

**ASSESSING SOCIO-ECONOMIC IMPACTS OF DROUGHT AND
COPING MECHANISMS:
A Case Study on Musikavanhu Area, Chipinge District, Zimbabwe**

by

Rumbidzai Patience Mtetwa

A mini-dissertation

Submitted in Accordance with the Requirements for the Degree

Masters in Development Studies

Centre for Development Studies

University of the Free State

Supervisor: Dr. Weldemichael A.Tesfuhuney

Bloemfontein, South Africa

2018

AUTHOR'S DECLARATION

I, RUMBIDZAI PATIENCE MTETWA, declare that the mini-dissertation hereby submitted for the Masters in Development Studies at the Centre for Development Studies, University of the Free State, is my own independent work and that I have not previously submitted this work for a qualification at/in another university/faculty. I hereby concede copyright to the University of the Free State.

SIGNED..... DATE

DEDICATION

“I dedicate this mini dissertation to the Lord God Almighty, my daughter Alyssa, my family, and friends. I love you so much guys”.

ACKNOWLEDGEMENT

Firstly I would like to say, thank you Almighty God for guidance and wisdom that you provided me to complete this study.

Secondly I would like to extend my gratitude to the following people and institutions. To all of you, I am eternally indebted.

- My supervisor, Dr. Weldemichael Tesfuhuney, for all his guidance, intellectual leadership, supervision and motivations during the study.
- All lecturers and supporting staff at the Centre for Development Studies (UFS) for all the material, moral support and encouragement you rendered.
- The Manicaland Provincial Administrator's Office, Chipinge District Administrator's Office, Chipinge District Food Security and Nutrition Committee, Miss Paidamoyo Immaculate Dhliwayo (Chipinge District Nutritionist) for the support and cooperation rendered through protocol and logistic arrangements for data collection.
- The leadership and community of Ward 23 of Musikavanhu area for taking time away from their daily schedules to be part of the discussions and providing valuable information towards the study.
- My friends for all the encouragement throughout the year.

Finally to my family, for all the support and encouragement, I am forever grateful, thank you for all your love.

TABLE OF CONTENTS

DEDICATION	iii
ACKNOWLEDGEMENT	iv
LIST OF TABLES	x
ACRONYMS AND ABBREVIATIONS	xi
ABSTRACT	xii
CHAPTER 1: INTRODUCTION	1
1.1 Background to the study	1
1.2. Problem Statement	2
1.3 Research Questions	3
1.4 Hypothesis	3
1.5 Aim	4
1.6 Specific Objectives	4
1.6 Conceptual framework	4
1.7 Structure of this mini-dissertation	6
CHAPTER 2: LITERATURE REVIEW	7
2.1 Introduction	7
2.2 The concept of drought.....	7
2.3 Definitions of drought.....	8
2.3.1 Meteorological drought.....	9
2.3.2 Hydrological drought.....	10
2.3.3 Agricultural drought	10
2.3.4 Socio-economic drought.....	10
2.4 Trends in global drought	11
2.5 Drought trends in Africa	12
2.6. Drought in Southern Africa	14
2.7 The El Nino Southern Oscillation	15
2.8. Impact of drought in developing countries	16
2.9 Drought management and response	18
2.9.1 National drought policies	19
2.9.3 Building resilience of households and communities to drought	20
2.9.3.3 Transformative capacity	21
2.10 Zimbabwe	21
2.10.1 Overview of the agriculture sector in Zimbabwe	21

2.10.2 History of drought in Zimbabwe	22
2.10.3 The 1991 to 1992 drought in Zimbabwe	24
2.10.4 El Nino induced drought in Zimbabwe 2015/2016	25
2.10.5 Emergency preparedness and response coordination structure in Zimbabwe ..	25
2.10.6 Drought monitoring and early warning systems in Zimbabwe	27
2.10.7 Zimbabwe vulnerability assessments	27
2.10.8 El Nino drought response -2015/16.....	27
2.11 Conclusion	28
3.1. Introduction	29
3.2. Study area	29
3.2.1. Location and topography	29
3.2.2 Demography	30
3.2.3 Climate	31
3.2.4 Agriculture Production	31
3.3 Research Design	32
3.4. Primary data	33
3.4.1 Quantitative data	33
3.4.2 Qualitative data.....	35
3.4.3 Focus group discussions	35
3.4.4 Key informant interviews	35
3.5 Secondary data	36
3.6 Sampling Design	36
3.6.1 Sample Size	36
3.7 Data Analysis	37
3.7.1 Data cleaning and analysis.....	37
3.7.2 Analytical approach	37
3.7.3 Dimension reduction techniques	38
3.7.4 Univariate ANOVA.....	39
3.7.5 Multinomial logit regression analysis	39
3.8 Research Ethics	40
3.9 Study Limitations	40
CHAPTER 4: DATA ANALYSIS AND INTERPRETATION	42
4.1 Introduction	42
4.2 Household demographics and characteristics	42

4.2.2 Respondent characteristics	43
4.2.3 Household head characteristics.....	44
4.2.4 Household size	45
4.3 Household income and assets	45
4.3.1 Household primary and secondary occupation.....	45
4.3.2 Household source of income	46
4.3.4 Domestic asset ownership.....	47
4.3.6 Livestock Ownership	49
4.3.7: Crops grown by households	50
4.4 Socio-economic impacts of the drought.....	51
4.4.1: Comparison of crop yield of drought year to 2016/17 season	51
4.5.2 Sources of water in normal and drought years	52
4.5.3 Drought as a challenge in the area.....	53
4.6. Impact of the drought.....	54
4.6.1 Yield loss	54
4.6.2 Hunger.....	55
4.6.3: Loss of livelihoods	56
4.6.5 School drop outs.....	57
4.6.6 Depleted water sources and increased distance to water sources	57
4.6.7 Diseases and pests	58
4.6.8 Loss of vegetation and soil degradation	58
4.6.9 Migration and Relocation.....	59
4.7 Significance of the effects of drought	59
4.8 Household Coping Strategies.....	62
4.8.1 Household based coping strategies.....	62
4.8.2 Livelihood based coping strategies.....	63
4.8.3 Selling of livestock.....	64
4.8.4 Withdrawal of children out of school.....	65
4.8.5 Child marriages	65
4.8.6 Diversification of livelihoods options	65
4.8.7 Coping strategies related to socio economic impacts experienced	66
4.9 Interventions that were available during the drought	67
4.9.1 Preparedness and response	68
4.9.2 Community support mechanisms during the drought	69

4.9.3 Situation of households after the drought	72
4.5 Conclusion	74
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS	75
5.1 Introduction	75
5.2 Main conclusions of the study by objectives	76
5.3 Recommendations	78
REFERENCES	82
Annexes	88

LIST OF FIGURES

Figure 1.1: The Sustainable Livelihoods Framework.....	6
Figure 2.1: Historic and future drought events in Europe, during the summer season	12
Figure 2.2: Drought events in African countries (1970-2004) <i>Source: Adapted from Noojin, Leah 2006, Factors that influence famine in Sub-Saharan African countries</i>	13
Figure 2.3: Number of droughts and affected people in Africa (1964 to 2003).....	14
Figure 2.4: Zimbabwe agro-ecological zones map.....	22
Figure 2.5: The Structure of Zimbabwe’s Emergency Management System.....	26
Figure 3.1: Map of the study area.....	30
Figure 4.1: Household income sources.....	46
Figure 4.2: Domestic assets ownership.....	47
Figure 4.3: Main crops grown by households.....	50
Figure 4.4: Perception of yields acquired during drought year in comparison with 2016/17 season.....	51
Figure 4.5 Sources of water in normal and drought years for different sources....	52
Figure 4.6 Impact of the drought.....	54
Figure 4.7 Assessing yield loss and loss of livelihood opportunities.....	60
Figure 4.8 Household based coping strategies during drought events.....	62
Figure 4.9 Available institutions and agencies during the drought.....	68
Figure 4.10 Situation of households after the drought.....	71

LIST OF TABLES

Table 2.1: History of El Nino induced drought in Southern Africa.....	16
Table 2.2: History of droughts in Zimbabwe from 1950 to 2016.....	23
Table 3.1: Summary of the data collected from the household questionnaires.....	34
Table 3.2: Analytical Approach used for the study.....	38
Table 4.1: Household characteristics for Musikavanhu area.....	42
Table 4.2: Types of primary and secondary occupation.....	45
Table 4.3: Categories of farming implements.....	48
Table 4.4: Livestock ownership and use.....	49
Table 4.5: Family separation and relocation.....	58
Table 4.6: Livelihood based coping strategies during drought events.....	63
Table 4.7: Univariate ANOVA statistical results.....	65
Table 4.8: Support received from institutions during the drought.....	66
Table 4.9: Institutions and agencies that offered support during the drought.....	67
Table 4.10: Household preparedness to cope with climate related disasters.....	68

ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
DCP	Department of Civil Protection
DFID	Department for International Development
ECHO	European Civil Protection and Humanitarian Aid Operations
HIV	Human Immune Virus
NGOs	Non-Governmental Organizations
SADC	Southern African Development Committee
UN	United Nations
USAID	United States Agency for International Development
ZIMVAC	Zimbabwe Vulnerability Assessment Committee

ABSTRACT

Droughts and desertification are some of the major challenges that threaten sustainable development globally and food and nutrition security in developing countries. In Africa drought is part of the natural climatic variability and countries on the continent are vulnerable to the adverse impacts of drought because their economies are agriculture based. Multidimensional responses are needed to support communities in the face of a changing climate that is continuously exposing communities to shocks such as drought. Strong institutional capacity is essential for drought mitigation and response to prevent the negative social and economic impacts on vulnerable populations. This study assesses the socio economic impacts of the 2015/16 El Nino induced drought and identifies coping mechanisms, preparedness and response mechanisms that were employed in the Musikavanhu area in the Chipinge district of Manicaland Province of Zimbabwe. The Musikavanhu area is prone to drought and has an erratic rainfall pattern characterized by dry spells. Frequent droughts are making it harder and harder for households to cope with each drought occurrence. It is important to understand how rural households, during periods of drought, cope in order to determine how best to implement micro level efforts to support households as part of risk management and resilience building.

Data for the research was collected using quantitative and qualitative methods through household interviews, key informant interviews and focus group discussions. A descriptive analysis was conducted, which characterized households according to their demographics, household income and assets, socio economic impacts of the drought, household based coping strategies; livelihood based coping strategies, preparedness and response mechanisms. Results showed that, to a large extent, households in the Musikavanhu community were negatively impacted by the drought and experienced yield loss, hunger, loss of livelihoods, food shortages, and loss of livestock, depleted water sources and school drop-outs among other effects. Some of these impacts influenced the coping mechanisms that were adopted, which include selling of livestock, pulling children out of school, reduction of meals, selling of assets and begging for food from neighbours and friends. Results also showed that households that were better off before the drought and had better capabilities and assets managed to bounce back quicker and better than others. In terms of preparedness and response, there is a need

to capacitate households on drought risk reduction through training and sensitization, so that they are able to deal with the effects of drought. The study recommends strengthening the absorptive capacities of households in order to improve the stability of households when drought occurs through improving knowledge on disaster risk management, access to informal safety nets and savings. The study also recommends that support should be provided to encourage livelihood diversification, asset rehabilitation, protection and accumulation at both household and community levels.

Key words: drought, assets, coping mechanism, socio-economic impact, preparedness, response, resilience

CHAPTER 1: INTRODUCTION

1.1 Background to the study

Droughts and desertification are some of the major challenges that threaten sustainable development globally (United Nations, 2007). Droughts largely affect areas that provide food security and nutrition, but they also affect other social, economic, and environmental sectors (Manyeruke, et al., 2013). Globally, droughts are the most detrimental of all the natural disasters, accounting for a fifth of all the damage caused by natural disasters (Gerber & Mirzabaev, 2017). Available estimates on the impact of drought show that 642 drought events were reported across the world from 1900 to 2013 (Masih, et al., 2014). These affected over 2 billion people, resulting in 12 million deaths and costing a total USD135 billion in response and mitigation (Masih, et al., 2014). The slow onset and creeping nature of droughts makes them difficult to detect, quantify and manage, resulting in severe social and economic impacts. The impact of drought has been recorded in both developed and developing countries, although a more significant impact is felt in the developing countries (Eriyagama, et al., 2008). Developing countries are most vulnerable to drought because their economies are agriculture based, have limited infrastructure development and low institutional capacity to respond and mitigate against droughts effectively (Gerber & Mirzabaev, 2017).

In Africa drought is a frequent occurrence that is caused by natural climate change (Masih et al 2014). Studies have found that the main cause of drought in Africa is the El Niño–Southern Oscillation (ENSO) and the sea surface temperature (SST) (Masih, et al., 2014). Of the five regions in Africa Southern Africa and East Africa are the most vulnerable to drought (Paek, et al., 2017). According to (Paek, et al., 2017) East Africa usually experiences drought during the cold phase of the ENSO (La Nina) while Southern Africa experiences drought during the warm phase of ENSO (El Nino). East African countries such as Somalia, Ethiopia and Kenya, which form part of the Horn of Africa are prone to famines caused by prolonged drought periods, while in Southern Africa Botswana and Zimbabwe experience drought as frequently as every 5 to 6 years (Paek, et al., 2017)

During the 2015/16 agriculture season sub-Saharan Africa experienced an El Niño induced drought, the strongest and widespread ever since the 1997/98 El Niño (FAO, 2016). The drought caused a humanitarian crisis that affected food and income security of the Southern African population. Among affected countries were Botswana, Malawi, Mozambique, South Africa and Zimbabwe. Low rainfall and high temperatures resulted in crop failure and a reduction in food production in these countries. In Zimbabwe the drought affected the food security of 4.1 million people, who make up 40% of the population (ZIMVAC, 2016). On the 5th of February 2016 the government of Zimbabwe declared a state of emergency, calling for regional and international assistance (FAO, 2016). Responses to the drought was late, which left households to cope using their own spare resources. The drought affected both rural and urban households, but rural households were the most affected because their main economic activities are related to agriculture. According to (Kinsey, et al., 1998) agriculture associated risks such as drought, crop diseases and pest attacks affect rural households the most and increase their vulnerabilities to food and nutrition insecurity.

1.2. Problem Statement

In Zimbabwe droughts are the most significant threat and major risk facing rural households (Manyani, 2014). Rural households are more prone to drought and its impact because they lack the resources to cope with the natural risks of farming (Gerber & Mirzabaev, 2017). Rural households also rely heavily on agriculture, which is one of the productive sectors that are first and most affected by drought. Micro level efforts by rural households to cope with natural disasters such as drought are often underappreciated, yet they are an important element of drought risk management. Learning and understanding the ways that rural households cope with drought can help countries support low cost risk management strategies for drought.

This study assessed the socio economic impact of the 2015/16 drought and the coping strategies that were used by rural households in Musikavanhu during the drought. Musikavanhu is made up of a population whose main source of livelihood is subsistence farming. The area is characterized by dry conditions, erratic rainfall, and high

temperatures and is regularly prone to drought. Frequent droughts are making it harder and harder for households in the area to respond to shocks and cope with each drought occurrence. When drought occurs this rural community is adversely affected by its effects and is left destabilised. The information gathered during the study can be used to better understand how rural households in the study area cope during periods of drought. The information will also help to determine how best to implement micro level efforts to cope with drought, how these communities can be supported as part of risk management, and how they can build resilience.

Supporting and enhancing local coping mechanisms can lessen the cost of responding to future droughts and their effects. The understanding of the socio-economic effects of droughts on rural households and their local coping strategies is important for risk management, planning and the design of response strategies. This will result in less crisis management when droughts occur and more of risk management and preparedness before a drought occurs.

1.3 Research Questions

- To what extent were the lives of the people in the Musikavanhu community affected by the drought, socially and economically?
- To what extent were the coping mechanisms, employed by the community, effective in improving the livelihoods of the affected people?
- What is the status of households in terms of recovery after experiencing the effects of the 2015/16 drought?
- How to identify important preparedness and response mechanisms that can be implemented to cushion communities in the face of strong drought events?

1.4 Hypothesis

The study hypothesizes that households in the study area did not experience any negative impacts and did not employ any negative coping strategies during the drought.

1.5 Aim

The overall aim of this study is to assess the socio-economic impacts of drought on the Musikavanhu area in the Chipinge district and to identify coping strategies that were employed by households during the time of drought. The drought in question is the 2015/16 El Nino induced drought.

1.6 Specific Objectives

The specific objectives of the study to be investigated are as follows:

- To assess the socio-economic impacts of the drought in the study area
- To identify drought coping mechanisms that were employed by households during the drought and to assess the factors affecting adoption.
- To identify support systems and mechanisms that can be used by households for drought preparedness and response.

1.6 Conceptual framework

This study is based on the concept of the sustainable livelihood approach. The objectives of the study were formulated and achieved through a livelihood framework analysis, similar to the one used by the British Department for International Development (DFID). The DFID defines a livelihood as follows:

A livelihood comprises of the capabilities, assets and activities required for a means of living. It is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets, both now and in the future, while not undermining the natural resources (DFID, 2000).

The sustainable livelihood approach aims to establish how vulnerable populations survive in areas prone to shocks and hazards such as seasonal constraints, economic shocks and stresses over which have no control over. The approach prioritizes resources and assets that people or households have access to and how they can use them to absorb shocks and stresses such as drought and recover from it. For the purpose of this study the sustainable livelihood approach was used (Figure 1.1).

1. The rural households and their stakeholders in the study area were interviewed in order to get an understanding of the vulnerability in which they live, and the shocks to which that they are continuously exposed to. In this case the shock was a continuous drought as a result of climatic related factors such as erratic rainfall and high temperatures.
2. Information on different types of assets owned was gathered ranging from human assets, physical assets, social assets, natural assets and financial assets. These five assets are at the core of a sustainable livelihood, upon which the livelihoods of households are built.
3. The study analyzed how ownership of certain assets or lack thereof affected the practice of certain coping strategies and the extent and impact of the drought on households.
4. The study identified the structures and mechanisms available in the Musikavanhu area that can influence access to assets by households before, during and after the drought period.
5. Recommendations on certain policies, livelihood strategies and interventions that can influence the transformation of households and facilitate achievement of outcomes such as food, nutrition and income security were also made by the study.

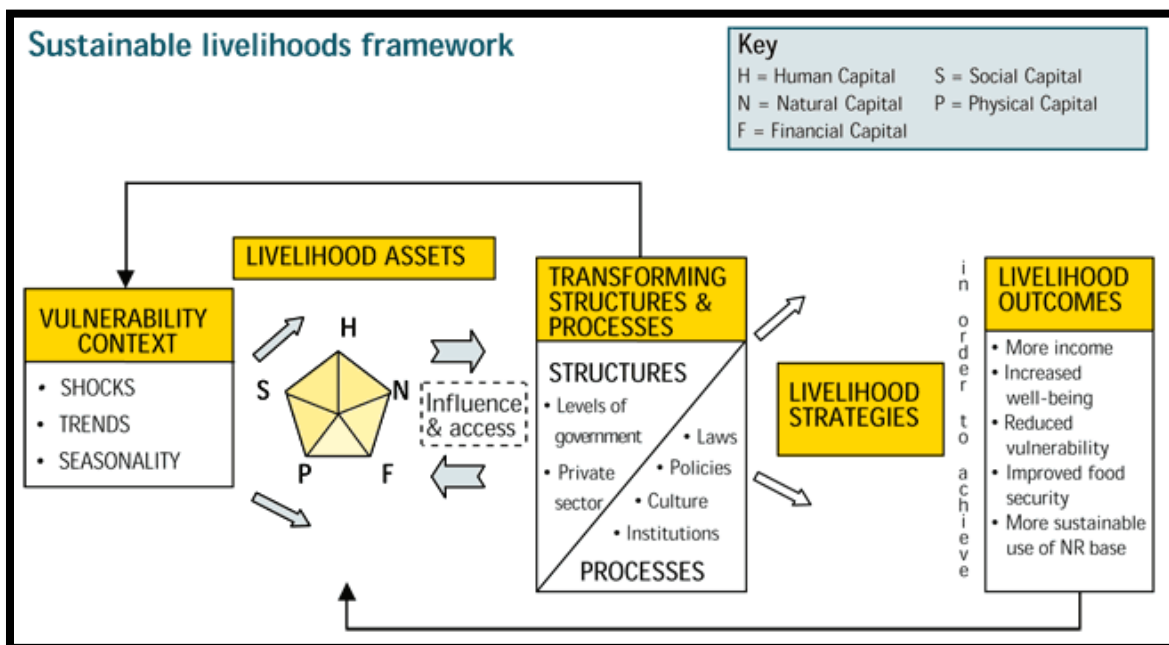


Figure 1.1: The Sustainable Livelihoods Framework (DFID, 2000)

1.7 Structure of this mini-dissertation

This study is organized into five chapters. The first chapter outlines the problem statement, study objectives and hypothesis. The second chapter is a literature review on drought, drought trends in Africa, impact of drought, coping mechanisms, drought management strategies and El Nino trends and effects. The third chapter outlines the study area and its climatic conditions. It also details sampling procedures and methods used for data collection and analysis. The fourth chapter is a presentation of the findings from the data collected with visual analysis in the form of graphs and tables. The fifth chapter discusses the results based on the analysis presented in chapter 4. The sixth chapter comprises of the conclusion, recommendations and areas that need further research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of the literature on drought and its impact. It begins by presenting the definitions of drought and goes on to outline the different types of drought that exist. The chapter also gives an overview of drought globally, Southern Africa and Zimbabwe and outlines some of the impacts of drought. The chapter further focuses on drought response, adaptation and management and concludes by giving an overview of the drought situation and drought management structure in Zimbabwe.

2.2 The concept of drought

According to (Cook, et al., 2013) extreme climate and weather events have increased in frequency, severity and duration due to climate change. One such extreme weather phenomenon is drought. (Li, et al., 2011) explains that drought is of interest because of its impacts on natural resources, agricultural production, social and economic activity. (Wilhite, et al., 2014) agrees by saying that a remarkable increase in the impacts of drought have been noticed in the agriculture, energy, tourism, and recreation sectors as a result of increased frequency, severity and duration. Drought related disasters have been more devastating than other natural hazards and the direct effects of drought have been followed by secondary and indirect effects such as famines and epidemics (Panagoulia & Dimou, 1998). Unlike other natural hazards drought is a slow accumulating process, which has an indefinite commencement and termination (Wilhite, 2000). The effects of drought may still be felt years after the termination of the drought event (Martinez-Sanchez, 2010) and can still be felt in the subsequent periods when normal to average precipitation occurs. Drought occurrence is naturally driven (Brüntrup & Tsegai, 2017) and occurs as a result of extremes in climate, caused by natural occurrences such as the El Niño–Southern Oscillation (ENSO) (Sheffield & Wood, 2008). However (Brüntrup & Tsegai, 2017) notes that human activity has increasingly shaped the environment with drought risks becoming socially induced, due to activities such as overgrazing, soil mining, land and water mismanagement, which increase the risk of drought.

2.3 Definitions of drought

Drought is a complex natural phenomenon that is hard to quantify and manage (Miyan, 2015). According to (Wilhite & Glantz, 1985) there is no 'good definition' of drought and a completely agreeable definition of a drought is difficult to find. (Sivakumar & Wilhite, 2011) also state that there are hundreds of definitions of drought, which adds to the confusion about the existence and degree of severity of droughts. The lack of a single definition of drought has been one of the challenges in further research of droughts (Yevjevich, et al., 1978). (Wilhite & Glantz, 1985) support this by saying that the lack of a single agreed definition of a drought often leads to confusion, inaction and ad hoc responses by decision makers. (Sivakumar & Wilhite, 2011) argue that the definition of a drought should be based on its effects and the specific climatic characteristics of the region in which it is occurring. According to (Sivakumar & Wilhite, 2011) a drought that occurs in North America is different from one that occurs in Southern Africa or Northeast Brazil because of the climatic differences and the resulting effects. (Sivakumar & Wilhite, 2011) go on to say that the definition of drought should be application specific, because drought impacts vary between sectors. For example, to a hydrologist drought means lower than average water levels in the water bodies, and to an economist drought means water shortages that negatively affects the existing economy. To a farmer who needs adequate water for his crops drought can simply mean a shortage of moisture in the soil.

Although there is no single agreed definition of drought, 'shortage of moisture and lack of precipitation' run common throughout most definitions. (Wilhite & Glantz, 1985) classify drought into conceptual and operational definitions. Conceptual definitions are used to describe the drought in general terms, whilst operational definitions are used to define the start, severity and end of drought episodes. (Wilhite, 2000) provides a conceptual definition of a drought as the result of natural effects, and the reduction in the amount of precipitation received over an extended period of time. Reduction in precipitation, in this case, is associated with other climatic factors such as high temperatures and high winds. (Martinez-Sanchez, 2010) defines drought as a deficiency in precipitation over an extended period of time. The deficiency in moisture or precipitation can last for more than one season, resulting in water shortages that have negative impacts on agriculture

production, animals and people. (Hisdal & Tallaksen, 2000) defines drought as a period of days with precipitation less than the expected amount. (Eriyagama, et al., 2009) define drought as a temporary meteorological event, which results from a deficiency in precipitation over an extended period of time.

However (Eriyagama, et al., 2008) is quick to point out that drought should not be treated the same as aridity. Aridity is a permanent characteristic of the climate whilst drought is a deviation of precipitation from the average or normal and a temporary situation. (Wilhite, 2009) also states that drought should not be confused with water scarcity because drought is a feature of the climate whilst water scarcity is a social construct where there is an excess of water demand over available supply. Damages that result from droughts are dependent on the intensity, duration and frequency of the drought and geographical location of the affected area (Wilhite, 2009). Drought is also classified into three categories, these are meteorological, hydrological and agricultural or any combination of the three (Hisdal & Tallaksen, 2000). (Wilhite & Glantz, 1985) add a fourth category to these three where drought is classified according to social and economic effects known as a socio-economic drought.

2.3.1 Meteorological drought

Meteorological droughts, also known as climatological droughts, occur over an extensive period of time, in a large area, when there is a lack of precipitation (Hisdal & Tallaksen, 2000). A meteorological drought is a deficit of precipitation relative to the average or normal rainfall of a particular place (Golian, et al., 2015). Sometimes meteorological droughts are defined based on the deviance between current amounts of rainfall and the average amounts of rainfall on a monthly, seasonal, or annual basis. Intensity and duration are key characteristics of identifying meteorological droughts (Byun & Wilhite, 1999). (Wilhite, 2000) notes that the definition of a meteorological drought is region specific because conditions that result in low precipitation vary between regions. To fully identify this type of drought other climatic variables such as evaporation and temperature are also used.

2.3.2 Hydrological drought

Wilhite & Glantz, (2000) assert that hydrological droughts occur after a meteorological drought and are characterised by extended periods of precipitation shortages that have negative impacts on both surface and subsurface water supplies. (Golian, et al., 2015) defines a hydrological drought as a period of time in which the amount of available water in streams, groundwater and reservoir levels is less than normal. (FAO, 2013) also explains that hydrological droughts are characterised by less than normal amounts of water in different types of water bodies and its impacts are seen in sectors other than agriculture. Examples of negative impacts in other sectors include public water supplies and depleted hydro-electric power production. Effects of hydrological droughts may continue for a longer period, since recharging of reservoirs and groundwater take time. An example cited by (Wilhite, 2000) is that of severe drought years between 1987 and 1992 in the Missouri River basin. It took an estimate of four to five years of normal precipitation to bring back the water to normal levels in the river basin.

2.3.3 Agricultural drought

Agricultural droughts occur in situations where soil moisture is not adequate to meet the needs of crops at a given time (FAO, 2013). An agricultural drought is defined by the availability of soil moisture to support crop and vegetation growth and not by the precipitation, which is below normal or average (Sivakumar & Wilhite, 2011). According to (Martinez-Sanchez, 2010) the impacts of agricultural droughts stay longer because crop yields would have been affected during this drought. Communities that rely on agricultural production usually wait for the production from the next agricultural season whilst still experiencing the effects from the previous season.

2.3.4 Socio-economic drought

Socio-economic droughts happen when physical water shortages affect health, wellbeing, quality of life and economic stature of the people (Petja, et al., 2008). Socio-economic droughts have elements of all three droughts mentioned above that is meteorological, hydrological, and agricultural droughts (FAO, 2013). Human activities such as overpopulation, poor land-use and unfriendly environmental practices can intensify the

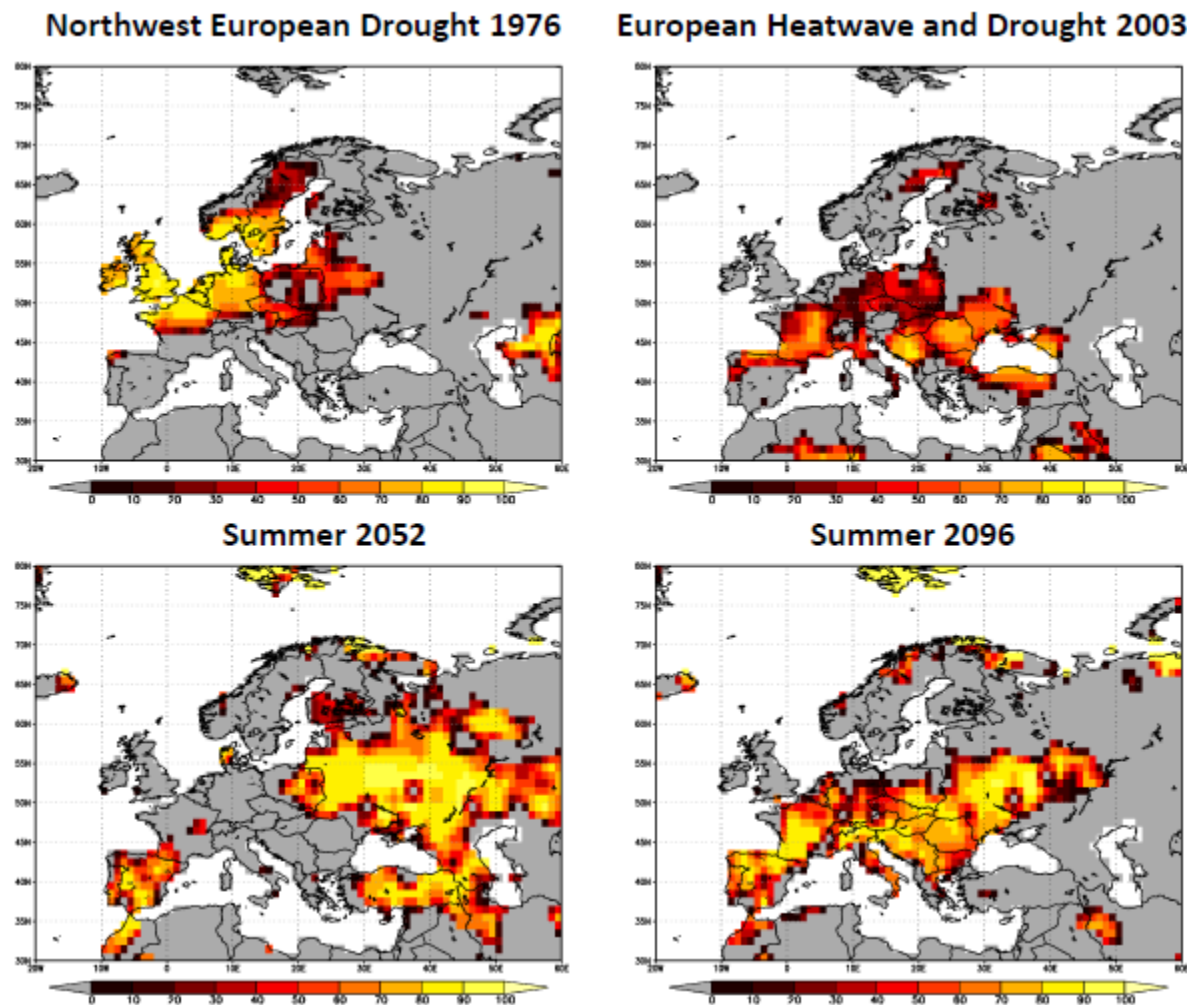
impacts of droughts leading to a socio-economic drought (Wilhite, 2000). A study conducted by (Eriyagama, et al., 2008) showed that vulnerability to a socio-economic drought is higher in African and Asian countries because their economies rely heavily on agriculture. Countries who were part of the study and scored a high socio-economic drought vulnerability index included Guinea-Bissau, Ethiopia, Niger, Afghanistan and Cambodia.

2.4 Trends in global drought

There is a growing perception that natural disasters such as droughts have intensified in the past three decades and are increasing in terms of frequency and severity (J.M.Brewer & Richard, 2011). Since the 1970s there has been a drying trend globally (Miyan, 2015) and an increase in drought occurrences due to the changing climate (Cook, et al., 2013). According to (Mishra & Singh, 2010) climate change is now recognized as one of the major threats for the planet in the 21st century. Over the past 157 years global average surface temperatures have risen significantly by 0.35°C from 1910 to 1940 and by 0.55°C from 1970 to the present (IPCC, 2007). The consequences of global warming has not just been the changes in average temperatures but the resulting increases in extreme events such as droughts. Severe and intense droughts have been recorded in regions as diverse as the United States, East Africa, Australia and the Sahel region (Miyan, 2015). However (J.G.McCabe & D.M.Wolock, 2015) argue that this increases in drought occurrence might not be due to global warming but also to better reporting and tracking systems of weather events as compared to the past.

(Cook, et al., 2013) observed that dry periods will intensify for many regions as a result of a rise in global temperatures. (Sheffield & Wood, 2008) used a soil moisture-based drought index over selected global areas to examine global and regional trends in drought over a 50 year period from 1950 to 2000. In the analysis drought is described in terms of duration, intensity, and severity. Results showed that global drought trends have not varied significantly between the 20th and 21st century. Projected changes show that drought occurrence will increase twofold by the mid-21st century and threefold by the end of the 21st century for many regions. However, there is an increasing decline in soil

moisture in North America and significant drying over West Africa driven by a reduction in precipitation in the Sahel region.



(Sheffield & Wood, 2008)

Figure 2.1 Historic and future drought events in Europe, during the summer season.

2.5 Drought trends in Africa

Drought is often seen as Africa's principal type of natural disaster and recurrent feature of the African climate (Benson & Clay, 1994). Many African countries are vulnerable to the effects of drought because of their reliance on rain-fed agricultural and livestock production (FAO, 2013). Drought has significant effects on human health, food security, nutrition security, economic activity and the environment (ECA, 2007). Drought also threatens human security, especially when it leads to famine for example in the Horn of

Africa. Limited infrastructure and low levels of per capita income have increased vulnerability to drought for Southern African Countries (Benson & Clay, 1994). Figure 2.2 indicates a map of drought events over the African continent from 1970 to 2004. The map shows that the majority of droughts on the continent are occurring in East, West and Southern Africa. In East Africa Ethiopia, Kenya, Tanzania and Somalia experienced more than 10 droughts from 1970 to 2004. In Southern Africa countries such as Zimbabwe and Zambia experienced more than 10 droughts during the period of 1970 to 2004. Although other countries in the rest of the region have experienced less droughts than Zimbabwe and Mozambique, they are still susceptible to the occurrence of droughts, with some of them experiencing between 6 and 9 droughts during the same period.

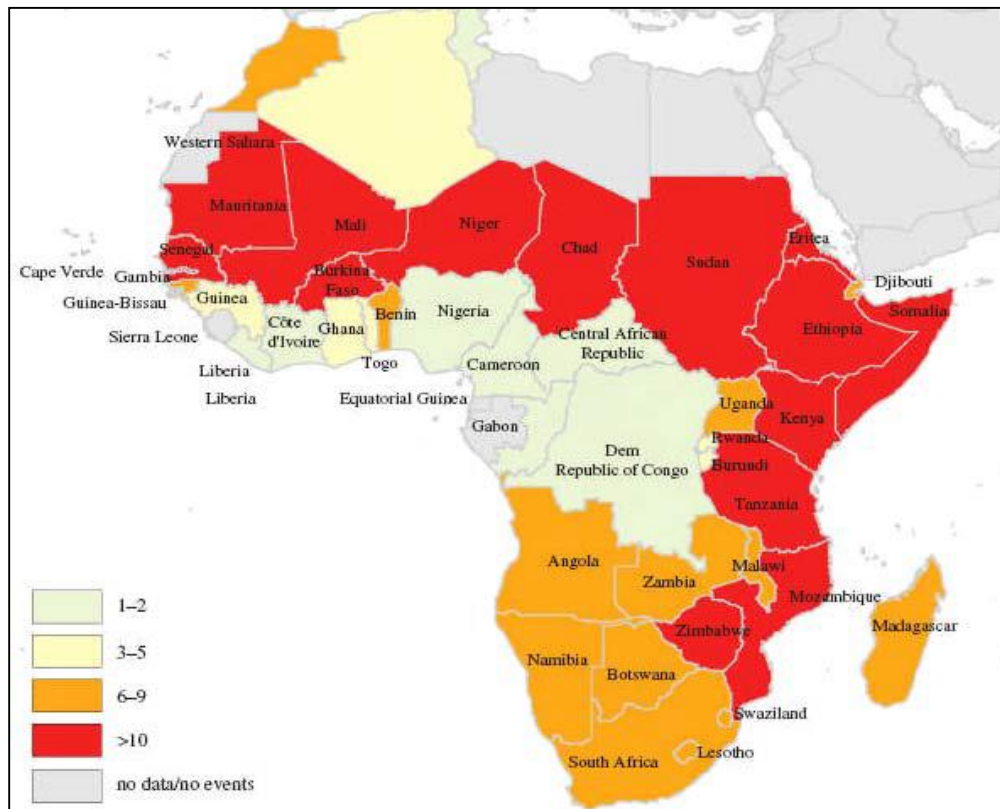


Figure 2.2: Drought events in African countries from (1970 to 2004). (Adapted from Noojin, Leah 2006)

(Gautam, 2006) also shows the impact of drought on the African continent between 1964 and 2003. According to (Gautam, 2006) East Africa accounted for over 70% of the total people affected by drought whilst countries like Zimbabwe, Malawi, Mozambique, and

Kenya accounted for 9 - 12%. Figure 2.3 shows the number of people affected in the different countries over the same period.

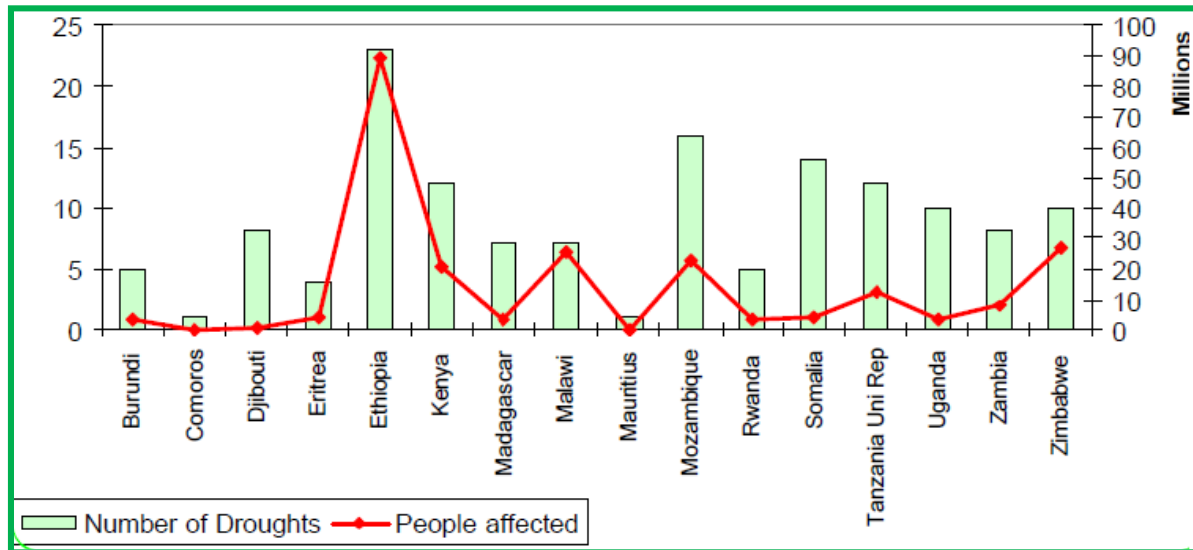


Figure 2.3: Number of droughts and affected people in Africa (1964 to 2003)
Source: (Gautam, 2006)

2.6. Drought in Southern Africa

According to (FAO, 2016) droughts in the Southern African region have significantly affected agriculture and food production. Estimates show that 60% of sub Saharan Africa is vulnerable to drought (Benson & Clay, 1998). A shift in climatic conditions over sub Saharan Africa has resulted in changing rainfall patterns and an increase in temperature. A study conducted by (Unganai, 1996) in Zimbabwe, shows that from 1933 to 1993 daytime temperatures over the country rose by 0.1% degrees per decade, while precipitation declined by up to 10% on average over the same period. Besides changing climate, one of the main causes of drought in Southern Africa is the El Nino and La Nina phenomenon (Gautam, 2006). During the 2015/2016 October-to-January rainy season, countries in Southern Africa experienced the lowest-recorded rainfall amounts in 35 years, resulting in wide spread drought conditions (UNDP, 2016). According to (USAID, 2016), (FAO, 2016) and (OCHA, 2016) the drought was exacerbated by the El Niño climatic event of the same year, which caused food insecurity, deteriorating nutrition, and low agriculture production throughout the region. (RIASCO, 2016) described the El Nino of that year as a climatic event that caused the worst drought in 35 years in the region

and compounded existing vulnerabilities in Lesotho, Malawi, Swaziland and Zimbabwe. During that time the agriculture season, which normally runs between October and April, did not receive rainfall until February of the following year (FAO, 2016). The previous agriculture season of October 2014 to April 2015 was also characterized by rainfall deficits. As such, countries were experiencing a second cycle of severe rainfall deficits and a second consecutive year of food insecurity (Bonifacio, 2015). Agricultural production for the 2015/16 season decreased by 15 percent (FAO, 2016), and the regional cereal deficit for April 2017 was about 9.3 million tonnes (OCHA, 2016). Livestock production was affected with by more than 643,000 cattle deaths recorded in Swaziland, South Africa, Namibia and Zimbabwe (Musiiwa, 2016). Deaths were due to diseases, poor pasture and lack of water. The humanitarian impact extended beyond food insecurity into other social effects such as increased school drop-out rates and increased incidences of communicable diseases.

2.7 The El Nino Southern Oscillation

The El Nino fully known as the El Nino Southern Oscillation (ENSO) is a pattern of reversing air pressure over the Pacific Ocean that occurs when seas warm up in South America (Hirons & Klingaman, 2016). The warming up of the sea causes low rainfall, dry spells and drought in east and southern Africa (Maddox, 2007). In the northern parts of the world the El Nino causes cold winters and in the southern hemisphere it causes high temperatures and low rainfall. According to (Sarachick & Cane, 2010) the El Nino phenomenon has transformed over the years into a global hazard that has led to devastating events such as droughts, floods and disease outbreaks among others. The El Nino tends to occur every 3 to 7 years, lasting for about one and half years. (S.G.Philander, 2004) However (S.G.Philander, 2004) and (Maddox, 2007) point out that the El Nino does not occur on a predictable schedule. An El Nino event is usually accompanied by a La Nina, which results in heavy rainfall causing flooding and heavy rains. According to (Juana, et al., 2013) the ENSO modulates rainfall variability over southern Africa. There is a strong relationship that exists between severe droughts in the region and ENSO events (Nicholson & Kim, 1997). Looking at the history of El Nino induced droughts in Southern Africa, the 1992 and 1997/1998 droughts and recently the

2015/16 drought were the most severe droughts that had significant impacts on the population (Juana, et al., 2014). In their publication (Rojas, et al., 2014) listed El Nino related droughts and their severity occurring from 1986 to 2010 (Table 2.1).

Table 2.1 History of El Nino induced drought in Southern Africa from 1986 to 2010

El Nino Year	Duration and effects	Severely affected countries in Africa
1986/87 & 1987/88	Two consecutive moderate to strong warm events without interruption lasted for 19 months, the most prolonged period during 1984-2013 time frame.	Tunisia, Botswana, South Africa, Niger, Mali, Chad, Nigeria, Sudan, Senegal, Ethiopia, Somalia, Zimbabwe, Mozambique, Namibia, Madagascar
1991/92	Moderate event that lasted 14 months, the second longest of the last 30 years.	South Africa, Zimbabwe, Botswana, Malawi, Mozambique, Madagascar, Morocco, Senegal, Somalia, Sierra Leona, Ivory Coast, Ghana, Nigeria, Ethiopia, Uganda
1994/95	Moderate event that lasted 7 months, this El Niño caused few negative impacts on global agriculture.	Morocco, Tunisia, Botswana and Zimbabwe
1997/98	Strong intensity that lasted 12 months also known as climate event of the century because of its intensity.	Senegal, Algeria and Tunisia were Niger, Sudan, Ethiopia and northern Tanzania.
2002/3	Moderate intensity that lasted 10 months	Ethiopia, Nigeria, Tanzania, Botswana, South Africa
2004/5	Classified as week and lasted 7 months.	Kenya, Tanzania, Mali, Burkina Faso, Sudan, Ethiopia, Somalia
2006/7	Classified as week and lasted 5 months.	Niger, Nigeria, Somalia, Uganda Botswana, South Africa, Madagascar
2009/10	Classified as moderate intensity that lasted 10 months	Somalia, Kenya, Tanzania, Ethiopia

Source: (Rojas, et al., 2014)

2.8. Impact of drought in developing countries

According to (Rembold, et al., 2016) drought has significant economic, environmental, and social impacts, which manifest directly and indirectly in the short term and long term. (Benson & Clay, 1998) state that drought is a threat to global food security with the major impacts occurring in agriculture and related sectors such as forestry and fisheries. Drought impacts on agriculture include crop losses, depressed livestock production,

increased livestock deaths, increased plant and animal diseases, damage to natural habitats, land degradation and soil erosion (IFAD, 2000).

Several empirical studies that used different approaches have been conducted to establish the effects of droughts on different communities. (Butt, et al., 2005) conducted a study on the economic and food security impacts of drought on the agricultural sector in Mali. Data analysis of crops, forages and livestock was done and showed that drought resulted in reduced crop yield and decline in forage yields and livestock weights. (Butt, et al., 2005) also found that drought results in substantial economic losses for consumers and an increase in hunger among the affected population.

In a case study conducted by (CPAU, 2011) in the local village of Faryab, in a province in northern Afghanistan, that was affected by drought over a period of seven years, it was discovered that drought limited the agricultural activities practiced and reduced the number and value of livestock. Farmers changed the types of crops that they were planting but production was of low quality. The drought in Faryab also had negative effects on women and children and caused unemployment and migration of labour. As (Roy & Hirway, 2007) documented the effects of drought in India where no-food production, loss of employment and loss of casual labour for people working on farms were cited as immediate impacts of drought. The study also cited shortage of water for drinking and domestic use for both people and animals as another effect of drought. This was as a result of the depletion of water volumes in water sources such as rivers, lakes, streams and boreholes.

In another study conducted in Turkey (Dellal & McCarl, 2010) noted that the effects of droughts are based on frequency, severity and the degree of vulnerability of affected areas. The study found that during droughts animal production was low, as a result of unavailability of livestock feed, high livestock mortality rates, decreased stock weights and reduced productivity of rangeland. The study also shows that droughts have economic effects such as income losses, reduction in economic development, fewer agricultural producers and loss of the rural population. (Juana, et al., 2014) used the computable general equilibrium approach to analyze the socio-economic impact of

drought in Botswana. Their results showed that the impact of drought led to a decline in agricultural output and input markets. Unskilled labor and skilled manual labour were impacted as there was a loss of labour on the farms translating to reduced income at household level.

In a separate case (Sivakumar & Wilhite, 2011) also noted that drought has an impact on humans in the form of food and water shortages, malnutrition, displacement of people, migration and loss of human life (FAO, 2013) , (Butt, et al., 2005). The negative impact of drought often results in affected communities adopting coping strategies that puts them at risk (CPAU, 2011). According (Roy & Hirway, 2007), in the long term, farmers make low investments, which translate to low productivity, low profits and loss of agriculture based income sources. Further, the lack of productivity of agriculture decreases the supply of raw materials for food processing and this means that other sectors also suffer. (Dellal & McCarl, 2010). The environment is affected by the loss of vegetation and lack of pastures, which leads to overgrazing and degradation of pastures by livestock and other animals (Panagoulia & Dimou, 1998). As water sources dry up animals and humans travel longer distances looking for water. According to (DFID, 2007) droughts negatively affect certain social groups such as women, children and households belonging to marginalized tribes, therefore increasing their vulnerabilities.

2.9 Drought management and response

Proper drought management and response planning is important in drought prone countries. According to (Eriyagama, et al., 2008) one of the major weaknesses of most developing countries that are at risk to drought is a reactive approach taken to droughts. In many cases reactive approaches are costly and less effective (Brüntrup & Tsegai, 2017). There is an urgent need for affected countries to change from crisis to proactive approach in line with the principles of risk reduction and prevention (Brüntrup & Tsegai, 2017). Developing countries economies are largely agriculture based which puts them at risk of negative drought impact since agriculture is the first most affected by droughts (FAO, 2013). Most developing countries in Asia and Africa are lagging behind the rest of the world in terms of drought preparedness and risk management (Eriyagama, et al.,

2008). This is because developing countries lack proper infrastructure, early warning systems and drought mitigation policies for drought management. More progressive economies of developed countries cushion populations from the effects of drought and any fluctuations in agriculture production (Gerber & Mirzabaev, 2017). Developing countries tend to respond to droughts in a reactive manner which is costly and less effective in some cases (Gerber & Mirzabaev, 2017). To add on to this chronic poverty, slow international action and weak governance increases the risk and effects of drought on the population and on the environment (Oxfam, 2016).

2.9.1 National drought policies

National drought policies provide a framework for pro-active drought management (Wilhite, et al., 2014) and are based on the principle that risk reduction plays a key role in mitigating drought impacts (Brüntrup & Tsegai, 2017). According to (Wilhite, et al., 2014) national drought policies should include important elements such as monitoring, early warning systems and impact assessment procedures. These are the same key pillars that are outlined in International disaster risk management frameworks like the Hyogo and Sendai frameworks (Brüntrup & Tsegai, 2017). However (Wilhite, et al., 2014) notes that there have not been any rigorous processes at global level to encourage countries to prioritize national drought policies, despite the increase in drought frequency. This has increased the ineffectiveness and inefficiency of existing drought management practices.

2.9.2 Adaptation to drought disasters

According to (Easton & Faulkner, 2014) adaptation are practices that are taken up or adopted to improve resistance or resilience to a certain element. In the case of this research these elements are natural shocks and hazards such as drought. Adaptation also covers those practices that can transform production systems in the face of climate change and drought to reduce the negative impacts. Unlike coping strategies, adaptation involves long term shifts and adjustments of livelihoods or practices in response to drought (Opiyo, et al., 2015). As such, adaptation forms part of pro-active strategies for communities or countries that are prone to droughts or other climate related hazards.

(Easton & Faulkner, 2014), (Opiyo, et al., 2015) give examples of adaptation practices that drought risk communities can adopt as a means of improving their resilience to drought.

- Diversification of livelihoods- This refers to a process whereby households do not rely on one type of livelihood option. Instead households are encouraged to engage in a range of activities that reduce their risk and exposure to drought. For example, households are encouraged to engage in both on farm and off farm livelihood options to minimize the negative impacts of drought, which affect agriculture more than any other sector.
- Using drought-resistant crop varieties is another adaptation strategy that communities and households are encouraged to adopt drought-resistant crops such as wheat, corn, sorghum and cotton resist the impact of drought. This ensures that at risk communities are still able to harvest adequate cereal crops for consumption and for sale, whilst still maintaining their food security.
- Conservation agriculture reduces soil compaction and erosion and increases soil organic matter and infiltration capacity. Conservation agriculture has three principles, which are crop rotation, soil cover and minimum soil disturbance which reduces runoff and ensures that soil is protected.

Though the list is not exhaustive there are other adaptation strategies that communities can engage in (USAID, 2016). These include building social safety networks, increasing access to household productive asset ownership and increasing access to financial services.

2.9.3 Building resilience of households and communities to drought

The concept of 'resilience' has featured recently in the development sector where it is being used to frame discussions around sustainable development and humanitarian responses to emergencies (Pain & Levine, 2012). The concept of resilience building applies to at risk communities as a means of building capacities to withstand the exposure and absorb the effects of drought. Resilience is the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and

stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth (FSIN, 2016). There are three capacities which are important in building resilience. These are absorptive capacity, adaptive capacity, and transformative capacity (UNDP, 2015).

2.9.3.1 Absorptive capacity

This is defined as the ability to minimize exposure to shocks and stresses through preventative measures and appropriate coping strategies (USAID, 2016). Absorptive capacity interventions include improved access to savings, informal safety nets and asset protection and disaster risk reduction/management (DRR/DRM).

2.9.3.2 Adaptive capacity

(USAID, 2016) defines this as making proactive and informed choices about alternative livelihood strategies, based on an understanding of changing conditions. Adaptive capacity interventions include both humanitarian and development approaches, and typically focuses on livelihood diversification, human capital, asset accumulation, diversification, climate smart agriculture and access to financial services.

2.9.3.3 Transformative capacity

According to (USAID, 2016) transformative capacity is the governance mechanisms, policies, infrastructure and community networks that constitute the enabling of an environment necessary for systemic change. Transformative capacity include investment in infrastructure, good governance, basic service delivery and policies that result in outcomes such as good health, improved income, food security and nutrition security (UNDP, 2015).

2.10 Zimbabwe

2.10.1 Overview of the agriculture sector in Zimbabwe

Agriculture is the backbone of Zimbabwe's economy and is currently contributing 11-14 % of the GDP (ZimFA, 2017). The agriculture sector provides employment to 70 % of the population and generates 60 % of the raw materials used in the industry. (Nangombe, 2011) asserts that 80% of Zimbabweans depend on rain fed agriculture for their livelihoods, and of these 70% live in the rural areas. Zimbabwe has a total land area of

39.6 million hectares and 10,9% of that is 4.31 million hectares of arable land. According to (Matondi, 2013) the main agriculture commodities that contribute to the Gross Domestic Product (GDP) for Zimbabwe are tobacco (25%), maize (14%), cotton (12.5%), beef and fish (10%), sugar and horticulture (7%) and livestock (24%) (Matondi, 2013). Zimbabwe is divided into natural regions, which are determined by the amount of rainfall, soil quality, vegetation and temperature. Livelihoods that the population engage in are associated with these ecological zones. Areas that traditionally fall in the country's ecological zones IV and V are usually the first to be affected by droughts when they occur.

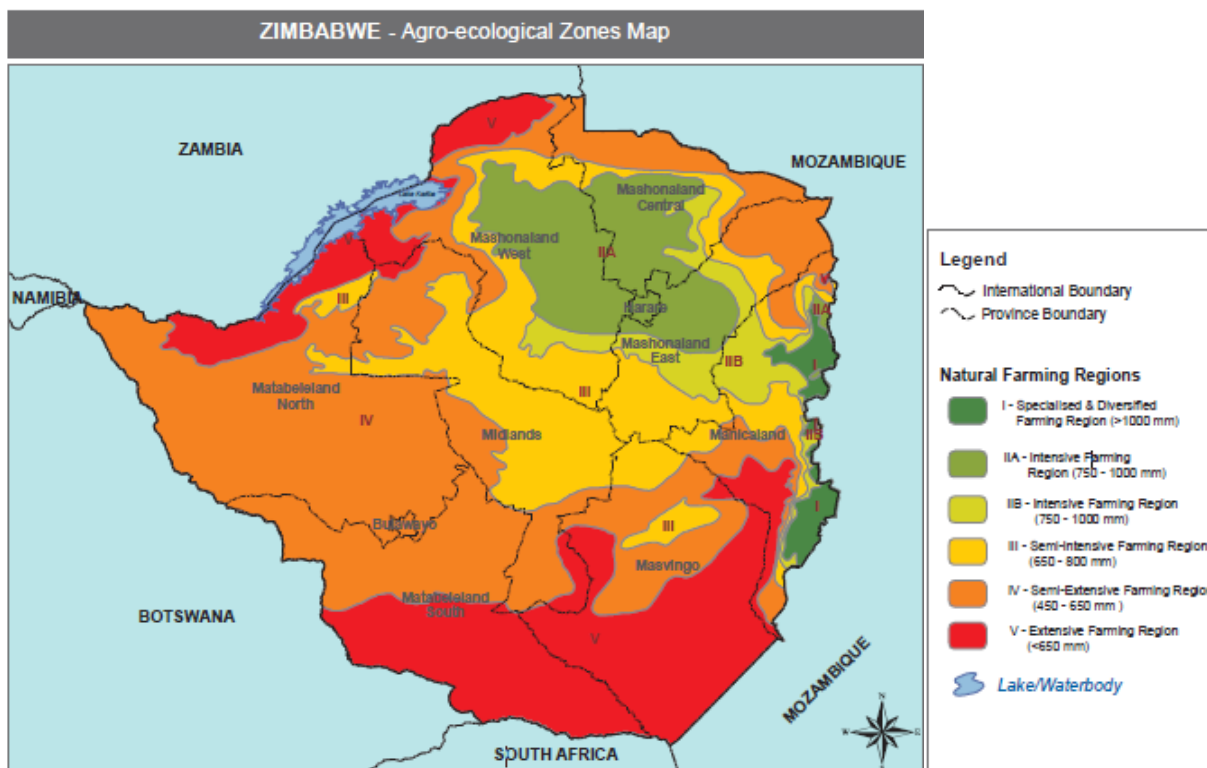


Figure 2.4 Zimbabwe agro-ecological zones map (UNOCHA, 2009)

2.10.2 History of drought in Zimbabwe

The main hazards that often affect Zimbabwe are flooding, drought, food crises and diseases such as HIV/AIDS and cholera (DCP, 2012). Flooding and droughts threaten the well-being and food security of Zimbabweans, especially in rural areas (Manyeruke, et al., 2013). According to (Mushore, et al., 2013) droughts are the most significant threat to Zimbabwe, compared to other natural disasters. Droughts have devastating impacts on the nation's food security (Chikoto & Sadiq, 2013) because the economy is largely

agrarian. The country has, in the past three decades, experienced increased dry spells and droughts due to climate change and global warming (FAO, 2008). Drought in Zimbabwe has greatly affected the livelihoods of people and pushed communities to resort to negative coping mechanisms. In the long term, sectors using surface water like lakes and dams and subsurface water are also affected. For example about 80% of the country's energy is hydrologically generated from the Lake Kariba dam. The energy sector is particularly vulnerable to water shortages and reduced flows (CivilProtection, 2000). Table 2.2 gives an overview of droughts experienced in Zimbabwe from 1820 to 2016. The data in the table also shows that from 1991 up to 2016 droughts were occurring more frequently than before.

Table 2.2 History of droughts in Zimbabwe from 1950 to 2016

Period	Event of drought and disaster
1820-1830	Decade of severe drought in Africa
1844-1849	Southern Africa experiences five consecutive drought years
1861	Well documented drought in Zimbabwe's Matabeleland region
1875-1910	Decrease in rainfall in southern Africa. Severe drought in 1910
1911-1912	Zimbabwe receives less than average rainfall
1915-1916	Drought in Zimbabwe. Average rainfall was a mere 394mm
1921-1930	Severe droughts in southern Africa
1930-1950	Dry spells alternating with wet conditions. 1933 considered the worst drought between 1930 and 1940. The 1946-47 severe drought has stuck in living memory
1967-1973	Dry period across southern Africa
1981-1982	Drought in most of southern Africa
1983	Severe drought for entire African continent
1986-1987	Dry conditions resulting in drought
1991-1992	Severe drought in southern Africa
1992-1993	Although conditions improve, communities still suffer from impacts of 1991-92 drought
1994-1995	Severe drought, in some cases surpassing the impacts of the 1991-1992 drought
1997-1998	Moderate to severe drought in Zimbabwe, this drought turned out to be less severe than had been expected
2001-2002	Drought in most parts of southern
2008-2009	Extreme dry weather conditions were experienced in several provinces including Masvingo, Manicaland, Mashonaland East and Matabeleland South
2013-2014	Moderate drought which affected parts of the country including Masvingo and Matabeleland South
2015-2016	Severe drought induced by the El Nino phenomenon, affected most provinces of the country including Masvingo, Manicaland, Mashonaland East and Matabeleland South, Matabeleland North

(Nangombe, 2011)& (Mutasa, 2011)

2.10.3 The 1991 to 1992 drought in Zimbabwe

(Maphosa, 1994) notes that the most remembered drought in the country in the last three decades is the 1991 -92 agricultural and hydrological drought. The 1992 drought was recorded as the worst drought in living memory that affected the whole country and had significant impacts on the overall performance of the agricultural based economy (CivilProtection, 2000). The drought area was declared a State of Disaster on 6 March 1992 and it is believed to have affected approximately 5.6 million people in the country with 92% of communal farmers' crops failing (Mutasa, 2011). National food security was threatened, as the drought resulted in no harvest throughout the country. During the drought maize production decreased by 75% and the majority of the population was in need of food aid. The Domestic maize intake by the GMB during the year was 13 000 tonnes, which was just enough for 2 days of consumption (Nangombe, 2011), (CivilProtection, 2000), (FAO, 2013). The droughts reduced the national herd by up to 50% and the drought recovery programme cost over US\$40 million (CivilProtection, 2000).

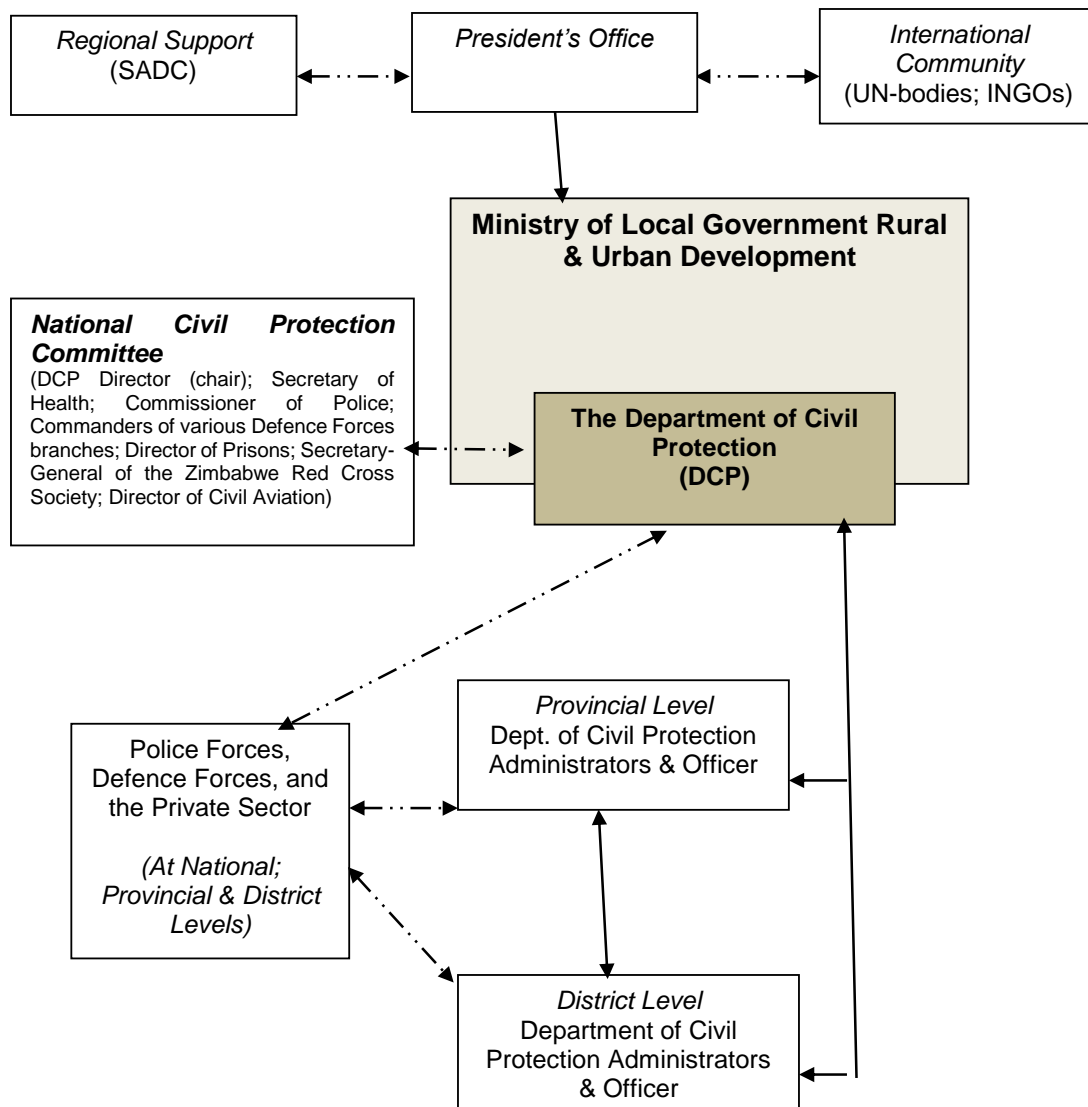
(Maphosa, 1994) notes that during the 1991 to 1992 droughts Zimbabwe learnt some lessons, which have been implemented after this drought, as part of preparedness against any future droughts. These include the need to build the capacities of communities and government institutions to be able to respond better during drought shocks and investing in climate change adaptation knowledge in rural communities. (Maphosa, 1994) goes on to add that another lesson for the country was the need to build the resilience of the communities through constructing community assets such as irrigation schemes, dams and addressing the underlying root causes of food insecurity. To a large extent the nation realised the obvious need to have surplus stock and adequate grain reserves through the national Grain Marketing board. Another lesson that (Maphosa, 1994) noted was the need for land resettlement for small holder farmers, to enable them to produce for their household and food security. It was also noted at the time that there was a need to put in place pricing policies that control any increase in food prices.

2.10.4 El Nino induced drought in Zimbabwe 2015/2016

During the 2015 to 2016 agriculture season Zimbabwe experienced a drought that was linked to an El Nino event. (Bonifacio, 2015) reported that the El Nino started in March 2015 and strengthened into the start of the 2015/16 agriculture season, which began in October 2015. The agriculture season, which runs from October to March, was characterised by a delay in expected rainfall dates, below normal rainfall and dry spells that all led to a severe drought. Grain stocks were reduced by 50% when compared to the previous season. (ZIMVAC, 2016) projected that 4.1 million rural Zimbabweans would be food insecure during the peak hunger period of January to March 2017 and in need of food aid. (WFP, 2017) conducted a vulnerability assessment that showed that all of the 60 rural districts in the country were affected by the drought, especially those in the northern and southern parts of the country.

2.10.5 Emergency preparedness and response coordination structure in Zimbabwe

To mitigate and prepare for hazards and disasters like drought the Government of Zimbabwe created the Department of Civil Protection (DCP), which is in charge of coordinating and managing disasters and reducing hazards in the country (Chikoto & Sadiq, 2013). The Department of Civil Protection was created under the Civil Protection Act of 2001; Part I, Section 2 and falls under the Ministry of Local Government Rural & Urban Development. The Department of Civil Protection in Zimbabwe manages a Disaster Fund, which receives funds from the Central Government and from the treasury, if funds are inadequate in order to fulfil all disaster management initiatives throughout the year. Zimbabwe also has decentralised local Government structures that include the Drought Relief and Civil Protection Committees, the Meteorological Office, the National Early Warning Unit (NEWU), Famine Early Warning systems Network (FEWSNET), World food Programme (WFP), Drought Monitoring Centre (DMC) and the Food and Nutrition Council. These institutions and structures assess and monitor drought hazards and maintain early warning systems.



(Chikoto & Sadiq, 2013)

Figure 2.5 The Structure of Zimbabwe's Emergency Management System

2.10.6 Drought monitoring and early warning systems in Zimbabwe

Drought monitoring and early warning systems in Zimbabwe fall under two ministries, namely the Ministry of Environment, Water and Climate and the Ministry of Agriculture (Nangombe, 2011). These ministries execute their roles through the Meteorological Services Department (MSD) and the Agriculture Research and Extension Services (AGRITEX), respectively. Activities conducted by the two departments include observation and monitoring of hydro-meteorological parameters, weather forecasts and information on other weather related products (Nangombe, 2011). MSD provides early warnings for drought through seasonal forecasts that are disseminated prior to the rainfall season. The drought status monitoring is continuous throughout the agriculture season. The MSD uses the Standardised Precipitation Index (SPI) as a drought indicator and AGRITEX monitors drought through measuring the water requirements for the crops and livestock. Both institutions are members of the Zimbabwean National Early Warning Unit (NEWU), which makes coordination and dissemination of information efficient and also advises the Government on the country's drought status.

2.10.7 Zimbabwe vulnerability assessments

Zimbabwe's drought vulnerability assessments are conducted every year through the Zimbabwean Vulnerability Assessment Committee (ZIMVAC). ZIMVAC produces reports that inform policy and decision making in the country with regard to the vulnerability situation across the country. The information gathered from the ZIMVAC assessments is used for programming purposes, to inform at national level on policy, food security and livelihoods. ZIMVAC is composed of various key partners from the UN, NGOs and the government departments. The DCP also conducts rapid assessments at community and household levels through its provincial and district structures. Data collected in the districts are shared at provincial and national levels.

2.10.8 El Nino drought response -2015/16

In collaboration with other stakeholders, development partners and the donor community, the government of Zimbabwe implements social support programmes that protect vulnerable groups from the impact of drought. During the 2015/16 El Nino drought

development agencies, United Nations agencies, the government of Zimbabwe, regional bodies such as SADC and the donor community such as USAID, ECHO, DFID, the government of Japan and the government of Sweden, among others put together resources to respond to the drought. Activities implemented included food aid, cash transfers, food for work programmes and capacity building of institutions on the DRR and resilience building activities. The government of Zimbabwe commissioned nationwide vulnerability assessments for both rural and urban areas to establish the exact impact of the drought on the population. The government of Zimbabwe also responded by providing assistance through the supply of grain, especially in affected rural areas.

2.11 Conclusion

The chapter outlined the concept of drought and challenges that arise from a lack of a single agreed definition of drought. The chapter also explained the global and regional trends of drought, the El Niño phenomenon and how it affects the African continent. The chapter reviewed the concept of building resilience and outlined the challenges faced by developing countries in preparedness and mitigation of drought. A review of the history of drought in Zimbabwe, lessons learnt from past droughts and drought response structures that are in place for the country was also done. The range of literature consulted showed a critical gap in the lack of single definition of drought which sometimes hinders further research into drought. The literature also showed an increase in drought occurrence on the African continent linked to climate change and the El Niño phenomenon. The importance of drought preparedness plans in developing countries such as Zimbabwe to improve efficiency was emphasized, as well as the importance of building capacities of households and communities to build their resilience against drought.

CHAPTER 3: STUDY AREA AND RESEARCH METHODOLOGY

3.1. Introduction

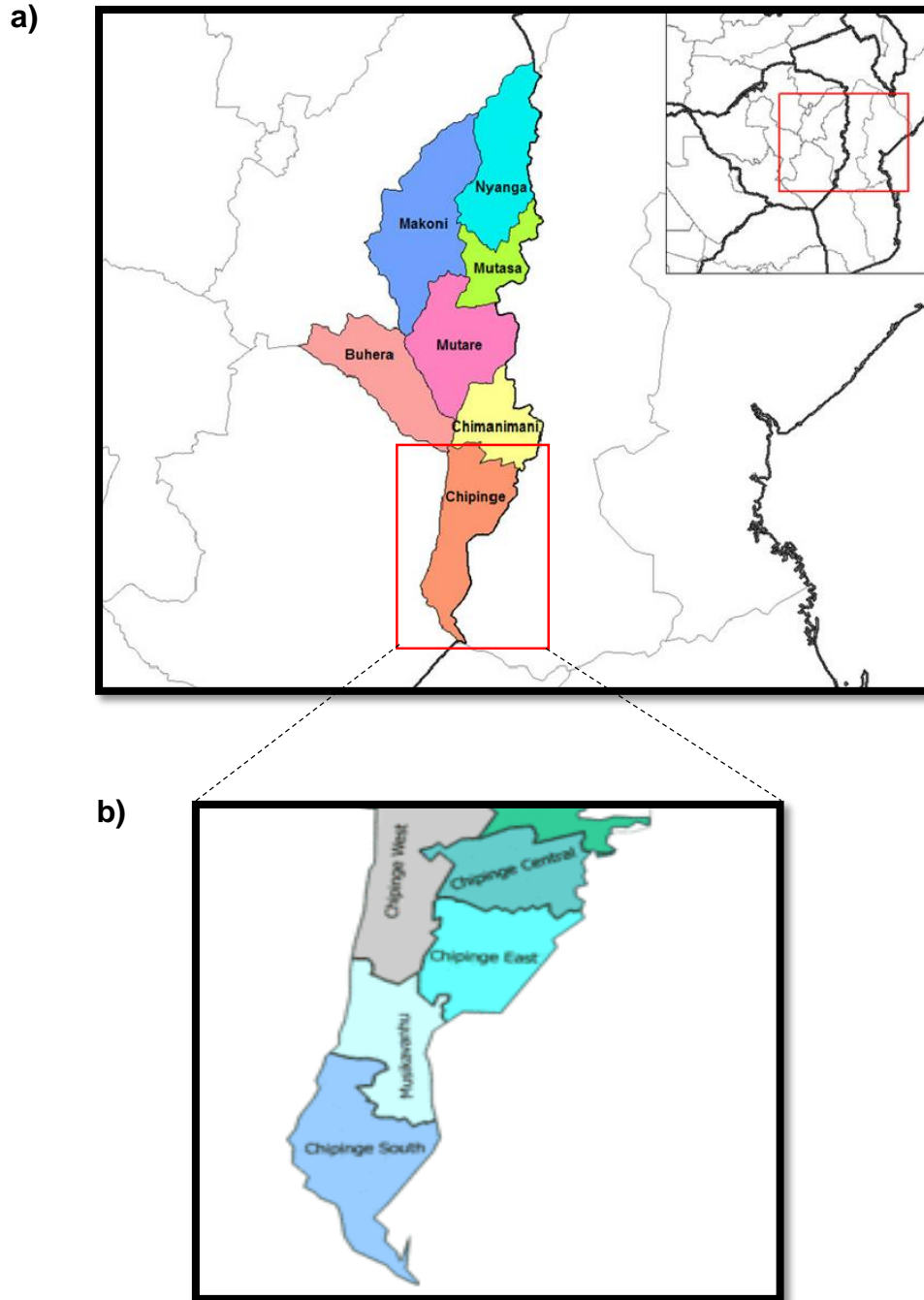
This chapter provides a description of the study area and the research methodology used. The chapter goes on to discuss the sampling strategy, data collection methods and the analytical approach used for the study. The chapter also presents the study limitations and ethical considerations that were made during the study and ends with a conclusion.

3.2. Study area

The study area is the Musikavanhu area, which is found in the Chipinge district of Zimbabwe. The Chipinge district lies in the Manicaland province, which is one of the 10 provinces of Zimbabwe (Figure 3.1).

3.2.1. Location and topography

Musikavanhu is a rural area, found in the southern part of the Chipinge district. The Chipinge district is electorally divided into five constituency areas namely Chipinge Central, Chipinge West, Chipinge East, Chipinge South and Musikavanhu (Figure 3.1a). One of the constituencies, Musikavanhu is the study area which lies south of the Chipinge district. Musikavanhu is also divided into 2 larger areas known as Chibuwe and Chibunji and comprises of 5 wards namely ward 20, 21, 22, 23 and 25 (Figure 3.1b). The area is rural and made up of people from the Shona tribe who speak the Ndaou dialect. Traditionally, Musikavanhu is ruled under chief Musikavanhu who is one of the four paramount chiefs in the Chipinge district.



(UNOCHA, 2009)

Figure 3.1 Map of the study area a) Manicaland province, where the Chipinge district is located and b) the Chipinge district where Musikavanhu area is found.

3.2.2 Demography

The total population of the Musikavanhu area is 55 154 with 25 522 men and 29 632 women with an average household size of 5 people. There are 22 primary schools with

an average of 4 schools per ward. The ratio of school enrolment is almost 1:1 with a slightly higher number of boys attending primary school compared to girls. There are also 7 secondary schools, which operate as day schools and offer ordinary levels to advanced levels of qualifications. There are also 7 rural health centres with at least one in each of the 5 wards, except for one ward (ward 23). All the rural health centres are under the ownership of the rural district council. In ward 20, where the actual survey was conducted, there is a population of 18000 people with an average household size of 4 people. There is one rural health centre and another one still under construction. Basic social services available include one Zimbabwe Republic Police station and three banks, which include two building societies and one agriculture bank. There is one business centre and 8 mobile money agents. The surveyed ward houses are near one of the main business centres, called Chibuwe business centre, hence the presence of some services like banks and mobile money agents. Information on demography was obtained from key informants that included ward councillors and village heads during the survey.

3.2.3 Climate

The study area is situated in a valley and characterised by low and erratic rainfall. It is predominantly dry and experiences high temperatures. The area falls under ecological zone 5 and has an average altitude of less than 600 metres above sea level. The area receives about 300 mm of rainfall or less every year. Some of the households in the area used to own plots in the Musikavanhu and Chibuwe irrigation schemes. Food insecurity is one of the major challenges faced by most of the households who derive their livelihoods from subsistence farming, but most of the times this is complemented by food aid provided by humanitarian agencies.

3.2.4 Agriculture Production

The Agriculture activity is rainfed, although some of the land is under irrigation. Households in the area grow maize, sorghum, sugar beans and millet as their main food crops. However, because the area receives low rainfall, households do not produce enough to meet the annual food security needs and there is no surplus for sale. Households in the Musikavanhu area keep various types of livestock including goats,

cattle, donkeys, pigs and indigenous chickens. Available statistics from the Livestock Production Department (LPD) show that Musikavanhu has a cattle census of 36 543 in 3 of its 5 wards with the largest livestock herd of 15 015 cattle found in ward 21. Ward 20 has the smallest herd of 8 957 cattle. Musikavanhu has a total of 15 dip tanks and, on average, one dip tank caters for about 2 436 cattle. There are also 3 animal health management centres that service all 5 wards. The area experiences a high prevalence of livestock diseases, which affects cattle productivity by reducing their growth rate and reproductive potential. Drought in the area reduces forage availability for livestock. Common disease outbreaks in the area include tick-borne disease, lumpy skin, and foot and mouth disease. Extension services and support for both crops and livestock are provided by the local agriculture extension staff from the Department of Agriculture and Extension (AGRITEX), Livestock Production Department and various non-governmental organisations that are implementing agriculture related interventions.

3.3 Research Design

This section gives an overview of how the research was conducted. It describes the guiding framework for sampling, the data collection strategy, methods and analysis. A case study approach was used for the research. A case study enables the researcher to carry out a detailed analysis of the research topic, in this case the socio-economic impact of the drought, and coping mechanisms employed in the Musikavanhu area. The case study approach is also effective in answering 'how' and 'why' questions. Mixed methods were used for gathering data. (Ivankova & Clark, 2016) define mixed methods as a procedure where collecting, analysing and combining both quantitative and qualitative data within a single study is used. Mixed methods provide both numeric and text data concurrently (Ivankova & Clark, 2016) and allows for contextual interpretations and flexibility in choosing the best strategies to answer the research questions (Mann, 2003). The choice of using the mixed methods was made after realising that in order to fulfil the research objectives both qualitative and quantitative methods would need to be employed. Quantitative methods were used to understand the relationship between certain variables such as coping mechanisms and household characteristics. Qualitative methods were used to understand the in depth experiences of the households and the

community with regard to the drought. The two approaches complement each other and therefore allow for a complete analysis of the results of the study, and in turn, a complete understanding of the research problem. The patterns from the quantitative data collected from the households were further explained by the data that was collected through qualitative data collection methods, that is focus group discussions and key informant interviews.

This study used the convergent parallel mixed method to collect data. This method combines both patterns and personal perspectives of the study population and both the quantitative and qualitative data are collected concurrently. According to (Sukamolson, 2012) the convergent parallel mixed method is one of the most common mixed method designs used by researchers. It is used to collect quantitative and qualitative data at the same time for a single phenomenon (Bryman, 2012). This method was used as it enabled data to be collected and analysed concurrently thereby saving time.

3.4. Primary data

The study used household interviews, focus group discussions and key informant interviews to collect primary data. The data collected comprised of both qualitative and quantitative data. Primary data was collected during the month of November 2017. Data from the household interviews was triangulated with data from the key informants and the focus group discussions to give a comprehensive analysis.

3.4.1 Quantitative data

Quantitative methods were used to collect measurable data at household level through face to face household interviews. A structured household questionnaire was used to collect data and administered at household level to one adult per household, who acted as the respondent. The household was the measurement unit for this study and was defined as people who have been living together for 3 months or more and are cooking from the same pot and eating a meal together as a family. The respondents selected were either the household head or another adult family member who was knowledgeable about

the drought period and had an overall view of the household activities. Data was collected for the following critical components of the research.

Table 3.1 Summary of the data collected from the household questionnaires

Component of research	Type of data collected
Household demographics	Respondent sex, relationship to household head, household size, age distribution, household head age, sex, marital status and education level.
Income sources	Primary and secondary occupation of household head, informal sources of income, formal sources of income and remittances.
Capital and household asset ownership	Household assets owned, ownership of heavy and light farm implements, number and source of farm implements, land size, owned, land rented and total arable land size.
Agriculture production and land ownership	Types of crop grown, yield levels, type of livestock reared, number of livestock owned, and use of livestock owned.
Impact of drought	Length of drought period, water sources before and during the drought, comparison of yield before and during the drought, yield losses, loss of livelihoods, loss of livestock, family separation, food shortages, hunger, soil erosion, loss of grazing land and water resource depletion.
Coping mechanisms employed during the drought	Household coping mechanisms and livelihood based coping mechanisms, dietary reducing strategies, food seeking strategies and food rationing strategies
Structures and support systems available during drought times	Community interventions during drought, institutional interventions, available preparedness and response structures and support systems, recommended interventions and livelihood strategies to achieve positive livelihood outcomes

Data was collected with technical assistance from the Chipinge District Food Security and Nutrition Committee (DFSNC). Key informants were drawn from this committee and some of the enumeration was conducted by three government officers who are part of the committee as well. The officers required minimum training on administering the questionnaires as they were familiar with the subject matter. Interviews were conducted at the homesteads of the sampled households. Questionnaires and data collected were checked and verified by this researcher at the end of each day's work.

3.4.2 Qualitative data

Qualitative data provided an in depth understanding and explanation of the impacts the drought had on the community. It provided insight into the vulnerability context of the community with reference to the drought. Qualitative research methods helped explore perspectives of the drought, coping mechanisms employed and the resulting impacts the drought had on the community. Qualitative data collected helped to explore and hear the real experiences and stories encountered during the drought, through the eyes of the community. The data was collected through one focus group discussion and interviews with 6 key informants.

3.4.3 Focus group discussions

One focus group discussion was conducted with a group of women and men knowledgeable about the community. The group comprised of 13 (7 male, 6 female) people with various roles in the community, which is village health workers, the councilor, the village head and the nutrition ward coordinator. Data collected was on the occurrence of drought in the area over the last five years, effects of the 2015/16 El Nino induced drought, coping mechanisms that were employed by households in the community, interventions and institutions that were present during the drought and future recommendations on better preparedness and response to the drought.

3.4.4 Key informant interviews

Key people who are knowledgeable about the community and have an overview of the key events happening in the community were interviewed as key informants. Six in depth interviews were conducted with members of the district food security and nutrition committee. These represented various government departments and committees. Data collected was on their roles and responsibilities within the study area and during the drought, the effects of the drought, and drought as a challenge in the area and the coping mechanisms they observed being employed during the time.

3.5 Secondary data

Some national surveys and localised assessments were conducted in 2016 in relation to the effects of the drought in the country. The data was collected by non-governmental organisations and government departments. These sources were consulted and used as secondary data to support the findings from the primary data. Some of the national assessments used include the lean season monitoring assessments of 2016, crop and livestock assessments of 2016, and the Zimbabwean Vulnerability Assessment Committee assessments conducted for the 2015/16 agriculture season.

3.6 Sampling Design

A sample should be representative of the general population and large enough for findings to be generalised to the wider population (Cresswell, 2016). The sampling methods employed should not be biased or distorted and provide valid, reliable and accurate data. The sampling methods or framework should also give all units in the population an equal chance of being selected. For the purpose of this study the following sampling design was used.

3.6.1 Sample Size

A multi stage, random sampling technique was used to draw 81 households for interviewing. The Musikavanhu area is comprised of five wards, namely ward 20, 21, 22, 23 and 25. In the first stage simple random sampling was used to select one ward out of the five. Ward 20 was selected out of the five wards. In the second stage simple random sampling was used again to select five out of the ten villages in the ward. From the five villages, systematic random sampling was used to get the households which would be interviewed. Households were proportionally and random sampled from each of the five villages, based on the total number of households in the villages. Sixteen households were then interviewed in each village to get a total of 80 households. However an extra household was interviewed in one village resulting in 81 households being interviewed in total. The method of sampling and sample size of 80 households was used to ensure that sampling errors were reduced and that a large enough sample was maintained.

3.7 Data Analysis

3.7.1 Data cleaning and analysis

Quantitative data was collected using hard copy questionnaires. After data collection, data entry and cleaning was done using the SPSS version 16.0. Data was analysed using both SPSS and Microsoft Excel. Descriptive, frequencies and cross tabulations were run and presented in graphs and tables.

Qualitative data was collected through key informants and focus group discussions. Data was recorded and notes taken during interviews. After data collection the recordings and notes were transcribed, compared and conceptualised into thematic categories. Categories that were identified included perceptions on the history of occurrences of drought in the area, the effects of the drought, coping mechanisms employed, positive and negative coping mechanisms, support structures and institutions and finally recommendations on how to make households more prepared to respond to drought. Analysed data was triangulated and interpreted with the results from the quantitative data analysis.

3.7.2 Analytical approach

Table 3.2 shows the analytical approach applied in the study to address each objective. Addressing the research questions required dealing with complex variables such as coping mechanisms that are defined in terms of other multiple variables. As such, the analytical approach involved reducing the dimensionality of such variables using statistically sound methods, specifically the Principal Component Analysis (PCA). Multivariate regression analysis was also used to investigate the relationship between the variables measuring coping mechanisms and the variables measuring the socio-economic effects of drought.

Table 3.2 Analytical Approach used for the study

Analytical Approach		
Objective	Data needed	Methodology/tools of analysis
To assess the socio-economic consequences of the 2015/16 El Nino induced drought in Musikavanhu area, Chipinge	Primary data on yield, livestock, water source and livelihood loss; and, increase in pests, disease and food shortage incidence due to drought	Descriptive statistics
To identify the drought coping mechanisms employed by households in response to the various consequences of drought	Primary data on the various coping mechanisms employed in response to drought and other socio economic fixed and random factors	Dimension reduction using Principal Component Analysis (PCA), Multivariate regression
To assess the factors affecting the adoption of key coping mechanisms.	Primary data on the various coping mechanisms employed in response to drought and other socio economic fixed and random factors	Multinomial logit regression analysis.
To identify support systems and mechanisms that can be used by households for drought preparedness and response.	Primary data on institutions, agencies and community structures that can be used for support during times of drought.	Descriptive statistics and frequencies

3.7.3 Dimension reduction techniques

PCA reduces multiple correlated variables into fewer uncorrelated linear dimensions by maximizing the variance accounted for in the data. The dimensions created are referred to as Principal Components and geometrically, the first component to be extracted from the data for instance, pc_1 represents the line of best fit to the total number of observations in the variable space. Similarly, more variables then represent the hyperbola of the closest fit.

In this study, coping mechanisms are defined by a vector of 22 variables. For aiding analysis, these 22 variables were reduced into fewer dimensions/principal components (pc), algebraically represented as in the equation below:

$$pc_1 = a_{11}x_{11} + a_{12}x_{12} + \dots + a_{1p}x_{1p} = \sum_{i=1}^p a_{1i}x_{1i} \dots \quad \text{eq. 3.1}$$

Twenty two variables were reduced and grouped into 5 main categories of coping mechanisms which are: (1) migration and relocation responses; (2) food production and consumption pattern changes; (3) cash and asset management responses; (4) livelihood source diversification; and, (5) socio-cultural responses.

3.7.4 Univariate ANOVA

After constructing coping mechanism indices from the 22 coping variables, these indices were used in Univariate ANOVA to assess the relationship between various coping mechanisms employed and the socio-economic consequences of drought. The basis of the Univariate ANOVA was that coping mechanisms employed by a household are the function of the socio-economic effects of drought as well as other household specific factors, as follows:

$$\text{Coping_mechanisms} = f(\text{socioeconomic_effects_of_drought,} \quad \text{eq.3.2} \\ \text{other_fixed / random_household_specific_characteristics})$$

The socio-economic effects of drought were measured by whether households had experienced the following: (1) yield losses; (2) livestock losses; (3) increased pest and disease incidence; (4) change in livelihood opportunities; (5) food shortages; and, (6) depleted water sources. The other household specific characteristics that were considered in the analysis include: (1) landholding (fixed) and (2) number of assets owned (random).

3.7.5 Multinomial logit regression analysis

After identifying the key coping mechanisms from the dimension reduction technique a multinomial logit regression analysis was used to identify the factors affecting the adoption of the various key coping mechanisms identified. The MNL model for coping mechanisms specifies the relationship between the probabilities of choosing any of the coping mechanism options referred to as A_i and the set of given explanatory variables.

The regression coefficients, β_i are expressed in the form of a vector of coefficients, β_j on each of the explanatory variables, X_i . The probabilities of A_i given the X_i , assuming the intercept = 0 can be shown as:

$$prob(A_i = j | X_i) = \frac{e^{\beta_j x_i}}{1 + \sum_{k=1}^j e^{\beta_k x_i}}, j = 0, 2 \dots J, \beta_0 = 0 \quad \text{eq. 3.3}$$

Interpreting the β_j with joint outcomes may be difficult and misleading. As such, the marginal effects derived from SPSS were interpreted. The marginal effects measured the expected change in probability of a particular choice A_i being made with respect to a unit change in the explanatory variable X_i .

3.8 Research Ethics

The study participants are vulnerable households, which practice subsistence farming among other farming related activities, in the Musikavanhu areas. As such, ethical issues might have arisen at different stages of this research were addressed as follows:

- Access to the community was acquired through a letter of notification of the study to key local authorities, starting at the Food and Security Council of Zimbabwe, the Manicaland Provincial Administrator, the Chipinge District Administrator, Chipinge District Food Security and Nutrition Council and the chief village head of ward 20. Respondents and participants of the study were not coerced in any manner to take part in the study. Fully informed and signed consent was sought in every household, key informants and the focus group discussions. Participants were assured of confidentiality of information that was collected and were informed on the use of the data and the objectives of the research.

3.9 Study Limitations

Every study usually comes with limitations, and this study was no different. The most common limitation encountered during the study was that some participants did not quickly remember the drought, and had difficulty in recalling the exact period, as the area

experiences continuous droughts, especially the elderly respondents. However, care and time was taken to explain to respondents what was asked, and most remembered after mentioning the word ‘El Nino’ as it was commonly used during the drought period.

CHAPTER 4: DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter gives the detailed findings and analysis from the data collected for the research through household interviews, focus group discussions and key informant interviews. The findings are presented in both tabular and graphical form and results are summarized based on the objectives of the study. The objectives of the study set to identify the socio economic impact of drought in the study area and the coping mechanisms employed by households during the 2015/16 El Nino induced drought. The chapter is divided into five sections with the first section presenting a description of the household demographics and characteristics. The second section presents household income and assets. The third section is a discussion on the socio economic impacts of the drought and the effect that they had on the household. The fourth section presents household based coping strategies and livelihood based coping strategies that were employed during the drought. The final section discusses the interventions, support structures and mechanisms that were available during the drought and that are in place as part of preparedness and response to shocks and hazards such as drought in the Musikavanhu area.

4.2 Household demographics and characteristics

4.2.1 Household demographics

In most rural areas the household is the basic unit of production and reproduction and where the most important decisions are made (Sherbinin, et al., 2008). According to the sustainable livelihoods framework a household is the unit in which intense social and economic interdependence occur between groups of individuals, which is usually a family (Sherbinin, et al., 2008). Analysis of household characteristics will help to give an understanding of the human capital a household has, which includes formal and informal education, ability to work and good health. Characteristics such as household size show the ability of a household to work and provide labor. Characteristics such as education level and the age of household members are likely to influence the livelihood options pursued, and some decisions that are made during times of drought. Household

demographic dynamics can also influence how vulnerable a household is to a shock and the decisions that are later made to deal with the consequences of the drought. The household demographic section presents findings on characteristics of the households that include gender, age of household head, household size and composition, respondent's characteristics, marital status, and level of education among others (Table 4.1).

Table 4.1 Household characteristics for Musikavanhu area

Characteristic	Description	Frequency	Percentage (%)
Number of respondents	All	81	100
Gender of respondents	Female	62	77
	Male	19	24
Relationship to household head	Self	38	47
	Spouse	32	40
	Daughter	7	9
	In laws and other relations	4	5
Sex of household head	Female	22	27
	Male	59	73
Age of household head	14-16	0	0
	17-24	0	0
	25-40	29	36
	41-65	45	56
	Above 65	7	9
Marital Status	Married	58	72
	Single/never married	3	4
	Divorced/separated	4	5
	Widowed	16	20
Education Level	Never went to school	12	15
	Primary	38	47
	Secondary level	29	36
	Tertiary	1	1
	Diploma/certificate	1	1

4.2.2 Respondent characteristics

Table 4.1 shows that from the 81 households interviewed 77% of the respondents were female whilst 24% were male. This was mainly because the women were the ones

present at the homestead during the time of the interviews, and were more knowledgeable about the information the interviews required. About 47% of the respondents were household heads and 40% were the spouse to the household head. The rest of the respondents were related to the household head in other ways such as in laws, daughters and sons.

4.2.3 Household head characteristics

Table 4.1 shows that although the majority of respondents are females, 73% of the households are headed by males whilst 27% are female. Household head age ranged from 25 years to above 65 years. There were no child headed households and more than (56%) of the household heads fell into the 41 to 65 age group. About 36% of household heads fell into the 25 to 40 age group and only 9% were above 65 years old. The majority of household heads were married (72%) whilst 20% were widowed.

Table 4.1 further shows that 15% of the household heads never went to school and of those that went only 47% went up to primary level and 36% went up to secondary level. According to (ZimStat, 2013) proportions of people across all age groups who left school before completion of tertiary levels is higher in rural areas than in urban areas. About 14.2% of tertiary students are from urban areas while only 3.2 % are from rural areas. This resonates with the findings of this study where the highest level of education attained by the household head is only secondary education. The proportion of those who did not go to school and the low levels of education imply that these household heads who are responsible for decision making processes, might not be in a position to read or write. This limits their access and understanding of early warning information or any current important information with regard to drought and other natural related disasters. This means any stakeholders or organizations that might want to bring awareness or information will need to use other methods of information dissemination such as voice addresses, community volunteers, radio messages or podcasts for all to get the necessary information.

4.2.4 Household size

Household size ranged between 2 and 13 with an average household size being 6. This average is higher than the national average household size of 5. An average household size of 6 means higher access to human capital in the household for farming related labour in some households. This also means that when designing relief programs for drought, considerations need to be made in the study area with regards to interventions like food aid where ration sizes would have to be higher than in other affected areas in the country. Therefore, it has been assumed that, in this area, the population at risk is higher than what is reflected by the national average numbers.

4.3 Household income and assets

Data collected targeted very poor to poor households, who are most vulnerable to shocks such as drought. Some of the household's characteristics, that help show the level of vulnerability of a household, are household assets or entitlements. According to the sustainable livelihoods framework there are five core assets namely physical, economic, human, natural, social and financial assets upon which livelihoods are built. Increased access or ownership of these assets improve the sustainability of livelihoods of poor people. It also improves the resilience of poor households against shocks and hazards that affect livelihoods.

4.3.1 Household primary and secondary occupation

Findings from the research show that the primary occupation of surveyed households is farming related with 46% primary occupation being farmers and 25% being farm laborers (Table 4.2). In total this makes up 71% of respondents having their primary occupation being farming related activities. The remaining 29% primary occupation is artisan (12%), informal traders (6%), brick molders (4%) and 5% who have no primary occupation. Twenty nine percent of secondary occupation of households is farming related (farmers and farm laborers) whilst 58% have no secondary occupation. Four percent of the households reported being artisans as a secondary occupation whilst 10% reported informal trading as a secondary occupation.

Table 4.2 Types of occupation in terms of primary and secondary in percentile and frequency during the interviews.

Description	Primary occupation		Secondary occupation	
	Frequency	Percentage	Frequency	Percentage
Farmer	37	46	16	20
Farm labourer	20	25	7	9
Artisan	10	12	3	4
Informal trader	5	6	8	10
Brick moulding	3	4	0	0
Civil servants	2	3	0	0
None	4	5	47	58
Total	81	100	81	100

4.3.2 Household source of income

The main source of income for the households in Musikavanhu is informal work, as reported by 84% of the households (Figure 4.1). These households are mostly engaged in informal farming related activities. The second main source of income is from gardening activities for 43% of the households. For some households gardens are being cultivated under the two local irrigation schemes, that is the Chibuwe and Musikavanhu irrigation schemes. The third major source of income is through informal trading such as small tuck shops, selling crafts e.g baskets, bags and hats made from tree bark and local grass known as 'murara' in the local language. Crop sales and livestock sales contribute to the income of 30% and 11% of households respectively. These proportions are low and they indicate that the households in the area are mostly subsistence farmers and mostly farm for household consumption and food security. Government grants, income remittances, formal work and formal businesses are also main sources of income for 31%, 21%, 5% and 6% of households respectively. Only 1% of the households are getting their income from pension funds, and this is also because household heads that are 65 years and above only accounted for 9% of the households. Income that the households get is

used to cover costs of basic essential needs that is food (cooking oil, sugar and salt) non-food items such as soap and clothes, paying school fees, covering medical expenses in the form of user fees at local clinics and other costs such as transport.

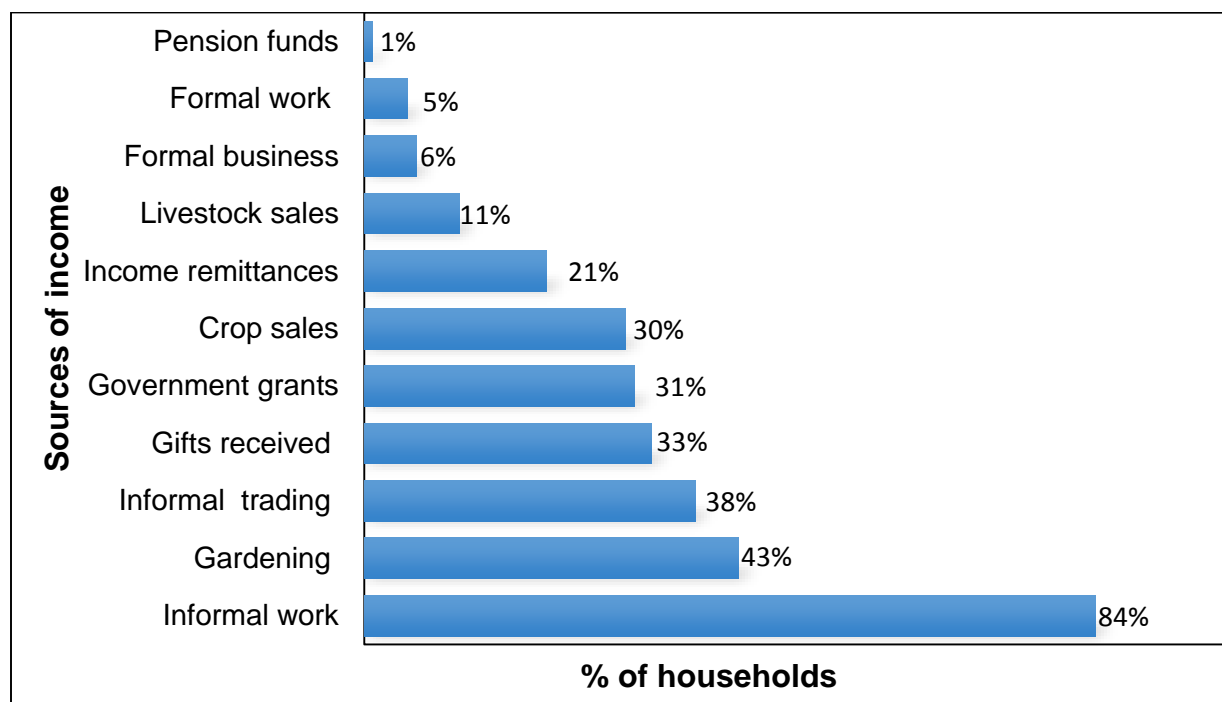


Figure 4.1 Household income sources

4.3.4 Domestic asset ownership

Households were asked whether they owned one or more of the following domestic assets: electricity, solar panels, cellphones, bicycles and radios among others (Figure 4.2). Ownership of assets is linked to the wealth ranking of households and whether a household is better off than others. The more assets a household has the better off they are perceived to be. If a household has more assets they can cushion themselves from shocks and hazards and use these assets to recover from shocks such as drought. In most cases households sell off some assets to cushion themselves or to raise income recovery. Ownership of assets such as radios, televisions and cellphones also increase access to information and early warning messages where they apply. Results show that most households (84%) own a cellphone for communication purposes. This shows that there is a high number of households that are able to receive information through their cellphones. Information can include early warning messages or weather updates that can be sent via short message services. This can also include sensitization messages on

extension services for crop and livestock farming, events such as food distributions and livestock destocking programmes during drought periods.

The second highest asset owned is solar panels or solar systems by 40.7% of the households. These are being used for lighting, powering radios and charging cellphones. Lighting is also important for children to read or do their homework at night after school and doing household chores. 38% of households own bicycles and 32% own radios. Bicycles are used for transport and radios for entertainment. Radios can be a source of weather and agriculture related information but ownership in the area is low. Only 3% of the households own a car and no households have electricity and telephones (landline). Access to electricity for subsistence farmers and rural households enable them to improve efficiencies in land preparation, irrigation and harvesting. Households can also use efficient ways of storing, cooling and preserving food and promoting small home based businesses for income generation.

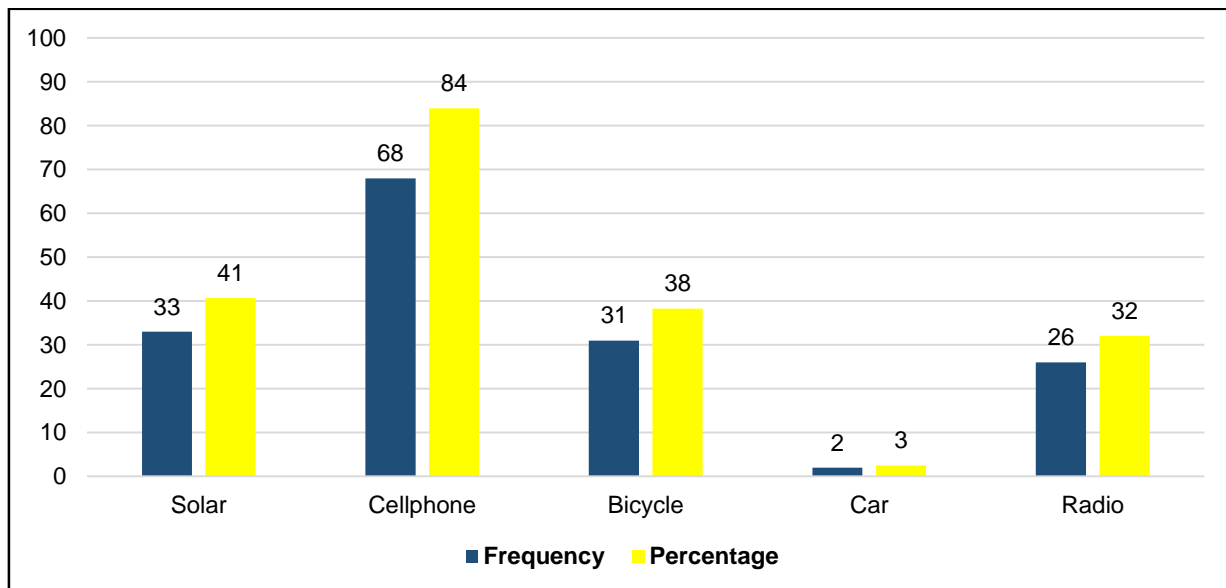


Figure 4.2 Domestic assets ownership

4.3.5 Ownership of farming implements

The results in Table 4.3 show that ownership of farming implements ranged from small implements to heavy implements. Households mostly own small implements like hoes(90%) for land preparation and weeding, slashers (84%) for land clearing, axes (44%) for land clearing and cutting down firewood and baskets (16%) for storage of farm

produce and other household goods. Only 11% of the households own ox drawn ploughs and less than 5% own spraying machines and trailers. Spraying machines reduce time and labor needed to apply herbicides or pesticides in the field. Trailers can be used to ferry produce from the field to storage or from storage to the market. With regards to the sources of implements a high proportion of households bought their implements with 79% having bought hoes, 77% slashers, 33% axes, 12% baskets and 10% ox drawn ploughs. A lower proportion of households inherited or acquired the implements as gifts. These are hoes (11%), axes (11%) and slashers (7%) respectively. Attention was been given to the top four pieces of equipment that was bought and the top three farming equipment that were gifted or inherited. Ownership of large farm equipment and technologically advanced equipment is known to increase farming efficiency, maximum use of land and the productivity of a farmer. The lack of a high number of households with large farming equipment showed that the households in the research area concentrate on small scale farming and do not have ownership of labour saving equipment to increase efficiency and productivity of their agricultural activities.

Table 4.3 Farming implements for categories of ownership, bought and gift/inheritance

Farming implement	Frequency (Ownership)	Ownership (%)	Bought implement (%)	Gift /inheritance (%)
Hoes	73	90	79	11
Slashers	68	84	77	7
Axes	36	44	33	11
Files	2	3	1	0
Baskets	13	16	12	3
Weeders	4	5	3	1
Ox drawn plough	11	14	10	1
Spraying machine	2	3	3	0
Trailers	4	5	3	3

4.3.6 Livestock Ownership

Livestock is a form of movable wealth, which is used for household activities that range from farming, consumption, income generation, cultural ceremonies such as bride price and the appeasing of spirits. According to (Sherbinin, et al., 2008) livestock are important physical assets for households, secondary after land, often one will see that poor households are characterized by small livestock and poultry numbers, which are easy to

acquire and maintain. This resonates with results on this study, which shows that a high proportion of households owned small livestock as compared to large livestock. Results show that only 11% of households own cattle, with the number of cattle owned ranging from 1 to 3 beasts only (Table 4.4). Cattle are used for both consumption and for sale by 5% of the households. About 33% of the households own goats with numbers ranging from 1 to 7 goats. Goats are used for consumption only by 14% of the households and for both sale and consumption by 11% of households. The highest number of households (53%) owns poultry in the form of chickens and ducks. About 35% of these households keep their poultry for consumption, whilst 16% rear poultry for both sale and consumption. The results also show that 14% of the households own pigs with the number ranging from 1 to 7. The use of the pigs for both consumption and sale is practiced by 7% of the households is (Table 4.4).

Table 4.4 Livestock ownership number for domestic consumption and sale

Livestock type	Ownership	Livestock owned(range)	Average livestock	Consumption	Sale	Both
Cattle	11%	1 to 3	0.15	5%	5%	3%
Goats	33%	1 to 7	0.65	14%	7%	11%
Sheep	1%	0 to 1	0.01	1%	0%	0%
Pigs	14%	1 to 7	0.36	4%	3%	7%
Rabbits	1%	0 to 1	0.01	1%	0%	0%
Poultry	53%	1 to 16	2.06	35%	3%	16%

4.3.7: Crops grown by households

Figure 4.3 shows the main crops that are grown by the households in the area. The top three crops that are grown by households in the area are sugar beans (59%), sorghum (53%) and maize (32%). Because the area is in a very dry region households grow small grains like sorghum compared to maize, which the majority of the country grows. The other crops grown are groundnuts and cowpeas. Sugar beans are mainly grown by households in the irrigation scheme for both consumption and sale and therefore one would see this crop being grown by a higher proportion of households than other cereals.

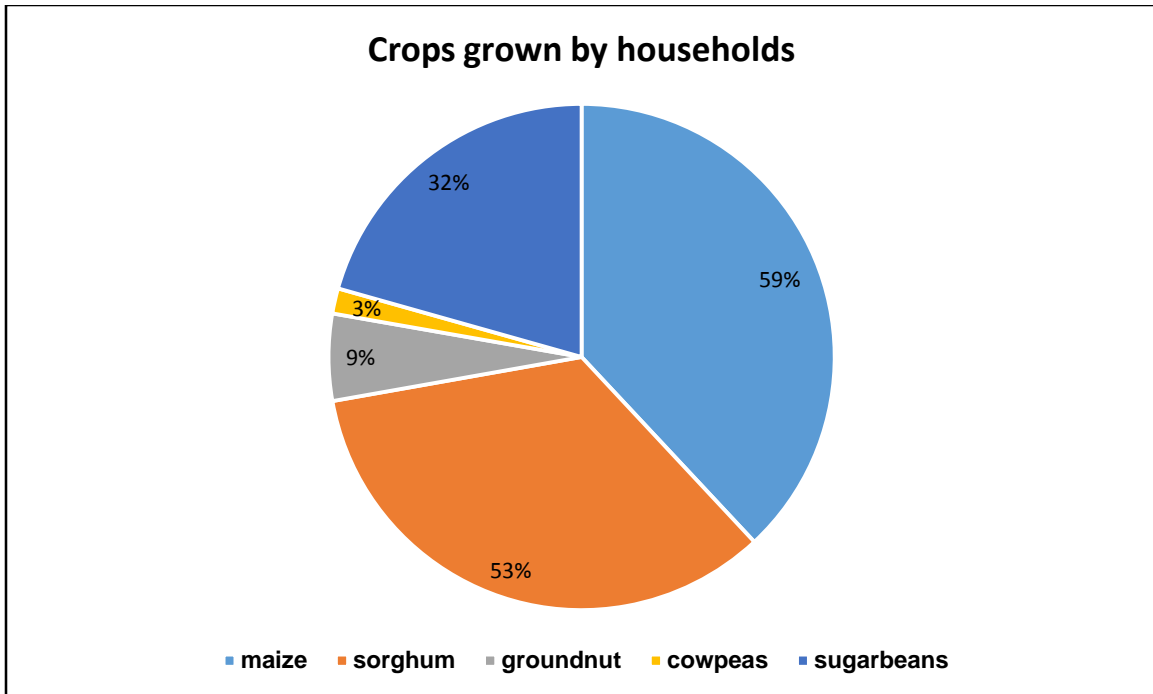


Figure 4.3 Main crops grown by households in the study area

4.4 Socio-economic impacts of the drought

This section presents the socio economic impacts that the drought had on households. It also deals with the resultant effects of some of the impacts that were experienced during the drought. Each impact and its subsequent effects will be discussed separately.

4.4.1: Comparison of crop yield of drought year to 2016/17 season

Figure 4.4 shows the household yields that they acquired during the 2016/17 agricultural season as compared to the yields acquired during the 2015/16 drought year. For all the crops the households described their yields during the drought as poor, very poor or a complete write off when compared to the year that came after the drought. For maize, during the drought year, 38% of the households achieved poor yields, 15% very poor yields and 4% complete write offs when compared to the 2016/17 season. For sorghum 37% of households described their yield as poor, 12% very poor yield and 3% complete write offs during the drought year as compared to the 2016/17 season. For sugar beans 21% perceived their yields from the drought year as poor, 9% very poor and 1% complete write offs when compared to the 2016/17 season. For groundnuts 5% described their yield as poor, 3% as very poor and 1% complete write offs when compared to the 2016/17

season. For cowpeas only 1% described their yields as poor and very poor when compared to the 2016/17 agricultural season. Maize had the highest yield as it was grown by most households.

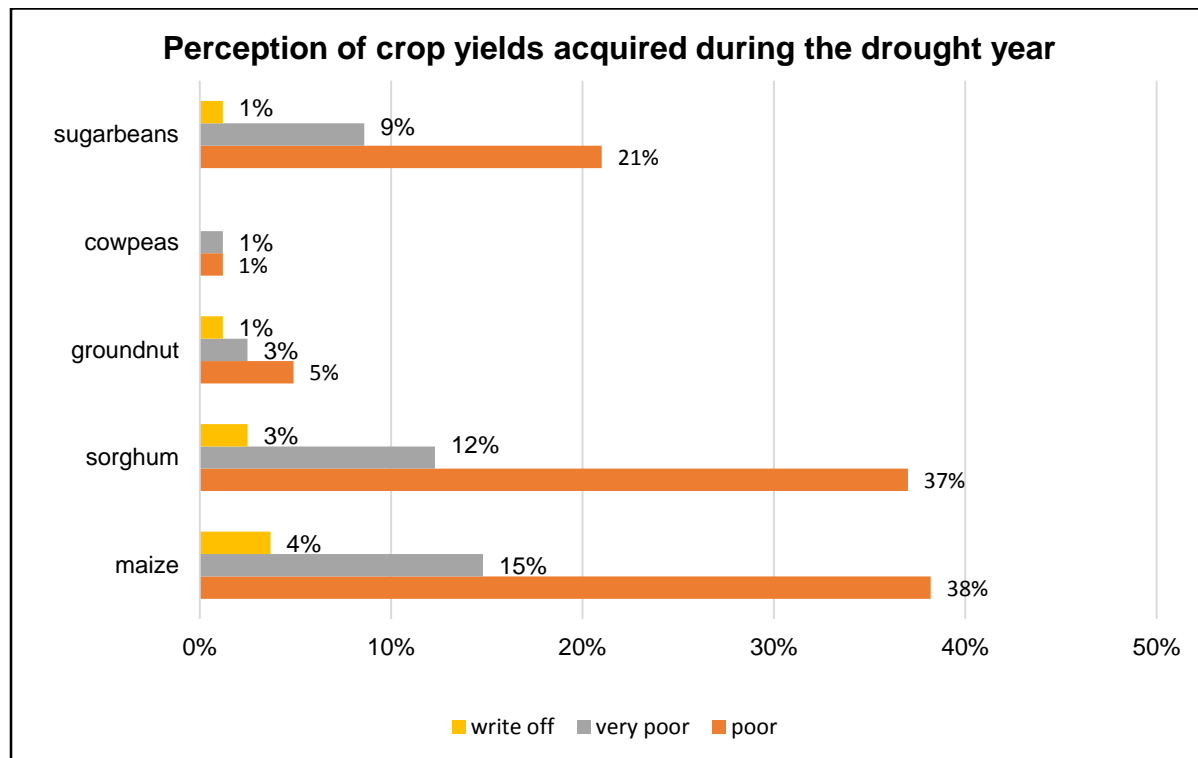


Figure 4.4 Perception of yields acquired during the drought year in comparison with the 2016/17 season

4.5.2 Sources of water in normal and drought years

Access to water is an everyday challenge for most rural households. During times of drought availability and access to water becomes an even bigger challenge as water sources such as rivers usually dry up and the water table goes down due to the lack of catchment rainfall. Households resort to unsafe water sources with compromised water quality and usually travel longer distances to look for water. During drought periods livestock have limited water as well and either travel long distances to the nearest drinking hole or die of thirst. Figure 4.4 shows a comparison of the sources of water that were used during the drought year versus the normal years. Sources investigated by the study were for drinking purposes, domestic purposes and for livestock. Results show that the sources of water for various purposes did not significantly change between the normal and the drought years. The main sources of water for both drinking and domestic

purposes were mainly boreholes and household open wells. Even though the sources of water did not significantly change, some households did report that it took them longer for water to come out of boreholes as the water table had gone down. Livestock water sources did not change at all between the normal and the drought years. The sources of water did not show significant changes or remained the same as there were no other sources that could be used or substituted besides the ones that existed.

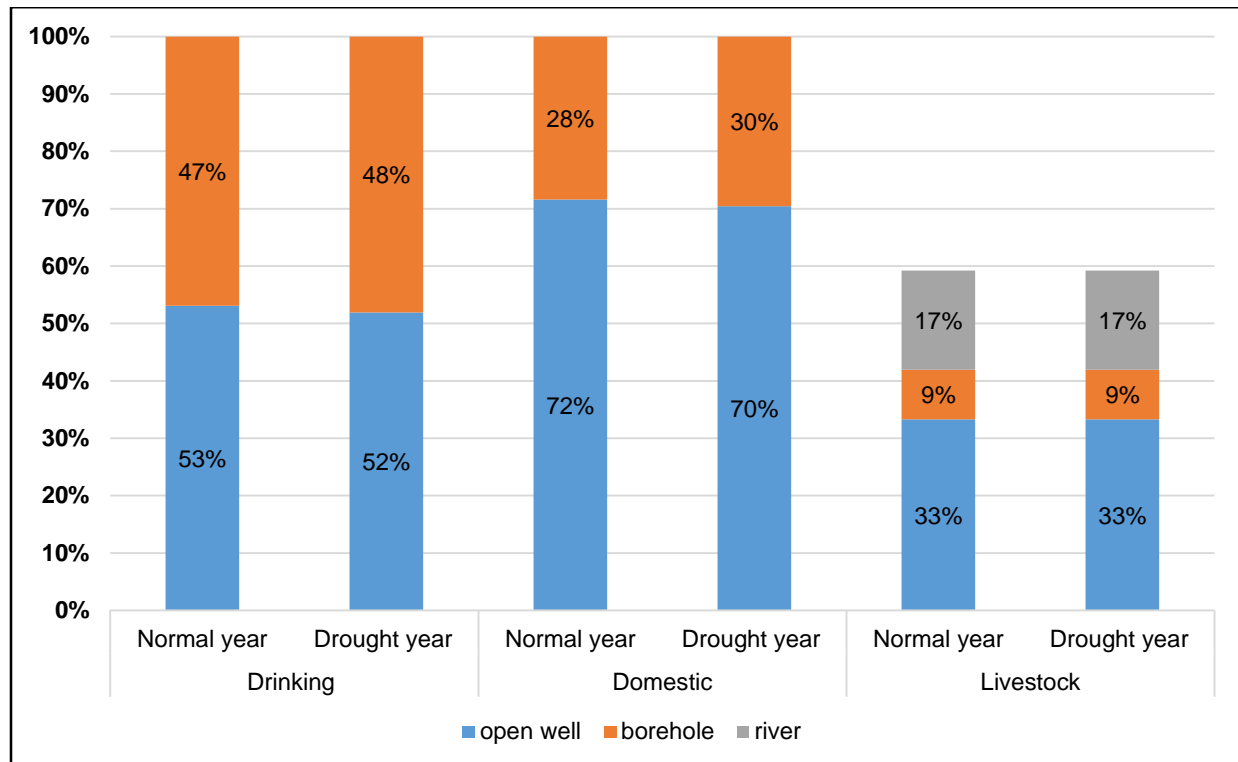


Figure 4.5: Sources of water in normal and drought years

4.5.3 Drought as a challenge in the area

In the past 5 years, ward 20 of the Musikavanhu area experienced drought for at least four out of the 5 years. From 2012 to 2017 the community experienced low rainfall and mild droughts, but described the 2015/16 drought as the worst drought year of all the five seasons. This was supported by one of the key informants who had this to say:

“Drought is a challenge in this area, rainfall is erratic and most households rely on rain fed agriculture, except for a few households who own plots in the irrigation schemes.”

According to another key informant, the drought was so severe that livestock perished and no grain was harvested. Some key informant respondents also noted that the drought affected all types of households because it was severe. However there were some categories of people and households who were affected more than others. These were women and children, the elderly, disabled, child headed households and female headed households. These households usually exhibit vulnerability characteristics to shocks and hazards as they lack labour, capital, physical assets and financial assets among others (DFID, 2000). Discussions during data collection revealed that, in the current season, the community has already started noticing signs of drought and are already anticipating that the area might experience a mild drought during the 2017/18 season, the signs that were witnessed was high temperatures and below to normal rainfall. As a result of the drought crops failed and people had little to no yields. They also had no income that they sometimes get from selling their harvest in good years. Most of the work that gives them an income is farm related work, which was limited during the drought year.

4.6. Impact of the drought

4.6.1 Yield loss

Figure 4.6 shows that 69% of the households experienced yield loss as one of the impacts of the drought. Since the area is dry most households grow small grains, which are known to be drought resistant, but even these failed and dried up in the fields during the drought year. As a result of yield loss 58% of the households experienced food insecurity, as they only got little to no harvests, had no surplus to sell and had grain that only lasted a few months. About 10% of the households also mentioned various other effects of yield loss, which included loss of employment in the fields (2.5%), selling assets to buy food (1.2%), conflict in the family (1.2%) and reduced meals (6%).The remaining 31% did not experience effects from loss of yield.

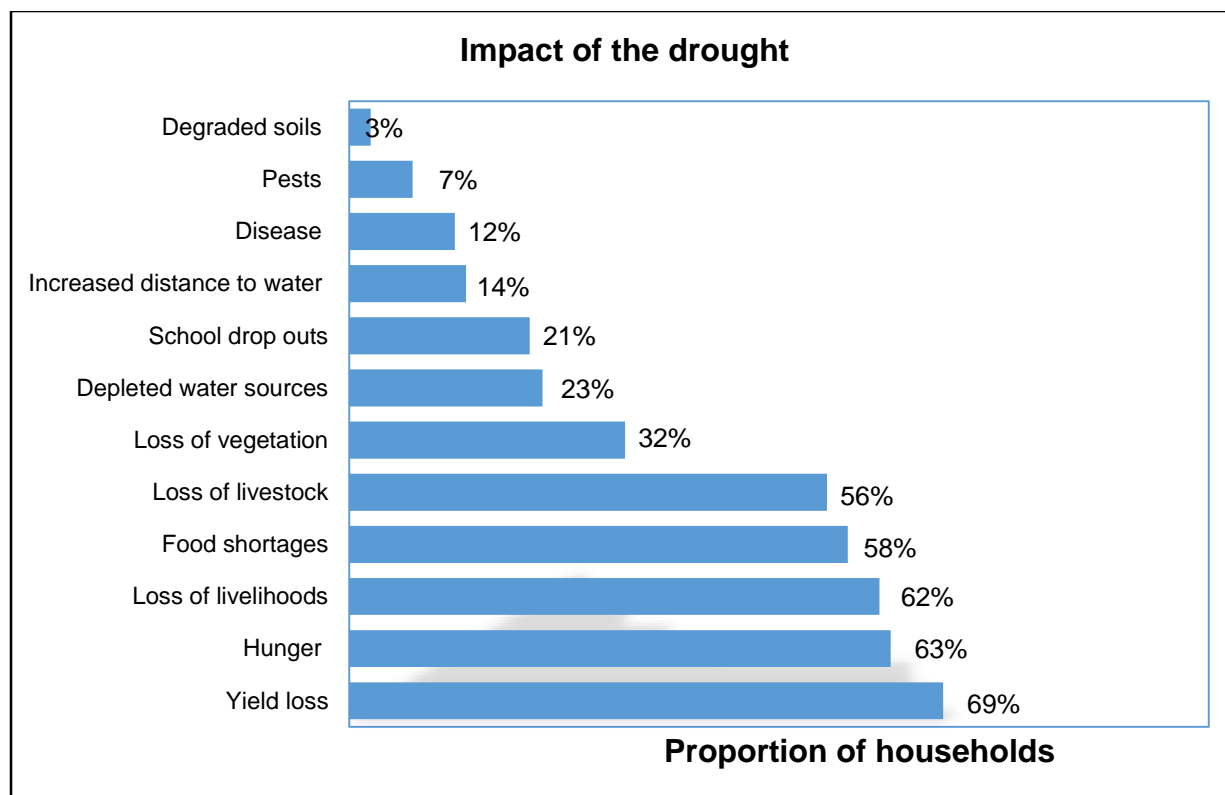


Figure 4.6 Impact of drought

4.6.2 Hunger

Figure 4.6 also shows that 63% of the households reported that they experienced hunger in the home during the drought. This was due to food shortages because of low harvests and yields. Figure 4.6 further shows that 58% of the households reported that they experienced food shortages because they had not harvested enough grain to cater for their household needs and to last them until the next season. According to several key informants food was available in the small tuck-shops and the nearest business center called the Chibuwe business Centre, however households reported that food became expensive, as demand was high and supply was low. Prices that went up were mostly the maize grain, sorghum grain and maize meal prices, which is the staple food. People had no disposable income and it was difficult for the poor households to buy food. Besides, because the basic food items were not affordable, people had to travel longer distances to buy food. This included either walking or using money for local transport to go and to buy food, putting more strain on the little available income.

4.6.3: Loss of livelihoods

A livelihood comprises of the capabilities, assets and activities required for a means of living (DFID 2000). It is a means of securing the necessities of life. The main source of livelihoods for the households in the area is farming related activities and work. Of the interviewed households 62% reported the loss of livelihoods as one of the impacts of drought, especially from farming activities. Loss of livelihoods resulted in 48% of the households using up their savings to buy food. Households mentioned that they had saved up money to fulfill their family visions and household development plans but ended up using the money to buy food during the drought year. Savings mentioned were mainly for the expansion of existing houses, roofing and building of new houses. One of the respondents had this to say:

“I could not improve my life that year and proceed with my building plans. I transferred all my money to buying food for my family.”

Another respondent had this to say -*“I wanted to roof my house, but had to divert my funds to buy food during the drought.”*

Fifteen percent of the households mentioned various other effects that the loss of livelihoods had on their lives. These included children not attending school (2.5%), selling livestock to get money (3.7%), selling off assets, such as radios, to buy food (2.5%), health related effects, such as stress and high blood pressure (2.5%) and no money to improve future livelihoods (2.5%). The remaining 37% did not experience any effects from the loss of livelihoods.

4.6.4 Loss of livestock

Another impact of the drought was the loss of livestock. Figure 4.6 shows that 56% of the households reported that they lost their livestock due to the drought. Grazing died and watering points dried up and cattle and goats had no reliable source of water. This resulted in livestock losing weight and most households losing large livestock, especially cattle, and small livestock such as goats. According to one key informant more than one thousand (1000) cattle died as a result of the drought. About 56.8% of the households indicated that loss of their livestock, due to death during the drought, left them with no livestock to sell for an income, no source of livelihood, no productive assets in the form

of livestock and no form of wealth, especially in households where cattle and goats were lost. Loss of livestock also reduced the standard of living and social standing of some households. The local veterinary department sensitized households on destocking of their livestock in the community, but households heeded the call too late. Households were reluctant to let go of their livestock, and could not fathom the thought of disposing of their most important assets and form of household wealth. It is usually not easy for poor households to acquire large livestock, such as cattle, because of their value, so they are also reluctant to let them go without realizing any income from them. Households had hoped that the drought will not affect their livestock that much.

According to one key informant –

“When households heeded the call it was already too late, as some livestock had already died and some no longer had the weight that would fetch the normal prices.” Besides domestic animals, we also noticed the deaths of wild animals as well, mostly grazers because there was no grazing and water.

4.6.5 School drop outs

School drop outs were both an impact and a coping strategy during the drought. Twenty one percent of the households reported that one of the impacts of the drought was school drop outs (Figure 4.6). Parents could not afford to pay school fees and there was not enough food for meals at home, so some children dropped out of school. School children came to school hungry and a lot of dropouts were especially experienced in the infant classes.

This was supported by one of the key informants from the education sector who had this to say:

“The El Nino induced drought was a heavy blow to the welfare of the school children. School going children were heavily affected, since they came to school on an empty stomach and little learning took place during that time.”

4.6.6 Depleted water sources and increased distance to water sources

Another impact of the drought was depleted water sources (23%) and increased distances to water sources (14%) as shown in Figure 4.6. Depleted water sources

resulted in some households having to walk increased distances to the nearest water source, in this case 12% of the households. Depletion of water sources also caused water shortages that resulted in the deaths of livestock. One of the focus group participants who is also part of the political leadership in the area had this to say:

We lost livestock during the drought because they had no other source of water besides the Save river. The Nyauswa and Nyandwara rivers now need distillation, so that when it rains these rivers can actually store more water and households can use this as an extra source of water. If these sources are rehabilitated the water can be used for gardening projects, laundry, livestock watering and other domestic activities. Households will not have to rely only on the Save river as the main source of water.”

4.6.7 Diseases and pests

Figure 4.6 shows that another impact experienced during the drought was diseases and pests that impacted 12% and 7% of the households respectively. Livestock, such as cattle, were affected by diseases called D22, and some children under 5 were affected by malnutrition related diseases. Because of the high temperatures crops such as sorghum were attacked by pests in the field, which in turn reduced yield.

4.6.8 Loss of vegetation and soil degradation

Results in Figure 4.6 show that 32% of the households experienced loss of vegetation and grazing land. Trees wilted and grass dried up, depleting grazing land for animals. According to 28.4% of the households, the lack of grazing contributed to the death of livestock. A low proportion of the households who experienced land degradation attributed this to negative coping mechanisms that people in the area were engaging in, such as digging small shallow wells in the dry riverbeds known as “mifuku’ in the local language. One of the focus group participants supported this by saying:

“People were digging shallow wells in the Save river, and as the leadership we tried to stop them, but they would respond by saying they had no other option to get water to survive.”

4.6.9 Migration and Relocation

Another impact of drought that households experienced was family separation and relocation. According to some key informants and the focus group discussion participants stress and suffering from the effects of the drought increased family conflicts during the drought year, and in some instances led to divorces and separation. Some household heads, mostly males, relocated to the Save river bank to farm there, as that is where water was available for crops. Some moved with their livestock and had to temporarily live there during harvest time. Families were temporarily separated during that period.

Table 4.5 Family separation and relocation in the Musikavanhu study area

Did anyone in your family relocate?	Frequency	Percentage
Yes	14	17.3
No	67	82.7
Total	81	100

Table 4.5 shows that out of the interviewed households 17.3% had one or more family members who relocated as a result of the drought. Of these 11.1% had one member who relocated in search of income generating opportunities, and 4.9% had between 2 and 5 household members relocating because of the drought. Of those households that experienced relocation 6.2% reported that their male spouses relocated and 4.9% reported that their male children relocated. Most of the households reported that the effect of this relocation was loneliness and increased burdens to fend for the family without the support of the spouse or other family members. One key informant had this to say:

“Some women were left by their husbands who went looking for greener pastures during the hard times of the drought. The wives were left fending for the kids and most of these families had children that later dropped out of school.”

4.7 Significance of the effects of drought

Yield loss and loss of livelihood opportunities

In order to further assess the socio-economic effects of drought and test the hypothesis of whether the drought contributed significantly to any negative effects, frequencies were generated and error bars were used at the 95% confidence level to determine the significance level. This was done for the following variables:

- Yield loss
- Loss of livelihood opportunities
- Increased incidence of pests and diseases
- Depleting water sources
- Loss of livestock and food shortages

As shown in Figure 4.7a, the number of households that experienced yield loss and loss of livelihood opportunities was significantly higher than the number of households that did not. The results are significant at the $p=0.05$ level. Hence yield loss and loss in livelihood opportunities are evident consequences of the drought.

Assessing increased incidence of pests and diseases and depleting water sources

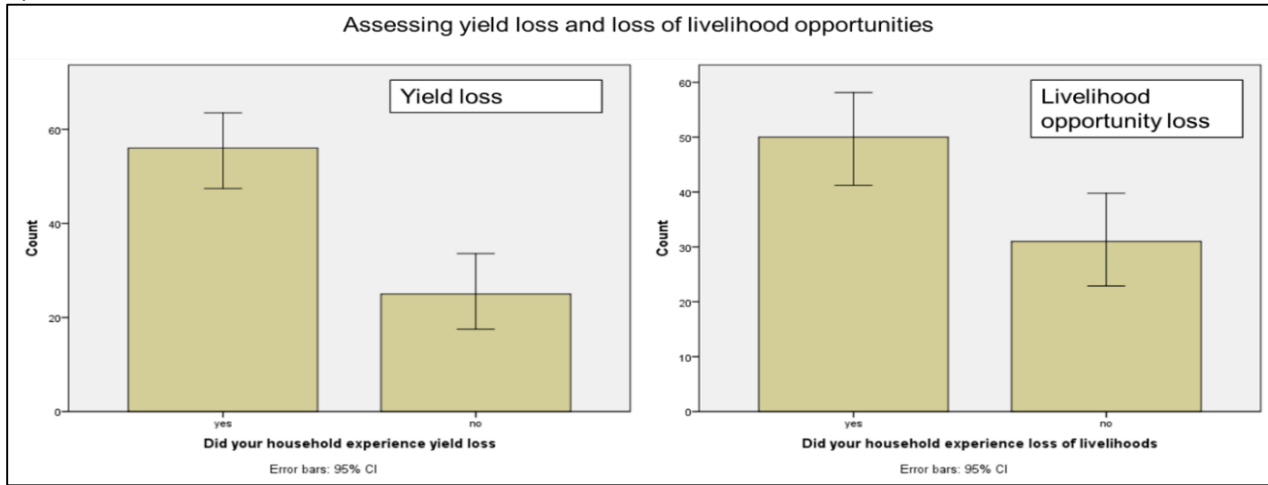
As shown in Figure 4.7b, the drought did not significantly result in increased incidences of pests and diseases as well as depleting water sources, as the number of households that did not experience these effects was significantly higher than the number of households that did at the $p=0.05$ significance level.

Assessing loss of livestock and food shortages

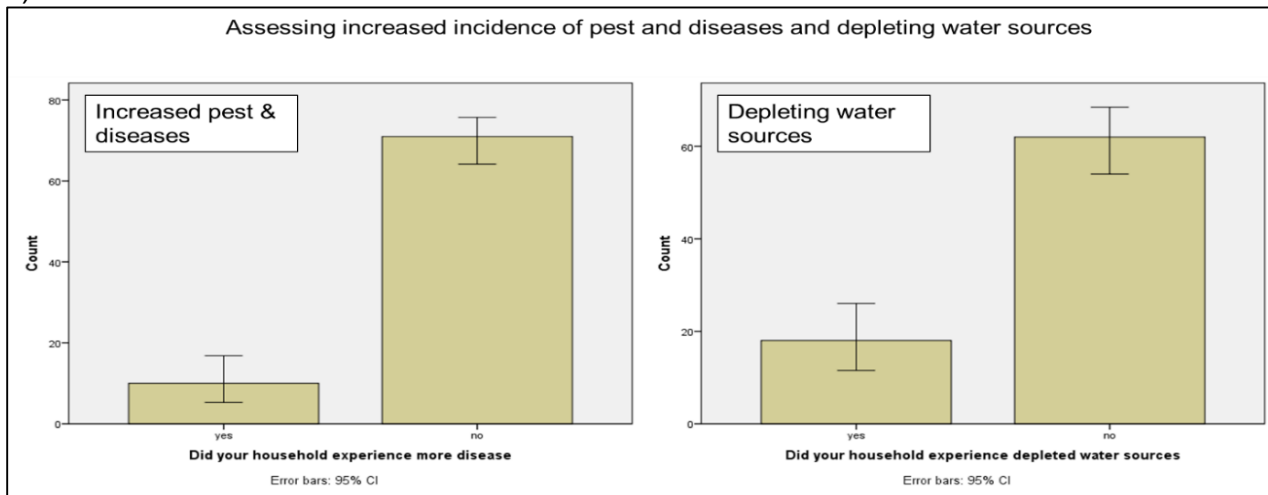
Lastly, Figure 4.7c shows that the number of people who experienced livestock loss as well as food shortages was higher, but not significantly higher than the number of those who did not. It is also important to note that most of the people who did not experience loss of livestock are also the poorest of households that did not have livestock at all even before the drought.

Although the number of households that experienced livestock loss or food shortages, due to the drought, was not significantly higher than the number of households that did not, the 2015/16 El Nino induced drought significantly influenced crop yield loss and loss of livelihood opportunities and opportunities to make a living. However, the drought did not result in higher pests and disease incidences and depletion of water sources.

a)



b)



c)

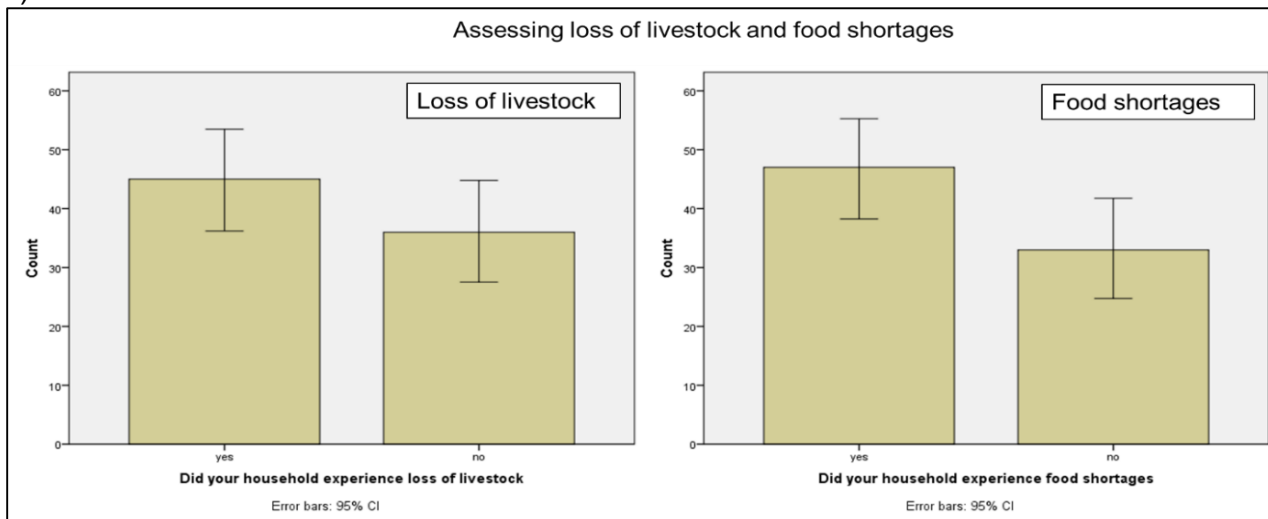


Figure 4.7 Assessing a) yield loss and loss of livelihood opportunities, b) increased incidence of pests and diseases and depleting water sources c) loss of livestock and food shortages.

4.8 Household Coping Strategies

Coping strategies are mechanisms that are used by households or communities to deal with a short term insufficiency of food caused by affected livelihoods (Snel & Staring, 2001). For this study coping strategies were categorized into household based strategies and livelihood based strategies. These strategies can be further classified into four categories, which are dietary change strategies, food seeking strategies, household structure strategies and rationing strategies. This study captured both household and livelihood based coping strategies that were employed by households.

4.8.1 Household based coping strategies

Figure 4.8 shows the range of household based coping strategies that were adopted during the drought. Households adopted food rationing strategies as shown by 94% of the households who reduced the number of meals taken per day, 93% reduced or limited portions of food during meals, 83% would sometimes go the whole day without food and 79% would have adults skip meals so that children could eat. Households also adopted dietary change strategies, which are shown by 63% of the households who started eating unusual foods and wild fruits. Figure 4.8 further shows that households adopted food seeking strategies with 89% providing labor in exchange for food, 73% borrowing from neighbors and relatives and 44% sending household members to beg for food. Thirty nine percent of the households changed farming methods and crops whilst 30% of the households reduced cultivation areas.

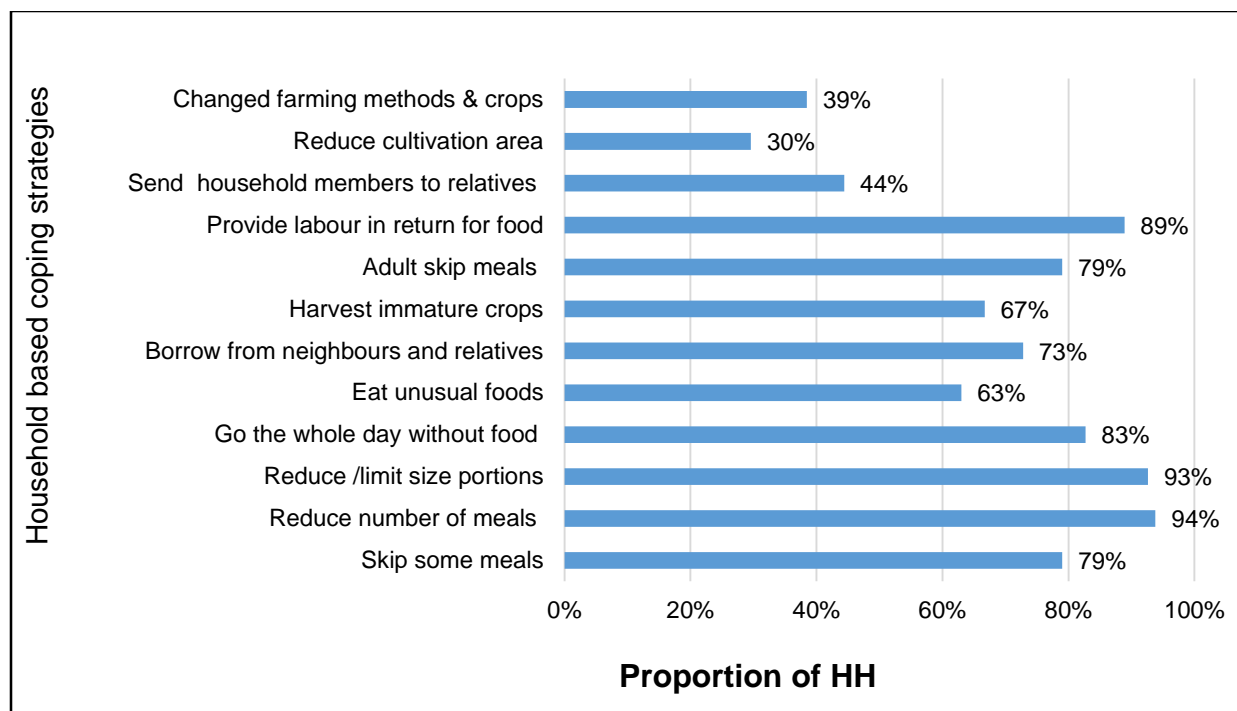


Figure 4.8 Household based coping strategies during drought events in the study area

4.8.2 Livelihood based coping strategies

Under livelihood coping strategies households adopted both household structure strategies and food seeking strategies. Table 4.6 shows that 47% of the households coped with the drought by begging for food or money to buy food. Forty percent of the households reduced non-food expenses, borrowed money and sold their assets to buy food. Forty two percent of the households withdrew their children from school and 17% sold productive assets to buy food. As a way of coping with the drought the majority of the households, that is 53%, received food aid from various agencies and the Government as discussed later in this chapter. Other livelihood based coping strategies employed included joining social networks like income savings and lending groups (15%), selling non-productive animals (9%) and selling houses or land to buy food (6%). Some of the worrying negative coping mechanisms that came to light included engaging in prostitution (7%), engaging in illegal activities (6%) and marrying off underage children (1%). Other coping strategies adopted, that also came out of the focus group discussions and key informant interviews, and are discussed under Section 4.8.3 - 4.8.7. These also include both negative and positive coping mechanisms.

Table 4.6: Livelihood based coping strategies during drought events in the study area

Livelihood based coping strategy	Percentage of households employed the strategy (%)
Sold household assets to buy food	40%
Reduced non-food expenses	40%
Sold productive assets to buy food	17%
Spent savings to buy food	47%
Borrowed money	40%
Sold house or land to buy food	6%
Withdrew children from school	42%
Sold last female breeding livestock to buy food	4%
Begging for food or money to buy food	47%
Sold non-productive animals more than before	9%
Engaged in prostitution	7%
Engaged in illegal activities	6%
Married off underage	1%
Joined social networks	15%
Received food aid	53%

4.8.3 Selling of livestock

To cope with the effects of drought households sold their livestock to get an income to buy food. Ownership of livestock, such as cattle and goats, define the wealth status of households. Ownership of livestock also elevates the wealth status and community standing of a household. Households resorted to selling off their livestock, which reduced their livestock unit and livestock asset base. Livestock sustains their lives by being a source of power and a source of income, fulfilling household projects such as building houses and providing an income during emergency situations such as illness. During the drought year livestock lost weight and households had to sell them for a quarter of the actual price.

“People sold their livestock for sick money, some exchanged their livestock for one 20L bucket of maize, just for them to get by” said one the key informant.

During the drought year cattle were sold for as low as USD40. In a good year, and depending on the weight and quality, cattle sell for between USD300 and USD600.

Households thought it better to sell off livestock, like cattle, and get the little money they could before the cattle died.

4.8.4 Withdrawal of children out of school

During the drought some parents did not have enough money to buy food and cover other basic expenditures such as health in the household. Food expenditures also increased, compared to previous years, as there was no food from the harvest. As a coping measure some households pulled children out of school, as they could not pay school fees at all. According to a key informant the girls suffered the most, as they were the first ones to be removed from school by the family before the boys.

4.8.5 Child marriages

Although there was an insignificant number of households that reported child marriages in the household interviews, focus group discussions revealed that, besides dropping out of school, cases of child marriages were on the rise. The girls became vulnerable and some parents were more than willing to let some children get married with the assurance that the child will be well taken care of. For some households it was a reduction in the number of mouths to feed and a benefit for them when the lobola money was paid, bringing in much needed resources in a very difficult time. This was supported by a focus group discussion participant who had the following to say: *“Children entered into early marriages so that they would get someone to take care of them, which is against our culture and the law. Some girls went looking for work as housemaids.”*

4.8.6 Diversification of livelihoods options

During the drought households also adopted positive coping mechanisms to cushion themselves from the effects of the drought. According to the focus group participants' households diversified to income generating activities such as basket weaving, brick molding, selling firewood and salt making processes. Some started gardening, where they mainly grew vegetables and small portions of grain. Households started savings and lending groups for income generation and have since continued with this well after the drought. However, some livelihood options that were taken up during the time, like selling firewood and salt making were not environmentally friendly and the local environment

authority, which is the Environmental Management Agency (EMA) was not happy with these activities.

4.8.7 Coping strategies related to socio economic impacts experienced

Univariate ANOVA was run to show the coping mechanisms that were related to the socio-economic effects of drought. Table 4.7 shows that only the following coping mechanisms: (1) changing the food production area or methods; (2) withdrawing children from school and, (3) working for food were significantly related to the socio-economic effects of drought as well as other household specific random factors. The analysis shows that the depletion of water sources caused by the drought is significantly related to households changing their food production area and/or methods. Further, reduction in opportunities to make a living that is induced by drought is significantly related to households withdrawing their children from school and/or engaging in prostitution. Reduction in livelihood opportunities is also significantly related, with households opting to provide labour in exchange for food. Apart from the socio-economic effects of drought, other household specific factors that include total available arable land and the types of household assets owned were also significantly related to the coping mechanisms employed by households.

Table 4.7: Univariate ANOVA statistical results

Dependent Variable:	Tests Between-Subjects Effects						
	Source		Sum of Squares	df	Mean Square	F value	Sig. level
Change in food production	Depletion of water sources	Hypoth.	8.44	1.0	8.44	3.36	0.073
		Error	113.00	45.0	2.51	-	-
Dependent Variable: Withdraw children from school.	Reduction: opportunities to make a living	Hypoth.	4.39	1.0	4.39	3.00	0.09
		Error	65.93	45.0	1.47	-	-
	Total arable land available	Hypoth.	28.60	10.0	2.86	1.95	0.06
		Error	65.93	45.0	1.47	-	-
Dependent Variable: Work for food	Reduction: opportunities to make a living	Hypoth.	15.43	1.0	15.43	13.65	0.00
		Error	50.88	45.0	1.13	-	-
	Household assets owned	Hypoth.	9.98	4.0	2.50	2.21	0.08
		Error	50.88	45.0	1.13	-	-

4.9 Interventions that were available during the drought

During the drought period the Musikavanhu area received support and interventions from NGOs (49%), the Government (11%) and friends and relatives 9% (Table 4.8). No support was received from local leadership. All sources of support and interventions were perceived to be adequate to cover food needs during the drought by only 5% for NGOs, 5% for the Government and 4% for relatives and friends. These were low proportions of households, which reflected that the support received was not enough to meet the needs at the time. Support given was however deemed to be timely as reported by 40% of the households for NGOs, 15% for the Government and 5% for relatives and friends (Table 4.8). These proportions are also below 50% and therefore reflect that support was not timely for the majority of households who needed it.

Table 4.8: Support that was received from institutions during the drought

Variable	Proportion of households that responded with a yes
NGO	49%
Government	11%
Local leadership	0%
Friends and relatives	9%
NGO support adequate	5%
NGO support timely	40%
Government support adequate	5%
Government support timely	15%
Community leadership support adequate	0%
Community leadership support timely	0%
Friends and relatives support adequate	4%
Friends and relatives support timely	5%

This was supported by one of the focus group discussions that had the following to say:

During the drought people were assisted by the Government and donors, but this was only after the effects of the drought got worse. Our ward councilor then hurried to the DA and appealed on behalf of the people and that's when we started getting food aid.

A key informant also had this to say:

As a member of the disaster risk reduction committee, we train the community on disaster preparedness and response. During the drought we had the task of organizing those affected by the drought and were part of the emergency food aid distributions. However, the response by the Government was not timely and effective, due to late deliveries and financial constraints”

Some of the interventions that were carried out are outlined in the table 4.9.

Table 4.9: Institutions and agencies that offered support during the drought

Name of agency	Type of agency	Support or intervention given
Social Welfare	Government	Maize grain, maize seed and fertilizer, feed subsidies for livestock improving accessibility of feed by households.
World Vision ENSURE Program	NGO	Sorghum, cooking oil, porridge, supplementary feeding in schools
World Food Programme	NGO	Maize grain, porridge and cooking oil
Family AIDS Caring Trust	NGO	Cash transfers and trainings
Red Cross Society	NGO	Cash transfers, borehole repairs and food for work programmes

4.9.1 Preparedness and response

In a bid to understand preparedness and response mechanisms that are available during times of shocks and hazards such as drought, households were asked to indicate any institutions and agencies that act in this capacity in their area. Table 4.11 shows that 72% of the households mentioned community based organizations and non-governmental organizations, 54% mentioned Government departments, 20% mentioned friends and relatives whilst only 3% mentioned their local leadership.

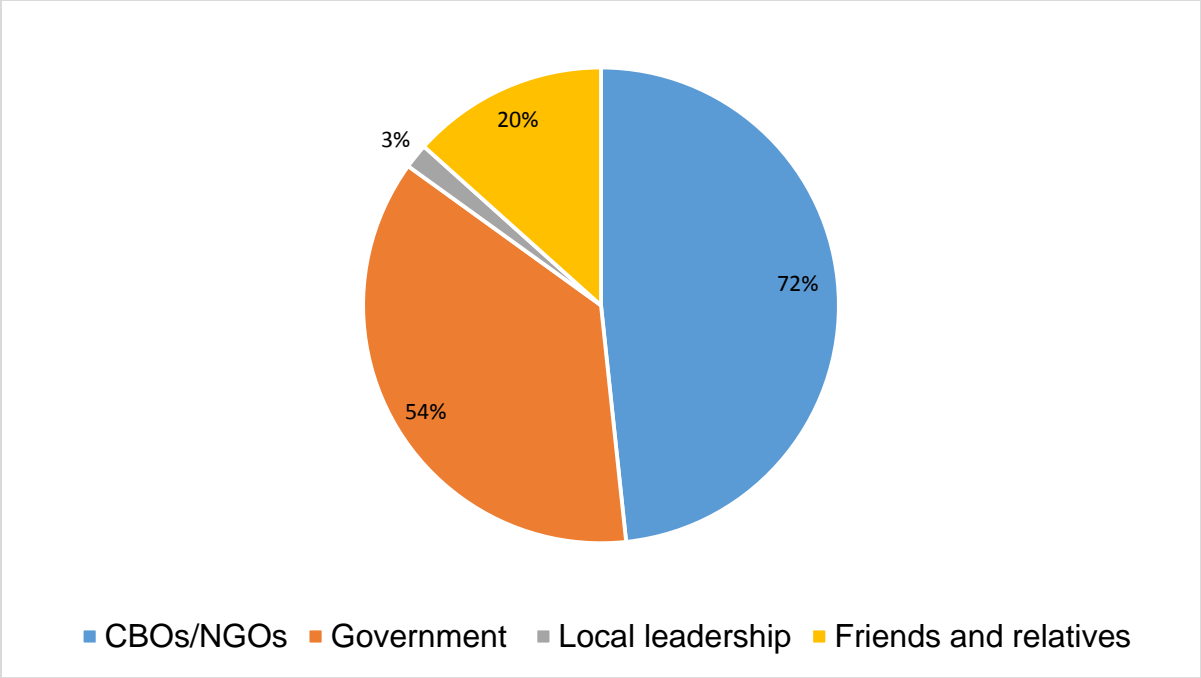


Figure 4.9 Available institutions and agencies during the drought

Table 4.10 shows that although the area experiences recurrent droughts, in the case of the 2015/16 El Nino drought, 88.9% of households was not well prepared to cope with the drought. The remaining 11.1% reported that they were somewhat prepared. This shows that there is a need for strengthening the disaster risk reduction and mitigation capacities in the area at household levels to assist households to cope better and be prepared in times of drought.

Table 4.10 Preparedness of households to cope with climate related disasters

In general how well prepared are you in coping with climate related disasters	Frequency	Percentage (%)
Not at all prepared	72	88.9
Somewhat prepared	9	11.1
Total	81	100

4.9.2 Community support mechanisms during the drought

As part of key informants and focus group discussions community support mechanisms were further investigated. This was done to further understand of the available internal capacities that exist in the area, before any interventions from external partners such as NGOs come in. Discussions and interviews revealed that during the time of drought the

community leaders took the lead in registering vulnerable households, so that they could be prioritized for response interventions that were being implemented by the Government and non-governmental organizations. Councilors, village heads and the chiefs registered and selected the most vulnerable households that included child headed households, the elderly and female headed households for first preference in getting food assistance. The chief in the area also donated grain to a few households that were in dire need. Community leaders were part of committees set up to coordinate interventions such as food distribution and cash transfers. Community leaders were also involved in the sensitization of communities during gatherings on the destocking program that was being promoted by the Livestock Production Department (LPD). However, as a community structure or mechanism the leadership did not have any community programmes or form of community safety nets in place that could be used to support households during the drought.

There are no other ways that the community assisted during the drought. However, the traditional leadership, including the chief, is still using the traditional ways of rainmaking processes and periodic beer making ceremonies to appease the spirits so that rains can come during the rainy season-Key Informant

Some key informants also mentioned that the community used to implement the *Zunde Ramambo* community safety net, but it has not been working well in the past years as a result of recurrent droughts and harsh economic environments(see text box 1). However, after the 2015/16 drought, some villages made efforts to revive this concept in preparation of future droughts. This was supported by one of the key informants who had this to say:

“After the drought experience some village heads realized the need for community and village granaries that were there under the Zunde Ramambo program. As we speak, right now, some granaries are being constructed at the homesteads of village heads to store community grain.”

Text box 1: Zunde raMambo/Isiphala SeNkosi

In Zimbabwe the *Zunde RaMambo/Isiphala SeNkosi* concept is a social safety net programme run by traditional leaders and designed to cushion the less privileged members of rural communities from food shortages. The concept is a self-sustaining model that is meant to improve the welfare of the vulnerable. All resources and inputs for Zunde RaMambo are all expected to be mobilized by the community themselves. Under this concept the traditional leaders are mostly chiefs. The project is meant to come up with community grain reserves to cater for the less fortunate and those affected by drought in communities. Grain reserves are set using different methods. The first method is that from their harvest households in a community donate a certain amount of grain to the community grain reserve or granary which is usually situated at the chief's homestead. The second method is that a certain portion of land allocated by the chief is cultivated and grown with cereals and the harvest is put into the community granary as community reserves. Usually the community granary or reserve is based at village level for each village to be able to cater for the most food insecure households. The concept has evolved over the years but has not been working well in most communities due to a number of factors. These include recurrent droughts, harsh economic climate, community conflicts and to some extent the dependency on food handouts by communities from non-governmental organizations.

4.9.3 Situation of households after the drought

Figure 4.10 shows that after the drought 63% of the households are better off than what they were before the drought. Twenty three percent have bounced back to the same level as they were before the drought, whilst 14% are worse off than what they were before the drought. This is supported by some key informants who reported that most households have recovered to the same situation they were in before the drought. Some of them are now better off than during the drought, since they went through a much improved season during the 2016/17 season. The 2016/17 season was a better season because households received above normal rainfall and better yields compared to the drought year. A lot of support was also channeled through development partners and the Government led Command Agriculture program after the drought (see text box 2). Households started practicing conservation farming methods, such as basins, and grew small grains based on climate smart agriculture training received from the Government and development partners. However, the most vulnerable households are now worse off after losing livestock, selling household assets and using up savings as coping mechanisms.

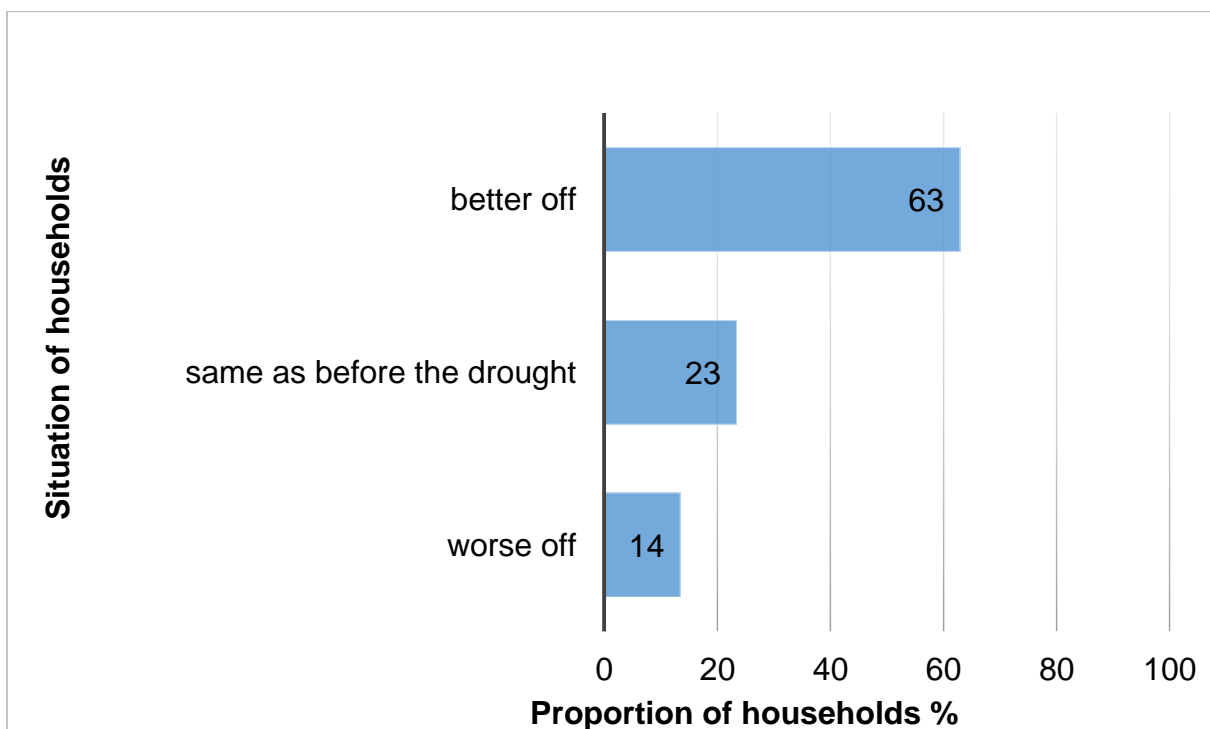


Figure 4.10 Situation of households after the drought under three different categories (Better off, same as before and worse off)

The situation of households after the drought is best summarized by one focus group discussion participant, who had this to say:

Households are now better off because of a better season in 2016/17 and because everyone worked hard to recover. The Government and donors came together and conducted training and distributed inputs. People adopted conservative agriculture to increase harvests, especially those without draught power. We were also trained on how to plant drought resistant crops that can thrive in the dry periods. However, this worked for households that had capabilities and assets before and after the drought. Households that were better off before the drought and had assets and social standing managed to bounce back. For poor and vulnerable households like the elderly, the disabled and child headed households it was not as easy, they still have no means and assets such as labour and land to utilize the inputs and training that was received after the drought. There have not been any changes in these types of households and no one is assisting them, since the majority of the households are now doing well.

Text box 2: The Command Agriculture programme in Zimbabwe

The Command Agriculture scheme was introduced in 2016/17 season by the Government of Zimbabwe (GoZ), with the aim of achieving food self-sufficiency. The scheme targeted farmers with irrigated / irrigable land who could put a minimum of 200 hectares under maize cultivation. About 2,000 farmers were registered for the 2016/17 season, and each farmer was required to produce at least 1,000 tonnes of maize. After the season each farmer was required to give back five tonnes per hectare as repayment of the loans advanced in the form of inputs and chemicals and irrigation equipment. Farmers could retain any surplus product produced in excess of the 1,000 tonnes. However the programme ended up benefitting even smallholder farmers that had smaller pieces of land

4.5 Conclusion

The main objective of this chapter was to present the impact that the drought had on the households of the Musikavanhu area. The chapter also presented coping mechanisms that were adopted as a result of the drought, and some of the factors that influenced the adoption of these coping mechanisms. From the results obtained the household's primary occupation is farm related activities. Main sources of income are derived from informal work that is carried out on the farms as well as gardening and informal trading. The major socio economic impacts of the drought were yield loss, hunger, loss of livelihoods, food shortages and loss of livestock. Other socio economic impacts experienced were loss of vegetation, depleted water sources and school drop outs. Some of these impacts influenced the coping mechanisms that were adopted that include selling of livestock, withdrawal of children out of school, reduction of meals, selling of assets and begging for food from neighbors and friends. In terms of preparedness and response there is a need to capacitate households on drought risk reduction through training and sensitization, so that they successfully deal with the effects of drought.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

About 70% of Zimbabwe's population derives its livelihood from subsistence agriculture and other rural activities. The agriculture sector in the country relies heavily on seasonal rain-fed agriculture, which further increases the vulnerability of households to droughts and other climate related events.

The Musikavanhu area is prone to drought and has an erratic rainfall pattern characterized by dry spells. The area falls under the ecological region 5 and over the past 5 years it has been receiving below normal rainfall. Erratic rainfall continues to put the population at risk of drought and food insecurity, year in and year out. The frequency of drought in the area negatively affect the livelihoods of households whose main source of income and primary occupation is agriculture based. Between 2012 and 2016 the community experienced mild droughts with the 2015/16 drought described as the worst of all in the five years. The drought was so severe that livestock perished and households experienced hunger and food shortages. The most affected groups during the drought were women and children, the elderly, disabled, child headed households and female headed households. This category of households are characterized by the lack of labour, capital, physical capital such as land, financial capital and social capital, which made them more vulnerable to the drought.

It is against this background that this research was conducted with the aim of assessing the socio economic impacts of the 2015/16 El Nino induced drought, and identifying coping mechanisms that were employed by households in the Musikavanhu area. Data for the research was collected through household surveys, key informant interviews and focus group discussions. A descriptive analysis was conducted, which characterized households according to their demographics, household income and assets, socio economic impacts of the drought, household based coping strategies, livelihood based coping strategies, preparedness and response mechanisms that were in place during dry

times. This chapter draws conclusions from the findings of the study and suggests recommendations for future policy.

5.2 Main conclusions of the study by objectives

The study hypothesized that households in the study area did not experience any negative impacts and did not employ any negative coping strategies during the time of the drought. Results of the study show that the households did experience negative impacts as a result of the drought and they did employ negative coping mechanisms to deal with the effects of the drought. Details supporting this are discussed in the results using objectives as follows.

Objective one: *To assess the socio-economic impacts of the drought in the study area*

To a large extent households in the Musikavanhu community were negatively impacted socially and economically by the drought and experienced various negative effects. Firstly, households experienced yield loss as one of the impacts of the drought. All the interviewed households in Musikavanhu described their yields for 2015/16 as poor, very poor or a complete write off. These were for the major crops grown in the area that include sorghum, maize, sugar beans, groundnuts and cowpeas. As a result of yield loss 58% of the households experienced food insecurity and food shortages because they had not harvested enough grain to cater for their households. Although food was available in the small tuck-shops and the nearest business centers, prices of food such as maize grain, sorghum and maize meal increased as demand grew. People had no disposable income and it was difficult for the poor households to buy food.

Households lost their source of livelihoods, which are mainly derived from farming activities. Grazing and watering points dried up and cattle and goats had no reliable source of water. This resulted in 56% of the households losing their large livestock, e.g cattle, and small livestock, e.g goats. An estimated 1000 head of cattle was lost during the drought. School drop outs were both an impact and a coping strategy during the drought, as parents could not afford to pay their school fees and diverted savings to buy food. Some households also experienced family separation and relocation by other

household members. Stress and suffering from the effects of the drought increased family conflicts during the drought year and in some instances led to divorces and separation.

Objective two: *To identify drought coping mechanisms that were employed by households during the drought.*

Households employed various coping mechanism that can be classified as both negative and positive to cushion themselves from the effects of the drought. To a large extent coping mechanisms that were employed did not improve the livelihoods of households. This is because most of the coping strategies adopted were negative and placed households in situations that worsened livelihoods and decreased the chances of speedy recovery. Results show that households adopted food rationing and dietary change strategies to manage the limited food supply until the next season. Some of the coping strategies included the reduction of meals per day, going a whole day without food and eating unusual foods among others. Households employed food seeking strategies such as borrowing, begging and working in exchange for food. Other negative coping strategies that were employed included selling of productive assets, livestock and using up savings to buy food. During the drought some households also adopted positive coping mechanisms, which included diversifying into income generating activities such as basket weaving, brick molding, salt making processes and gardening. Households started savings and lending groups for income generation, which have continued after the drought.

Objective three: *To identify support systems and mechanisms that can be used by households for drought preparedness and response.*

During the drought the Musikavanhu community received support and interventions from the Government and humanitarian organizations. Non-governmental organizations were the main source of aid (49%) followed by the Government (11%) and friends and relatives (9%). These sources of interventions were also reported to be the available mechanisms of support, whether there is a drought or not. However, all sources of support were deemed not adequate to meet the needs of the households at the time, although

interventions were timely. The research shows that there was little or no community led interventions to respond to the drought before external intervention commenced. In addition to identified institutions the area has Government departments, like the livestock department and the agriculture extension departments, which offer extension and education. The area also has a disaster risk reduction committee that mainly does training and sensitizations in times of drought.

Although the area experiences recurrent droughts a greater proportion of households were not prepared or somewhat prepared to cope with the drought. In terms of recovery after experiencing the effects of the 2015/16 drought, most households have recovered and are better off than before the drought (63%), some have returned to where they were before the drought (23%) but some (14%) are worse off than they were before the drought. After the drought the Government and donors came together with a number of interventions, such as training in good agriculture practices and distribution of inputs under the command agriculture program. Households that were better off before the drought and had better capabilities and assets managed to bounce back quicker than others. Poor and vulnerable households such as the elderly, the disabled, and child headed households still have no means and assets, such as labour and land, with which to utilize the inputs and training that was received after the drought and are worse off than before.

5.3 Recommendations

This section presents some recommendations based on the analysis and results from the study. In giving recommendations acknowledgement is given to the vast information and literature that has been gathered by other researchers over the years on the impact of drought and coping strategies. However the effects of drought and the extent of vulnerability towards shocks like drought keeps evolving and expanding in the face of a changing climate. Multi-dimensional responses are now needed to build the resilience of households, communities and systems that are experiencing increased frequencies of shocks such as drought and being continuously exposed to them.

One of the key findings of the research is that households were either not prepared at all or somewhat prepared when the drought occurred. This shows that the households and community lacked the risk reduction capacities to be able to deal with drought. Though drought is a recurring shock in their community, results showed that households do not have the absorptive capacities to respond to the drought without experiencing negative effects or employing negative coping mechanisms. The study recommends the strengthening of absorptive capacities of households in order to improve the stability of households when drought occurs. The Government and development partners should come up with programmes that improve knowledge on disaster risk management within the community, improve access to informal safety nets and access to savings in order to minimize exposure to shocks and stresses. Local weather-prediction mechanisms, early warning systems, timely access to information through cellphone technology, social networking and saving groups to improve social capital and bonding are some of the interventions that can be strengthened in the study area.

The study shows that households in the area have a low asset base in the form of human skills and knowledge, limited land tenure and physical assets among others. Productive assets, such as land, livestock and household assets act as a buffer against shocks and stresses and reduces the reliance on negative coping strategies. The study recommends interventions that build on existing farmer knowledge through extension education and training, promoting climate-smart agriculture and good agriculture and husbandry practices. For example, drought tolerant crops, such as sorghum and millet, should be promoted at a greater scale and provided with ready markets equivalent to the main staple maize. Support should also be provided to encourage on farm and off farm livelihood diversification, encourage climate change adaptation, promote community asset rehabilitation and protection, promote asset accumulation and improve access to financial services for the households. This will help households to make proactive and informed choices based on an understanding of changing conditions and available livelihood assets and strategies. In building the capacity of the households, gender and child protection issues should be taken into consideration.

It is also important that outside agencies such as nongovernmental organizations understand the local coping strategies that households usually employ during drought periods, to avoid undermining them with external interventions and creating aid dependency and other unintended negative outcomes. Local leadership and the community disaster risk reduction committees should play a more active role in leading drought mitigation strategies at community level, than just to be only associated with food aid distribution. Communities should also be active participants during response programmes and not only passive recipients of aid. This will help to strengthen community led response mechanisms that can act as first responders before any external support is called for.

At national level there should exist an enabling environment that promotes transformative capacities of communities and households. This can be done through investing in good governance, addressing resource challenges faced by public institutions, improving formal social protection mechanisms, improving access to basic services, markets and infrastructure.

The study has documented the socio economic impacts, coping mechanisms employed during the drought and recommended strategies to improve resilience to drought. However, the study leaves a gap, further research is necessary in understanding the extent to which these recommended interventions for strengthening resilience capacities can achieve the desired outcomes, such as food and nutrition security. Another area for further research is an in depth analysis of the sustainable non-agricultural related livelihood options that can be explored in this community to promote livelihood diversification, and to what extent these can be used to still achieve food security outcomes.

REFERENCES

- Benson, C. & Clay, E., 1994. *The impact of drought on sub-Saharan African economies: A preliminary examination*, London: Overseas Development Institute.
- Benson, c. & Clay, E., 1998. *The impact of drought on Sub Saharan African economies*, Washington DC: The World Bank.
- Bonifacio, R., 2015. *El Niño: Implications and scenarios for 2015*, Rome: World Food Programme .
- Brüntrup, M. & Tsegai, D., 2017. *Drought adaptation and resilience in developing countries*, Bonn: Germany Development Institute.
- Bryman, A., 2012. *Social Research Methods*. 4th ed. New York: Oxford University Press.
- Butt, T., McCarl, B., Angerer, J. & Dyke, P., 2005. The economic and food security implication of climat change in Mali. *Climate Change*, Volume 68, pp. 355-378.
- Byun, H. & Wilhite, D., 1999. Objective quantification of drought severity and duration. *Journal of Climate* , Volume 21, pp. 2747-2755.
- Chikoto, G. & Sadiq, A., 2013. *Zimbabwe's Emergency Management System: A Promising Development*, Indianapolis: Indiana University Purdue University Indianapolis.
- Civil Protection, 2000. *Civil Protection Directorate of Zimbabwe*. [Online] Available at: <http://www.zimdrm.gov.zw> [Accessed 17 December 2017].
- Cook, B., Smerdon, J., Seiger, R. & Coats, S., 2013. *Global Warming and Drought in the 21st Century*, New York: NASA Goddard Institute for Space Studies.
- CPAU, 2011. *Short-term & long-term effects of drought: Case studies from Faryab & Wardak*, Kabul: Cooperation for Peace and Unity.
- Cresswell, J., 2016. *First steps in research*. 2nd ed. Pretoria: Van Schalk.
- DCP, 2012. *Zimbabwe National Contingency Plan*, Harare : Department of Civil Protection.
- Dellal, I. & McCarl, A., 2010. *The economic impacts of drought on agriculture: The case of Turkey* , Texas: Texas A&M University.
- DFID, 2000. *Eldis*. [Online] Available at: <https://www.eldis.org/vfile/upload/1/document/0901/section2.pdf> [Accessed 2 December 2017].
- DFID, 2007. *Gender Equality-At the Heart of Development*, London : DFID..
- Easton, Z. & Faulkner, J., 2014. *Climate Change Adaptation for Agriculture: Mitigating Short- and Long-Term Impacts of Climate Change on Crop Production*, Virginia: Virginia Polytechnic Institute and State University.

- ECA, 2007. *Africa review report on drought and desertification*, Addis Ababa: Economic Commission for Africa.
- Eriyagama, N., Smakhtin, V. & Gamage, N., 2008. *Mapping Drought Patterns and Impacts: A Global Perspective*, Colombo: International Water Management Institute .
- Eriyagama, N., Smakhtin, V. & Gamage, N., 2009. *Mapping drought patterns and impact*, Colombo: International Water Management Institute.
- FAO, 2008. *Zimbabwe 2008/07 Agriculture Season Update* , Harare : Food and Agriculture Organisation of the United Nations.
- FAO, 2013. *Drought*, Geneva: Food and Agriculture Organisation of the United Nations.
- FAO, 2016. *2015–2016 El Niño Early action and response for agriculture, food security and nutrition*, Rome : Food and Agriculture of the United Nations .
- FAO, 2016. *Southern Africa El Nino response plan*, Rome: Food and Agriculture Organisation of the United Nations.
- FSIN, 2016. *The Food Security Information Network*. [Online] Available at: <http://www.fsincop.net> [Accessed 28 November 2017].
- Gautam, M., 2006. *Managing drought in Sub Saharan Africa: A policy perspective*, Washington DC: World Bank.
- Gerber, N. & Mirzabaev, A., 2017. *Benefits of action and costs of inaction: Drought mitigation and preparedness – a literature review*, Geneva: World Meteorological Organization (WMO) and Global.
- Golian, S., Mazdiyani, O. & AghaKouchak, A., 2015. Trends in meteorological and agricultural droughts in Iran. *Climate Change*, Volume 119, pp. 679-688.
- Hirons, L. & Klingaman, N., 2016. *La Nina 2015/16: Historical impact analysis*, London: Evidence on Demand.
- Hisdal, H. & Tallaksen, L., 2000. *Drought event definition*, Oslo: ARIDE.
- IFAD, 2000. *IFAD*. [Online] Available at: <https://www.ifad.org/topic/resource/tags/sla/2179541> [Accessed 2 December 2017].
- IPCC, 2007. *Climate Change Report* , New York: Intergovernmental Panel on Climate Change..
- Ivankova, N. & Clark, J., 2016. Foundations and approaches to mixed methods research. In: K. Maree, ed. *First Steps in Research*. Pretoria: Van Schalk, pp. 306-336.
- J.G.McCabe & D.M.Wolock, 2015. Variability and trends in global drought. *Earth and Space Science*, Volume 2, pp. 223-228.

J.M.Brewer & Richard, R., 2011. *The global drought monitor portal*, Nebraska: Drought Mitigation Center Faculty Publications.

Juana, J., Kahaka, Z. & Okurut, F., 2013. Farmers Perception and adaptations to climate change in sub-Saharan Africa:A synthesis of empirical studies and implications for public policy in african agriculture. *Journal of Agriculture Science*, Volume 5, pp. 121-135.

Juana, J., Makepe, P., Mangadai, K. & Narayana, N., 2014. The socio-economic impact of drought in Botswana. *International Journal of Environment and Development*, 11(1), pp. 43-60.

Kinsey, B., Burger, K. & Gunning, W., 1998. Coping with Drought in Zimbabwe: Survey Evidence on Responses of Rural Households to Risk. *World Development* , Volume 26, pp. 89-110.

Li, X., Waddington, S., Joshi, J. & Vicente, M., 2011. The relative importance of drought and other water related constraints for major food crops in South Asian farming systems. *Food Security*, 3(1), pp. 19-33.

Maddox, G., 2007. Sub-Saharan Africa:An environmental history. *Environmental History*, 12(3), pp. 678-679.

Mann, C., 2003. Observational research methods. *Emergency Medical Journal*, Volume 20, pp. 54-60.

Manyani, A., 2014. *The Sustainability of Rural Livelihoods in the Face of Climate Change in Chadereka Ward I of Muzarabani Rural District in Zimbabwe*, Bindura: Bindura University .

Manyani, A., 2014. *The Sustainability of Rural Livelihoods in the Face of Climate Change in Chadereka Ward I of Muzarabani Rural District in Zimbabwe*, Bindura : Bindura University .

Manyeruke, C., Hamauswa, S. & Mhandara, L., 2013. The effects of climate change and variability on food security in Zimbabwe: A socio-economic and political analysis. *International Journal of Humanities and Social Science*, 3(6), pp. 270-286.

Maphosa, B., 1994. Lessons from the 1992 drought in Zimbabwe: The quest for alternative food policies. *Nordic Journal of African Studies*, 3(1), pp. 53-58.

Martinez-Sanchez, O., 2010. *Droughts:Definitions,Monitors and Causes*, San Juan: US National Weather Service.

Masih, I., Maskey, S. & Mussa, F., 2014. A review of droughts on the African continent:a geospatial and long-term perspective. *Hydrology and Earth System Sciences* , Volume 18, p. 3635–3649.

Matondi, P., 2013. *Agriculture Sector Overview* , Harare : Ruzivo Trust .

- Mishra, A. & Singh, V., 2010. A review of drought concepts. *Journal of Hydrology*, 391(1-2), pp. 202-216.
- Miyan, M., 2015. Drought in Asian least developed countries: Vulnerability and sustainability. *Weather and Climate Express*, Volume 7, pp. 8-23.
- Mushore, T., Muzenda, C. & Makovere, T., 2013. Effectiveness of drought mitigation strategies in Bikita district in Zimbabwe. *International Journal of Environment Protection and Policy*, 1(4), pp. 101-107.
- Musiwa, M., 2016. *The Herald*. [Online] Available at: <http://www.herald.co.zw> [Accessed 26 October 2017].
- Mutasa, M., 2011. *Climate change vulnerability and adaptation in failing states: Zimbabwe's drought struggle*, Michigan: Climate Adaptation Research and Understanding through the Social Sciences (ICARUS).
- Nangombe, S., 2011. *Drought conditions and management strategies in Zimbabwe*, Harare: Zimbabwe Meteorological Services Department.
- Nicholson, S. & Kim, J., 1997. The relationship of the El Niño-Southern Oscillation to African rainfall. *International Journal of Climatology*, 17(2), pp. 117-135.
- OCHA, 2016. *United Nations Office for the Coordination of Humanitarian Affairs*. [Online] Available at: <http://unocha.org> [Accessed 20 November 2017].
- Opiyo, F. et al., 2015. Drought Adaptation and Coping Strategies Among the Turkana Pastoralists of Northern Kenya. *Journal of Disaster Risk Science*, Volume 6, pp. 295-309.
- Oxfam, 2016. *How climate change is making drought and humanitarian disaster worse in East Africa*, Addis Ababa: Oxfam .
- Paek, H., Yu, Y. & Qian, C., 2017. *Why were the 2015/2016 and 1997/1998 extreme El Niños different?*, California: Agu Publications.
- Panagoulia, D. & Dimou, G., 1998. *Definitions and effects of droughts*. Athens, 1 National Technical University of Athens.
- Petja, B., Moeletsi, M., Mpandeli, N. & Sibandze, P., 2008. *Drought mapping in South Africa using coarse resolution satellite imagery*, Pretoria: Institute for Soil, Climate and Water.
- Rembold, F., Kerdiles, H., Lemoine, G. & Perez-Hoyos, A., 2016. *Impact of El Niño on agriculture in southern Africa for the 2015/2016 main season*, Rome: European Union Joint Research Centre .
- RIASCO, 2016. *Response plan for the El Niño-induced drought in Southern Africa*, Johannesburg: Regional Inter-Agency Standing Committee.

- Rojas, O., Li, Y. & Cumani, R., 2014. *Understanding the drought impact of El Nino on the global agriculture areas: An assessment using FAO's Agriculture Stress Index(ASI)*, Rome: Food and Agriculture Organisation of the United Nations.
- Rouault, M. & Richard, Y., 2005. Intensity and spatial extent of drought in southern Africa. *Geophysical Research Letters*, Volume 32, p. L15702.
- Roy, A. & Hirway, I., 2007. *Multiple impacts of droughts and assessment of drought policy in major drought prone states in India*, Gujarat: Centre for Development Alternatives.
- S.G.Philander, 2004. *Our Affair with El Nino: How we transformed an enchanting Peruvian current into a global climate hazard*. 1st edition ed. Princetown: Princetown University.
- Sarachick, E. & Cane, M., 2010. *The El Nino-Southern Oscillation Phenomenon*. 1st Edition ed. Cambridge: Cambridge Univeristy.
- Sheffield, J. & Wood, E., 2008. Global trends and variability in soil moisture and drought characteristics, 1950–2000, from observation-driven simulations of the terrestrial hydrologic cycle. *Journal of Climate*, Volume 21, pp. 432-458.
- Sherbinin, A. d. et al., 2008. Rural household demographics, livelihoods and the environment. *Global Environment Change*, 18(1), pp. 38-53.
- Sherbinin, A. et al., 2008. Rural Household Demographcs, Livelihoods and the Environment. *Global Environment Change*, 18(1), pp. 38-53.
- Sivakumar, M. & Wilhite, D., 2011. *Drought Risk and Meteorological Droughts*, Nebraska: Global Assessment Report GAR.
- Snel, E. & Staring, R., 2001. Poverty, migration, and coping strategies: An Introduction. *Focaal-European Journal of Anthropology*, Volume 38, pp. 7-22.
- Sukamolson, S., 2012. *Fundamentals of quantitative research*, Bangkok: Chulalongkorn University.
- UNDP, 2015. *Building resilience in Zimbabwe: Towards a resilience strategic framework*, Harare : UNDP Zimbabwe.
- UNDP, 2016. *UNDP's response to El Nino and La Nina*, New York: United Nations Development Programme.
- Unganai, L., 1996. Surface temperature variation over Zimbabwe between 1897 and 1933. *Theoretical and Applied Climatology*, Volume 56, pp. 89-101.
- United Nations, 2007. *Africa Review Report on Drought and Desertification*. Addis Ababa, United Nations .
- UNOCHA, 2009. *Reliefweb International*. [Online] Available at: <http://reliefweb.int> [Accessed 26 November 2017].

USAID, 2016. *United States Agency International Development*. [Online] Available at: <http://www.usaid.gov> [Accessed 10 December 2017].

USAID, 2016. *Zimbabwe Resilience Building Training Workshop*, Harare: USAID.

WFP, 2017. *WFP Zimbabwe Country Brief*, Harare : World Food Programme .

Wilhite, D., 2000. Drought as a Natural Hazard: Concepts and Definitions. *Drought: A Global Assessment*, Volume 1, pp. 3-18.

Wilhite, D., 2009. *Defining drought: The Challenge for early warning systems*, Nebraska: World Meteorological Organisation.

Wilhite, D. & Glantz, M., 1985. *Understanding the drought phenomenon: The role of definitions*, Nebraska: Drought Mitigation Center Faculty Publications.

Wilhite, D., Sivakumar, V. & Pulwarty, R., 2014. Managing drought risk in a changing climate: The role of national drought policy. *Weather and Climate Change Extremes*, Volume 3, pp. 4-13.

Yevjevich, V., Hall, W. & J.D. Salas, 1978. *Drought research needs*. Fort Collins, Water Resources Publications.

Zimbabwe, C. P. o., 2000. *Civil Protection Directorate of Zimbabwe*. [Online] Available at: <http://www.zimdrm.gov.zw> [Accessed 17 December 2017].

ZimFA, 2017. *Ministry of Foreign Affairs Zimbabwe*. [Online] Available at: <http://www.zimfa.gov.zw> [Accessed 17 December 2017].

ZimStat, 2013. *Zimbabwe Education Report*, Harare: Zimbabwe National Statistics Agency .

ZIMVAC, 2016. *Zimbabwe Vulnerability Assessment Committee 2016 Rural Livelihoods Assessment Report*, Harare: ZIMVAC.

ANNEXES

Annex A: Household Questionnaire

Section A

Informed Consent

Introductions and information to obtain informed consent to be interviewed

My name is

I am conducting interviews with households in the area in order to understand more about your the socio economic impacts and coping strategies with regards to the El Nino induced drought that affected the area during the 2015/16 agricultural season. Information collected from the interview will be confidential and no names of the interviewees will be published or shared. All household information will be kept confidential. This work is an MSc research whose results are for academic purposes and its specific objectives are:

- 1. To assess the socio-economic impact of the drought in the study area*
- 2. To investigate the drought adapting and coping mechanisms employed by households*
- 3. To determine support systems and mechanisms that can be used by households for drought preparedness and response.*

Please note that there is no benefit or incentive being given for participating in the interview

now or in the future. You are free to accept or decline to be interviewed, and you are free to decline to answer certain questions at any point in time if you wish.

Are you willing to be interviewed? Yes

No

Section B

General Information

Section B:Please write in spaces provided	
Date of Interview	.../.../2017
District	
Ward	
Village	
Name of Interviewer	
Name of Respondent	
Sex of respondent	1=F 2=M

Relationship to HH: 1) self 2) spouse 3) son 4) daughter 5) in-law 6) other-specify

Section C: Household Characterisation							
Name of household head							
C1) Sex of household head				1=F 2=M			
C2) Age of household head							
C3) Marital Status of household head				1)married 2)single/never married 3)divorced/separated 4)widowed			
C4) Highest level of education of HH				1)never went to school 2)primary 3)O level 4)A level 5)tertiary 6)diploma/certificate			
C5) Household Size				Total		F	M
Under 5		Aged 5-17		Aged 18-59 years		Aged 60+ years	
F	M	F	M	F	M	F	M

Section D

Household Income and Assets

D1) What is the major occupation of the household head?

1)farmer 2)farm labourer 3)artisan 4)office worker 5)civil servant 6)teacher 7)health worker 8)informal trader 9)business

Primary occupation		Secondary occupation	
--------------------	--	----------------------	--

D3) Does the household have the following: (circle all that apply)

1) electricity 2) telephone 3) computer 4) solar 5) cellphone 6) bicycle 7) car

D4) How much land does the household have? (ha)

Total land area

Total arable

Owned

Rented

Farm Household Income and Asset Endowment

D5) What have been your main sources of income during the past 12 months?

Source	Response (allow for multiple responses) 1=yes 2=no
1. Crop sales	
2. Livestock sales	
3. Informal work	
4. Formal work	
5. Remittances	
6. Pension fund	
7. Gifts received	
8. Government grants	
9. Gardening	
10. Informal trading	
11. Business	
12. Other (specify)	

D6) What agricultural assets/implements do you own?

Assets	Do you own? 1=yes 2=no	If yes, how many?	Source 1-bought 2-gift inheritorce 3-
Light implements			
1. hoes			
2. slashers/machete			
3. axes			
4. files			
5. baskets			
6. weeders			
7. other.....			
Heavy machinery			
8. ox drawn plough			
9. tractor			
10. spraying machine			
11. harvester machine			
12. irrigation equipment			
13. trailers			
14. tillage machine			
15. others.....			

Section E

Drought Impact

E1) Do you know about the drought in question a) yes a) no

E2) How long did the drought last in months

Crop

E3) Does your household farm any of the following crops?	1=yes 0=no	Quantity harvested	Unit Code	Compare drought year's crop yield with what you are capable of producing?
1. Maize				
2. Sorghum				
3. Millets(rapoko, pearl millets)				
4. Wheat				
6. Groundnuts				
8. Round nuts				
10. Cowpeas				
11. Beans				
12. Bulgar wheat				
14. Other(specify)				

Codes

1= kg 2= 5 Litre Tin 3= 20 Litre Tin 4 = 50kg bag 5 = 90kg bag 6 = tonnes 99 = N/a

1) very good 2) good 3) poor 4) very poor 5) write off

E4) What is your main source of water?

Purpose	Source (normal year)	Source (drought year)
Drinking		

Domestic		
Livestock		

E5) What is the quality of water? Use the following codes 1) Good 2) Medium 3) Poor

Normal _____ Drought _____

E6) Livestock

Does your household own any of the following livestock?		If yes, how many?	Product use 1-own consumption 2-sale
1. Cattle	0 = No 1=Yes		
2. Donkeys	0 = No 1=Yes		
3. Sheep	0 = No 1=Yes		
4. Goats	0 = No 1=Yes		
5. Pigs	0 = No 1=Yes		
6. Poultry (including guinea fowl)	0 = No 1=Yes		
7. Rabbits	0= No 1=Yes		
8. Other (specify)			

E6) During the drought period did you household experience any of the following (*Tick all that apply*)

Effects	Y,N	Briefly explain how this affected you and your household?
9. Yield loss/Loss of crops		
10. Loss of livestock (death/sales)		
11. More diseases		

12. More pests		
13. Loss of livelihood		
14. Malnutrition		
15. Increased distances to water sources		
16. Food shortages		
17. Loss of human life		
18. Degraded soils		
19. Depleted water resources		
20. Loss of vegetation		
21. School drop outs		

E7) If livestock was lost or sold due to the drought please indicate how many?

Death

Sold/Exchanged..... How much (USD)

E8) During this period did you or any of your family members relocate because of drought?

a) Yes b) No

E9) If yes what is the number of families that have relocated?

E10) Who relocated?

a) spouse b) son c) daughter d) in law e) other specify

E11) Can you please explain how this affected your family as a whole?

.....

Section F

Coping strategies

Household Coping Strategies

F1) Which of the following household coping strategies were you forced to adopt during the drought period?	
Coping strategy	1= Yes 0=No
1. Skip some of the meals	
2. Reduce number of meals eaten per day	
3. Reduce/limit size of food portion	
4. Go the whole day without food	
5. Eat unusual wild fruits, vegetables and other foods	
6. Borrow from neighbours and relatives	
7. Harvest immature crops	
8. Adults skip meals so that children can eat	
9. Provide labour in return for food	
10. Send other members of the household to other	
11. Relatives.	
12. Reduce cultivation area	
13. Changed farming methods and crops	

Livelihood Based Coping Strategies

F2) Which of the following household coping strategies were you forced to adopt during the drought period?	
Coping Strategy	0 = No 1 = Yes 3 = Don't have
1. Sold household assets/goods (radio, furniture, television, etc...) to buy food	

2. Reduced non-food expenses on health (including drugs) and education to buy food	
3. Sold productive assets or means of transport (sewing machine, wheelbarrow, bicycle, car, etc...) to buy food	
4. Spent savings on food	
5. Borrowed money from a formal lender / bank to buy food	
6. Sold house or land (to buy food)	
7. Withdrew children from school (because of hunger or to help work for food)	
8. Sold last female breeding livestock (to buy food)	
9. Begging for food or money to buy food	
10. Sold more animals (non-productive) than usual (to buy food)	
11. Engaged in prostitution	
12. Engaged in illegal activities like stealing, illegal gold panning, selling illegal drugs	
13. Married off underage girls in exchange for food	
14. Joined Social networks	
15. Received food aid	

Section G

Preparedness and Response

G1) Did you receive any type of assistance during the drought 1) Yes 2 No

G2) If yes where did you receive it from and in what form?

Sources	Type of assistance	Adequate (Y,N)	Timely(Y,N)
1. CBOs/NGO / INGO			
2. Government			
3. Local leadership and the community			

4. Friends and Relatives			
5. Other (specify)			

G3) Which institutions are there for support during drought? (Where do you get your assistance from in times of drought?)

- 1) CBOs/NGO / INGO 2) Government 3) Local leadership and the community 4) Friends and relatives 5) Other (specify)

G4) In general how well are you prepared to coping with climate related disasters like drought? (circle one that applies)

- a) Not at all unprepared b) Somewhat prepared c) Quite a lot prepared d) Well prepared.

G5) How would you describe the status of your household after the drought when comparing to the time before the drought?

1. Worse off 2.) Same as before the drought 3.) Better off

G6) What assistance would you need to improve your adaptive capacity and resilience to drought?

- i).....
- ii).....
- iii).....
- iv).....

*****THANK YOU*****

ANNEX B:

Focus Group Discussion Guidelines

1. For the past five years how often has your community experienced drought. Which one was the most severe?

.....

.....

.....

.....

2. Do you see drought as a challenge to your livelihoods in this community?

.....

.....

.....

.....

3. What are the signs that you notice that indicate that there is going to be a drought?

.....

.....

.....

.....

4. Can you tell me the community's experience of the 2015/16 drought, what happened to the community during this drought, what were some of the impacts of the drought in your community?

.....

.....

.....

.....

5. During the drought what coping strategies were used by this community?

.....

.....

.....

.....

6. What were the effects of these strategies on the community (positive and negative?)

.....

.....

.....

.....

7. To what extent do you think these coping strategies were useful to the community to manage and cope with the drought? Explain why you say so?

.....

.....

.....

.....

8. How would you describe the current status of the most affected households in the aftermath of the drought-would you say they are **better off, worse off, same as before the drought?** Give reasons why?

.....

.....

.....

.....

9. What community support structures exist to assist households to cope with the drought? Can you tell us about these and how well they work?

.....

.....

.....

.....

10. Looking at the drought in what ways did community leaders support the community during the drought? Please give examples where possible.

.....

.....

.....

.....

11. In what ways did agencies and government respond during the 2015/16 drought?

.....

.....

.....

.....

12. What are the other agencies and departments that are actively involved in drought mitigation in your community? What are their roles?

.....

.....

.....

.....

13. What do you think can be done better by this community and other stakeholders to mitigate the drought impact?

.....

.....

.....

.....

14. Before we finish is there anything that is related to our discussion that you think is important to mention?

.....

.....

.....

.....

Thank you very much for your cooperation and participation!

**Annex C:
Key Informant Guidelines**

Questionnaire Code:.....

1. Briefly describe your role and the work that you do?

.....

.....

.....

.....

2. Do you see drought as a challenge to livelihoods in this district?

.....

.....

.....

.....

3. For the past five years in this district how many of them have been drought years?
Which one was the most severe?

.....

.....

.....

.....

4. How did the 2015/16 El Nino induced drought affect this community? (***Socially, economically, environmentally, market prices food security, education of young children, crops and livestock***).

.....

.....

.....

.....

5. Which category of households were mostly affected and how?

.....

.....

.....

.....

6. What coping strategies were used by households in this community during the drought? In your view did they work or not?

.....

.....

.....

.....

7. What would you say were the effects of these strategies on the households, the community at large and women and girls in particular (both positive and negative strategies employed)

.....

.....

.....

.....

8. In what ways did community leaders and communities support each other during the drought? Please give examples where possible.

.....

.....

.....

.....

9. What community structures and capacities currently exist to assist households to cope with drought? Can you tell us about these and how well they work?

.....

.....

.....

.....

10. What institutions, agencies, structures and capacities currently exist to assist the community to cope with drought? Can you tell us about these and how well they work?

.....

.....

.....

.....

11. Briefly describe the support mechanisms or systems that your department or institution has in place as part of preparedness or response to natural disaster like drought?

.....

.....

.....

.....

12. In what way did your institution intervene in the 2015/16 El Niño induced drought, what role you played if any?

.....

.....

.....

.....

13. What challenges does your institution or department face in responding to natural disasters like drought?

.....

.....

.....

.....

14. How would you describe the current status of the most affected households in the aftermath of the drought-would you say they are **better off, worse off, same as before the drought?** Give reasons why?

.....

.....

.....

.....

15. Briefly describe how government and other agencies responded to the drought in question? What roles did they play? Would you say the response was timely and effective?

.....

.....

.....

.....

16. What would you recommend for improved drought preparedness and response mechanisms by stakeholder for this community and other similar communities?

.....

.....

.....

.....

17. What do you think can be done better by households and communities to mitigate the drought impact?

.....

.....

.....

.....

Thank you for your cooperation