Most households could not diversify their livelihood sources due to low education, low income, and recurrence of droughts that reduced the household's ability to cope with droughts.

The study concluded that the duration, intensity, and severity of the drought were associated with low crop yields. Long duration, more severity, and high frequencies resulted to high decrease in crop yields. Droughts generally caused delayed germination, stagnated crop growth, and drying of crops.

The study concludes that droughts in Ngomeni caused a reduction in the number of livestock kept by households, caused changes in the kind/ type of livestock kept as well as the value of livestock kept. Most households in Ngomeni kept low-value livestock that could survive during droughts.

The study concluded that drought had an impact on the households' level of engagement in on-farm and off-farm labour. There was a high level of engagement in off-farm casual labour and low levels of engagement in on-farm casual labour.

The study concluded that droughts increased the level of dependence on credit, assistance & transfers as well as remittances to meet basic needs. The overall livelihood security was less secure during prolonged and intense droughts and this raised a need for the households to often change from their main source of livelihood.

The study further concluded that droughts aggravated environmental degradation. A high percentage of households were very likely to depend on the immediate environment when drought events were prolonged compared to when droughts were mild and short.

#### **5.4 Recommendation**

1. From the study findings it is clear that drought accelerates environmental degradation in Ngomeni. The study recommends county government training and support to households, through the extension officers on ways to diversify livelihood sources without causing harm to the environment. The households that could not diversify their livelihood sources are the most vulnerable to drought. Increased sensitization and involvement of the community in monitoring the environmental resources is key to reducing environmental degradation. There is need for the county to invest in capacity building of the extension officers on possible income diversification methods as well as dissemination of information on drought including effective drought coping mechanisms. There is a need for policy makers to support the local communities in developing local strategies and policies to ensure sustainable natural resource management. The guidelines and policies should cover charcoal burning, sand harvesting, wood logging and land.
2. Increased frequency, intensity and duration of droughts have affected climate sensitive sectors that are common sources of livelihood in Ngomeni Ward. The study recommends that the households should be sensitized to diversify their sources of income as a way of building resilience during droughts

3. Crops and Livestock production are the most affected sectors and therefore the study recommends that households should enroll in Agricultural insurance programs as a way of pooling the risks.

### **5.5 Suggestions for Further Research**

The study recommends for:

1. A study to evaluate the effectiveness of drought monitoring and coping strategies in Kitui County. Which strategies/programs/ projects have worked and what has not worked concerning the ability of households to cope with natural disasters like drought.
2. Opportunities available for drought-stricken households and how they can help reduce the level of dependence on the immediate environment.

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## APPENDICES

### APPENDIX I: HOUSEHOLD QUESTIONNAIRE

Hello! My name is Magdalene Kikuvi. I am a student in the University of Nairobi and carrying out academic research entitled “**Impacts of drought on household’s livelihood sources in Ngomeni, Mwingi North Sub County, Kitui County.**” I am kindly requesting you to take a few minutes of your time to respond to the following questions. Honest and objective responses are recommended. I further clarify that the information obtained will be maintained confidential and used for this research only.

#### **SECTION A: HOUSEHOLD INFORMATION**

1. Name of the Respondent: -----
2. Sub location
  - a. Kimela [ ]
  - b. Ndatani [ ]
  - c. Kalwa [ ]
  - d. Mitamisiyi [ ]
  - e. Ikime [ ]
  - f. Kavaani [ ]
  - g. Ngomeni [ ]
3. Gender
  - a. Male [ ]
  - b. Female [ ]
4. Age (years) \_\_\_\_\_
5. Type of Household:
  - a. Male headed [ ]
  - b. Female headed [ ]
6. Number of members of the household (household size) \_\_\_\_\_
7. Level of education
  - a. None [ ]
  - b. Primary [ ]
  - c. Secondary [ ]
  - d. College [ ]
  - e. University [ ]

#### **SECTION B: DROUGHT OCCURRENCE IN THE WARD**

8. Do you know what drought is?
  - a. Yes [ ]
  - b. No [ ]
9. Are you or has your household been affected by drought?
  - a. Yes [ ]
  - b. No [ ]

10. If yes in 2, how many drought events have you faced in the last 10 years?

---

11. On average, after how long does a drought event occur in this area?

- a. Yearly [ ] b. 1-2 years [ ] c. 3-4 years [ ] d. 5 years or more [ ]

12. On average, how would you describe the severity/intensity of the drought occurrences in this area over the past 10 years?

- a. Mild [ ] b. Moderate [ ] c. Severe [ ] d. Extreme [ ]

13. On average, for how long do drought events last in this area?

- a. A few months [ ] b. Several months [ ] c. A year [ ] d. More than a year [ ]

How can you describe the pattern of the duration of the drought for the last 10 years---

-----?

**SECTION C: FORMS/SOURCES OF LIVELIHOODS FOR HOUSEHOLDS**

14. Which of the following constitutes the source (s) of livelihood for your household?

(Multiple choice for the used sources only)

a) Crop farming [ ]

b) Livestock keeping [ ]

c) On farm casual labour [ ]

d) Off farm casual labour [ ]

e) Formal employment [ ]

f) Business [ ]

g) Remittances [ ]

h) Assistance and transfer [ ]

i) Credit [ ]

j) Other (specify) \_\_\_\_\_

15. Which of the above mentioned forms of livelihood would you say is the main source of livelihood for your household?

16. Please estimate your annual income in KSH.

---

17. On a scale of 0 to 100%, kindly estimate the percentage of the household's income for the past one year that is attributed to the following: -

Income source	% of each source to the total income (Total income is 100%)
a) Sale of crops	
b) Sale of livestock	
c) Sale of forestry products	
d) Agricultural wage labour	
e) Casual labour	
f) Non-farm enterprise/business	
g) Assistance and transfers e.g. from well wishers	
h) Remittances	
i) Credit	
j) Others	

**SECTION D: DROUGHT EFFECTS ON LIVELIHOODS**

18. How would you describe the effects of drought on the overall household income?

- a. Increased [ ]    b. Reduced [ ]    c. No change [ ]

19. i) How would you describe the crop yields in this area for the past 10 years on average?

- a. Increased [ ]    b. Reduced [ ]    c. No change [ ]

ii) If crop yields have reduced, by what percentage has your harvest reduced in the last 10 years on average?

- a. 1-20 [ ]    b. 21-40 [ ]    c. 41- 60 [ ]    d. 61-80 [ ]    e. 81-100 [ ]

iii) Kindly explain how drought events have impacted crop farming in this area over the past 10 years?

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20. i) Which kinds of livestock do you keep?

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ii) How many livestock in total do you have at the moment?

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iii) How would you describe the number of livestock kept by households on average over the past 10 years?

a. Increased [ ]    b. Reduced [ ]    c. No change [ ]

iv) Over the past 10 years, is there a change in the type of livestock that households own? a. Yes [ ]                      b. No [ ]

Explain your answer?

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v) If yes in (iv), how has the value of livestock that you own changed over the past 10 years?

a. Increased [ ]    b. Reduced [ ]

vi) How has droughts in this area affected your livestock keeping activities over the past 10 years?

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21. How would you describe the level of engagement in the following by households to meet daily basic needs in this area over the past 10 years?

i. On-farm casual labour

a. Low [ ] b. Moderate [ ] c. High [ ]

Explain your answer

---

---

---

ii. Off-farm casual labour

a. Low [ ] b. Moderate [ ] c. High [ ]

Explain your answer

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---

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iii. Business/non-farm enterprises

a. Low [ ] b. Moderate [ ] c. High [ ]

Explain your answer

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22. On average, how would you rate the level of dependency on the following to sustain households in this area over the past 10 years?

i) Formal employment

a. Low [ ] b. Moderate [ ] c. High [ ]

Explain your answer

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ii) Remittances

a. Low [ ] b. Moderate [ ] c. High [ ]

Explain your answer

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iii) Assistance and transfers from e.g. government, NGOs

a. Low [ ] b. Moderate [ ] c. High [ ]

Explain your answer

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---

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iv) Credit

a. Low [ ] b. Moderate [ ] c. High [ ]

Explain your answer

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23. Overall, how would you describe your livelihood security in the face of drought in this area?

a. Least secure [ ] b. Less secure [ ] c. Average [ ] d. Secure [ ] e. Very secure [ ]

24. Is your main source of livelihood able to sustain the basic needs of your household?

a. Yes [ ] b. No [ ]

25. In the past 10 years, have you found a need to change or switch from your main source of livelihood to others?

a. Yes [ ] b. No [ ]

26. If yes in 23, to what extent have you diversified your sources of livelihood in the past 10 years?

a. Not at all [ ]

b. Small extent [ ]

c. Moderate extent [ ]

d. Large extent [ ]

e. Very large extent [ ]



**SECTION D: DROUGHT COPING STRATEGIES AND ENVIRONMENTAL DAMAGE**

27. Which are the common coping strategies that you apply in the event of drought?

- a. Sale of livestock [ ]
- b. Planting drought resistant crops [ ]
- c. Reduce the number of meals per day [ ]
- d. Reduce the portion of meals [ ]
- e. Other (Specify)

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28. Rate your likelihood of depending on the immediate environment to meet your basic needs when drought occurs?

- a. Not likely [ ]
- b. Somewhat likely [ ]
- c. Very likely [ ]

29. Have you participated in the following activities in the past 10 years?

<b>Activity</b>	<b>Yes</b>	<b>No</b>
Hunting		
Charcoal burning/ wood logging/selling firewood		
Small scale stone quarrying		
Sand harvesting		

30. Which of the following would you say are indirect social effects of drought?

<b>Indirect social effects</b>	<b>Yes</b>	<b>No</b>
Increased distances to water points		
Conflicts over water and pasture		
School dropouts		
Theft		
Poor human health		
Migration		

Other		
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30. Please explain the reasons for school dropout.....

*Thank you for your time and cooperation*

## **APPENDIX II: KEY INFORMANT INTERVIEW GUIDE**

1. How has the rainfall trends been in the last ten years?
2. Has there been drought events in this area (Ngomeni ward)?
3. According to you, how has droughts affected the household livelihoods sources
4. Is there a time this area experienced successive/ persistent droughts? Please explain how the households build resilience, especially when they are out of stock
5. Is there a relation between droughts and environmental degradation? Explain this regarding this area.
6. Any other additions

## APPENDIX III: UNIVERSITY RESEARCH PERMIT



### UNIVERSITY OF NAIROBI

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

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P.O. BOX 30197-00100  
NAIROBI  
KENYA

January 06, 2020

The Director,  
National Commission for Science & Technology  
Nairobi, Kenya.

Dear Sir/Madam,

#### **RESEARCH PERMIT: MAGDALENE M. KIKUVI**

This is to confirm that the above named is a Master of Arts the Department of Geography and Environmental Studies, University of Nairobi registered in Environmental Planning and Management.

Ms. Kikui is currently undertaking research on a topic titled: **"Impacts of Recurrent drought on Livelihoods of people in Ngomeni Ward, Kitui County"**

Any assistance accorded to her will be highly appreciated.

**CHAIRMAN**  
Department Of Geography  
and Environmental Studies  
UNIVERSITY OF NAIROBI

**Dr. Boniface Wambua**  
Chairman, Department of Geography & Environmental Studies

# APPENDIX IV: NACOSTI RESEARCH PERMIT

  
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**NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION**

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**This is to Certify that Miss.. Magdalene Muthio Kikui of University of Nairobi, has been licensed to conduct research in Kitui on the topic: Impacts of recurrent droughts on the livelihood of the people in Ngomeni ward, Mwingi sub county, Kitui county for the period ending : 03/April/2021.**

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