DROUGHT RISK EFFECTS ON LIVELIHOODS OF RURAL COMMUNITIES IN CHIPINGE SOUTH, ZIMBABWE

By

CLEMANCE JOSIAH MUTEKWA

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DECLARATION

I, the undersigned, hereby declare that the work contained in this dissertation is my own original work, that all sources used or quoted, have been indicated and acknowledged by means of complete references, and that this dissertation was not previously submitted by me or any other person at any other university for a degree.

Name : Mutekwa Clemance Josiah

Signature : ……..

Date : ……..

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DEDICATION

I would like to dedicate this research to my wife Sencia Dhoro, my daughter Charlotte and my son Tinashe. I also dedicate this research to all the households in Chipinge South, Zimbabwe who are experiencing recurrent droughts which present a difficult situation in their daily lives as they strive to provide basics to their families.

ABSTRACT

This study seeks to understand the effects of drought risk on the livelihoods of rural communities in Chipinge South, Zimbabwe. It explores the main sources of the livelihood of the rural community in Chipinge South and how drought plays a role in shaping their lives negatively or positively. This study will also look at efforts made by government and other organizations such as NGOs and CBOs, to provide services and goods to the community, and how this is affected by droughts. Such arguments have been used to withdraw, or reduce aid. Secondly, the study assesses whether the food aid promoted livelihood strategies as a way of building resilience to further shocks.

A mixed method approach, which includes quantitative and qualitative techniques, was used in this research. It made use of a structured questionnaire which was administered to a random sample from the case study area of Chipinge South. The questionnaires were administered through interviews with households guided by the questions on the questionnaire. Focus group discussions, with local authorities of Chipinge district, local traditional leaders, government field workers, NGO field workers and villagers, were held. Observations were also used to gain a sense of the status quo in the villages. Sampling was done in two stages to enable systematic sampling of the wards, and then randomly sample individual households from the sampled wards. Secondary information was sourced from Parliamentary Reports since Chipinge South is a Parliamentary constituency on its own.

The study discovered that there is a relationship between the effects of drought risks and the sources of livelihoods of the households in the Chipinge South Community. Most households sampled, showed that they depend on farming as their major source of livelihood, and on the other hand most households fail to harvest more crops for sale. The failure to sale is attributed to poor harvests because of drought, causing most households to have below US$1 000 as their average income per annum.

It is recommended that development of the area in aspects such as rural electrification, service provision, infrastructure and decentralising of viral services can improve the conditions in the community and allow for diversification of the sources of livelihood.

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LIST OF ACRONYMS

AAI : Action Aid International
AAH : Action Against Hunger
ACF : Action Contre la Faim
AIDS : Acquired Immune Deficiency Syndrome
ARC : African Risk Capacity
AREX : Agricultural Research and Extension
AGRITEX : Agricultural Technical and Extension Services (Old name before AREX)
ATR : African Traditional Religion
CRED : Centre for Research on Epidemiological Diseases
CBOs : Community Based Organisations
CH_4 : Methane
CPU : Civil Protection Unit
CO_2 : Carbon Dioxide
CSO : Central Statistics Office
DA : District Administrator
DRC : Democratic Republic of Congo
DMC : Drought Monitoring Centre
DDF : District Development Fund
EPA : United States Environmental Protection Agency
EC : European Commision
EDII : European Drought Impact report Inventory
EDR : European Drought Reference
EMA : Environmental Management Agency
ENSO : El nino Southern Oscillation
EU : European Union
EW : Early Warnings
EWI : Early Warning Information
EWS : Early Warning Systems
FAO : Food and Agricultural Organisation
FEWSNET : Famine Early Warning System Network
GAR : Global Assessment Report
GCE : General Certificate of Education
GDIS : Global Drought Information Systems
GDP : Gross Domestic Product
GoZ : Government of Zimbabwe

Gvt : Government
HIV : Human Immunodeficiciency Virus
IFAS : Institute of Food and Agricultural Sciences
INGC : Instituto Nacional de Gestão de Calamidades
IOM : InternationalOrganisation for Migration
IPCC : Intergovernmental Panel on Climate Change
ISDR : International Strategy for Disaster Reduction
MSD : Meteorological Services Department
n.d : Not Dated
NDMC : National Drought Mitigation Centre
NEWU : Zimbabwe's National Early Warning Unit
NGOs : Non-Governmental Organisations
NR : Natural region
NRZ : National Railways of Zimbabwe
^{o}C : Degrees Celcius
O_3 : Ozone
RBZ : Reserve Bank of Zimbabwe
N_2O : Nitrogen Oxide
SADC : Southern African Development Community
SMS's : Short Messages Services
SPSS : Statistical Package for the Social Sciences
SSTA : Sea Surface Temperature Analysis
SSA : Sub-Saharan Africa
TCPL : Total Consumption Poverty Line
UN : United Nations
UNDP : United Nations Development Programme
UNISDR : United Nations International Strategy for Disaster Reduction
UNOCHA : United Nations Office for the Coordination of Humanitarian Affairs
USA : United States of America
USAID : United States Agency for International Development
USDA : United States Department of Agriculture
US$: United States Dollar
WFP : World Food Programme
ZESA : Zimbabwe Electricity Supply Authority
ZIMSTAT : Zimbabwe National Statistics Agency

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CHAPTER ONE

RESEARCH PROPOSAL

1.1. **Introduction**

The most complex and the least understood of all natural hazards, which affect more people than any other, is drought (Water Encyclopedia, n.d.). It is argued in support to the preceding statement that, "*Drought affected more than one billion people between 1994 and 2013, or 25% of the global total. This is despite the fact that droughts accounted for just 5% of disaster events in this period*" (CRED, 2015, p. 7). Risks associated with droughts are less understood, compared to those associated with tropical cyclones and floods, moreover drought is seen as a less visible risk without systematically recorded losses and impacts all because of slow introduction of standard ways for measuring and collecting data for droughts (Preventionweb/UNISDR, 2011). People tend to focus more on the lack of adequate rainfall as the major drive for drought impacts while ignoring other factors such as political marginalisation and rural poverty, which assist in translating meteorological drought into a widespread disaster.

Drought is a phenomenon linked to inadequate rainfall due to a change in the rainfall patterns or a below-normal rainfall. Drought is not a permanent phenomenon of the climate, but is a phenomenon which regularly occurs. The onset of drought is not instantaneous but is characterised by a progressive deterioration of conditions. When drought comes to an end, it is not abrupt and conditions will only improve gradually. This makes it difficult to measure the onset and end of drought, hence making both incidences processes rather than events (Wilhite, 2011).

There is no single way of detecting the onset of drought and its intensity. The impacts of drought on communities are usually difficult to measure and it is non-structural. Impacts of a drought usually occur within large areas, making it a challenging task to effectively assess and respond to the affected communities. The effects seem to increase if the drought extends from one season to the next.

The challenges of drought are highlighted in the SSA and only touch on the drought risk management strategies, especially the issue of technology and policy options which can be used to manage drought risks in order to protect livelihoods and reduce vulnerability (Shiferaw, et al., 2014). It is argued that drought is one of the natural hazard posing a threat to livelihoods of people and community socio-economic development (UNISDR, 2009, p. iii). It is acknowledged that most of the small scale farmers in SSA are relying on

rain-fed agriculture for their livelihood. As a result, they are afflicted by variances of weather and climate (Gautam, 2006).

It is argued that droughts vary according to characteristics and impacts. This is the reason why drought does not to have a universally recognised definition. Since drought is a slow onset hazard, it is possible to check the root causes, people's vulnerability, unsafe conditions which are related to poverty, the strength of local economy, the livelihoods that are at risk, absence of strategies and plans, poor institutional capacities and resources. If these issues are well understood by the authorities and the communities, it may pave a way for drought mitigation and preparedness, as pointed out by UNISDR in the Drought Risk Reduction Framework and Practices in contribution to the implementation of the Hyogo Framework of Action (UNISDR, 2009).

Even though there is no universally accepted definition of drought, it is defined as a period of unusual dryness experienced in both wet or cold areas and semi-arid areas of the tropics (Borton & Nicholds, 1994). A generally accepted definition of drought was given as "*a temporary reduction in water or moisture availability significantly below the normal or expected amount for a specified period*" (Reed, 1997, p. 98) (Borton & Nicholds, 1994, p. 12). This explains the physical nature of a drought which encompasses meteorological drought and hydrological drought. The way these two types of drought affect agriculture and the entire economy leads to agricultural drought and economic drought. The definition is supported by the argument that the reduction is temporary, significant, in relation to the norm of the area and the period for the basis of the norm is specified (Borton & Nicholds, 1994).

"*Meteorological drought describes a situation where there is a reduction in rainfall for a specified period (day, month, season, or year) below a specified amount – usually defined as some proportion of the long term average for the specified time period*" (Borton & Nicholds, 1994, p. 15). This definition involves only precipitation statistics to conclude that there is a meteorological drought.

"*Hydrological drought defined by expressions of deficiencies in surface and subsurface water supplies*" (Hisdal & Tallaksen, 2000, p. 3). The definition involves data on the availability and off take rates of water in relation to the normal requirements of the system (domestic, industrial, irrigated agricultural) being supplied (Borton & Nicholds, 1994).

Agricultural drought is defined principally in terms of soil moisture and plant behaviour whereas socio-economic drought occurs when the demand for an economic good is more

than the supply rate due to weather-related deficit in water supply (Maliva & Missimer, 2012).

Drought impacts on people or communities as a result of water deficiency or and the imbalance of water demand and its availability. Drought occurs anywhere regardless of the climatic conditions since it is relative to the normal rainfall of the area. Droughts can occur in areas which receive low rainfall, semi-arid areas or even those areas which receive high rainfall. UNISDR concurs with Reed (1997) when it says drought is a deficiency of precipitation over an extended period of time, usually a season or more, which results in water shortage of some activity, group or environmental sectors (UNISDR, 2009, p. 5).

Droughts and floods alone are believed to account for 80% loss of lives and 70% of the economic losses in SSA (Bhavnani, 2008). Various researches were done in Zimbabwe and SSA which indicates that it has come to terms with the nature, impacts and remedies to droughts. This study is not an extension of efforts of previous researchers but will address the effects of drought risks on livelihoods of rural communities in less developed countries with a specific focus on Zimbabwe's southern parts of Chipinge district.

This study will uncover effects such as economic losses, social impact, political impact and the long term effects on the development of the communities caused by droughts. The effects of colonialism will also be investigated and how the post-colonial government failed to implement planned projects to alleviate poverty by making the communities resilient to hazards such as drought in Chipinge South.

In order to have a better understanding of why droughts continue to ravage rural communities in less developed countries, this research will investigate the reasons why droughts seem to be unbearable events in rural communities, yet they are also inevitable in most instances. The Chipinge South area will be used as a case study to the problem of drought and its effects on livelihoods of rural communities which rely on subsistence farming. Findings drawn from this research will be used to provide recommendations on how the problem of the effects of droughts on people's livelihoods can be reduced, if not avoided.

1.2. **Background**

Drought exacerbates the poverty levels in rural communities such as Chipinge South due to the lack of irrigation systems and exhaustion of the land. Moreover, for many years, Zimbabwe has experienced high poverty levels and famine (Rankomise, 2015). Drought directly affects production, lives, health, livelihoods, assets and infrastructure which

contribute to lack of food security and poverty in the southern parts of the Chipinge district. Drought is believed to indirectly degrade the environment and lower the welfare of households by affecting the prices of livestock and crops (Zimmerman & Carter, 2003). This is because people try to cope with their daily needs since they will not be able to supply themselves from their own harvest due to drought. Desperation forces them accept any amount for their menial disposable belongings.

Food security in the Chipinge South area can be achieved by encouraging the public and private sectors to revamp and expand the irrigation developments along the Save river (Jaka, 2009). Drought in this area led to participation of a number of NGOs like Christian Care and Plan International with the aid of WFP to provide food to the affected families in the area. The efforts of the NGOs are sometimes retarded by lack of proper infrastructure like roads due to lack of implementation of developmental projects in the area.

Zimbabwe is a former British colony and the country became independent in 1980. Colonial rule marginalised the rural areas where black communities were disadvantaged and not provided with the necessary infrastructure which help the communities realise better livelihoods. Instead, they focused the attention on urban areas and commercial farming areas. After independence, the new government was slow in correcting the mistakes they inherited. Most of the villages in Chipinge South such as Tuzuka, Mwangazi, Muumbe, Nyazvikari, Zamuchiya, Maria, to mention a few, are still lacking proper infrastructure such as roads, electricity, dams, boreholes and health centres in the form of clinics. Action Aid International (AAI) reported that, "*Although the economy has stabilised due to the use of the multi-currency system, it remained stagnant in 2012 mainly due to limited growth and low capacity utilisation (below 50%) in key sectors such as agriculture and manufacturing*" (Action Aid International, 2012).

During droughts the communities suffer due to a lack of food and water to feed their families and livestock. Their livestock are not spared from these droughts and it leads to a double loss of livelihood, both from livestock and crops, and low food provisions expose them to severe poverty. There are few boreholes where people can collect water, or where they can source water for their livestock. The poor road network in the area also makes it difficult for relief organisations to deliver grain to the affected families during droughts. Starving people end up walking long distances (in the range of 10km to 20km) to the Tanganda – Chiredzi highway to access food resources.

Since 2000, continuous food aid to the Chipinge South area by NGOs, raises some questions to whether this will be accepted as a norm or if it has become a problem that needs an immediate solution. This calls for means of reducing the risk from droughts in

this area by empowering the communities through other means. The added effect of climate change and global warming did not spare the Chipinge South area, hence the reason why it is continually experiencing drought since the beginning of the twenty-first century.

1.3. **Description of Study Area**

The Chipinge South Constituency is located in the extreme south of the Manicaland Province, bordering on Mozambique to the east and south. It comprises of 12 wards, namely ward 16 and ward 20 to 30. The area is arid and lies in a valley. It covers approximately 5 393km^2 with the whole district of Chipinge having a total population of approximately 298 841 people, 68 291 households and an average household size of 4.4 as of 2014 statistics from 2012 census (ZIMSTAT, 2015). Chipinge South has both Natural Region 3, 4 and 5. Zimbabwe is divided into five agro-ecological regions, known as natural regions, on the basis of the rainfall regime, soil quality and vegetation among other factors. NR III is semi-intensive farming with average rainfall ranging 650-800mm, NR IV is semi-intensive farming with average rainfall of 450-650mm and NR V is extensive farming with average rainfall below 600mm (UN/OCHA, 2012).The quality of the land resource declines from Natural Region (NR) I through to NR V (Moyo, 2000; Vincent and Thomas, 1961) in (FAO, n.d.).

Crop yields are generally poor; thus the constituency is prone to food insecurities. Poverty levels are also high as people rely more on humanitarian organisations for food aid (Parliament of Zimbabwe, 2011). The area is rural and characterised by poor communities whose livelihood depends solely on subsistence farming, although they sometimes manage to sell surplus produce during successful harvests, which are not very common since the year 2000. Drought has been a recurrent phenomenon since the year 2000 unlike years before the millennium.

"*Climate change related effects continue to dominate smallholder systems of Zimbabwe that are dependent on rain-fed agriculture. Zimbabwe as a whole has an unreliable rainfall regime and is impacted by one to three severe droughts every ten years, which represent a risk to the livelihood systems of smallholder farmers that depend on rain-fed agriculture*" (Action Against Hunger/ ACF International, 2014).

The staple food in Zimbabwe is *sadza* made from maize meal and relish, which can be made from vegetables and meat. Most families in this area are not used to buying maize meal from shops, instead they take maize grain to the grinding meal which makes life more affordable, rather than buying processed maize meal. The occurrence and reoccurrence of drought in these areas therefore expose them to risk of hunger and

malnutrition. In 2008, amid the worst economic era of Zimbabwe, coupled with poor harvest, people were importing maize meal from South Africa to Zimbabwe and it was sold at exorbitant prices, which the poor and marginalised could not afford. The vulnerable population, i.e. the poor, women, children and the elderly, are exposed to high risk during droughts.

Chipinge South is found along the highway from Tanganda Halt on the way to Chiredzi, with the greater part situated on the southern and northern part of the highway. Most parts of Chipinge South lie on the rain-shadow of the eastern highland mountains. This geographical situation makes most of the rainfall received in this area orographic rainfall, caused by winds from the Indian Ocean, which releases moisture on the windward side of the eastern highlands, and by the time the winds blow over the leeward side they will be dry, hence bringing little or no rain to the area. The vegetation is more drought resistant, evidenced by the acacia, baobab and other hardwoods such as *musharu*, which are typical low-veld trees. The area lies between the Sabi river and Musirizwi river which are the perennial rivers that are found to be closer to the area, but too far for people to rely on them.

Zimbabwe is one of the countries believed to be vulnerable to climate change due to various factors, as most of the country relies on rain-fed subsistence agriculture exposing it to vicissitude of weather patterns, (Intergovernmental Panel on Climate Change(IPCC), 2010; Tigere, 2010; Chamunoda, 2011) in (Mutambara & Mutambara, 2014). This geographical location makes the area susceptible to droughts and therefore not advisable for communities to rely on rain-fed agriculture. This is endorsed by the fact that modernisation is about exchanging of older agriculture practices with something more recent (Smith 1973) in (Matunhu, 2011) . On the contrary, there is a lack of irrigation facilities and water harvesting methods which exposes the communities to droughts.

1.4. **Research Problem**

This study is aimed at studying the effect of drought risks on the livelihood of rural communities in the Chipinge district, focusing mainly on Chipinge South. This study intends to find ways of reducing risks associated with drought. This will also assist in determining ways of building capacity within the communities focusing on drought risks rather than providing food aid, and a promotion of a dependency syndrome which exposes them to further risk if the aid organisations move out of the area.

1.5. **Research Questions**

(i) What are the drought risks to rural communities?

(ii) What are the effects of drought risks to the livelihoods of rural communities?

(iii) What are the mitigation measures in place to cope with drought risks:- good farming practices and early warning systems for droughts in the district?
(iv) What are the beliefs and practices that maybe exacerbating the drought conditions?

1.6. **Hypothesis**

1.6.1. **Null Hypothesis**

There is no relationship between the effects of drought risks and the livelihood of communities.

1.6.2. **Alternative Hypothesis**

There is a relationship between the effects of drought risks and the livelihood of communities.

1.7. **Research Aim and Objectives**

1.7.1. **Aim of the Study**

This research is aimed at finding out what the risks associated with drought are in the rural communities of Chipinge District and how they impact the livelihood of the community members of Chipinge South in the event of drought. This research will also look at how best the government can implement activities that will help reduce the impacts of drought risks on the communities' livelihood and improve their resilience.

1.7.2. **Main Objective**

To investigate the impacts of drought risks on the livelihoods of communities in Chipinge South.

1.7.3. **Sub-Objectives**

- To investigate or identify the drought risks prevailing in the area.
- To find out the major sources of livelihoods of the community members.
- To find out the beliefs and practices of the communities with respect to drought.
- To investigate the mitigation, preparedness and coping capacities of the communities.
- To find out the policies and structures in place for improving livelihoods.

1.8. **Significance of the Study**

This research will assist in the Planning, Civil Protection and Agricultural Extension departments if they consider and implement the findings and recommendations in their future development and drought management plans. It may assist the communities in this area to derive ways of securing food reserves to rely on during times of drought. A number of mitigation measures will be availed to the communities to reduce their risk to

drought and may motivate them to move towards building resilient communities in the event of a drought.

The livelihood of the communities will be expected to improve through knowledge and recommendations that will be put forward in the study. The communities are expected to develop a positive attitude towards preserving their environment and practising good farming methods which may reduce drought risks. They may also devise more successful water harvesting methods to sustain their livelihood and at the same time preserve the water resources.

1.9. **Research Methodology**

1.9.1. **Research Design**

A case study approach will be used within the Chipinge South area to investigate the effects of drought on the rural communities' livelihood. This may assist in improving livelihoods to increase capacity and resilience of rural communities when drought occurs. A case study is argued to yield valuable results in social sciences and behavioural sciences (Cook & Campbell, 1979:p 96) in (Babbie & Mouton, 2001). The limited time for the research makes a case study suitable for this research since the study will focus on one district and gather the necessary information which is thorough rather than by engaging a wider area with little information because of the time limit. This idea is supported by the view that a case study can be defined as an intensive investigation which is done on a single unit (Handle, 1991; Runyan, 1982 & Yin, 1994) in (Babbie & Mouton, 2001).

1.9.2. **Target Population and Sampling**

Since this is a case study of Chipinge South, the whole area will be considered, by sampling households randomly using random numbers in the wards which make up Chipinge South. The 12 wards will be subdivided into villages where the respondents to interviews will be selected.

There are 7 296 households with the average household size of 4 people per household in the district. The population for this study is the entire populace of households in Chipinge South and the sample will constitute of people from Ward 21, 22 and 23. The wards were selected on basis of accessibility and the idea to reduce transport costs for field officers. Chipinge South constituted 24% of the population of Chipinge district from the 2011 report (Parliament of Zimbabwe, 2011). This will be used to calculate the samples size. A sample of 110 households will be used for data collection. The sample will be randomly selected using random numbers assigned to households in villages.

1.9.3. **Data Collection**

The data for the research will be collected using a survey structured questionnaire through individual interviews. The structured questionnaire will be used to collect data on the demographics of the households; forms of livelihoods; farming practices and beliefs; mitigation, preparedness and coping capacities; institutions and policies in place and general economic level of the households. The interviews will be conducted with individuals from different groups in the communities like village headman, the elderly men and women, the youth, churches, politicians like Member of Parliament for the constituency.

Focus group interviews will also be conducted to accommodate organisations of youth, churches and political organisations. This will assist to get information which had more meaning since would be from a group which gathered and created meaning among them. If things are discussed with colleagues, there is room for correction so that the correct information is captured.

1.9.4. **Data Analysis**

Data collected using questionnaires will be coded using numbers for easy input into the computer software program SPSS. The coding system will help to quantify responses into percentages of the sample size. This also helps the researcher to see the popular responses in all the aspects addressed by the questionnaire with respect to the set objectives.

The data collected from structured responses will be analysed through content analysis which include categorising the information and noting any patterns, beliefs, human activities which exacerbates drought situations. The patterns identified in the analysis will be interpreted and described to explain the relationship with the literature and the guided questions.

Textual criticism will also be employed to analyse the collected information to refine the important ideas that relate to the research topic so as to answer the posed research questions. Where possible the discourse analysis will be also used to check the consistency of the collected information.

1.10. **Limitations of the study**

The findings of this study might not be applicable in other districts which have different conditions than Chipinge south. Dynamic changes in the capacity of the communities may not guarantee the same scenario to prevail hence making the study to be time and space

limited. Availability of funds to conduct the interviews may be limited hence limiting the number of people or communities who will participate in this study.

There is also the possibility of biased results since participants in this research may not tell the truth fearing political confrontations or thinking that it is a politically motivated research, because the area once experienced political violence in the past years. Thorough explanations will be afforded to participants to avoid possibility of bias. Permission will be sought from the chief and headman to make sure the research accumulates authentic data.

Finally, inaccessibility of communities in the district due to bad roads may limit the number of communities to be interviewed or participate in this research. However, efforts will be made to make sure that all vulnerable components of the communities take part in the study to make it more representative and accurate in exposing the issues associated with drought risks in the area.

1.11. **Delimitations**

Chipinge South is an area bounded by a line drawn from the intersection of the northern boundary of Musikavanhu Communal Land with the Save River, eastwards along that boundary to its intersection with the north-western boundary of the former Vergenoeg of Eureka; it extends southwards and northwards along the boundaries of the Vergernoeg and Chikore; the western boundaries of the former Vergernoeg and Chikore, and the western, southern and southern-eastern boundaries of Nyagadza to the northernmost beacon of Sabi 59 (Parliament of Zimbabwe, n.d.).

It includes Ndowoyo Communal Land and Sabi Purchase Land going eastwards along their northern boundaries and stretches to the north-eastern beacon of Jersey. It again stretches southwards along the western boundary of Jersey to its intersection with the Zimbabwe-Mozambique international boundary and goes southwards along the boundary to the Save River, and up the Save River to the starting point. Chipinge South constituency is made up of twelve rural wards and most of the wards are characterised by high NGO activities that are operating in different fields of human development.

1.12. **Ethical Considerations.**

There are steps that need to be followed before the researcher can collect information from the people in the village. The Ethical clearance letter of approval will be acquired from the University of the Free State to serve as proof of permission to carry out the research by the University of the Free State to the District Administrator of Chipinge district and the chiefs in the affected areas. To avoid being charged with treason,

permission will be sought from the District Administrator for Chipinge District, Chief Musikavanhu for Chipinge South area and the village headmen in the various wards. This will be done to give assurance that the information to be collected is not meant to sell out to enemies of the state.

The credentials of respondents to the interviews will be confidential and they are not required to write names on the questionnaires. The questions will be structured in a way which categorises information rather than asking for specific values or information which is sensitive to disclose.

1.13. **Conclusion**

A conclusion will be derived from the findings to see if the research questions have been all answered and the findings from the research and the researcher's recommendations to the community, authorities, relief or aid organisations and other stakeholders.

1.14. **Structure of the report**

The study's report is divided into five chapters as follows:

1.14.1. **Chapter One: Introduction**

The introductory chapter focuses on the background of the study area and what led to the researcher to embark on this research. The statement of the problem will also be included in this chapter as well as the research objectives and the questions leading to this research. This chapter unfolds the structure of the whole report.

1.14.2. **Chapter Two: Literature Review**

Since research is continuous and evolving, the analysis of the views of other scholars pertaining to drought, its economic, social, political impacts and how it affects livelihoods will be analysed in this chapter not forgetting the previous findings by other scholars as well. This assists the researcher to check if it is justified to proceed with the research and how to tackle the problem of drought risks having seen what was done by other researchers. This chapter also presents an overview of Chipinge South and the drought problems.

1.14.3. **Chapter Three: Research Methods**

This chapter dwells on the research tools used to collect data and collate data. The advantages and disadvantages of chosen methods of data collection and collation vis-a-vis the study area, ethical considerations and implications as well as the time allocated for the research.

1.14.4. **Chapter Four: Research Results and Analysis**

A deep and focused analysis will be done in this chapter on the basis of the data collected from the survey. The chapter also touches on the policies or statutes that are in place towards reducing the impact of droughts on communities' livelihoods.

1.14.5. **Chapter Five: Conclusion and Recommendations**

Facts drawn from the analysis will be synthesised looking into the findings on impacts of droughts on livelihoods. This chapter will also explore whether enough has been done to reduce exposure of people to impacts of droughts on their livelihoods and how this can best be attended to in order to reduce chances of communities being exposed to the impacts of droughts in the event that a drought occurs in the near future. This chapter will also look into the extent to which the research objectives will be achieved.

CHAPTER TWO

LITERATURE REVIEW

2.1. **Introduction**

Drought is defined as a natural hazard and a threat to people's livelihoods and the community's socio-economic development (UNISDR, 2009). Drought is one of the most serious hazards which result in significant economic, social and environmental costs (Vogt & Somma, 2000). Since drought is a slow onset hazard, there is time to identify the root causes, people's vulnerability and unsafe conditions which are related to poverty; the local economy's strength; the livelihoods which are at risk; absence of strategies and plans and poor institutional capacities and resources. If these issues are well understood by the authorities and the communities it would pave way for drought mitigation and preparedness (UNISDR, 2009).

2.2. **Definition of Drought**

"*Drought is the consequence of a natural reduction in the amount of precipitation received over an extended period of time, usually a season or more in length, although other climatic factors (such as high temperatures, high winds, and low relative humidity) are often associated with it in many regions of the world and can significantly aggravate the severity of the event*" (Wilhite, 2000, p. 7). This statement is supported by Sivakumar when he defines drought as the consequence of a natural reduction in the amount of precipitation over extended period of time, usually a season or more in length, often associated with other climatic factors (such as high temperatures, high winds and low relative humidity) that can aggravate the severity of the event (Sivakumar, et al., 2005).

"*Drought is a sustained and regionally extensive occurrence of below average natural water availability. It is mainly caused by low precipitation and high evaporation rates, but in regions with a cold climate, temperatures below zero can also give rise to a winter drought*" (van Lanen, et al., 2007). This makes it clear that drought is not only expected in dry and hot areas only, but also within areas experiencing cold weather. Drought is relative to normal rainfall, and therefore extremely wet areas can experience a drought without looking dry. A combination of below normal rainfall and high temperatures promote drought conditions when such conditions prolong for relatively long time than normal. "*Drought results from long continued dry weather and/or insufficiency of rain, which causes exhaustion of soil moisture, depletion of underground water supply and reduction of stream flow*" (Rathore, 2005).

The drought impacts people or communities as a result of water deficiency and the imbalance of water demand and its availability. This is supported by Ngaira (2004) when

he defines drought as "*a form of environmental stress that originates from a deficiency in precipitation over an extended period of time long enough to cause moisture deficiency, biotic loss, crop failure, loss of lives both human and bovine and general hardships*" (Huho, et al., 2010).

Drought refers to scarcity of water, adversely affecting various sectors of human society, like agriculture, hydropower generation, water supply and industry. A combination of droughts or successive droughts coupled with human activities may result in desertification in areas that are already vulnerable like the arid, semiarid and dry sub-humid areas whereby soil structure and soil fertility are degraded and bio-productive resources decrease or are depleted, (Kundzewicz, 1997) in (Panu & Sharma, 2002).

Drought occurs anywhere regardless of the climatic conditions. Droughts can occur in areas which receive low rainfall, semi-arid areas or even those areas which receive high rainfall. This is supported by Wilhite and Glantz when they said," Drought occurs in high as well as in low rainfall areas. It is a condition relative to some long-term average condition of balance between rainfall and evapo-transpiration in a particular area, a condition often perceived as "normal." Yet average rainfall does not provide an adequate statistical measure of rainfall characteristics in a given region, especially in the drier areas" (Wilhite & Glantz, 1985).

Drought is a "creeping phenomenon" which is difficult to predict its beginning or end (Wilhite & Glantz, 1985). This implies that drought is a slow onset phenomenon which is unlike other hazards that are abrupt like earthquakes and floods.

(UNISDR, 2009) also concur with (Wilhite, 2000) by saying drought is a deficiency of precipitation over an extended period of time, usually a season or more, which results in a water shortage of some activity, group or environmental sectors.

The definition of droughts needs to consider (Dracup et al. 1980) in (Maliva & Missimer, 2012).

> *"• nature of the water deficit that is being considered (e.g., precipitation, stream flow, soil moisture)*
> *• averaging period (e.g., days, months, years)*
> *• selection of the truncation level (cut off) to separate droughts from the remainder of the time and*
> *• regional aspects."*

2.3. **Types of Droughts**

Drought can be classified into four categories namely meteorological, agricultural, hydrological drought and Socio-economic drought (Wilhite, 2000). This is also supported by The American Red Cross Society (Ditoro, 2016). All type of drought emanate from a deficiency in precipitation (Sivakumar, et al., 2010).

2.3.1. **Meteorological Drought**

"*Drought is a prolonged period of dry weather caused by a lack of precipitation that results in a serious water shortage for some activity, population, or ecological system*" (EPA, 2014). This shows that it is a natural event caused by climatic conditions which vary according to location. It is normally caused by low precipitation than the normal average rainfall expected. The extent of dryness compared to the normal and the period of dry conditions makes the type of drought to be meteorologically determined.

"*Drought can be considered to be strictly meteorological phenomenon. It can be evaluated as a meteorological anomaly characterized by a prolonged and abnormal moisture deficiency*" (Palmer, 1965, p. 1). The American Meteorological Society defines drought as a prolonged and abnormal moisture deficiency (Palmer, 1965). It is also argued that meteorological drought is determined by the threshold of precipitation deficiency over a predetermined period of time and the precipitation threshold chosen (e.g. 75% of normal precipitation) and duration period (of about 6 months) which can vary according to location and the needs associated with the location or users (Sivakumar, et al., 2005).

This meteorological definition of drought focuses on precipitation amounts fall below average for a longer period of time than expected. Maliva & Missimer (2012) concur with the previous author by perceiving meteorological drought in terms of precipitation deficiencies, in absolute amounts for a given period of time (NDMC, 2006). Meteorological drought can also be identified by be the degree of dryness compared to "normal" or average amount precipitation; and the duration of the dry period and there is emphasis that the definition of meteorological drought is region specific as a result of the fact that different places have different conditions which result in precipitation deficiency (Monacelli, et al., 2005). The author also focuses on precipitation as the main aspect of meteorological definition of drought just like the other previous authors.

2.3.2. **Hydrological Drought**

Hydrological drought can be defined as a declining amount of water resources such as land and underground water, lakes and reservoirs (Dracup et al. 1980, Klemeš 1987 in (Wilhite, 2000). There is need to bear in mind that, in the same manner the agricultural drought, the underground and surface waters have no direct relationship with precipitation

since hydrological storages are exposed to variety of uses such as irrigation, recreation, tourism, flood controls, transportation, power generation, domestic, ecosystem and environmental preservation.

In general, it is viewed as reduced stream flow as compared to normal conditions (Gornall, et al., 2010). Drought is fundamentally distinguished from aridity, which is a long term phenomenon of climatic conditions whilst a drought is a temporary phenomenon that constitutes water deficit (Maliva & Missimer, 2012). This means an arid region can experience drought if the water levels are below the expected normal.

It is noted that if drought conditions persist, it may lead to the onset of drier conditions because of climate change, hence the need to re-evaluate what is deemed to be normal (Agnew & Anderson, 1992) in (Maliva & Missimer, 2012). The latter authors went on to define hydrological drought as reduction in groundwater levels, stream flow, lake and reservoir storage. This is regardless of whether it is an arid region or not.

"*Hydrological drought is normally defined by deficiencies in surface and subsurface water supplies relative to average conditions at various points in time through the seasons*" (UNISDR, 2009). Hydrological drought is perceived as a situation where a hydrological system lacks water which is shown by below normal stream flow in rivers and below normal levels in lakes, reservoirs and ground water (Van Loon, 2015). The author went on to indicate that hydrological drought affects drinking water supply, crop production, recreational facilities, electricity production and water transport.

"*Hydrological drought refers to a prolonged period with below-normal water availability in rivers and streams, and lakes, or groundwater bodies due to natural causes*" (Van Lanen, et al., 2013, p. 1716). It is further noted that indicators of hydrological drought are different from those of meteorological drought (Peters et al,2006; Tallaksen, 2009) in (Van Lanen, et al., 2013).

2.3.3. **Agricultural Drought**

An agricultural drought is identified as the effects of meteorological and hydrological droughts on crops and livestock. Agricultural drought is perceived as, "*lake of availability of soil water to support crop and forage growth.*....." (UNISDR, 2007, p. 5). A famine drought is a form of extreme agricultural drought where severe food shortages cause substantial numbers of people to be malnourished or to die. "*It is defined more commonly by the availability of soil water to support crop and forage growth than by the departure of normal precipitation over some specific period of time*" (Sivakumar, et al., 2010). This

suggests the reason being absence of direct relationship between precipitation and infiltration of precipitation into the soil.

This is supported by the fact that infiltration is determined by factors like antecedent moisture conditions; slope; soil type and intensity of precipitation events (Sivakumar, et al., 2010). In reality, this suggests that an area can receive above average rainfall or precipitation but still lacks moisture in the soil because of conditions not conducive for infiltration to take place effectively. Hence, agricultural drought does not depend much on precipitation but rather availability of soil moisture.

Agricultural drought is also defined as principally outlined by soil moisture and behaviour of plants (NDMC, 2006 in Maliva & Missimer, 2012; Matthai, 1979) in (Maliva & Missimer, 2012). Agricultural drought is also taken as a link between aspects of meteorological and hydrological drought to how they affect agriculture but with much focus on shortages in precipitation, the variations in actual and potential evapo-transpiration, soil water deficit, reduced ground water or surface water reservoirs (Monacelli, et al., 2005).

There is cohesion of ideas from different authors where agricultural drought is understood as deficiency in soil moisture and the increased plant stress (NDMC, 2006) in (Maliva & Missimer, 2012) and (Gornall, et al., 2010). In general, agricultural drought occurs when there is no enough moisture to support average crop production on farms or any agricultural activity that primarily depends on availability of moisture in the soil. This is evident in the various definitions of different authors.

It is also clear that agricultural drought is not solely linked to dry, hot periods of low precipitation but can still take place even when average precipitation is achieved. This is mainly caused by the conditions of the soil and agricultural techniques that which maybe requiring more water to produce meaningful harvest.

Agricultural drought is experienced in situations where moisture available in the soil fails to match the needs of certain crops at a specific time. It is also noted that agricultural drought follows meteorological drought and precedes hydrological drought (IFAS, 1998). This shows that agricultural activities are the first ones to be affected by drought. Furthermore, agricultural drought is characterised by a deficit in water availability for crop or plant growth. It is elaborated that even though deficiencies in precipitation are significant in this case, the severity of this type of drought is more associated with soil moisture deficiency which is deemed the most critical factor determining production potential of crops in agriculture (ISDR, 2003).

2.3.4. **Socio-economic Drought**

Socio-economic drought is different from the other three in the sense that it looks at the link between supply and demand of commodities or economic goods such as water, livestock forage, or hydro-electric power which highly depend on the levels of precipitation in the area. Socio-economic drought is also viewed as the imbalance between supply and demand of water to society which ends up affecting social and economic activities (Gornall, et al., 2010). This also touches on the relationship between human activities and drought such as poor land-use which impacts on vulnerability to future droughts.

The idea is supported by the definition which views socio-economic drought as a situation where there is high demand for an economic good exceeding supply because of weather related shortage of water (Maliva & Missimer, 2012). This happens in most Southern African countries where maize grain is on high demand during drought spells. This is because of the fact that it is a staple food for most of the countries in the sub-Saharan African region. In most cases, this is caused by shortages or shortfalls in precipitation and water in the reservoirs to produce maize.

Chipinge South is not spared from any of the above mentioned occurrences of drought. The area is subject to all these types. In the early 2000's the area experienced socio-economic droughts and in 1982 and 1992 there was a combination of meteorological and hydrological drought. IOM indicated that drought is one of the causes of forced migration in Chipinge hence encourage farmers to opt for off-farming livelihoods since Chipinge is one of the areas that are drought prone (IOM, n.d.).

2.4. **Progression of Drought**

Figure 1 below shows how drought progresses or advances from one type to the next as time progresses. Some types of drought emanate from others. Meteorological drought if prolonged leads to agricultural drought and if it persists the result will be hydrological drought and finally socio-economic drought.

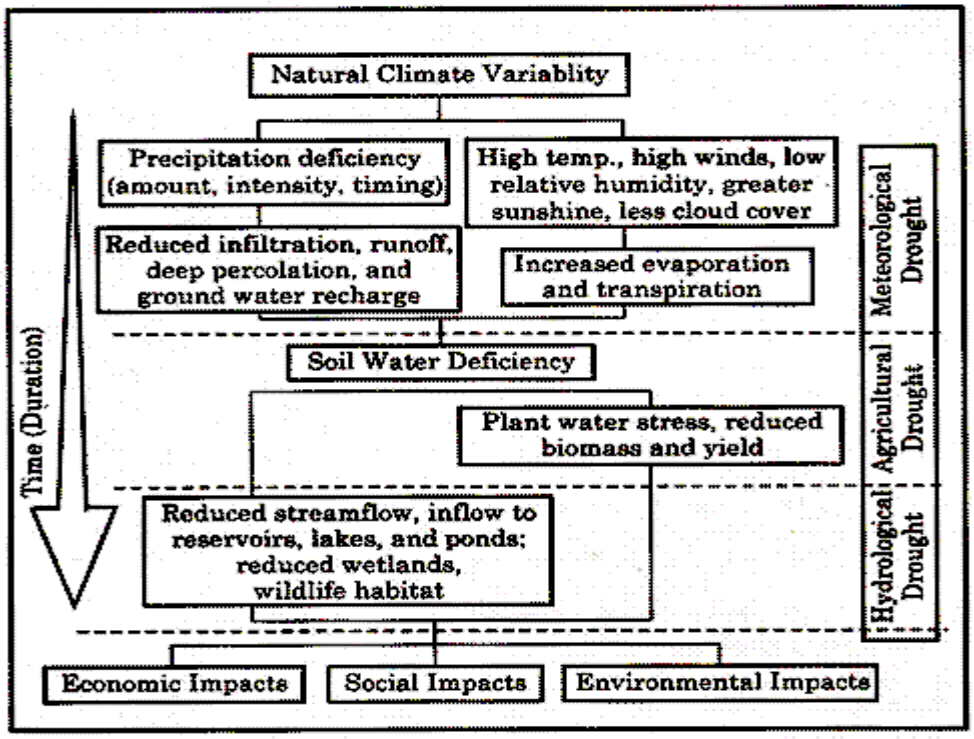

Figure 2.1: Progression of Drought

Adopted from Puja Mondal, Essay on Drought.
http://www.yourarticlelibrary.com/essay/drought-essay-on-drought-with-diagrams/28195/

2.5. **An International Perspective of Drought**

2.5.1. **Drought in America**

"*The likelihood of extended periods of severe drought, similar to conditions experienced centuries ago, and its effects on 21st-century society in the United States raise several issues for Congress*" (Folger, et al., 2013). Drought is therefore not a new phenomenon to the Americans. It may not be affecting the whole United States of America, but there are areas which had been victims of drought in one way or another.

The quotation above is supported by the events summarized below. "*Drought has afflicted portions of North America for thousands of years*" (Folger, et al., 2013). Severe, prolonged drought are suggested to be one of the contributing factors towards the disintegration of the Pueblo society in the Southwest during the 13th century, and in the demise of central and lower Mississippi Valley societies in the 14th through 16th centuries (Folger, et al., 2013).

Droughts occurred in America even in the early 20th century. This is supported by the fact that at one moment overgrazing resulted in increased erosion and dust storms that exacerbated the Dust Bowl drought of the 1930s in the Great Plains in North America

(Dai, 2011). This author also indicates that, "*over the United States, drought causes $6–8 billion per year in damages on average, but as much as $40 billion in 1988*". The twenty-first century also is characterized by droughts and this is supported by literature that drought severity and frequency have been high during the last few decades in the West, Southeast, and Lake States, and is the reason why there is high tree mortality (USDA, 2016).

2.5.2. **Drought in Europe**

"*Drought refers to a temporary decrease in water availability, for example, when it doesn't rain over a long period of time. Water scarcity, on the other hand, occurs when demand for water exceeds the available sustainable resources*" (European Commission, 2010, p. 1). The same report indicated that main droughts in the twenty-first century in the European Union occurred in 2002, 2003, 2005 and 2007-2008. The 2007-2008 drought had a wider coverage followed by the 2003 whilst others affected selected areas but not as big as the other two.

> *Since 1980, the number of droughts in Europe has increased, and they have become more severe, costing an estimated €100 billion over the past 30 years. One of the worst droughts occurred in 2003, when one-third of EU territory and over 100 million people were affected. Between 1976 and 2006, the number of people and areas hit by drought rose by almost 20%, and the yearly average cost has quadrupled* (European Commission, 2010, p. 2).

The results of an analysis done by using the European Drought Impact report Inventory (EDII), shows that impacts on agriculture and public water supply dominate the data collected for drought impact reports for most countries and for all major drought events since the 1970s (Stahl, et al., 2015).

In 2015 a similar situation to summer of 2003 occurred in June and July when greater part of the EU experienced severe drought as a result of shortage of rain coupled with high temperatures. This caused plants water requirement to be high and subsequently causing high evapo-transpiration. France, Benelux, Germany, Hungary, the Czech Republic, northern Italy, and northern Spain were noted to have experienced exceptional conditions (European Commission, 2015).

This information shows that drought is not an unusual occurrence in Europe, it has been a common feature in the EU causing unprecedented costs to the continent. The history of droughts in EU also shows highest cost in 2003 of more than 11.6 billion Euros and the lowest cost was in 2008 with a cost of 0.15 billion Euros (Horizons, 2009).

Table 2.1: Major European drought events included in the EDR database

Year	Location	Approximate Duration
1959	Northern Europe	05/1959 – 02/1960
1972	Northern/ Eastern Europe	12/1971 – 07/1972
1973	Central Europe	01/1973 – 07/1973
1975-1976	Europe	11/1975 – 02/1977
1989-1990	Mediterranean	02/1989 – 10/1990
1991 – 1995	Mediterranean	02/1992 – 10/1994
1996-1997	Northern Europe	04/1995 – 07/1996
2000	East /South East Europe	01/2001 – 03/2001
2003	Europe	04/2003 – 11/2003
2004-2007	Iberian Peninsula	07/2004 – 06/2007
2007	Eastern Europe	02/2007 - 08/2007

Adopted from European Drought Reference (EDR) database

Url: http://www.geo.uio.no/edc/droughtdb

2.5.3. **Drought in Asia**

"*Droughts that occurred in China during 1950–2010 can be clustered into three periods: 1959– 1961, 1978–1982, and 1987–2003. The top three years in terms of the maximum drought disaster area are 2000, 2001 and 1997*" (Zhang & Zhou, 2014, p. 7). This means drought did not spare Asia and have been a common feature in the continent.

In China, many natural hazards occur every year which result in massive economic losses. Among these natural disasters, the area affected by drought is the most severe (Zhang 2012 GDIS workshop) in (Zhang & Zhou, 2014, p. 5).

"*The Near East Region is one of the most water-scarce regions in the world, with a regional annual average of 1,700 cubic meters (m^3) of water available per person in 2005*" (FAO, 2007) in (FAO, 2008, p. 1). These levels are very low compared to the regional lows which varied from a low of 8 m^3 per person in Kuwait to as much as 7,134 m^3 in Kazakhstan in 2005.

Besides the scarcity of rainfall in most areas in the region, rivers are also highly variable and not easy to manage, ground water is being exploited at an alarming rate, and on the other hand water pollution is reducing the number of safe and quality water sources

(Shetty, 2006) in (FAO, 2008). “Drought is a recurrent feature in the Near East Region that results in significant social, environmental, and economic impacts” (FAO, 2008, p. 5).

“*The twenty-first century brought severe drought conditions to much of the Near East region. In Central and Southwest Asia, the drought was reported to be the worst in 50 years, causing widespread social and economic impacts, particularly in Iran, Afghanistan, western Pakistan, Tajikistan, Uzbekistan, and Turkmenistan*” (Agrawala et al., 2001) in (FAO, 2008, p. 10)

Drought disaster was reported to remain significant problem in the Asian and Pacific region because of global warming and human activity. Countries in South-West and Central Asia are the most affected and have challenges on drought mitigation plans than other countries in Asia because of pronounced drought coupled with the effects of protracted socio-political disturbances (Liu, 2007).

2.5.4. **Drought in Australia**

” *Drought has deeply affected Australia throughout its history. The Millennium Drought from 1996-2010 serves as a recent reminder of the wide-reaching impacts that drought can have on Australia’s people and environment*” (Steffen, 2015, p. 1). Australia is known as one of the driest and arid continents on Earth and drought is a significant feature of Australia’s climate.

Droughts occur regularly in Australia and the inhabitants have learnt to live with drought as well as the associated ugly effects. As if this is not enough there are high chances that Climate change will make drought worse in the southeast and southwest, some of the most populous regions in Australia (Steffen, 2015).

Major droughts in Australia since 1850 were noted to be 1864-1866; 1880-1886; 1888; 1895-1903; 1911-1916; 1918-1920; 1939-1945; 1963-1968; 1972-1973; 1982-1983; 1991-1995; and 2002-2003. Out of these twelve major droughts the severe ones were 1885-1903; 1963-1968; 1982-1983 and 2002-2003 (Jacaranda Project, 2005).

Australia also suffered regular or recurrent droughts between 2002 and 2010. Based on FAO statistics, total Australia yield of wheat decreased by 46% in 2006 and the yield was below 1960-2010 yield trend level (FAO, n.d.).

2.5.5. **Drought in Africa**

“*Drought and desertification are at the core of serious challenges and threats facing sustainable development in Africa. These problems have far reaching adverse impacts on human health, food security, economic activity, physical infrastructure, natural resources*

and the environment, and national and global security" (UN, 2007, p. 3). This means drought is still a big challenge which needs effective mitigation measures in Africa.

Besides drought being a serious challenge, it also causes massive economic loss in the production sector and food aid. "*It is noted that droughts significantly threaten record GDP growth in sub-Saharan Africa. A 1-in-10 year drought event could have an estimated adverse impact of 4 percent on the annual GDP of Malawi, with even larger impacts for 1-in-15 and 1-in-25 year events*" (ARC, 2012).

Drought is the natural hazard that has the most severe impacts on the greater part of the population in Africa with most devastating consequences which lead to famine. The two highest death tolls in 1974 and 2007 in Ethiopia and or Sudan and the Sahel region with figures of 450 000 and 325 000 respectively was as a result of drought (Vincente-Seranno, et al., 2012).

> *Most of the studies based on instrumental records indicate that droughts have become more frequent, intense and widespread during the last 50 years. The extreme droughts of 1972–1973, 1983–1984 and 1991–1992 were continental in nature and stand unique in the available records. Additionally, many severe and prolonged droughts were recorded in the recent past such as the 1999–2002 drought in northwest Africa, 1970s and 1980s droughts in western Africa (Sahel), 2010–2011 drought in eastern Africa (Horn of Africa) and 2001–2003 drought in southern and south eastern Africa, to name a few*. (Masih, et al., 2014, p. 3635).

The types of drought mentioned above did not spare Southern Africa, and Zimbabwe was a victim to most of them, only that the country was still deemed the bread basket of Africa. Droughts which occurred after the millennium were worse for Zimbabwe because of the associated economic meltdown. This has seen the country receiving food from different NGOs to avoid droughts ending into famine.

2.6. **Causes of drought**

Meteorological droughts are caused by disturbances in the atmospheric circulation (Wilhite,2000) in (Dube, 2008, p. 3). Weather conditions like anticyclones or high pressure systems which can cover an area for a long period of time result in subsiding air and drought. Zimbabwe in 2001/2002 farming season experienced a dry spell from January 2002 to March 2002. This dry spell was characterised by very low rainfall. This was linked to a subtropical anticyclone.

EL Nino conditions are associated with drought in Africa. It is argued that sea surface temperature anomalies (SSTA's) linked to EL Nino southern oscillations (ENSO) events in the pacific cause invasion of warm waters into called waters of the coast of South America and usually coincide with droughts in Africa and other countries like Australia, India, Brazil and USA (Reed, 1997, p. 99).

In addition, human activities cause drought through land-use practices which promote desertification like deforestation, over cultivation, overgrazing, monoculture and irrigation schemes which are not well managed. Population pressure has led people in Africa to abandon traditional practices like nomadic pastoralism which was a coping system for controlling drought promoting practices.

Economic policies can also cause droughts where government policies fail to promote food security and development of water reservoirs like dams for irrigation. Zimbabwe found itself experiencing problems leading to drought due to poorly planned land redistribution and Chipinge South has a portion which was affected by the land redistribution programme and most irrigation facilities were mismanaged by the new farmers. This led to worse drought conditions in the millennium (2000-2002).

To further explore this topic, other authors' views on definitions of some climatological terms and associated global warming factors are necessary.

Atmosphere is the blanket of air that surrounds the earth which is both horizontally and vertically thereby causing variations in weather and climate. The atmosphere absorbs energy from the sun, that is where recycling of water and other chemicals take place. The atmosphere also experiences electrical and magnetic forces which provide a moderate climate. The earth is shield from high radiation of energy by the atmosphere (Ramamasy & Baas, 2007).

Weather is the current condition of the atmosphere in a given place at a specific time which includes variables like temperature, rainfall, wind or humidity (Ramamasy & Baas, 2007) (Baede, et al., n.d.). The author went on to distinguish between weather and climate, where weather is the condition experienced at a place now, or is most likely to take place tomorrow or sometime in the near future. **Climate** is taken to be "average" weather for a given place or a region and defines associated weather conditions for a given area based on long-term averages. Traditionally, climate is viewed as the description in terms of the mean and variability of relevant atmospheric variables like temperature, precipitation and wind (Goosse, et al., 2010).

Climate variability is defined as climatic parameter of a region varying from its long-term mean. It usually happens that every year in a specific time period, the climate of a place is different where some years record below average precipitation, some are characterized by average or above average precipitation (Ramamasy & Baas, 2007).

> *"These changes result from atmospheric and oceanic circulation, caused mostly by differential heating of the sun on earth. The atmosphere and ocean circulate in three dimensions and each acts on the other. The atmosphere moves faster than the ocean, but the ocean stores a large amount of heat and releases it slowly over long periods. Thus, the ocean acts as a memory in this circulation. These atmosphere-ocean circulations cause climate to vary from season-to-season or year-to-year time periods",* (Ramamasy & Baas, 2007, p. 2).

Climate change is linked to both natural variability and anthropogenic factors. Although variation in climate elements is in most instances associated with natural forces, however, due to changes in the earth's climate since the era before industrialisation, some of these changes are now considered to be caused by human activities (Ramamasy & Baas, 2007).

The climate of an area can change because of natural changes, either within the climate system (such as in the oceans or atmosphere) or outside (such as in the amount of solar energy reaching the Earth) such as volcanic activity which is an earth-based event but taken to be outside the climate system with significant effect on climate change (Trenberth, et al., 2000).

"*At the root of climate change is global warming caused by anthropogenic emissions of carbon dioxide (CO_2), methane, and other greenhouse gases. The warming occurs worldwide and temperatures are rising on the African land mass and in the surrounding oceans*" (Helm & Hepburn, 2009, p. 125). The author also argues that combinations of clear climate change effects are experienced in Africa and there is evidence that the African continent is warming than the global average and this is assumed to continue.

In Africa, climate change seems to be substantially contributing to many regional climate changes which are detrimental to some areas and beneficial to other regions. There are three things that are a cause for concern, like the fact that there is evidence that Africa is warming faster than the global average and this is likely to continue. On the other hand the size of the African continent is so enormous that the climatic effects differ depending

on the location within the continent, hence there is no Africa-wide climate effect (Collier, et al., 2008).

Another author supports this by noting that it is important to recognise that the climate of Africa is naturally highly diverse and highly variable. It comprises of the extremes such as the Saharan deserts which are very arid and on the other hand the extreme humidity of the Congo rainforest (Conway, 2009).

The author goes on to stress that agriculture is the largest single economic activity in Africa which accounts for around 60 per cent of employment and in most countries the sector contributes more than 50 per cent of GDP. This means climate change has immediate and direct effects which surpass those experienced in other regions of the world.

The enhanced greenhouse effect is strongly believed to be the result of human activities that exacerbated concentrations of greenhouse gases and aerosols in the atmosphere from time dating back to the pre-industrial era. The concentration of major greenhouse gases in the atmosphere which include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and ozone (O_3) in the atmosphere is very much believed to be promoting greenhouse effect (Ramamasy & Baas, 2007). The same authors argue that these gases reached their highest levels ever recorded in the 1990s, mainly as a result of combustion of fossil fuels, agriculture, and land-use changes.

Attributed to the greenhouse effect, are the surface temperatures in the northern hemisphere which increased by a bigger margin during the twentieth century than for any other century in the past 1000 years. Statistically, the global mean surface temperature rose by 0.6±0.2°C and the number of hot days experienced in a year went up in most areas. On the other hand, cold days reduced in number in almost all land areas (IPCC, 2001) in (Ramamasy & Baas, 2007).

"*The climate of Africa is warmer than it was 100 years ago and model-based predictions of future GHG-induced climate change for the continent clearly suggest that this warming will continue and, in most scenarios, accelerate*" (Hulme et al. 2001; Christensen et al. 2007) in (Herrero, et al., 2010). Documented records reveal that the 20th century has seen the African continent warming up at a rate of about 0.05°C per decade with noticeable higher rate of warming in the June–November seasons than in December–May (Hulme et al. 2001) in (Herrero, et al., 2010). The climate of the African continent is influenced by complex maritime and terrestrial interactions which result in a variety of

climates across various regions, such as from the humid tropics to the hyper-arid Sahara, (Christensen et al., 2007).

2.7. **Effects of Drought**

"Drought is assessed based on frequency of occurrence, severity, affected area, economic damages, environmental and social effects and severe long term impacts. It is a very important and dangerous phenomenon compared to other disasters" (Nosrati & Kazemi 2011) in (Golmohammadi, 2012). Effects of natural disasters like drought on the economy of a region can be split into direct and indirect effects (Cheng et al. 2011; Yin, Yin, and Xu 2011) in (Yingzhi, et al., 2013). "Effects of drought can be grouped into sectors: Economic, environmental and social" (Reed, 1997, p. 101).

> *"Direct effects are characterized by abruptness and refer to direct physical damage caused by natural disasters on production factors and products. Indirect effects are derivatives of direct effects and refer to impacts of output and supply dislocation between economic sectors caused by natural disasters. Indirect effects of drought are always more serious than direct effects because agriculture is the foundation of economy and is always hit first by drought (Wu et al. 2009)"* in (Yingzhi, et al., 2013).

The direct effects of drought are also perceived to contribute to reductions in output and loss in revenues for agricultural producers. Indirect effects are deemed to be the lost revenues from upstream and downstream entities on the supply chain mainly because of reduction in output which is experienced by the directly impacted producers (Bauman, et al., 2013).

Drought effects are classified in three realms and this is also supported by the NDMC when their article on types of drought said, "The many different drought impacts are often grouped as "economic," "environmental," and "social" impacts. All of these impacts must be considered in planning for and responding to drought conditions" (NDMC, 2016)

2.7.1. **Economic Effects**

"*The economic evaluation of drought impacts is essential in order to define efficient and sustainable management and mitigation strategies*" (Gil, et al., 2013). This is rubberstamped by the fact that if economic impacts of the drought are quantified, it is of importance in terms of both informing current efforts of coming up with mitigation measures to the impacts of the current drought, and also helps in the designing policy

which can make these areas more prepared and resilient to future periods of drought (Bauman, et al., 2013).

It is noted that drought usually causes economic and financial challenges for agricultural production and also that if it persists for some years it can cause huge and devastating agro-economic problems as well as serious economic hardships for agricultural production and businesses that are agriculturally-based in rural communities (Johnson & Smith, 2003). Economic impacts are referred to as impacts of drought which cost people (or businesses) money (NDMC, 2016).To support this, drought is seen to be historically causing direct and indirect economic, social, and environmental problems throughout the world (Glantz, et al., 2007).

The effects that a drought may have on macro-economic variables, such as the economic growth rate, investment, the current account of the balance of payments, inflation and employment all seem to have financial implications for farmers and the government (Pretorious & Smal, Undated) . The authors went on to argue that the South African Reserve Bank's macro-econometric model was used to estimate the extent of the damage caused by the previous drought in 1992.

> *"Drought-induced economic losses include those resulting from impaired dairy and beef, crop, timber, and fishery production; lack of power for industrial use; decline in agriculture-dependent industries; increased unemployment in agriculture and other drought-affected industries; strain on financial institutions (capital shortfalls, credit risks); loss of revenue to state and local governments (from reduced tax base); reduced navigability of waterways; and increased costs for transport of water and development of new sources (Wilhite and Glantz, 1985). Such effects are felt by municipalities, business and industry, agricultural enterprises, households and individuals, and governments"* (Glantz, et al., 2007).

Drought slows the growth rate of the economy of a country. Most countries in Southern Africa have agro-based economies, although they do not solely depend on agriculture as a source of revenue it is clear that agriculture contributes a greater percentage to the GDP of most countries in the region. This is supported by the fact that measures of GDP over time reveal that economic downturns often result from a drought. "*For example, in the year after the 1984 droughts in Sub-Saharan Africa, the GDP for Mali, Niger, and Ethiopia*

fell by 9 percent, 18 percent, and 7 percent, respectively. Zimbabwe's GDP declined 3 percent after the 1983 drought "(Benson and Clay, 1994) in (Glantz, et al., 2007).

Drought impact directly on production on farms which reduces the expected harvest hence reduces income to farmers which end up having a ripple effect on taxes that the farmers have to inject in the economy both in terms of local sales and exports. Farmers export fresh vegetables, flowers, beef and poultry meat as well as pork and mutton within the region, across the African continent and overseas. "*The ramifications of drought are extended throughout the economy. Zimbabwe faced enormous economic losses as a result of the 1982/83 drought, including US$ 360 million in direct agricultural losses and US$ 120 million in drought relief costs"* (Ogallo, 1987) in (Glantz, et al., 2007).

Economic bilateral agreements between countries are affected by drought when countries fail to meet their agreed terms on quantities due to shortages posed by the drought. Pressure to meet the export targets also result in local shortages within a country, consequently forcing prices to go up as supply fails to meet demand. "*Regardless of the motivations behind the reduction in stocks, the fact is that even before the planting of the 1991/92 crop, Zimbabwe faced food shortage problems. It is difficult to say whether the GoZ was prodded by economic reform interests to trim storage costs, or felt compelled to fulfil its regional supplier role by exporting maize to politically strategic countries like Mozambique and Zambia, or was reluctant to admit to the decline in its maize production*" (Glantz, et al., 2007).

Table 2.2: Timing of Zimbabwe's maize exports 6

Year	Time Period	Exports (tonnes)
1990	January – March	463,000
	April – December	268,000
	Total for the year	731,000
1991	January – March	187,000
	April – June	95,800
	July – December	124,200
	Total for the year	407,000
1992	Calendar Year	10,000
1993	Calendar Year	195,000
1994	Calendar Year	546,000

Adopted from (Central Statistics Office, 1996) in (Glantz, et al., 2007)

Unemployment rates increase as farmers scale down their labour force due to dropping figures on production. Unemployment is seen as one of the variables affected indirectly by drought, which is so evident in agricultural sector. Though it is not analysed on economic

terms in Gil's research, it is rather measured in terms of the number of jobs lost (Gil, et al., 2013).

> *Drought has also economic effects such as income losses, loss to industries directly dependent on agricultural production, decreased land prices, unemployment from drought-related declines in production, strain on financial institutions (foreclosures, more credit risk, capital shortfalls), reduction of economic development, fewer agricultural producers (due to bankruptcies, new occupations), rural population loss (NDMC, 2010)* in (Dellal & McCarl, 2010).

A research done in Ebo River Basin in Spain estimated a total employment loss due to drought of 11 275 jobs, and losses directly linked to agriculture, forestry and fisheries of 8094 jobs (Pérez y Pérez and Barreiro-Hurlé, 2009) (Gil, et al., 2013, p. 2691). This indicates a relationship between drought and agricultural employment. Agricultural production is a primary industry which in turn affects the processing companies since there will be short supply of raw materials. Secondary industry factories will have no option except to have skeletal workforce.

Volumes of food imports increase as the drought worsens and this may increase debt for the country in the region and internationally. This is illustrated in the case of Malawi where droughts also have macroeconomic implications evidenced by tobacco which accounts for a third of the country's export earnings. Thus, if demand for maize imports goes up whilst tobacco production and exports decline, it makes Malawi's exchange rate to depreciate (Pauw & Thurlow, 2009). The 2015/2016 drought has seen Zimbabwe importing grain from South Africa and Zambia in the SADC region thereby straining the economy which is already in an unpleasant situation because of lack of production industries and poor production on farms even in years of good rains.

Power generation also is not spared since dam water levels continue to dwindle during droughts as evidenced by the Lake Kariba case in Zimbabwe and Zambia. Countries end up importing electricity from neighbouring countries like South Africa, DRC and Mozambique. This raise government expenditure due to imports of power to sustain business and domestic use of electricity.

Loss of income for financial institutions due to unpaid loans by farmers because the farmers could not get a harvest to sell so as to pay the money owed to banks. Farmers also may lose their properties which they attached as collateral for the loan towards inputs

and equipment for the farm. "*Drought impacts the marketing assistance loan program. If there is no production, there is no loan collateral*" (Johnson & Smith, 2003).

2.7.2. **Environmental Effects**

Droughts affect soil quality in the sense that soil moisture is essential for the breakdown of organic matter. Droughts reduce the quality of soils, by lessening organic activity, increasing wind erosion, and as a result soil insects or organisms perish (eSchoolToday, 2006-2014) (Owen, 2008).

Drought affect bodies of water like lakes, creeks, ponds, and lagoons, drying them out, hence killing animals that live in water. It simple amounts to habitat destruction and when aquatic animals and other wild life die, the whole food chains and ecosystems are also disrupted, (eSchoolToday, 2006-2014). Water bodies can be affected by drought like what happened in Botswana when Lake Ngami had water in the nineteenth century, but was largely dry in the twentieth century (Marshall & Maes, 1994).

Besides a decline in aquatic life, drought also reduces the quality of water because reduced water flow reduces dilution of pollutants but increases contamination of remaining sources of water (Golmohammadi, 2012) (Owen, 2008).

Drought contributes to desertification, which occurs when fertile lands like vegetation lands or forests become bare and infertile, mainly as a result of overgrazing and overstocking, deforestation and veld or runaway fires, (eSchoolToday, 2006-2014). These conditions are made worse by drought which accelerate the process of desertification and reduce any possibilities of the land reclamation or recovering (Vogel, 1994) in (Vetter, 2009).

Periods of drought result in the health and quality of Freshwater Biomes like lakes and ponds, rivers and streams being compromised. Wetlands are also affected in such a way that lives of living organisms in those habitats are endangered (eSchoolToday, 2006-2014) (Gibbons, 2006).

Drought causes animals to migrate to new areas. Wild animals travel very long distances in search of water. This results in animals ending up in new habitats with totally new experiences and threats, making them vulnerable (eSchoolToday, 2006-2014).

The quality of air decreases as a result of dust, pollutants and reduction in visibility due to droughts.

> *"Between 1933-1940, severe droughts in the great plains of the USA resulted in massive dust storms that left thick dust in the clouds for*

> *days. This dust cloud was nicknamed '**black blizzards**'. The extremely dry conditions exposed the top layers of the land to wind action. The real cause of the dust bowl is known to be the severe drought and the failure to apply crop farming methods that were resistant to wind erosion",* (eSchoolToday, 2006-2014).

2.7.3. **Social Effects**

Social effects of droughts are most probably experienced more severely, since they directly involve people. Most people in developed countries have no experience of what it feels like to live without adequate water, but in the less developed countries this is a common nightmare (eSchoolToday, 2006-2014).

The decline in rural population, reduced access to education, and serious health and well-being indicators in rural populations are all well-established trends in the event that a drought occurs (Salt, 2000; Tonts, 2000; Sidoti, 2000 and Lawrence, 1995) in (Alston & Kent, 2004).

Health has a direct relationship to the water supply of any settlement. Droughts have significant influence on the quality of water that people use. Clean fresh water for drinking, cleaning and sanitation help communities prevent and manage diseases.

> *"Hunger, malnutrition, anaemia and mortality impacts of droughts are indirect in nature. Droughts cause low food production (crops and livestock), and particularly in poorer regions, people have less to eat. Food nutrition also is a problem, and that leads to vulnerability, diseases/illness and deaths. This is particularly so in remote communities of poorer countries, where communication and accessibility is usually poor"* (eSchoolToday, 2006-2014).

During drought people migrate to other areas with better alternatives, in search of better living conditions. Migration of young people makes the area they are abandoning vulnerable, left in the hands of the aged and children who cannot boost production in the area. Subsistence farm families are the most affected when other members migrate. This strains the lives of farming communities in rural areas around the world (eSchoolToday, 2006-2014). It is argued that, "as many as 50 million could become environmental refugees if the world did not act to support sustainable development" (Park, 2011).

"*Anxiety, stress and the generally low and drained feeling of not knowing when things will improve can have a negative effect on people*", (eSchoolToday, 2006-2014). On the other

hand, community networks are disrupted and social interaction jeopardized as result there will be low esteem and people will feel to be socially isolated.

2.8. **Drought Risks to Rural Communities**

Unlike the risks associated with tropical cyclones and floods, those associated with drought remain less understood. Drought is initially a less visible risk (Global Assessment Report, 2011).

2.8.1. **Conflict**

Drought contributes to the likelihood of conflict by causing displacement and migration, increasing competition for scarce resources and exacerbating ethnic tensions, and by encouraging poor rural farmers to join armed resistance groups (Barnett and Adger, 2007; Reuveny, 2007) in (Global Assessment Report, 2011). Since the 1950s, drought precipitated waves of migration and contributed to intense conflicts in India and Bangladesh, and drought during the 1980s and 1990s were a factor that precipitated ethnic conflict and border skirmishes between Mauritania and Senegal (Reuveny, 2007) in (Global Assessment Report, 2011). A 1,100-year analysis of drought in equatorial East Africa found evidence of drought induced famine, political unrest and large-scale migration during the six centuries before 1895 (Verschuren et al., 2000) in (Global Assessment Report, 2011).

2.8.2. **Mortality and well-being**

Drought can result in deaths of community members and their well-being is affected by the occurrence of drought. The impact on nutrition which results in morbidity and mortality is the most obvious and well recognized health impact of drought (Yip, 1997; Taye et al, 2010) in (Stanke, et al., 2013). Previous research shows that there is high prevalence of malnutrition and/or mortality at the time of drought and this supports the idea that droughts affect well-being of people and ends up with deaths related to drought (Mason, 2010; Chotard, 2010) in (Stanke, et al., 2013).

2.8.3. **Rural Livelihoods**

Seventy-five percent of the farmers in Syrian Arabic Republic experienced total crop failure in the 2007/2008 drought. This saw the livestock population reduce by more than 50% after one year into the drought compared to the pre-drought period (Erian et al., 2010) in (Global Assessment Report, 2011). Matebeleland Province in Zimbabwe was reported to lose 600 000 cattle amid the fears of a severe 2015/2016 drought. The Chronicle Newspaper reported that 99% of the cattle in the province could be lost (News 24, 2015). There is risk of losing livestock whenever there is drought, either through lack of grazing lands and water or selling to pay debts and put food on the table.

2.8.4. **Increased Poverty**

Mozambique is one of the few countries in the SADC region with a disaster database on drought losses that are systematic which makes the real scale of drought risk visible (INGC, 2010) in (Global Assessment Report, 2011). It is noted that since 1990, drought events destroyed 8 million hectares of crops which is only half of what was destroyed and affected 11.5 million people (Global Assessment Report, 2011). It was estimated in 2012 that 72% of the population of Zimbabwe was living below the national poverty datum line and that 11.5% of the population was in severe poverty ([UNDP] 2013a, 2013b) in (Mamvura, et al., 2015).

2.8.5. **Migration**

In the Syrian Arab Republic, a million people migrated from rural areas to cities after experiencing recurrent droughts and crop failures from 2007–2009 (Erian et al., 2010) in (Global Assessment Report, 2011). In another case half of rural Mexican people responded to both recurring droughts and low rural livelihoods in the twentieth century by fleeing to urban centres (Neri and Briones, 2010) in (Global Assessment Report, 2011).

In Zimbabwe this is seen by the influx of people in cities like Harare where everyone is trying to make a living from buying and selling since there is no hope of harvesting if one plants something in the fields. The people who migrate to towns face new challenges and are at more risk when they experience hardships because of drought.

Drought does not affect people in rural areas or farms only. It has a ripple effect since prices of commodities are also affected by prices of raw materials and also employment opportunities dwindle. The rural areas face a challenge of being female-headed since men are the most likely to leave first to seek for greener pastures to take care of their families.

This is supported by the fact that migration causes people to alter their patterns of decision making in households and this usually leads to more female-headed households. Case studies from Jordan and Lebanon show that there will be significant changes in the family dynamics and women's public roles due to drought-associated migration (Erian et al., 2010) in (Global Assessment Report, 2011).

2.8.6. **Environmental risks**

Habitats, bodies of water, rivers and streams are not spared by effects of drought and major ecological impacts may be experienced which makes species more vulnerable thereby forcing them to migrate and ultimately leads to loss of biodiversity (Lake, 2003; NDMC, 2006; Shaw et al., 2010) in (Global Assessment Report, 2011).

"*Drought is universal phenomenon that can occur everywhere and can cause harmful impacts on human beings and natural ecosystems*" (Golmohammadi, 2012: 238). Longer periods of low or no rainfall directly damages farms, gardens, pastures, and forests whose water resources are rain fed (Golmohammadi, 2012).

2.8.7. **Suicide risks**

Concerns have been raised in Australia that drought significantly increases the cases of suicide in rural populations, especially in the male led farms and their families (Hanigan, et al., 2012). More so, it is alleged that the suicides in Australia are mainly as a result of drought associated problems (Hanigan, et al., 2012). Droughts lead to high financial stress on farmers and farming communities. Such problems may be coupled with other economic stresses like rising interest rates, falling prices of commodities from farms, or unfavourable exchange rate of the local currency against other major currencies (Hanigan, et al., 2012).

2.9. **Mitigation Measures to Cope with Drought Risks**

2.9.1. **Agricultural Institutions**

"*The provision of agricultural technical expertise and extension services is critical for long term sustainability of agriculture*", (Gono, 2005). Adequately resourcing the department of AREX and stretching its manpower resources sufficient enough to meet high demand and needs of farmers was adopted as a way of reducing the impacts of drought in Zimbabwe (Gono, 2005).

It is argued that, if nations focus on youthful energy and flexible thinking, applying minds to agricultural science, the whole world will benefit, but if this opportunity is ignored then the drought risks will lead to an abyss of poverty, hunger, environmental degradation and societal conflict (Solh & van Ginkel, 2014). This supports strengthening of agricultural institution and incorporating new ideas from the new generation in the quest to mitigate drought risks.

2.9.2. **Ensuring Uninterrupted Power Supply.**

A reliable supply of electricity is necessary for agriculture and electricity is not only required for direct agricultural activities, but also for consistent supply of inputs which include coal, fertilizer, pesticides and herbicides which depend on electricity for smooth running of production in industries (Gono, 2005). "*Power outages have been high and are still affecting firms (industry), farms, mines and households*" (Kaseke, Volume 2, No.10, October 2013). This entails that regular load shedding which characterized Zimbabwe

early 2000 to date have significant impact on production in farms, hence there is need for RBZ to support ZESA to ensure that power supply is less disrupted.

2.9.3. **Regular Fuel Supplies**

There is a great need for a consistent and regular supply of fuel such as diesel and petrol to support preparations of land to arrest the situations of rains coming when land is not prepared. Irregular supplies of fuel hamper land preparation as well as tillage programs (Gono, 2005). The government has to make sure that there is a backup of fuel imports other than the lately unreliable private sector importers. Lack of regular fuel supplies is one of the draw backs identified among several issues that hamper shift and the subsequent re-initiation of a solid, positive growth path for agriculture (Anseeuw, et al., 2012).

2.9.4. **Regular Supply of Coal**

Coal is used for drying crops such as tobacco which bring foreign currency in the country. "*Adequate supplies of coal are required for a range of agricultural activities, but most notably for the tobacco subsector*" (Gono, 2005, p. 21). The supply of coal to the various sectors of agriculture where it is needed, depends on volumes produced at Hwange Colliery which is also affected by power cuts and fuel supplies. Efficient running of various sectors sees successful operations in various sectors.

2.9.5. **Rail and Road Networks**

Transportation of coal affects production of tobacco in the country. Transportation of fuel affects all the sectors of agriculture. "*The supply of coal is dependent on production by Hwange Colliery and efficient railage by the National Railways of Zimbabwe (NRZ). Over the past few years, NRZ was faced with serious capacity challenges*" (Gono, 2005, pp. 21-22). Road networks are also a factor since transport operators may select destinations looking into factors like accessibility and conditions of roads.

2.9.6. **Dams and Irrigation**

"*Changes in climatic conditions and weather patterns clearly indicate recurring drought conditions for the SADC countries*" (Gono, 2005, p. 22). This type of background shows that agricultural recovery is now dependent much upon development of dams and irrigation infrastructure. Zimbabwe needs to construct a number of dams to sustain reasonable production in the agricultural sector and avoid worse situations during drought years.

2.9.7. **Agricultural Financing**

Agricultural production requires extensive financing for both working capital and initial capital expenditures. Government funding of agriculture from budgetary process should be sufficient to meet national agricultural financing requirements (Gono, 2005). This means agricultural production needs to be among high priority sectors to ensure that there is food security even in bad years.

2.9.8. **Labour Market**

"*Currently the agricultural sector is characterized by shortage of both skilled and unskilled labour* "(Gono, 2005, p. 24). This calls for a comprehensive training of labour, both new and those already in the field to address shortages of labour. The problem of people shunning working on farms can also be addressed by research into farm mechanization which suits the needs of the vast majority of farmers including communal farmers.

2.10. **Drought Coping Capacities**

"*Communities that have lived under drought situations for many generations develop coping strategies to lessen the impact of drought. Recently, people in southern Africa have developed effective responses to alleviate the ravages of drought on their communities. These indigenous responses go a long way in alleviating food shortages caused by droughts*" (FAO, 1997) in (Masendeke & Shoko, 2014, p. 137).

2.10.1. **Migration**

During the drought years most people migrate from communal areas to urban areas to look for better livelihoods. People in Chipinge South even migrate to as far as South Africa. Migration reduces the risk of drought effects since the migrants get jobs in their new locations and sent money home to their families. "*Mobility has increased in many countries in southern Africa where climatic variability and declining agricultural productivity, among other stresses, have jeopardised rural livelihoods*" (Potts, 2006; Sall et al., 2011; Simon and Leck, 2010; Stringer et al., 2010) in (Brown, et al., 2012)

2.10.2. **Reduced Consumption**

Households in rural communities reduce the quantity and number of meals during drought to allow their reserves to last longer to avoid the high prices of commodities which results in high expenditure. Most families consume two meals a day to avoid depleting their food reserves and skyrocketing prices in years of drought. It is argued that reduction in the number of meals taken dail is a common seasonal phenomenon during the hectic period which helps households to cope with drought (Kinsey, et al., 1998).

This is supported by a research conducted in Mberengwa in Zimbabwe where communities that have experienced drought situations for some generations come up with coping strategies to reduce the impact of drought. Reducing consumption usually starts by reducing the number of meals and subsquently resort to migration and disposing assets like livestock in exchange for cash to buy food (FAO, 1997) in (Masendeke & Shoko, 2014)

2.10.3. **Drought Tolerant Farming Practices**

Communal farmers usually address the problem of drought through various faming methods like planting early varieties, planting early, river valley tillage, barter trade, destocking andbegging to mention a few. Some farmers are slowly discarding the idea of growing maize as the main crop. They are shifting to the use of traditional crops e.g. small grains, i.e. millets, sorghums. These crops are drought resistant and therefore give a good yield even with very little rain (Shumba, 2001).

2.10.4. **Alternative Livelihoods.**

Communal farmers have now resorted to diversifying their means of livelihood. Horticulture and crafting are other means by which rural communities curb the ravage of droughts. They take their vegetables to nearby growth pionts or shopping centres. Pieces of craft are sold along the highways where people from towns and tourists become their target market. This concurs with previous research where it was noted that, "*the way out for the poor in a drought prone area is the development of non-farm rural activities, which help to boost the income and thus enable households to fend for themselves…these activities range from gardening to craft production*" (Masendeke & Shoko, 2014, pp. 138-139).

It has been noted that during the 1982-1984 drought, most households in rural parts of Southern Zimbabwe earned a living through harvesting, shelling and selling wild marula nuts, an indigenous species found in several parts in the southern low veld region (Chenje, 1994) in (Masendeke & Shoko, 2014).

2.10.5. **Asset Disposal**

Assets or belongings acquired during the good years are there to bail out communal farmers in the years of drought. "*Assets play a greater role in coping with drought as they can be converted to cash in order to buy food in during drought*" (Masendeke & Shoko, 2014, p. 139). It starts with smaller items and encrouches to the bigger possessions as the drought worsens.

The authors went on to support their point when they said, "*Smaller assets like chicken are sold first, and if conditions continue to worsen, bigger assets like livestock, ploughs and fields are also sold* (Masendeke & Shoko, 2014, p. 139). Some possessions like livestock are not valuable much during drought since they also tend to lose value because they will not be as fat and healthy as they will be when grazing lands are plenty, or markets take advantage of the situation.

It was noted in a research conducted in Bulilima and Mangwe districts when it was discovered that the main livelihood strategy in both Bulilima and Mangwe Districts was always selling of livestock (cattle, goats and chicken) because the area is not good for crop production (Ndlovu, Undated)

2.10.6. **Indigenous Weather Forecasting**

Traditional ways of predicting the weather are helpful when coping with drought conditions. They help the communal farmers to be prepared for the harsh conditions of drought. A study carried out in Mberengwa district, Ward 12 and 13, revealed that community members of these wards depend significantly on weather forecasting indicators such as the behavior of birds and celestial bodies to make adept decisions towards mitigating the severity of effects of droughts (Shoko, 2012; Shoko, 2013) in (Masendeke & Shoko, 2014).

From information gathered withing the community of Bulilima and Mangwe districts, it has been found that prior to drought conditions, birds such as guinea fowl, will not have chicks or have very few chicks; cattle will bear more bull calves; there will be less ants; there will be no circle patch around the moon (assumed to be a water) and there will be a circle patch around the sun (assumed to be water); the winter period will be longer than normal and some species of trees show differences in flowering and fruits (Ndlovu, Undated).

2.10.7. **External Assistance**

In most cases, assistance from outside the communities is in the form of Government assistance through programmes like food for work, public works projects, supplementary feeding schemes, food aid (Masendeke & Shoko, 2014). NGOs are also important stakeholders in the household external coping capacities.

Food aid has been a very popular drought mitigation strategy since 1991/92 drought where the majority of the households receive food hand-outs during times of drought due to serious food shortages (Mushore, et al., 2013). In rural communities, most households that are vulnerable benefitted from food aid in Zimbabwe and food aid programmes have been there for years since the 1991/92 drought (Munro, 2006) in (Mushore, et al., 2013).

The food Aid programmes cushion households from the extent of hunger and starvation during droughts however there are cases also of some of the households complaining that there are challenges in accessing the aid.

2.11. **Farming Practices in Chipinge South**

Traditional or indigenous farming practices have allowed small farming families to harvest from their subsistence activities despite environmental variability which posed challenges to their livelihoods. They did not depend much on modern agricultural technologies even though they were faced with climate variability challenges (Denevan, 1995) in (Altieri & Koohafkan, 2008).

"*In Zimbabwe, farmers therefore often try to compensate low yields through extensification (increasing cropping areas wherever possible), rather than intensification to meet the basic household food requirement*" (Marongwe, et al., 2011, p. 153). This type of farming makes the inputs and labour that are already inadequate to be spread over a large area and in most cases lowers the yield.

"*The loss of fertile top soil through erosion caused by conventional tillage and the expansion of cropping into unsuitable areas (e.g. steep slopes, riverbanks) has also contributed to fertility decline and yield reductions*" (Marongwe, et al., 2011, pp. 153-154).

Conservation agriculture has the potential to sustainably and significantly improve yields of various crops for farmers that are poorly resourced and even in drier agro-ecological regions (Mazvimavi, et al., 2010). "Farmers across Zimbabwe have shown a growing interest in the conservation agriculture technology with evidence of yield gains of between 10 and more than 100% depending on input levels and the experience of the farm household" (Mazvimavi et al., 2009) in (Mazvimavi, et al., 2010, p. 2).

Conservation agriculture is based on the three principles of minimum soil disturbance, retention of crop residue and crop rotations, focuses on low soil fertility, deficits in moisture and low management standards by employing technologies that promote soil fertility (precision fertilizer application, crop rotations, sequencing and interactions), using moisture in efficient ways and raising of agronomic management practices (Marongwe, et al., 2011).

Conservation agriculture is believed to improve food security for poor farmers in areas that are semi-arid in Zimbabwe and as such, needs to be protected, sustained, and promoted so that its technology helps make smallholder households benefit from their farming efforts (Mazvimavi, et al., 2010).

Most parts of Chipinge South are characterized by harsh agro-ecological, socio-economic, and climatic conditions. This pushes the less-resourced farmers to engage in small holder communal mixed farming biased more towards subsistence farming than commercial farming. Only the surplus if it is there, will be sold in the good years. “In these areas, small-scale farming is the major economic activity and households have many farming enterprises ranging from crop production to animal husbandry. These enterprises are designed to minimise or spread the risk of failure due to drought and other constraints to production” (Makanda, et al., 2009, pp. 705-706).

Most conventional tillage methods as well as spreading crops to restricted areas like steep slopes and riverbanks is likely to cause loss of fertile top soil through promotion of soil erosion hence contributing to decline in fertility and reduced yields (Marongwe, et al., 2011). Poor yields from the designated fields of communal farmers due to recurrent droughts force some farmers to encroach into the restricted areas.

> *“Recent observations, studies and research suggest that many farmers cope and even prepare for climate change, minimizing crop failure through increased use of drought-tolerant local varieties, water harvesting, extensive planting, mixed cropping, agro forestry, opportunistic weeding, wild plant gathering and a series of other traditional farming system techniques. This points to the need to re-evaluate indigenous technology as a key source of information on adaptive capacity centred on the selective, experimental and resilient capabilities of farmers in dealing with climate change”* (Altieri & Koohafkan, 2008, p. 14).

2.12. **Early Warning Systems for Droughts**

An Early Warning System (EWS), is a system which collects data to keep track on people’s access to resources and protection so as to avail notices of threats in time which stimulates appropriate responses (Stephenson, 1994; Buchanan-Smith, 2000; Monnik, 2000) in (Shamano, 2010). The Early warnings are believed to be public goods which need to be delivered to the people at risk in order to minimise future risks, (Samarajiva and Waidyanatha, 2007) in (Shamano, 2010).

In Zimbabwe, drought is considered a common hazard which accounts for six disasters out of ten from 1982 to 2012. It is associated to the El-Nino Southern Oscillations (ENSO) in the Pacific Ocean, (Brown, 2014). The author goes on to say drought occurs almost once in every two years countrywide but with more effects in the semi-arid areas.

The importance of Drought EWS is that, it:

- allows for early drought detection,
- improves response (proactive),
- triggers actions within a drought plan,
- is a critical mitigation action,
- Is a foundation of a drought plan (Svoboda, 2009).

Zimbabwe's National Early Warning Unit (NEWU) is housed under the Ministry of Agriculture and Lands which is the main source of information pertaining to crop forecasting for all sub-sectors of agriculture and for drought monitoring (Brown, 2014). Another author seems to agree with this by noting that drought monitoring in Zimbabwe is done by two main ministries, the Ministry of Environment, Water and Climate assisted by the Meteorological Services Department (MSD) and ministry of Agriculture through Agriculture Research and Extension Services (AGRITEX) (Sangombe, Undated)

NEWU works in conjunction with the Drought Mitigation Centre located at the Met Office to determine the chance of a drought occurring. The EWS constitutes sub-weather stations that are localised and have weather instruments like rain gauges, barometers, wind vanes, thermometers and computers used for modelling and analysis of weather (Brown, 2014).

All of the 10 provinces in Zimbabwe have weather stations (sub-national) manned by the Agriculture Extension service (Agritex) under supervision of the Met Office. The EWS is a 24 hour system operating 24 hours a day which continuously monitors situations with the help of hazard precursors and parameters, (Brown, 2014).

The system generates information linked to agro-meteorological use on short-term basis like period of 30 days with much emphasis on wind direction, wind speed, rainfall, temperatures coupled with an analysis on how various crops will be affected by the predicted conditions. This helps the Drought Mitigation Centre leading to perform risk assessments leading to ranking of mitigation actions, a draft of prevention strategies for drought if predicted and a plan of actions as well as how it unfolds at provincial and district level (Brown, 2014).

Early Warning Information (EWI) is distributed to different organizations of farmers by NEWU, who in turn also pass on the information to local communities. Bulletins of the information are also freely made available to different government departments, national newspapers and civil society organisations in both English and vernacular languages, (Brown, 2014) . This is also supported by Literature which notes that National Early

Warning Unit (NEWU) has mandate to conduct risk analysis, interpretation, dissemination of disaster warnings, and avail advance food security information (Chagutah 2010; EMA 2010) in (Mudombi & Nhamo, 2014)

Telecommunications companies such as Econet Wireless and radio broadcasts are also working together with NEWU make information available to farmers through SMS alerts. Besides this, awareness campaigns are done by NEWU on drought and mitigation strategies through workshops with Farmer Organisations and outreach programmes for remote communities in collaboration with NGOs like FAO, WFP, UNOCHA, and the Civil Protection Unit (Brown, 2014).

Traditional or indigenous knowledge on how to predict hazards like droughts are also useful if coupled with the modern knowledge enhanced by technology. This is supported by argument that, "It emerged that through meticulous study of plant and animal behaviour such as bird species like (Dendera and Mafudzamombe) people could easily predict the likelihood of a severe drought or low rainfall and thus would be able to adequately prepare in advance for the impending climatic catastrophe" (Gukurume, 2013, p. 96). *Dendera* is the slow demise of the great bush bird. In the *Ndau* tribe in Chipinge South if the green worms called *Nhowa* or black striped worms called *Mashonja* are too many it is a sign that there will be drought. The traditional or indigenous coping strategies are to a larger extent based on experience accumulated over the years and passed from one generation to the other (Gukurume, 2013).

Famine Early Warning System Network (FEWSNET) is one of the initiatives of USAID which covers 17 countries in the Sub-Saharan Africa. FEWSNET provides a range of information products, tools and services intended to strengthen the abilities of the countries and regional organisations to manage threats of food security through the timely provision of information, and analytical early warnings as well as vulnerability status, (Shamano, 2010).

2.13. **Beliefs and Practices Worsening Drought Conditions**

"*In Zimbabwean mythology, mermaids (njuzu) were viewed as water spirits. The mermaid spirits possessed some Zimbabweans who then became mermaid (njuzu) spirit mediums…..The water spirit mediums (majukwa) were not only restricted to rain-making but to the conservation of the whole natural environment*" (Machoko, 2013, p. 286).

There was an issue of the existence of mermaids (*njuzu*) causing operations to stop at a dam. The rumours started when water pipes were found to be blocked, and workers felt they were "haunted" at Osborne Dam in Mutare, Manicaland province. The issue

worsened to the extent that Sam Sipepa Nkomo, a Minister of Water Resources reported to the Senate that mermaids were haunting workers at the dam (Gonda, 2012; Staff Reporter, 2012) in (Machoko, 2013). This shows that there is a clash of beliefs between the Shona African Traditional Religion (ATR) devotees and Zimbabwean western modernity adherents. The later seem to align themselves to Christianity and modern technological advancement.

The two divorced beliefs can be integrated to realize a natural environmental conservation paradigm to claim the natural environment that was there before colonisation by the Europeans (Machoko, 2013). There is evidence of shunning Shona ATR by the extinction of ceremonies that used to be very common in communal areas of Zimbabwe like rainmaking ceremonies (*Mukweverera* or *Mutoro*). Water Spirits are neglected and it is now rare to see people performing rainmaking ceremonies to the Spirit mediums (Machoko, 2013). This is believed to be one of the reasons why droughts are a common feature in the country.

The destruction of the sacred forests and other water spots where the spirit mediums and mermaids were respectively believed to be found is another myth which locals in the communal areas think is another cause for droughts to occur regularly.

2.14. **Factors Contributing to Vulnerability**

"*Vulnerability in the semi-arid areas of southern Africa is a function of the existing environmental and climatic conditions coupled with governance, socio-economic, health, education, culture and human demography issues*" (Spear, et al., n.d.).

2.14.1. **Drivers of Vulnerability to drought**

Limited institutional support

Southern Africa's semi-arid areas lack adequate agricultural extension services and government ministries operate centrally which restricts the capacity and effectiveness to implement activities at a local level. Lack of markets to provide opportunities for the sale of products in an attempt to diversify livelihoods is another contributing factor on lack of institutions which can reduce vulnerability of communities to droughts. In some countries, institutions are in place but are not accessible to the rural communities. In the case of Zimbabwe, there is the Drought Monitoring Centre (DMC) which was set-up in 1989 as a regional centre for Southern Africa (Unganai, 1994).

There is a Civil Protection Act, number 5 of 1989, which is under the Ministry of Local Government, Rural and Urban Development (Betera, 2011). The department of Civil

Protection needs to have decentralized offices so as to deal with emergencies and do awareness campaigns and dissemination of information to the public.

Poverty

Semi-arid areas are usually the poorest areas in a country and such poverty makes communities in Southern Africa particularly vulnerable (David, et al., 2013). If a household is poor, its capacity will be low in terms of development and sustaining economic activities, instead poor households rely much on natural resources and what the ecosystem avails to them (Reid, et al., 2007) (Brown, 2009). These households find themselves with few resources to cope with and recover from man-made and natural disasters.

Unemployment

In rural areas of semi-arid southern Africa there are limited employment opportunities which expose the communal area people to vulnerabilities associated with hazards like drought when they occur (Twyman, et al., 2007). The scarcity of jobs outside the farming fraternity for unskilled labour makes the people even more vulnerable since most of the people are not educated and level of literacy is very low (Archer, et al., 2008). Thus, employment in the commercial and semi-commercial farms in the area is periodical, depending on which season has high demand for labour, as such it will be just complementary to their subsistence farming income not something which can sustain them for a long time (Archer, et al., 2008) .

Limited access to loans and to farmers' insurance

The lack of access to loans and lack of insurance awarded to farmers makes the farmers in communal areas more vulnerable to droughts (Zeidler, et al., 2010) (Nyambe & Belete, 2013). If farmers access loans and insurance easily, they cope and recover fast from regular disruptions, such as more frequent and intense droughts which are a result of climate change. Farmers also do not have property that they can attach to the loans as collateral which makes it difficult for the banks to give loans to the farmers. If a drought strikes, it just worsens the situation because the farmers will even sell the few that they have to buy inputs and equipment in preparation for the next season.

Low level of education and literacy

The low level of education and illiteracy persists in other countries like South Africa, where Limpopo has the highest proportion of people over 20 years old with no schooling (17,3%), followed by Mpumalanga and North West province (14,1% and 11,8% respectively) (Statistics South Africa., 2012). This makes the rural population more vulnerable to drought when it occurs since education is critical in addressing shortage of

skills and help people to access paid jobs in the Southern Africa. Low levels of education has been discovered to disadvantage people from getting well-paying jobs, as noted in South Africa for instance (Archer, et al., 2008) and in semi-arid Namibia (Reid, et al., 2007). In Zimbabwe it is a different case, since there is reasonable higher literacy level but drought still is a challenge when it occurs due to other factors.

2.14.1.6. **Population growth**

"*The earth's current population of almost six billion people is growing at a rate of 1.6% annually. In addition, the global economic product per capita is also growing at 1.5% annually. These two related trends imply increased consumption of the earth's natural resources that can lead to resource scarcities*" (Wekwete, 1995). This does not spare Zimbabwe from the problem of population growth versus its Gross Domestic Product and economic growth which seem to be not doing well. This implies pressure on unavailable resources and in times of drought things become even worse because there is also no capacity to exploit the available resources.

The greater part of the population of Zimbabwe is found in rural areas and by 1995 it was estimated to be 70% which lived in rural areas where communal farms were situated, and there is high reliance on the environment for livelihood, moreover people rely on land for cultivation of agricultural products as the main source of sustenance (Wekwete, 1995). This exerts much pressure on land and leads to land degradation which exacerbate drought conditions whenever they occur and makes people more vulnerable.

Migration

Migration of people from rural areas to towns and cities is a common feature in SADC countries. This may be due to a stronger emphasis by governments on urbanization at the expense of improving living conditions in rural areas. Neglecting rural population force people to migrate to towns in search for better livelihoods causing pressure to resources in the urban areas. Population densities usually increases in areas where there is high economic activity and/or natural resources like arable land, water and grazing fields which offer better livelihood alternatives and at the same time cause pressure to mount on natural resources and increasing vulnerability to effects of climate change (Kuvare, et al., 2008).

Health.

The capacity which handicapped people or sick people have to work as paid labour, is reduced and as such, households with disabled or sick people usually have access to less income, and depend more on their direct environment for survival (DEA, 2011). Children of farm workers may end up dropping out from school if the parents' general health is not

good since the ability to take care of the family will be compromised. People in this situation are at high risk and when a drought occurs, they will be most affected because they do not have adequate capacity to deal with the drought conditions.

"*Studies about the combined impact of drought and HIV/AIDS on agricultural livelihoods have emphasized the importance of understanding how these events place populations at risk and the strategic use of resources to access food and to care for the health of individuals*" (Baro and Deubel 2006) in (Mazzeo, 2011, p. 405). The purpose of Mazzeo's article was to show the dynamics between HIV/AIDS and drought which results in progressive worsening of poverty that compounds the vulnerabilities of households (Mazzeo, 2011).

Low livelihood diversification.

There are limited opportunities in semi-arid areas in southern Africa for diversifying livelihoods. This is in part due to the limited availability of natural resources and limited availability of markets. However, in some cases there is a lack of initiative and knowledge in terms of exploiting possible opportunities. "*A diverse portfolio of activities contributes to the sustainability of a rural livelihood because it improves its resilience in the face of adverse trends or sudden shocks. In general, increased diversity promotes greater flexibility because it allows more possibilities for substitution between opportunities that are in decline and those that are expanding*" (Munyani, 2011).

The current economic meltdown in Zimbabwe presented an opportunity for voluntary and involuntary diversification of incomes in the rural areas, where most households embark on various concurrent non-agricultural activities year round as a way of arresting the stresses of rising agricultural input prices on the market, low production on the farm as well as drought.

CHAPTER THREE

METHODOLOGY

3.1. **Case Study**

A case study is a method where the researcher explores in detail a program, an event, an activity, a process, or one or more individuals where the case(s) are limited by time and activity, and researchers collect detailed information by employing various procedures of data collection in a sustained time period (Stake, 1995) in (Creswell, 2003).

Chipinge South has 12 wards (ward16, 20 to 30) including several villages. Because of lack of funding and time constraints only five villages were selected for this research. The five villages were selected on the basis that they experience drought often and were more accessible than other villages. Remote villages would be difficult to access but the selected villages were representative of the other villages since they had the same characteristics.

A case study approach was used within the Chipinge South area to investigate the effects of drought on rural communities' livelihood. It is argued that a case study yields valuable results in social sciences and behavioural sciences (Campbell,1979) in (Babbie & Mouton, 2001, p. 280).

The limited time for the research also makes a case study suitable for this research since the study was focusing on one district to gather the necessary information which is thorough rather than engage on a big area but with little information because of time limit. "*Case study is an intensive investigation of a single unit*" (Handle, 1991; Runyan, 1982 & Yin, 1994) in (Babbie & Mouton, 2001, p. 281). The names of the villages are Rimbi, Manzvire, Muumbe, Zamuchiya and Mwangazi which bear the same characteristics as most of the other villages in Chipinge South.

"*Chipinge South Constituency has 67 611 people constituting about 24% of the District's population of 283 792. There are 7 296 households with the average household size of 4 people per household in the district*" (Parliament of Zimbabwe, 2011). A sample of 110 households was used in this research since 24% of 7 296 households is approximately 1 750 households in Chipinge South and 10% of that is approximately 175 households. A sample of 110 was arrived at after considering financial constraints for paying field officers.

3.2. **Research Method**

The research method constitutes the detailed procedures of data collection, analysis, and writing (Creswell, 2003). This research used a mixed approaches technique, which include quantitative and qualitative approach. Quantitative techniques were used to prove or disapprove the null hypothesis that 'There is no relationship between the effects of drought risks and livelihoods of rural communities' and the alternative hypothesis that 'There is a relationship between effects of drought risks and livelihoods of rural communities'. Results from data analysis were used to determine choice of hypothesis although there was no rigorous statistical method used to accept or reject the hypotheses. The general trend from the results assisted in the choice of hypothesis.

3.2.1. **Sampling**

"*A sample is a subset of the individuals in a population; there is typically data available for individuals in samples" (Hanlon & Larget, 2011, p. 7). The sample was drawn from Chipinge South households' population.*

*A **population** is defined as "all the individuals or units of interest; typically, there is not available data for almost all individuals in a population*" (Hanlon & Larget, 2011, p. 7).

Random quota sampling was employed to select households that would constitute a sample to be interviewed. The selected villages had many households, hence, a grand sample of 110 households was chosen from the five villages where 22 households were expected to be drawn from each village. This is called quota sampling which refers to controlled selection to ensure that specific quantities (quotas) are obtained from each specified population subgroup (Elder, 2009). The 22 households in a village were selected randomly and when the number was achieved field officers moved to the next selected village until the number reached 110 households.

Random sampling in villages makes the research more realistic, where each village was represented by 22 households which were randomly selected to allow the households an equal chance of being chosen. This helped to avoid biased data which might have led to a different conclusion than the one that was arrived at with unbiased sample. Random sampling is also known as probability sampling. The goal of this research was to have a true picture of the effects of drought to livelihoods of the Chipinge South community, hence it made probability sampling the most appropriate since it reduced chances of a biased outcome.

Probability sampling was used within select households for interviewing which concurs with the idea that when a researcher needs to have a certain level of confidence in the

data collection, probability sampling should be used (MacNealy 125) in (Latham, 2007). Although non-probability sampling would be helpful for researchers to achieve certain objectives that are at hand in a research, this study did not employ it because it would not provide that advantage in this case.

The reason for choosing only 110 households in Chipinge South which has more than 1750 households was because of the constraints on funding and time to take a sizeable sample. A true representative sample would be 10% of the households which is at least 175 households. This is supported by the fact that the sample should be representative such that each sampled part will bear the qualities of a known number of units in the population"(Lohr 3) in (Latham, 2007). The selected households in this study were representative because the area as a whole bears the same characteristics.

A qualitative approach helped by using focus group interviews with stakeholders in the community gathered necessary information that was pertinent to the effects of drought in the area.

3.2.2. **Mixed Approaches**

Mixed methods approach is implemented when the researcher tends to base knowledge claims on pragmatic grounds (e.g., consequence-oriented, problem-centred, and pluralistic). "*It employs strategies of inquiry that involve collecting data either simultaneously or sequentially to best understand research problems. The data collection also involves gathering both numeric information (e.g., on instruments) as well as text information (e.g., on interviews) so that the final database represents both quantitative and qualitative information*" (Creswell, 2003, pp. 18,20).

This research combined the quantitative approach and qualitative approach in order to exhaust all possibilities and views of the community members that were engaged in the data collection process. Mixed method approach ensures that there is adequate coverage of data to represent the geographical area and subject under study (Creswell, 2003). Choice of this method was induced by the idea of trying to reduce shortfalls of methods of collecting data through employing various methods to compensate for biases that might be inherent in one method by the other (Cronholm & Hjalmarsson, 2011).

The case study approach goes hand-in-hand with the mixed methods approach and it provides a deeper exploration of the area under study and in this case which is Chipinge South (Creswell, 2003). The mixed approaches method synthesizes ideas from the common two approaches which put together techniques, method and concepts used in both qualitative and quantitative approaches (Johnson & Onwuegbuzie, 2004).

"*There is increasing interest in the field of mixed methods research and the diverse ways in which quantitative and qualitative methodologies can be systematically combined*" (De Lisle, 2011, p. 87). This paves way for achieving the best out of the two great ideas as supported by Reinchardt and Cook when they argue that researchers do not necessarily need to be limited to one method when they can get the best from both (Johnson & Onwuegbuzie, 2004).

Quantitative Approach

"*A quantitative approach is one in which the investigator primarily uses post-positivist claims for developing knowledge (i.e., cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories), employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data*" (Creswell, 2003, p. 18).

Quantitative research is defined as social research that makes use of empirical techniques and empirical propositions, where an empirical proposition is a descriptive statement on what is experienced in the "real world" rather than what is supposed to be.

Qualitative Approach

"*Qualitative approach is one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives (i.e., the multiple meanings of individual experiences, meanings socially and historically constructed, with an intent of developing a theory or pattern) or advocacy/participatory perspectives (i.e., political, issue-oriented, collaborative. or change oriented) or both*" (Creswell, 2003, p. 18). Qualitative approach is a combination of methods and ways sharing a certain set of principles or logic which makes it use qualitative methods of reaching the subjects (Babbie & Mouton, 2001).

3.3. **Data Collection Methods**

3.3.1. **Data**

"*Data are pieces of information that any particular situation gives to an observer*" (Leedy & Ormrod, 2005). The authors argue that research is the appropriate way to a problem only if data is available to support it. Data is not a complete representation of reality, neither is it pure, undisguised naked truth in all the phenomena that most researchers observe. Instead, data just manifests reality, in other words it gives a picture of the real situation. This can be explained through an example of people seeing light from the sun every day, which gives a picture of what the sun may look like even though no one has seen the sun at close range.

This entails that the truth research seeks to pursue is in most cases beyond what is manifested by the data, hence it is just beyond human reach. However, this makes it possible for researchers to continue getting new ideas on similar researches done before.

The data that was used in this research portrayed a picture of what the reality is with reference to effects of the drought risks in Chipinge South villages. Data is transient and ever changing, hence effects of drought risks experienced 20 years ago may not be exactly the same as the ones communities are experiencing now because of dynamics and variables that influence the status quo. The effects of climate change, the economic situation and other variable factors present a different scenario for drought whenever it occurs.

This is supported by the fact that research seems to capture only a fraction of what is true at the moment and this may not necessarily be true after a given time in the future (Leedy & Ormrod, 2005). This means that data is volatile and can change anytime. This called for a sense of carefulness to be adhered to during this research on data collection and results obtained were relevant to the data collected and the situation under which it was collected.

3.3.2. **Measurement of data**

Measurement helps to limit the data of any phenomenon under study, whether substantial or insubstantial for easy interpretation and comparison to an acceptable level of qualitative or quantitative standard (Leedy & Ormrod, 2005).

This research comprised of both substantial and insubstantial phenomena. Observable objects constitute the substantial phenomenon, which means they have an obvious basis on the physical word. Infrastructure, services and institutions in place which contribute positively or negatively to the effects of livelihoods of the rural communities to drought risks were checked.

Insubstantial phenomena are ‘things that exist only as concepts, ideas, opinions, feelings or other intangible entities’ (Leedy & Ormrod, 2005, p. 24). These things were measured using interviews and questionnaires to get the feeling and characteristics of the community. Much of the information was tangible and was collected through use of questions like size of household, gender of the head of household, number of orphans in the household, level of education, sources of livelihoods and level of income.

3.3.3. **Scales of Measurement**

Since measurement is ultimately a comparison where things being measured are compared to point of limitation through use of scales, there was need to use scales of

measurement in the questionnaires for data collection. The scales of measurement do fall into four categories namely: nominal, ordinal, interval and ratio (Stevens, 1964) in (Leedy & Ormrod, 2005). The first two scales of measurement were employed in the questionnaire for data collection in this research.

Nominal Scale

A nominal scale assisted through assigning names or numbers to the responses from the respondents for example, when collecting information about gender of the respondents, 1 was assigned to males and 2 assigned to females. This reflected on various questions where options of numbers were used from 1,2,3,4 etc. Although it seemed elemental and unrefined, it helped to subdivide data into discrete categories for easy comparison.

Nominal data have few statistical measures appropriate for its analysis, but it was helpful to get measures like mode, percentages and comparison of relative frequencies.

Ordinal Scale

The ordinal scale was also used to rank–order data when recording on the questionnaire by use of signs like greater than or less than, or just use of words 'more than' or 'less than'. This helped to compare various pieces of data. For example, the level of education of respondents was classified as elementary, high school, college or diploma, undergraduate and postgraduate.

This scale of measurement helped to accommodate more statistical techniques that could be applied to the data that was collected in this research. This added to the package, measures such as the median, which covers half the data when arranged in order of size. Percentile ranks could also be employed to show the position of pieces of data and also spearman's rank order of correlation could be used to analyse the data.

3.4. **Data Collection Tools**

3.4.1. **Surveys**

"*Surveys include cross-sectional and longitudinal studies using questionnaires or structured interviews for data collection, with the intent of generalizing from a sample to a population*" (Babbie, 1990) in (Creswell, 2003). *"It is the approach that looks most closely at a phenomena of the moment*" (Leedy & Ormrod, 2005, p. 196). It is sometimes called a descriptive survey or normative survey.

A survey was conducted to collect primary data from the villages in Chipinge South. Data was collected from 3 wards namely ward 21, 22 and 23. Five villages were picked randomly from these wards using random numbers.

3.4.2. **Questionnaire.**

A questionnaire is a written list of questions, of which the answers are recorded by respondents (Kumar, 2011). A structured questionnaire was used to collect data from the households in villages. The questionnaire constituted of seven sections starting with the introduction which explains the purpose of the research and identification of interviewer. After the introduction there was a section for demographic information; section C1 for livelihood information; section C2 for beliefs and practices; section C3 for mitigation, preparedness and coping capacities of the community to drought risk; section C4 for policies and structures in the community and section C5 for the likely drought risks that the community faces when droughts occur. The last part was a portion for comments or suggestions on how members think the drought risks could be reduced so as to improve coping capacities.

All in all, the questionnaire had 41 questions and was administered by four people including the researcher himself. The other three field officers were trained on how to collect data. A one day workshop was conducted to have the same interpretation of questions and how to choose the households. A sample of 10 questionnaires was used in the training process. Administering of questionnaires was done in a space of two days with each field officer expected to ask at least 10 households per day. A few days were allocated because of shortage of funds to pay the field officers. Responses on the questionnaire were assigned numbers 1, 2, 3 etc depending on number of possible responses.

3.4.3. **Focus Group discussions**

Group discussions were held at community meeting places considering times like when communities converge for meetings arranged by other organs through the headsman. This allowed people ample time to air their views on the problems or challenges they were facing especially in times of drought like the current situation.

3.4.4. **Observations**

The generally state of the community was also observed as the field officers and the researcher were carrying out data interviews with households. Things like dry rivers, barren grazing lands, water sources, farming fields and livestock (cattle and goats) were observed. This was done through transient walks through the villages in the communities to assess the extent of damage caused by drought. This way of collecting data could be done by the researcher as a relative outsider or as a participant observer (Leedy & Ormrod, 2005). It is further indicated by the authors that this allows the researcher to be

flexible and shift focus to new data coming to light as the research unfolds, however not losing focus of the primary objective of the research.

There is a likely disadvantage of the researcher influencing or altering the responses of people and what they do, as well as the way events take place. Observed situations were narrated in the findings to support the results of data analysis. Some pictures of features of interest were taken to show the effects of drought in the community. There was emphasis of caution for the researcher or field officers not to confuse actual things observed with the perceptions of individual field officers or researcher.

Images of depleted water resources, dry rivers, land degradation and alternative sources of food for the community were captured. Infrastructure, transport networks and land preparation methods were noted to see how they impact on the livelihoods of the rural communities.

CHAPTER FOUR

DATA ANALYSIS

4.1. **Introduction**

The collected data from the field was analysed based on the codes assigned to responses on questionnaire as discussed in the previous chapter. The questionnaire also had a section for comments where participants were at liberty to add other comments which were not addressed in the closed-ended questions. Microsoft Excel was used to analyse the data in most cases looking at the percentages of participants who chose a given option out of the total number of participants (households) which amounted to 110 respondents.

Households were used as units for the interview where one person deemed to be the head of the household would respond to the questions on the questionnaire. The Households were chosen from 3 wards out of the 12 wards in Chipinge South numbered from Ward 16, 20 to 30, this still constituted 25% of the area under study. Participating households were chosen from ward 21, 22 and 23 considering their proximity to each other for ease access although it might have an effect on the results. However, considering that the different wards present similar climatic conditions the deviations will be assumed to be insignificant

4.2. **Demographics**

Demographics present a picture of the sample used in the research and how it represents the different characteristics of the population. Demographic information like age, gender, size of households, level of education, children and orphans in the household as well as the marital status of respondents.

4.2.1. **Age of Respondents**

Age groups which had higher percentages of respondents were in the 41 to 55 years' group, older than 55 years and 31 to 40 years which had 35%, 27% and 23% of respondents respectively. Most of the respondents were between the ages of 31 to older than 55 years. Respondents who were 30 years and younger only constituted 15% of the interviewees.

The probable reason why over half of the respondents (62%) were older than 41 years can be attributed to rural urban migration which is predominant among age groups younger than 30 years. This age group is highly mobile as the move from one place to another looking for work or a better school. Employment rate is high in urban areas hence

youth prefer to move to urban areas and most of them are reluctant to work in the fields in rural areas.

On the other hand, as people retire or are retrenched from work most of them relocate to rural areas where they tend to permanently reside. Furthermore, rural home ownership increases with an increase in age. This means that as people grow older they start their own families so it is normal to have older people participating in the survey. This explains why there are more participants older than 41 years. The information is further illustrated on the chart below in Figure 4.1.

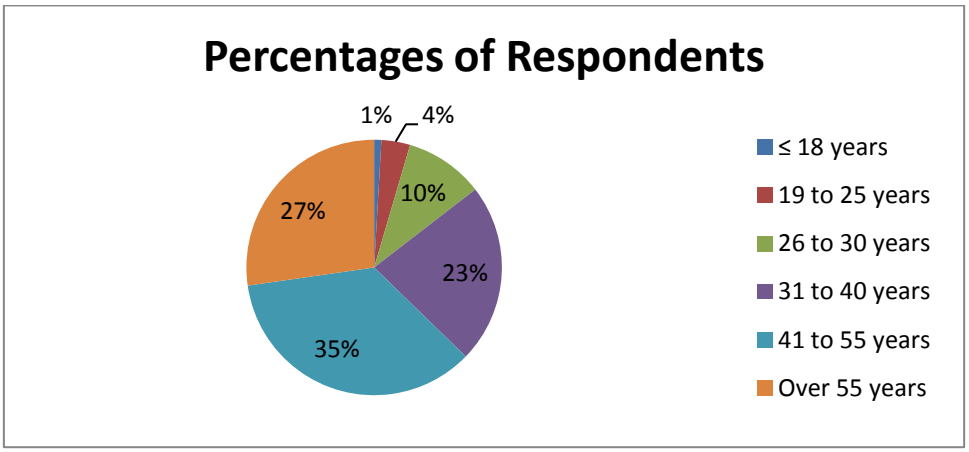

Figure 4.1: Percentages of respondents by age group

4.2.2. **Gender**

The distribution of respondents according to gender was also considered. The sample shows that 35% of the interviewed people were men and 65% of the respondents were women. This corresponds to the 2011 national statistics where communal lands had 52.9% females and 47.1% males (ZIMSTAT, 2013). Generally, females are more than males by a smaller percentage according to the ZIMSTAT 2013 report, although the results in this research show a bigger percentage for females. This fits well in the rural setting since men tend to migrate to towns or nearby places in search for jobs to support the families.

It is argued that, "rural to urban push in search of employment opportunities has led to the migration of the male population to urban centres leaving their families in the rural areas" (Shumba, 2001, p. 13). This might be caused by the fact that their usual means of life is threatened by drought, hence migrate in search of greener pastures. The percentages of males and females are shown in the table 4.1 below.

Table 4.1: Gender distribution of respondents

Gender	Male	Female
Percentage of Respondents	35%	65%

Women are left home as caretakers or managers of the households in the absence of their husbands. This suggested the main reason why women constituted a greater percentage of respondents, however it is also normal to find most households being headed by women in the African rural communities. Figure 4.2 below shows distribution of gender by age.

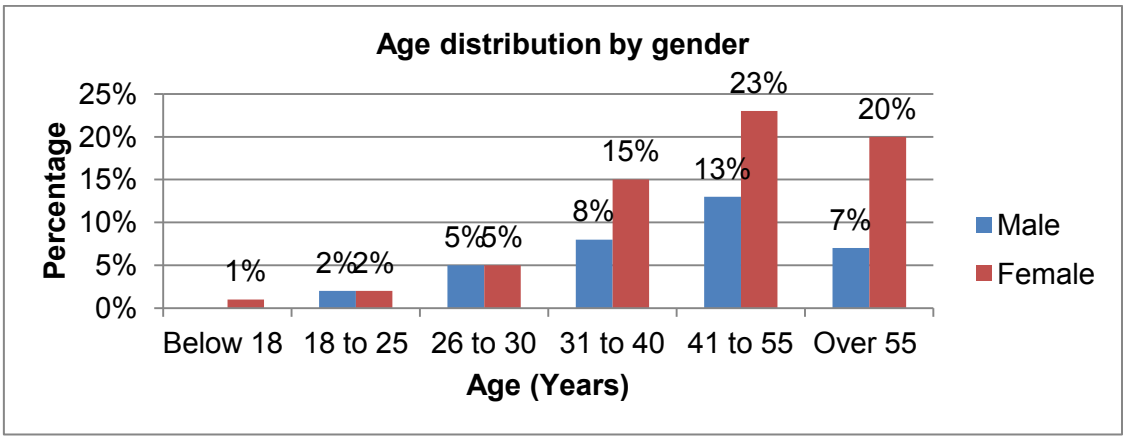

Figure 4.2: Distribution of Gender by age groups

The distribution of gender per age group also shows that women were more than men in the age groups of 31 years and older. This still supports the fact that most household respondents were women. However, age groups of 18 to 25 years and 26 to 30 years had equal percentage of men and women who responded in this research, 2% and 5% respectively.

4.2.3. **Marital Status**

Sixty percent of the respondents are married and living together with their spouses, followed by widows who made 25% of the respondents. This is a cause for concern because the widows are usually one of the vulnerable groups in communities who need to be assisted to cope with catastrophes like drought, lest they will become beggars. Figure 4.3 below shows marital status of respondents in percentages.

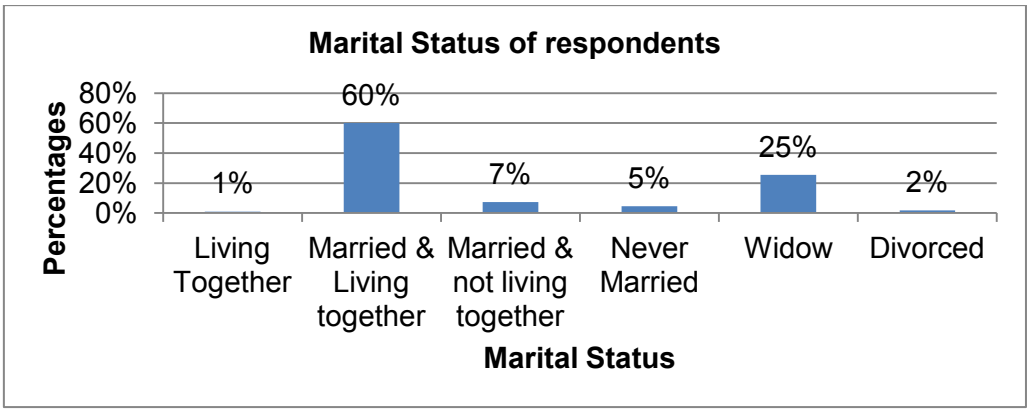

Figure 4.3: Marital status of Respondents

Figure 4.3 shows that 25% of the respondents were widows although a widow can be male or female. It is distinctively shown in Figure 4.4 below that 25% of the respondents were females who are widows while only 1% of the respondents were males who are widowed. Generally, the community is socially sound since most of the respondents are married and living together and will assist each other in decision making and how to approach a hazard like drought. The results correspond to the provincial statistics of census 2012 where 59.3% (ZIMSTAT, 2012). This generally shows that the community is not much different from the provincial standard.

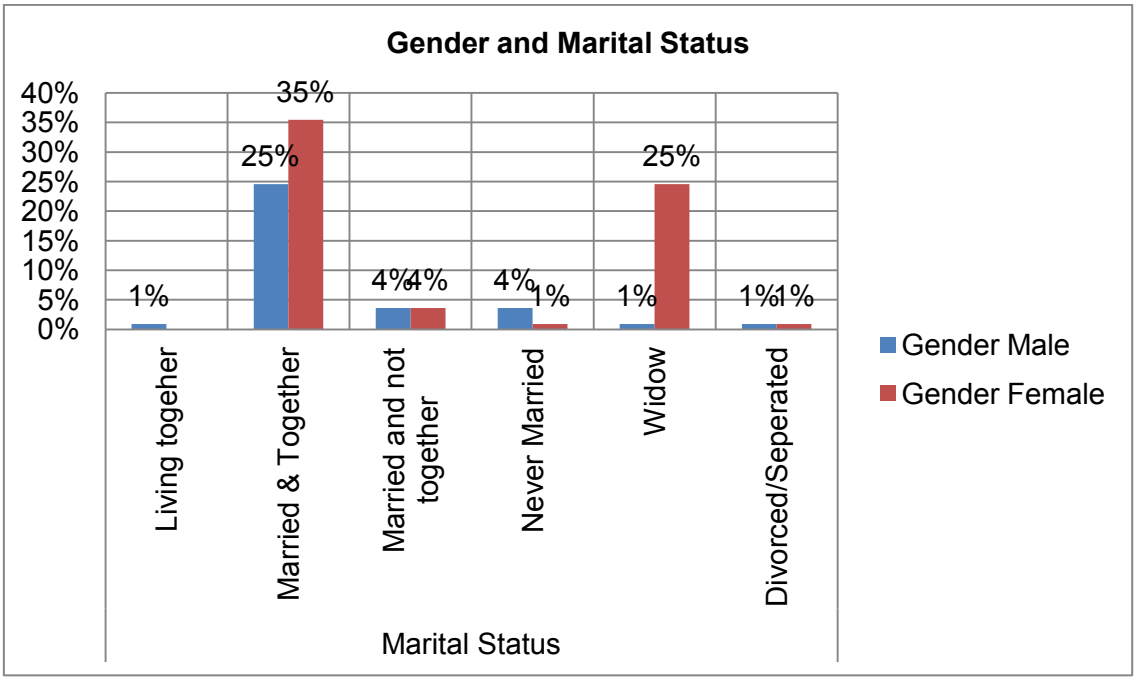

Figure 4.4: Percentages of marital status by gender

4.2.4. **Types of Marriage**

The results show that 72% of the respondents are married to one person and 21% are in a polygamous marriage where a man marries more than one wife. In a situation like this,

women usually cater for their children and tend to compete for the husband. Only 7% are married in community of property meaning the women are vulnerable in the event that the husband passes away, as they are likely to lose the property and become more vulnerable to drought. The most common type of marriage in the study area is Monogamous marriage defined as marriage between two people. Figure 4.5 shows the marriages of respondents in percentages.

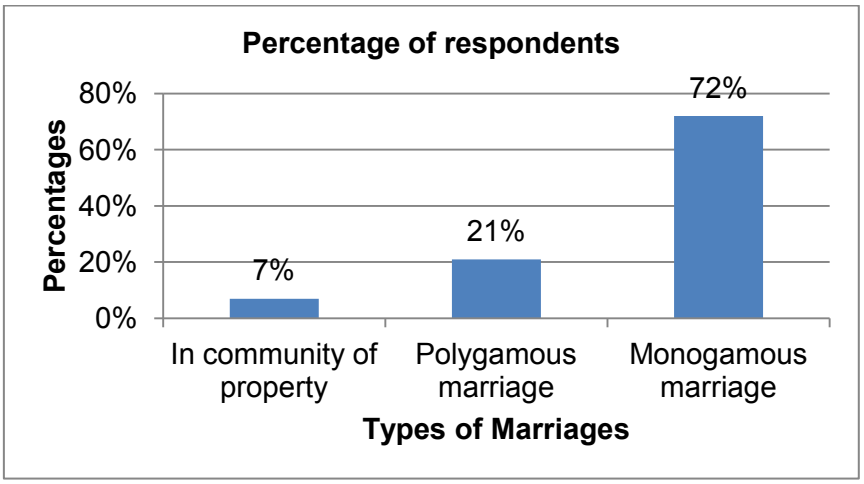

Figure 4.5: Types of marriage displayed by respondents

Comparing the type of marriage and marital status reveals that out of the married respondents where both partners are still alive, 58% are in a monogamous marriage, 10% are in polygamous marriage and 2% are in community of property. On the other hand, out of the widows interviewed, 12% were in a monogamous marriage; 10% were in a polygamous marriage and 4% were in community of property.

The condition of being married in a polygamous marriage out of community of property puts the households at risk of a drought if it occurs since there is likely to be competition for resources in the household and there are more chances of divorce because there is no stress on attachment of property when a couple divorce. This is presented on a graph in Figure 4.6 below.

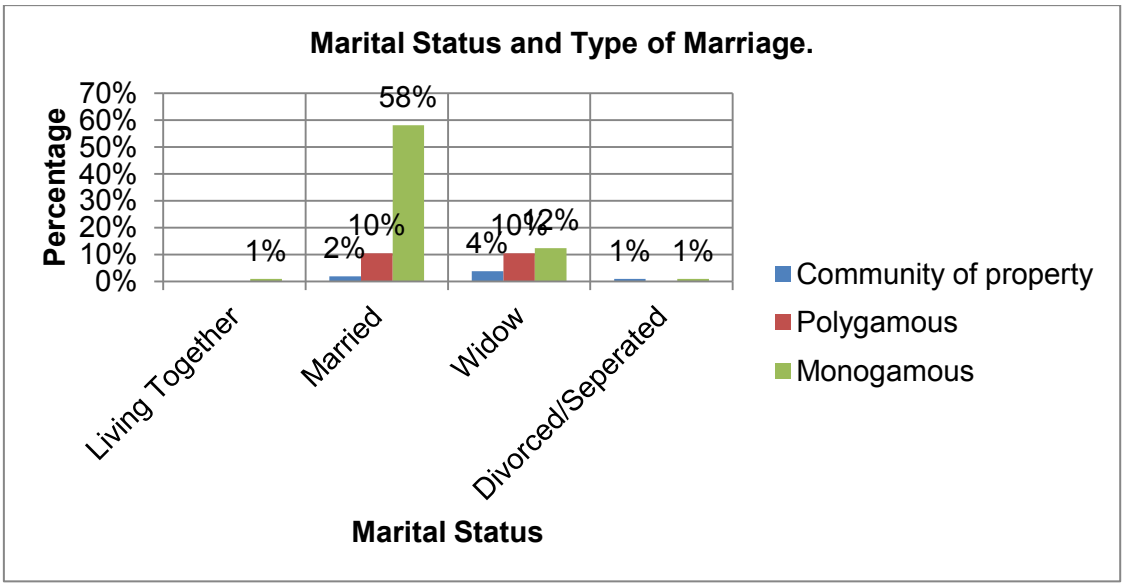

Figure 4.6: Marital status by type of marriage

4.2.5. **Size of Households**

Fifty-one percent of the respondents were from households of size greater than five people. Households with five people were 21% of the total respondents. Cumulatively, households with more than four people amounted to 73% of the total. The size of households in the study area determines the number of people to be fed, sent to school and clothed, although there are other positive gains like labour in the fields. The national average household size from 2012 census was 4.2 (ZIMSTAT, 2012). This is not much different from the notion that 73% of households in this study had more than 4 people.

This shows that the area generally has big households. Big households present a problem of feeding and dressing more people. This is a challenge during drought years, where the household need to spend more to feed the family. This puts the household at risk of drought. Table 4.2 below shows the respective percentage for different household sizes.

Table 4.2: Sizes of households for respondents

Size of Household	One	Two	Three	Four	Five	> Five	**Total**
Percentage of Respondents	3%	1%	8%	15%	22%	51%	**100%**

4.2.6. **Children Below Eighteen Years of Age and Children Going to School**

Households interviewed with 2 to 4 children below the age of eighteen were 71% and of the respondents. The remaining 29% of the households had less than four and more than four children below eighteen years of age. More children below eighteen years suggest a bigger number of children to be sent to school.

In Zimbabwe education is not free, hence parents pay school fees, and they need to buy uniforms and stationery for their children. All this goes for a price and if a household has more children it means more money is needed. When a drought occurs, the household will be at more risk than those who have a small number of children below eighteen years. The percentages of households with different number of children below eighteen years are shown in table 4.3 below.

Table 4.3: Percentages of households with children below eighteen years of age

Children Below 18 Years	One	Two	Three	Four	Five	> Five	None	**Total**
Percentage	6%	27%	24%	20%	6%	13%	4%	**100%**

4.2.7. **Households with Orphans**

Among the children there were also orphans, either with one parent or without both parents. Orphans are among the vulnerable more than children with parents when hazards occur. The data collected shows that 29% of the households had orphans and 71% of the households had no orphans. This means almost one third of the interviewed households have vulnerable elements hence becomes a drought risk. Orphans tend to be ignored when there is a crisis and people tend to feed their children first before they think of other people's children. This information is illustrated in Figure 4.7 below.

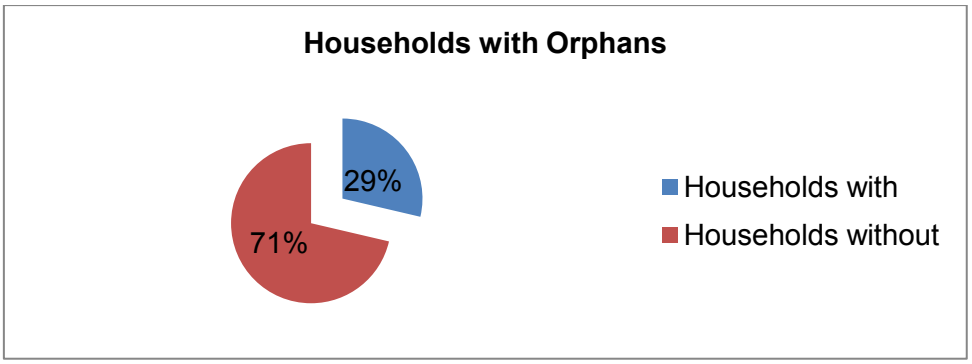

Figure 4.7: Percentages of households with orphans

The households that indicated that they had orphans staying with them were 78% with 1 to 2 orphans followed by 51% of households with one orphan, 27 % of households with two orphans and 22% of the household had three or more orphans. The percentages are shown in Figure 4.8 below.

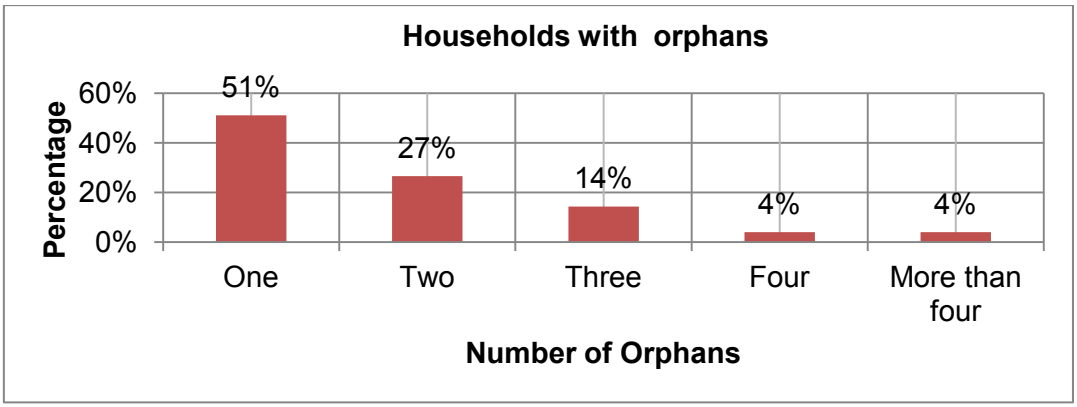

Figure 4.8: Percentages of households with orphans by numbers

4.2.8. **Children of School-going Age**

Statistics of children at school-going age were also analysed and showed that most households had two or more children of school-going age. The highest proportion was households with three children making 29% of the households interviewed followed by households with two children of school-going age making 21% of the interviewed households. The chart on Figure 4.9 below shows the information.

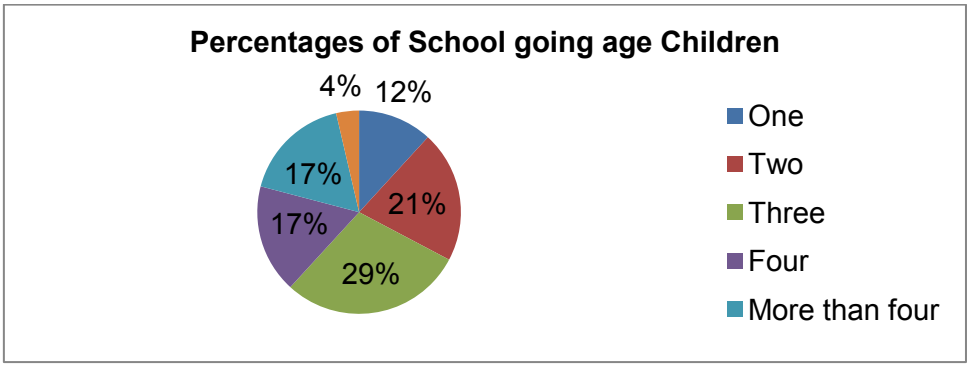

Figure 4.9: Percentages of households with school-going age children by numbers

Twenty-six percent of households had two children of school going age, 22% of households had three children of school-going age and 21% had four children of school going age. It was interesting to note that 6% of the households did not have children of school going age. Most households had 2 to 4 children of school going age. This information is displayed in table 4.4 below.

Table 4.4: Percentage of households with different numbers of children going to school

Number going to school	One	Two	Three	Four	>Four	None	**Total**
Percentage	14%	26%	22%	21%	11%	6%	**100%**

Comparing the school-going age and children going to school revealed that Households with three children of school going age which made 22% of the total households also made 19% of the total with three children going to school and 9% of the total with two

children going to school as well as 1% of the total with more than four children going to school. This shows that there is a relationship between the number of school going age children and children going to school. Overall, households with three school-going children had highest percentages of children going to school as shown in Figure 4.10 below.

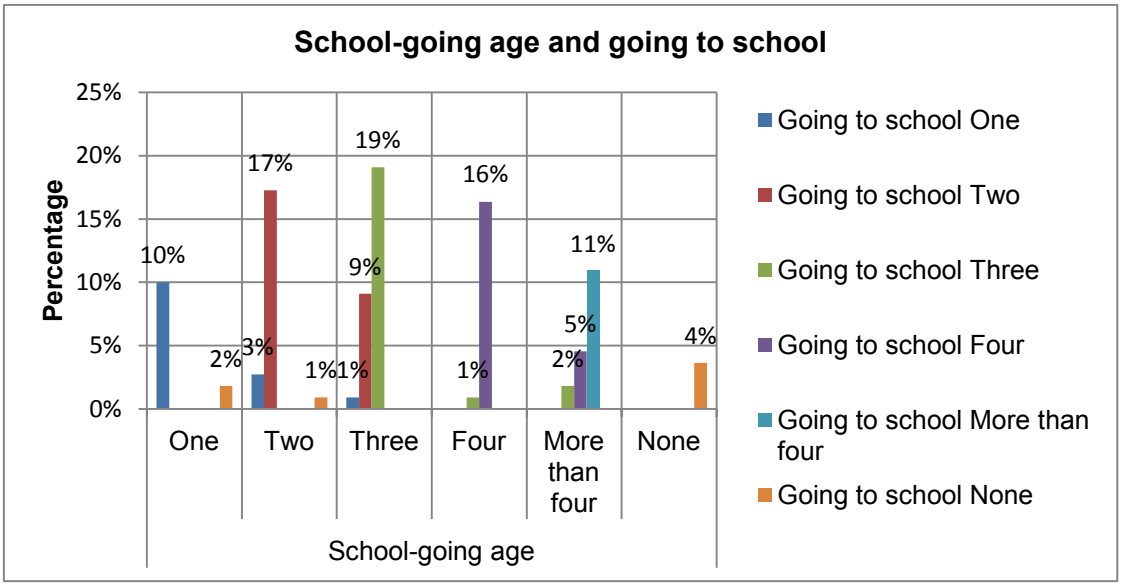

Figure 4.10: Comparison of percentages of household with school-going age and those going to school

4.2.9. **Level of Education**

The results show that out of the interviewed households, 40% of them had General Certificate of Education (GCE) Odinary level as the highest qualification, followed by 29% who had other qualifications like primary education and others with up to standard 6 obtained before independence wich is equivalent to form 2 now.

Only 3% had GCE Advanced level, 6% with diplomas, 4% with undergraduate qualifications and finally 24% without any qualification. This shows that the greater percentage of the community is uneducated. This is a risk in the fact that they may fail to interpret instructions on inputs for farming, understanding early warning messages for drought may be a challenge to them. All these make the greater part of the community be at risk of drought because of lack of education. Moreover they have less options when it comes to employment as a resilience factor for drought. The results of the level of education are shown in figure 4.11 below.

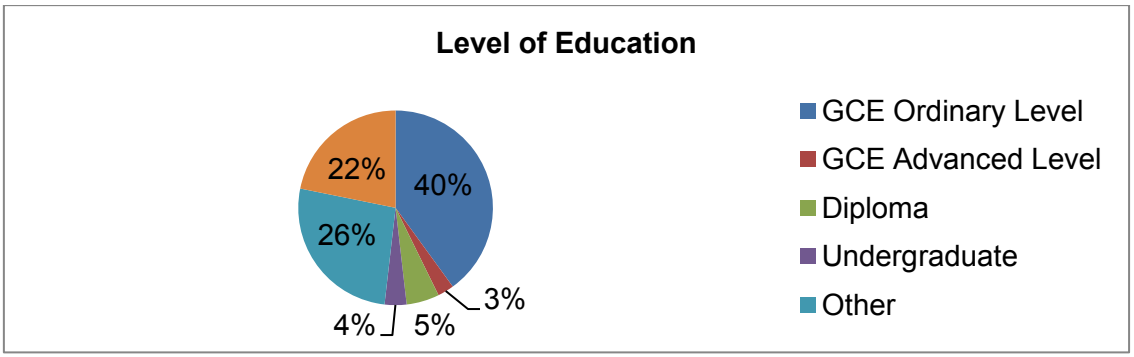

Figure 4.11: Level of education of households in percentages

The comparison of level of education on gender basis shows that women dominate in percentages for lower qualifications like GCE ordinary Level where they had 23% while men had 17%. Other qualifications (primary or elementary level) where women had 17% compared to men with only 9% and 21% of women had no qualifications compared to only 1% of men.

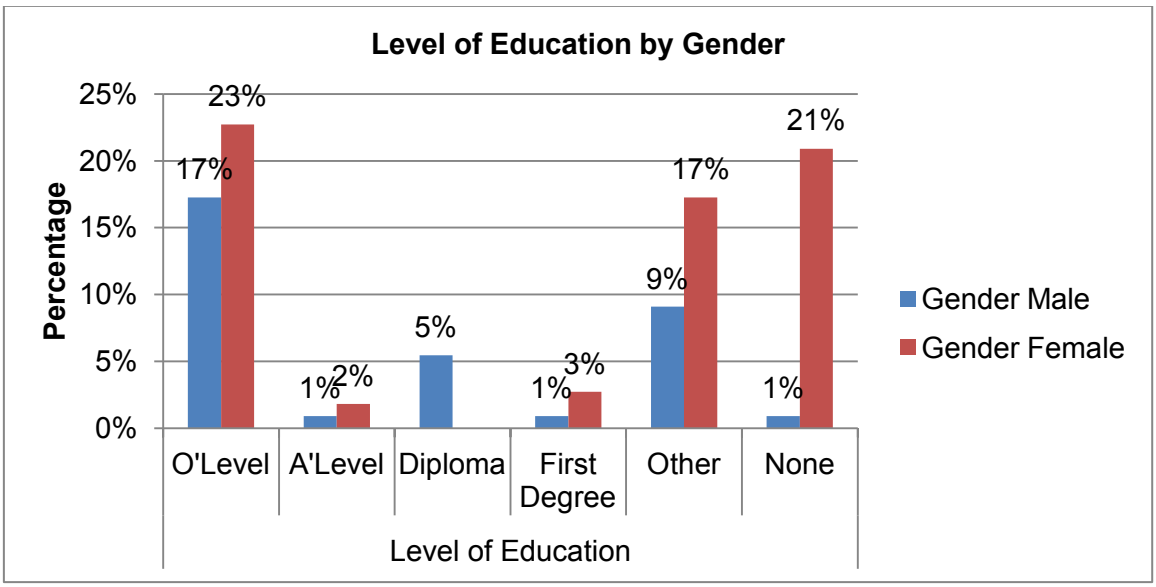

Figure 4.12: Comparison of level of education by gender

On the other hand, men dominated on higher qualifications like a Diploma where men had 5% compared to women with 0%. However, 3% of the women had a first degree compared to 1% of men and 2% of women had GCE Advanced level compared to 1% of men. Generally, there is a balance of qualifications since men dominate in others whilst women dominate in some. Generally, the community is likely to be at risk on both males and females since they all lack education which can be key to their resilience against risks posed by droughts. The comparison of level of education for males and females is shown on Figure 4.12 above.

4.3. **Main Sources of Livelihood**

The collected data shows that 85% of the households rely on farming as their main source of livelihood and all the other options had percentages below 10 out of the total number of households interviewed. Farming is followed by piece jobs at 7%, yet this is an unreliable means of life and then follows formal employment with 6%. Farming is the most affected source of livelihood if hazards like drought occur. However, drought affects almost all professions if it prolongs for a long time, however, those who rely on farming are the first ones to be affected.

The data also shows that only 1% of households which depend on remittances from family and friends. Since farming is the main source of income and also provides them with food to feed their families, this community is at risk in times of drought because most of them will not be able to feed their family and have extra money to buy other things. When the harvest is low because of drought, they will have to buy food yet they did not get income from their major economic activity.

It is argued that the major risk facing rural households in Zimbabwe is that of drought. What increases the risk level in rural areas is the dependence on farming (Kinsey, et al., 1998). Lack of or limited variation in other reliable sources of livelihoods is a major threat to the community in the event that drought occurs. The bar chart in figure 4.13 below shows the percentages of households and their sources of livelihoods.

Figure 4.13: Percentage of households and main sources of livelihoods

Besides farming being the main source of livelihoods, the data also shows that 98% of the households are into farming for family consumption and or sale whilst only 8% indicated that they are doing farming for other reasons which may include the fact that others are doing it for traditional attachments. There is lack of diversity since 98% of the community rely on farming for both family consumption and for sale and also 85% depend on farming

as a source of livelihood. The data for percentages of households depending on farming for consumption and or sale are shown in the table 4.5 below.

Table 4.5: The purpose of farming

Farming Purpose	Percentage
Farming for consumption/sale	92%
Farming for other use	8%
Total	**100%**

4.4. **Size of Land**

The highest percentage, 41% of the households have 1.1ha to 2ha followed by those with less than one hectare at 34% and those with 2.1ha to 3ha at 17%. Those who own more than 3ha were only 12% of the households. The respondents seem to be concentrated on less than one hectare to three hectares on size of land.

This suggests that the households do not have large pieces of land. This gives them less option on varieties of crops and also staggering the times of planting because they have small area to work on. If the piece of land is large, crops can be planted at different times looking into the fact that there may be early rains and late rains of which people do not know which ones will give them good harvest. Figure 4.14 below shows the sizes of land and percentages of households in each category.

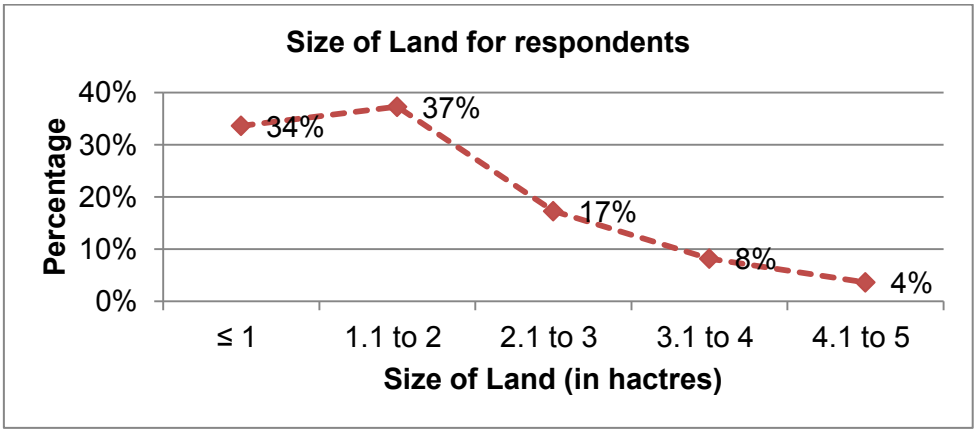

Figure 4.14: Sizes of land and percentages of households

4.5. **Types of crops**

Households grow more than one type of crop on their land and this is supported by the data which shows that 37% of the households grow corn or maize and small grains (millet, rapoko and sorghum) and also 4% of the households grow three or more crops. This corresponds to sources of livelihoods where most of the people are into farming and do farming for both family consumption and for sale when they get surplus. The distribution of households against the number of crops they grow are shown in table 4.6 below.

Table 4.6: **Number of different types of crops grown and percentage of households**

Number of Crops	One type	Two types	Three or more types
Percentage	60%	37%	4%

Considering that only 4% of the households grow more than three types of crop, there is lack of variety in the types of crops. The data also show that 24% of the households grow small grains only whilst 42% grow only maize or corn, which makes 60% growing only one type of crop. Although drought prone areas are encouraged to grow small grains, this community shows that they are growing less small grains compared to corn or maize. This may be because of the fact that the staple food for Zimbabwe is *sadza* made from maize meal.

The varieties or types of crops show that they will not manage to cope if a drought occurs. They depend too much on corn and maize which is vulnerable to drought and needs a lot of rain to mature. This may be because of the unavailability of seeds for other crops or because the inputs programme from government and NGOs provide them with seeds for maize hence they are bound to grow maize. The results for types of crops are shown in Figure 4.15 below.

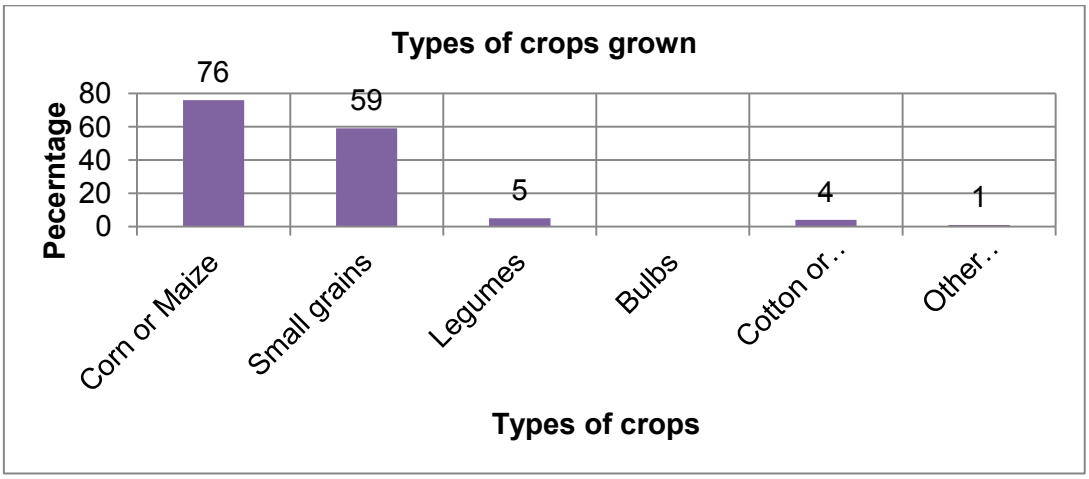

Figure 4.15: Types of crops and percentage of households

4.6. **Crops Producing Surplus for Sale**

Forty-one percent of the households produced surplus small grains followed by maize with 28% of the households getting surplus for sale and the least is Legumes with 1% of the households managing to sale. It is of much concern that 20% of the households fail to get surplus for sale as displayed on Figure 4.16 below. The collected data shows that households that grow different types of crops also do have crops that sometimes give them surplus for sale. The analysis shows that small grains produce more surplus for sale than maize.

When comparing the crops cultivated, and those that produce surplus for sale, it was realised that corn or maize being the popular crop with 76% of the households growing it only 28% of the households manage to get surplus for sale. This resulted in a shortfall of 48% of the households failing to get surplus for sale. Small grains on the other hand had 59% of the households growing them but 41% manage to get surplus for sale hence giving a shortfall of 18% who fail to get surplus for sale. Small grains seem to be a better bet.

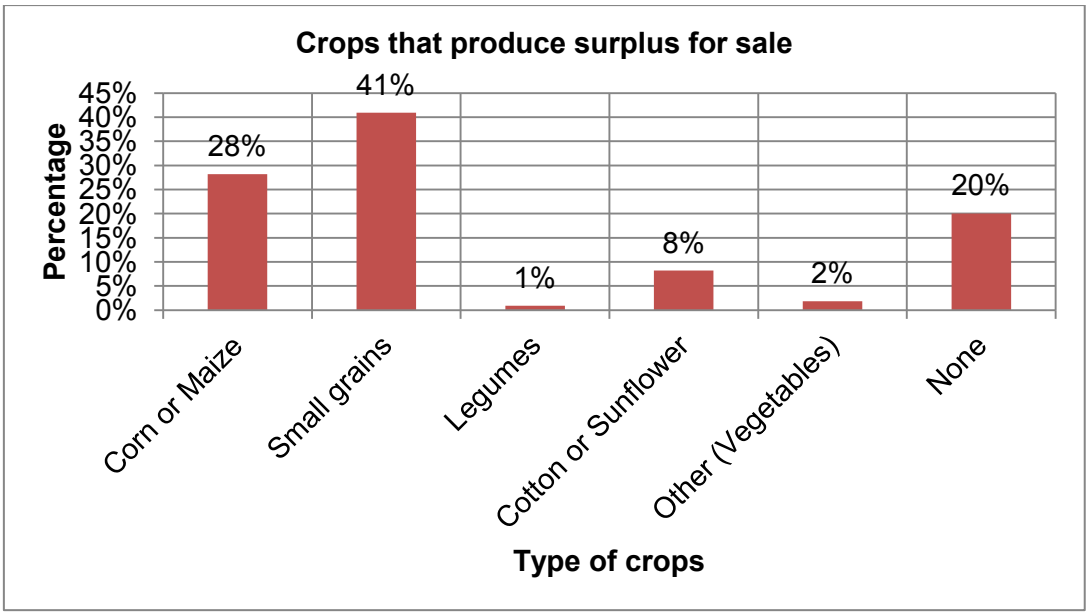

Figure 4.16: Crops producing surplus for sale and percentages of households

Cotton and sunflower are the only crops which had more percentage of households getting a surplus from the percentage of households who grew them although the proportions are smaller, less than 10%. This shows that if they are grown by more people they can improve their livelihoods than sticking to maize. Generally, it shows that small grains, cotton and sunflower can do better in the area since they do not require a lot of rain to grow until they mature to be harvested.

The community increases its risk to drought by growing crops which need a lot of rain whereas they can reduce the risk by growing drought resistant crops and sale to get money then use the money to buy grains of their choice. Figure 4.17 below shows the comparison of crops grown and those sold according to percentages of households interviewed.

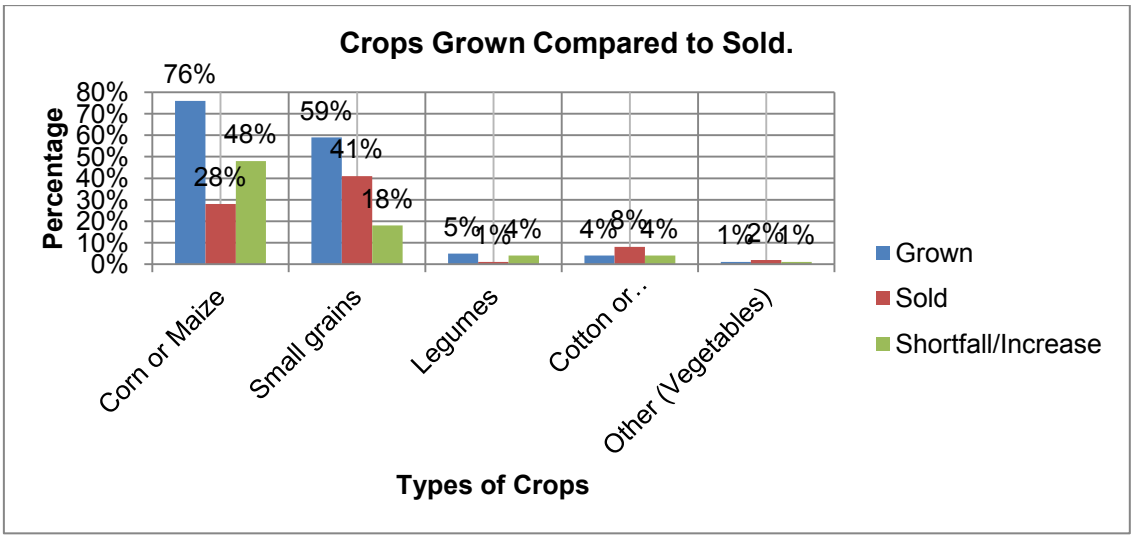

Figure 4.17: Types of crops grown and crops sold by percentages of households

4.7. **Reasons for Not Selling**

The data when analysed shows that 93% of the households failed to sell surplus because of low harvest whilst 5% of the household attributed the failure to sell to low market prices. Lack of transport and other reasons were on 1% each and there are no households which blamed it on theft and high rates of transport.

The reasons for not selling surplus by households were also explored from the collected data. There were various suggested reasons why households may fail to sell surplus which include low prices of grain at the markets, low harvest from the fields, lack of transport from households to the market, high rates of transport, theft of grain from the fields resulting in low yields and other reasons. The results are shown in table 4.7 below.

Table 4.7: Reasons for not selling surplus and percentage of households

Reason for not selling surplus	Low prices	Low Harvest	Lack of transport	Other Reasons
Percentage	5%	93%	1%	1%

Low harvest in the area is in most cases attributed to low rains and this is supported by the fact that after the year 2000, the area did not have normal rains for their rain seasons. The twenty-first century started with a series of below normal or average rainfall which resulted in low harvests to the community. This is a drought risk which threatens the community's livelihoods.

4.8. **Average Income of Households per Annum**

The results show that 97% of the households get less than US$1 000 per annum which is an average of less than US$100 per month. Only 2% of the households get between US$1 001 and US$2 500 and 1% get an average income above US$2 500 per annum.

The majority of the households are in the low income bracket. The statistics suggest that the low income turnover of households may be attributed to the low harvest hence their produce end up being for family consumption if it is at all enough to feed their families.

The community is highly exposed to drought risks because their income as an average per month cannot sustain a family with more than four members as shown previously that households with more than four members are 73% of the sampled group. The results show that farming in the community is not for commercial purposes as the earnings are too little to justify that. Probably, the earnings are from sales of surplus on a good harvest year.

Research results above are justification for intervention during drought as they show that the community had too little to fall back on during drought. It is argued that farmers from rural communities who live from hand to mouth are likely to be the worst affected during droughts (Maphosa, 1994). The bar chart of Average income for households per annum in percentages is shown in Figure 4.18 below.

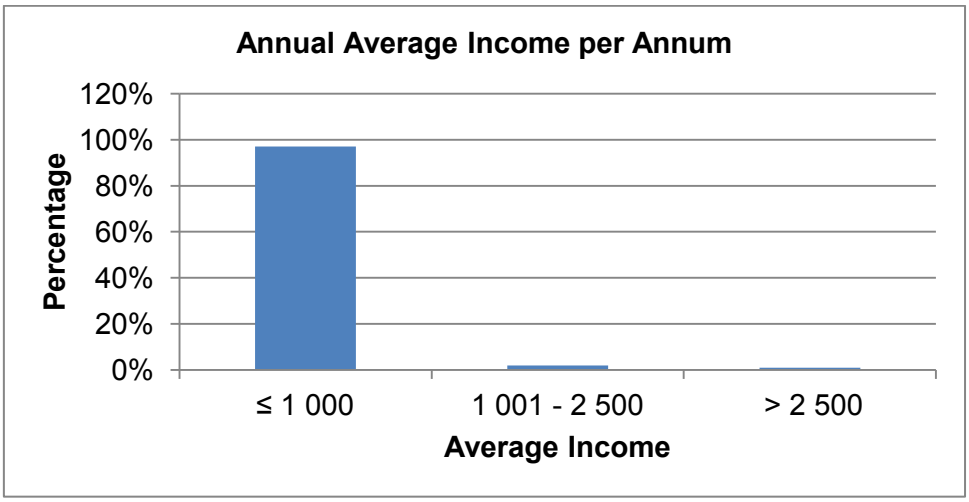

Figure 4.18: Average Income per annum and percentage of households

The low average income is attributed to the failure to sell surplus grain and when comparing average income per annum and reasons for not selling surplus, 91% of the households with income below US$1000 is found to be those who gave a reason of low harvest as causing them not to sell surplus.

This shows that low harvest is the major contributing factor to low average income per annum. This situation can be turned into a better scenario when the community improve on sale of surplus to push the 91% of households from low average income to more than US$1 000 to improve livelihoods. The relationship between reasons for not selling surplus and average income per annum is shown in Figure 4.19 below.

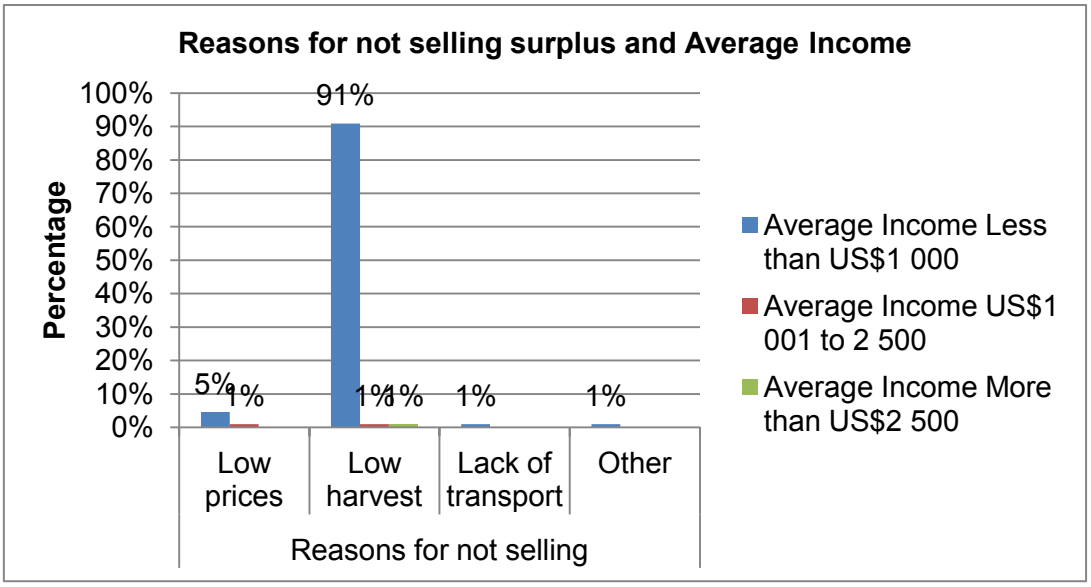

Figure 4.19: Reasons for not selling surplus and average income

The reasons for engaging into farming also have a relationship with the average income per annum that the households get. The data shows that 90% of the households doing farming for sale and use are in the low average income of less than US$1 000 per annum whilst 7% of the households who do farming for other reasons are in the same bracket.

Low percentages are found in the higher income brackets and this poses a threat to the low income bracket since it holds a greater portion of the community. Occurrence of drought in the area will exacerbate the conditions under which the low income earners live for they are already in the red zone. Figure 4.20 below shows the relationship between average income per annum and the reasons why households engage in farming.

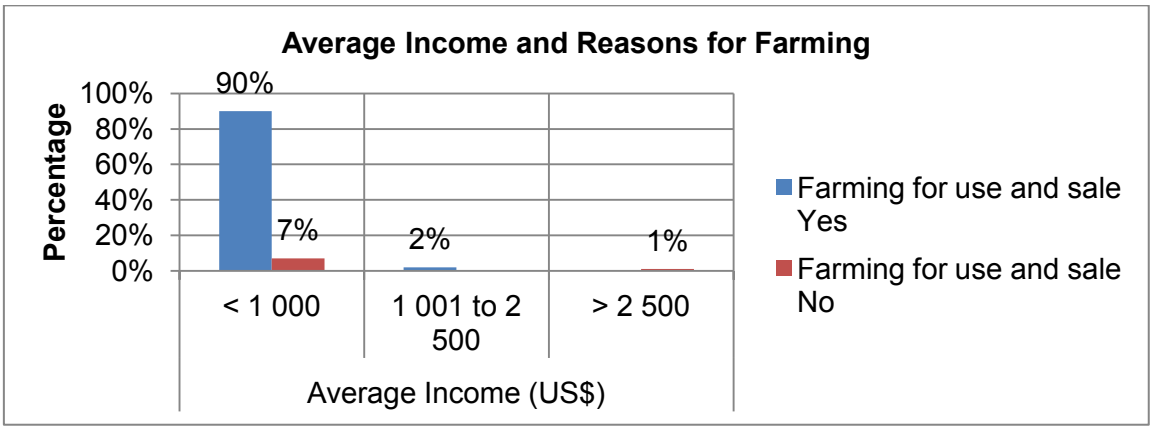

Figure 4.20: Average Income per annum and percentage of households

4.9. **Method of Tilling the Land**

The data shows that 62% of the households use an ox-drawn plough whilst 38% of the households still use hand hoes for digging. There are no households that afford to use a

tractor or other modern ways of preparing the land. Most households in Chipinge South use drought power to till the land using either cattle or donkeys for pulling the plough.

Hand digging using hoes is strenuous and it takes a long time to complete the work so this may lead to failure to plant in time hence the reason why households get low harvest. Some households may also end up digging holes for planting without preparing the land because of lack of faster ways of preparing the land and this affects the way crops grow.

The chart on Figure 4.21 below shows the percentages of households for different methods of tilling the land.

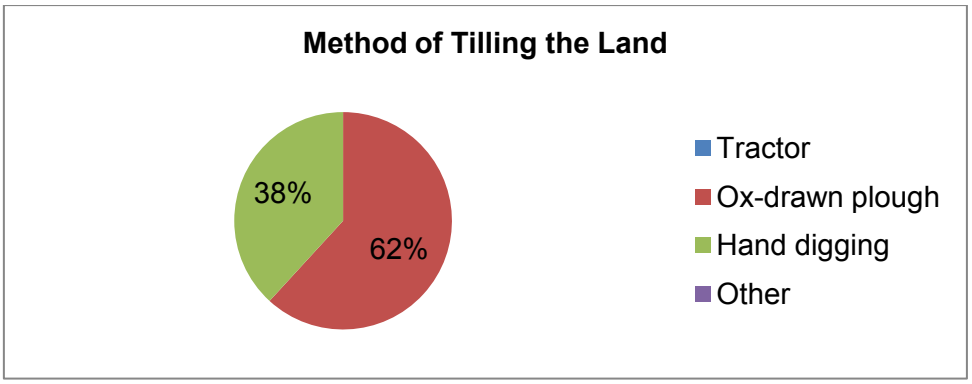

Figure 4.21: Methods of Tilling the land and percentage of households

Comparison of average income per annum and method of tilling the land shows that 59% of households use ox-drawn ploughs and 38% of households use hand digging and they are both in the category of low average income below US$1 000.

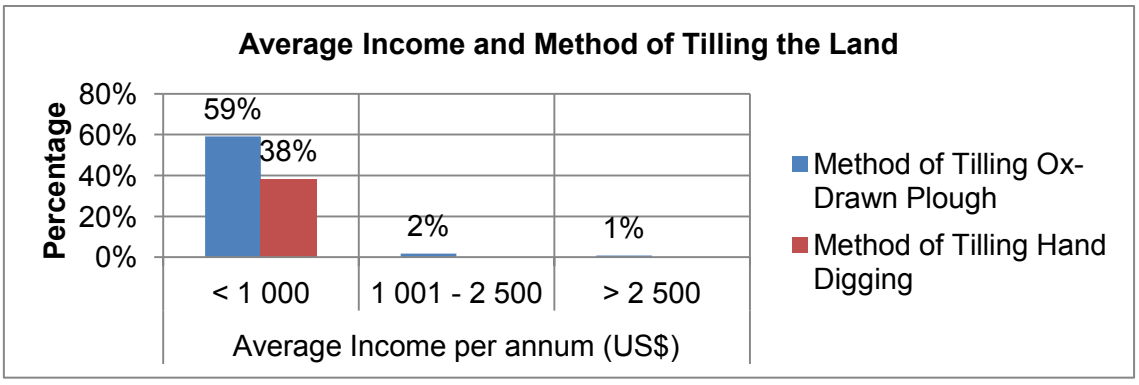

Figure 4.22: Method of tilling, average income per annum and percentages of households.

There are very low percentages of households using the two methods which make it to the higher income brackets as shown in figure 4.22 above. This suggests that the methods of farming also contribute to the average income per annum and they all put the households at risk of drought.

The reasons for not selling surplus are also related to method of tilling the land. The results show that the households which get low harvest have bigger percentages of households that use ox-drawn ploughs and hand digging. This means that the more people are using the two methods for preparing land the more they are likely to get low harvests. This still makes them more prone to drought risks because occurrence of drought will worsen the situation. Figure 4.23 below shows the relationship between the method of tilling land and the reasons why households fail to sell surplus.

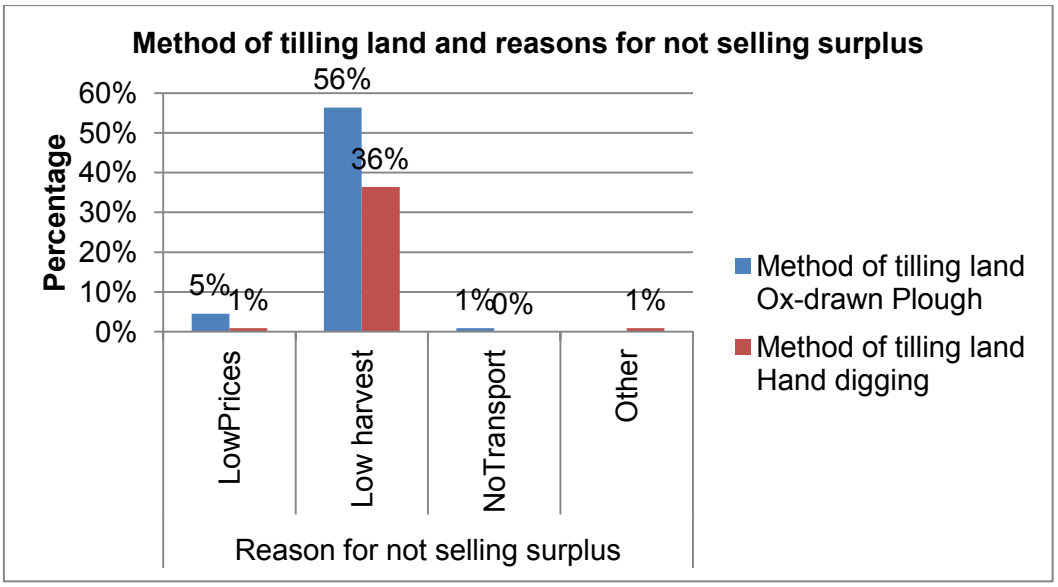

Figure 4.23: Methods of tilling land, reasons for not selling surplus and percentages of households.

4.10. **Weeding Methods**

The data collected also showed methods of weeding on the farms of sampled households. All households indicated that they use manual labour which might be the reason why they are getting low harvest. This might be associated with the timing of weeding which sometimes fail to correspond with the needs of the crops because farmers will be overwhelmed by the amount of weeding and cultivation to be done. This slows the rate of growth of crops since they will be competing with weeds for nutrients and sunlight. All this increases the risk of households to droughts when they occur.

4.11. **Additional Inputs**

Analysis of data also shows that 64% of the households use manure from their livestock, 2% uses fertilizers, 4% use both, 8% uses other inputs and 23% do not use any other inputs besides seeds. The soils in the area shows show that it has been a long time being used for the same purpose which renders then depleted of nutrients hence the need to be enhanced by adding inputs like manure and fertilisers or lime.

The 23% that are not using any additional inputs could reduce the risk of drought since crops will be well nourished hence grow faster reducing the chance of slow growth rate which leads to low harvests. Figure 2.24 below shows the percentages of households using different inputs on their crops.

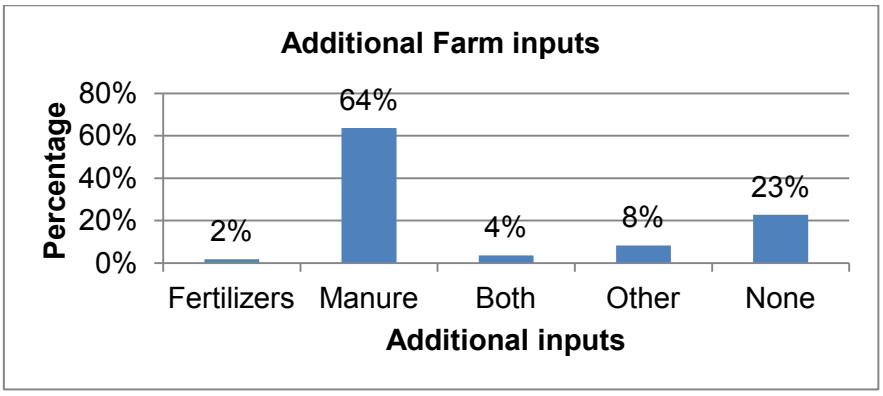

Figure 4.24: Percentages of households using different farm inputs

The information on Figure 4.25 shows that 59% of households using manure get low harvest, 8% of the households use other inputs and still get low harvest whilst 20% of the households do not apply any inputs but still get low harvests. This suggests that the effort of households to aid their crops with different inputs does not bring much difference but just make them remain in the low harvest bracket. This may mean that the rainfall patterns are irregular and below average to the extent that efforts by farmers are fruitless. A drought prone area does not respond to any efforts by farmers, it makes them lose hope.

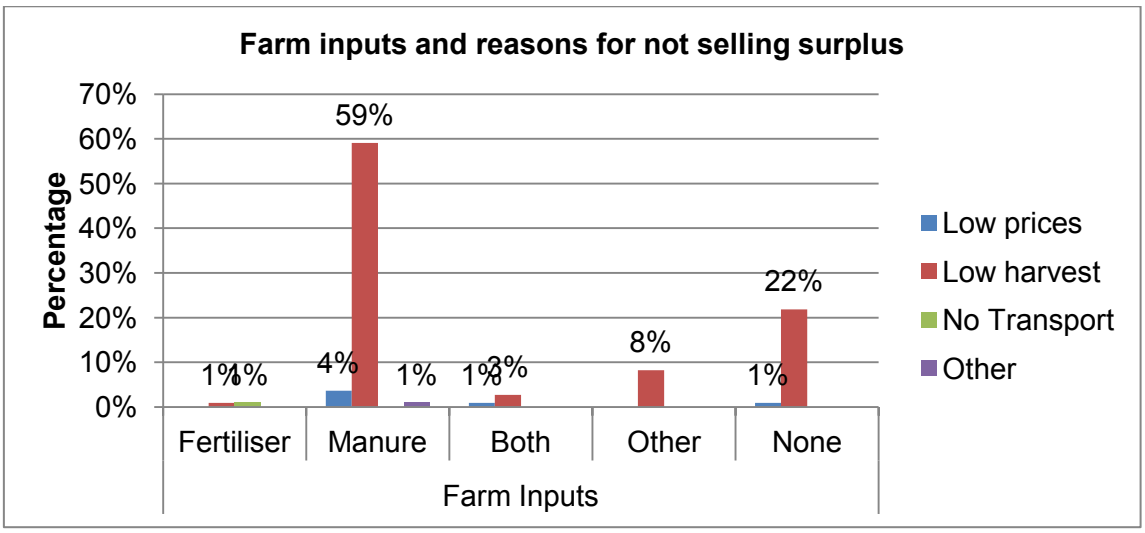

Figure 4.25:Farm inputs, reasons for not selling surplus and percentage of households

4.12. **Types of Livestock**

Information collected show that households keep different types of livestock including cattle, goats, sheep, pigs, donkeys, chicken, dogs and other animals. Sixty-three percent of households have goats followed by 54% households owning chickens, followed by 14%

owning donkeys, 10% of the households own dogs and 5% of the households own cattle and another 5% own sheep. Only 1% owns pigs and 3% own other types of animals (Turkeys) whereas 3% do not own livestock. The analysis shows that most people own goats maybe because they are more resilient to drought than cattle.

This information shows that the larger part of the community owns livestock that have lower value. Cattle which have a higher value are owned by just a small proportion of the community. Maybe this is attributed to the drought conditions where cattle tend to succumb to drought easily compared to the other animals and households do not prefer to have them fearing that they will lose them if a drought occurs. On the other hand, if a drought does not starve cattle to death they can be used to trade for other things needed in the household since they have higher value. Results of types of livestock area shown in Figure 4.26 below.

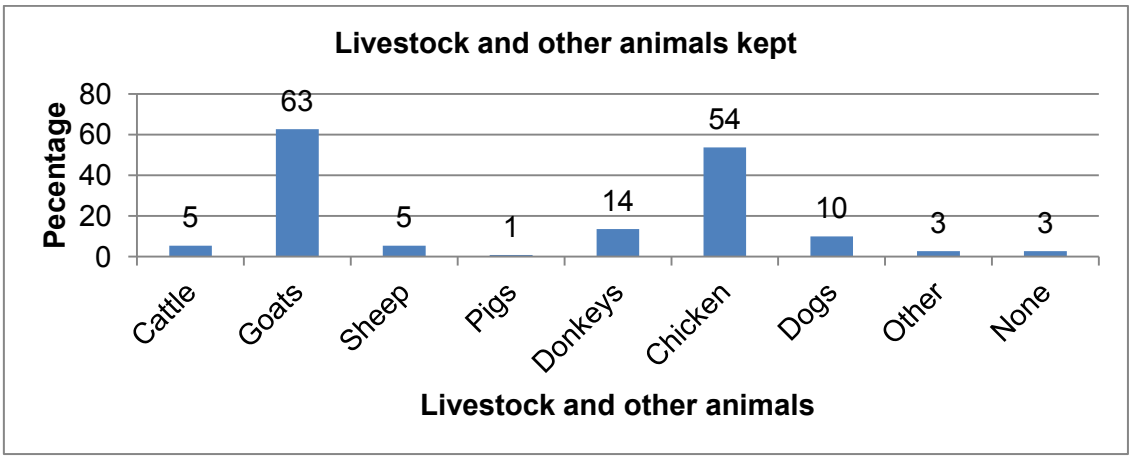

Figure 4.26: Types of animals and percentage of households

4.13. **Farming Methods**

The analysis shows that 69% of the households are still using traditional farming practices followed by 24% of households using both traditional and modern farming practices. Modern farming practices alone are used by only 7% of the households. The collected data shows that households are either using modern or traditional farming methods or both.

Traditional methods include use of harvested grain as seed in the next season and these seeds may not give good harvest because they were not scientifically checked for use. Table 4.8 below shows the information of farming methods used in the area.

Table 4.8: Methods of farming and percentages of households using the methods

Farming Methods	Modern	Traditional	Both	**Total**
Modern	7%	69%	24%	**100%**

The analysis shows that 68% of the households using traditional methods of farming are getting an average of less than US$1 000 per annum, 6% of households are using modern farming methods and still get less than US$1 000 as average income per annum and 23% of the households use both traditional and modern farming methods yet still get less than US$1 000 as average income per annum. There is a relationship between farming methods and the average income that households get per annum. Figure 4.27 below shows the methods of farming, average income of households and their percentages.

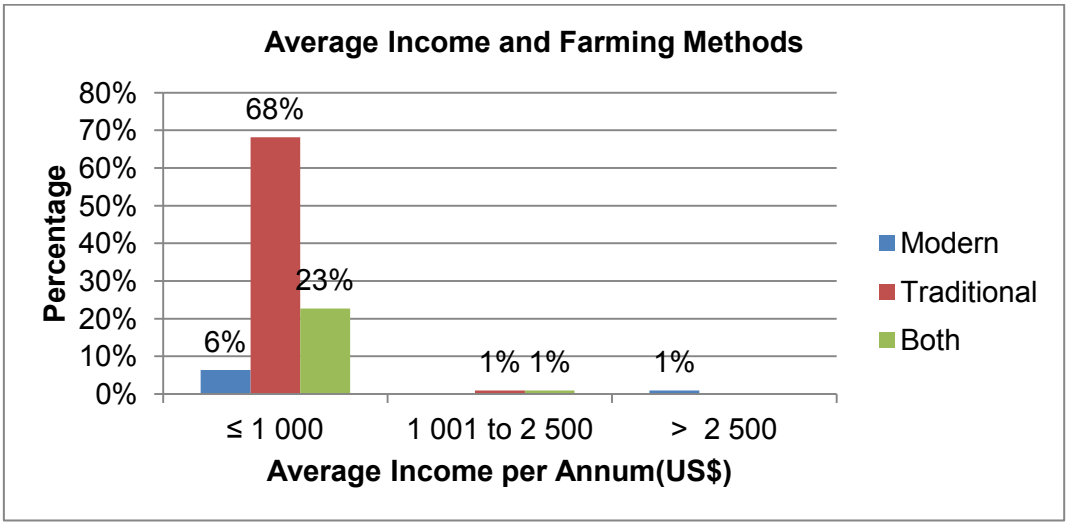

Figure 4.27: Farming methods, average income per annum and percentage of households

A very small percentage of households get more than US$1 000 average income whether modern or traditional farming methods have been applied. This may be caused by prevalence of drought which affects their income level.

4.14. **Drought Mitigation Measures**

The analysis shows that 42% of the households rely on food aid, 25% of the households use drought resistant crops, 15% sell their properties, and 8% sell livestock whilst 17% use other mitigation measures. Droughts are inevitable, but the effects can be reduced to avoid a disaster. This can be done by putting in place mitigation measures to reduce the effects of drought.

Other mitigation measures include borrowing and begging, growing vegetables, exchanging food for work, selling handmade shoes from used tyres and piece jobs. Only 3% and 4% of households use food reserves and irrigation respectively, whilst 1% of the households do not use any mitigation measures.

This community shows that a greater part of it now relies on food aid which promotes laziness and reduces the level of creativeness of a community. Households may become reluctant and take it as a norm to be fed by NGOs and may fail to come up with their own mitigation measures. The bar chart on Figure 4.28 below shows the percentages of households that have various mitigations measures.

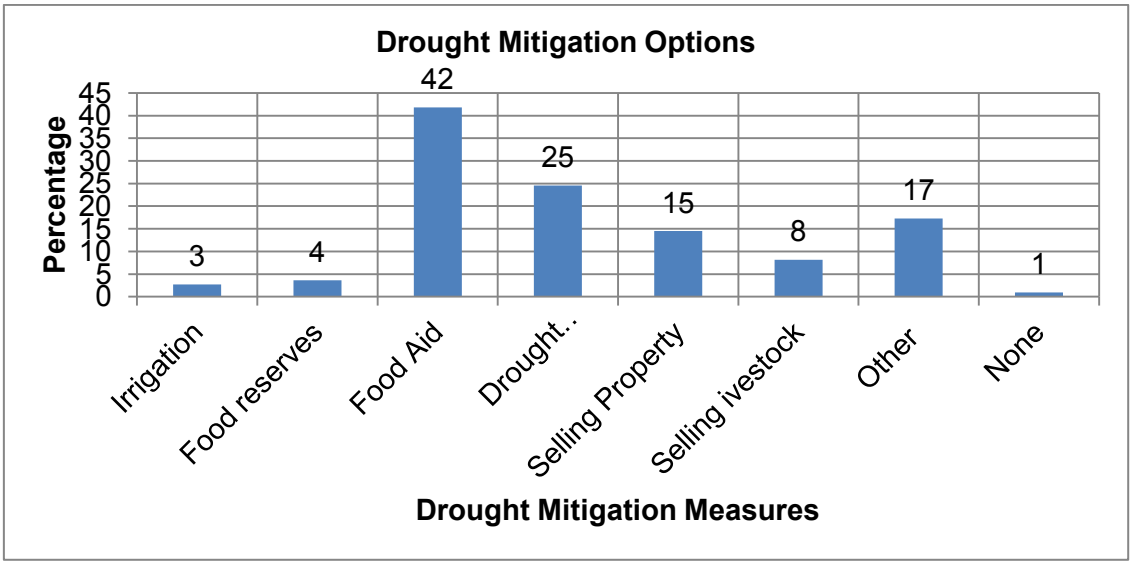

Figure 4.28: Mitigation measures used by households

4.15. **Drought Early Warning Systems (EWS)**

The data shows that 50% of the households rely on community leaders, 22% of the households rely on reports from the ZMET stations,14% of the households rely on local media, 2% depend on international media whilst 9% do not use any systems and 4% use other warning systems.

The formal UN definition of EWS is as follows: “The provision of timely and effective information, through identifying institutions, that allow individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response” (ISDR, 2003) in (Sivakumar, n.d.).

The author went on to explain that Early Warning (EW) involves forecasts based on climate projections and the area’s drought history, possible outcomes of developing drought events, and answering questions about how long a drought might last and how severe it might be. It becomes a system when it has input (data collected about droughts), process (using various techniques to process the data) and output (information on possible droughts in future). The output information needs to be disseminated to the communities to alert them.

Drought early warning systems inform communities about possibilities of a drought well in time so that they can prepare to reduce its impacts. Prevalence of EWS was checked by the systems of dissemination of information to communities. The collected data shows that Zimbabwe Meteorological Stations, Community leaders, International media, Local media and other Warning Systems are the EWS in place for drought. The results of the EWS for this study are shown in Figure 4.29 below.

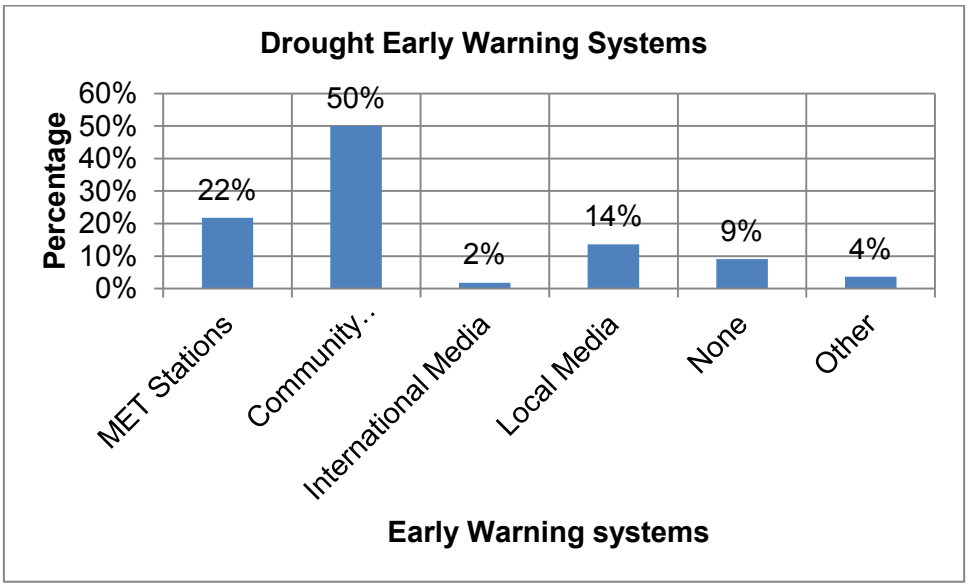

Figure 4.29: Drought EWS used by the community

Those who rely on other warning systems said they use indigenous early warning systems and prophets. Indigenous EWS include use of bird's sound and a circle like a pool of water around the sun or moon. However, there was a concern from most of the households on the reliability of the warning systems and how they reach the community. Data collected also shows that there are ways of disseminating drought early warnings to communities which are used by different organisations.

Data analysis shows that 75% of the households get information through radio channel during news or special announcements or programmes for farmers, 2% of the households get information from televisions, 1% of the households get information from newspapers and 4% get informed through SMS's. On the other hand, 16% said they used other means of communication whilst 2% do not have any way of getting information.

Those who rely on other ways of getting information said they use medium spirits, witch doctors and prophets to determine whether there is going to be a drought or not. Information about the EW communication is displayed in Figure 4.30 below.

The results show that most of the households rely on radios for drought early warnings. This is possibly due to the remoteness of the area with poor television besides the fact that most people cannot afford them moreover there are few houses with electricity. Most people are using solar panels and solar batteries which may not supply enough power for a television. Their base of information is limited and poses a risk condition on getting drought early warnings.

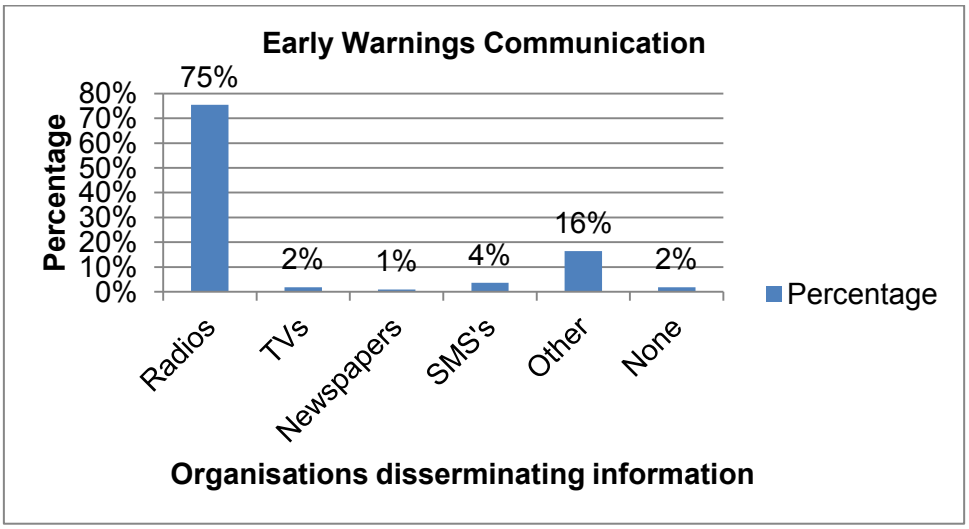

Figure 4.30: EWS communication

4.16. **Reliability of Early Warning Systems**

The households presented their views about whether they think the EWS are reliable or not using experience of the past droughts. The collected data shows that 72% of the households think the EWS are sometimes reliable which means most of the times they are not accurate. Eighteen percent of the households think that the EWS are not reliable and 10% of the households said the EWS are reliable. Figure 4.31 below shows the results of EWS reliability analysis.

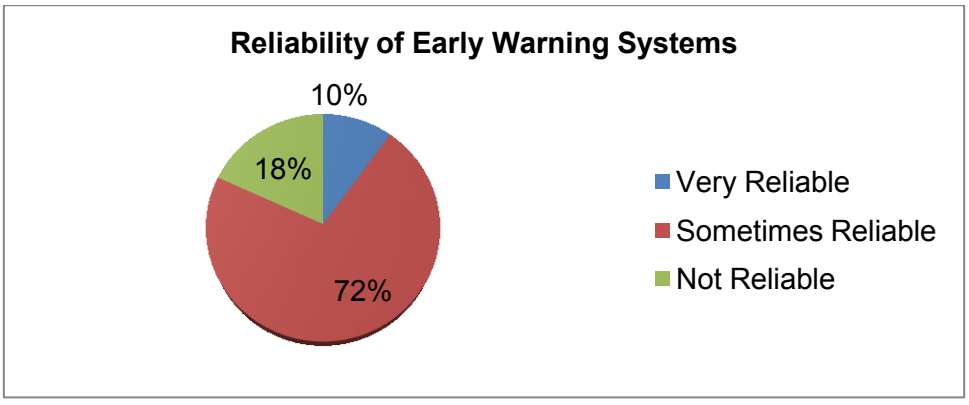

Figure 4.31: EWS reliability and percentages of households

Comparison of EWS data and the reasons why households fail to get surplus for sale was done and it showed that 66% of the households viewed EWS as sometimes reliable and

also got low harvests, 16% of the households said EWS are not reliable and also got low harvest and 10% said the EWS are reliable but still got low harvest.

This suggests that there is a relationship between low harvests in households and unreliable EWS. The community is at high risk of drought if the EWS are not accurate or if they are not interpreted well because this community also has low level of education. Figure 4.32 below shows the relationship between EWS and the reasons why households fail to get surplus for sale.

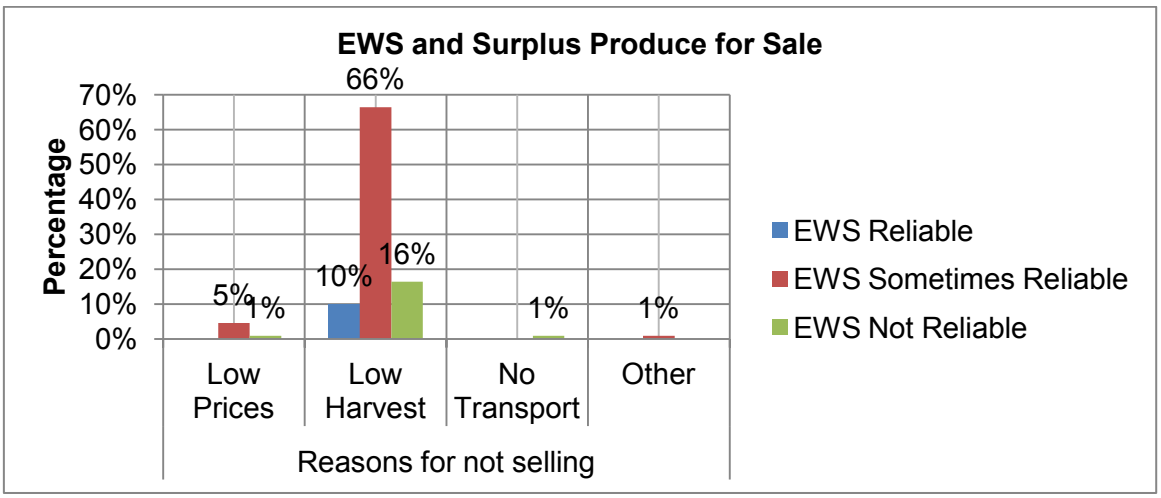

Figure 4.32: EWS, Reasons for not selling surplus

The EWS were also compared to the average income per annum for households and they show that 70% of the household said EWS are sometimes reliable and get less than US$1 000 average income per annum, 18% said EWS are not reliable and get less than US$1 000 and those who said EWS are reliable are 9% of the households who are also in the less than US$1 000 average income.

This shows that there is a link on the unreliability of EWS and the resultant income that the households get. It is either the EWS are not telling the households the truth or there is mismanagement of the EWS. Both scenarios present drought risk to the households. Figure 4.33 below shows the relationship between the EWS and the income that households are getting from their source of livelihood.

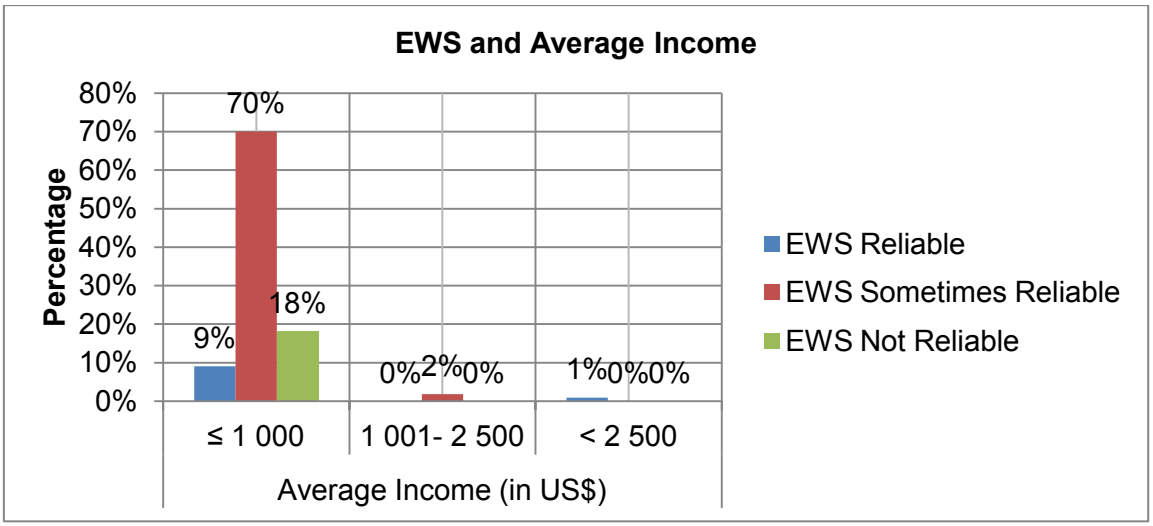

Figure 4.33: EWS and average income of households

4.17. **Coping Measures to drought.**

The coping measures to drought were analysed and the data showed that 78% of the households rely on food aid; 25% rely on drought resistant crops; 4% rely on grain banks and water harvesting; 3% rely on other coping measures like piece jobs, gardening and working in the community and 8% of the households do not have any drought coping measures.

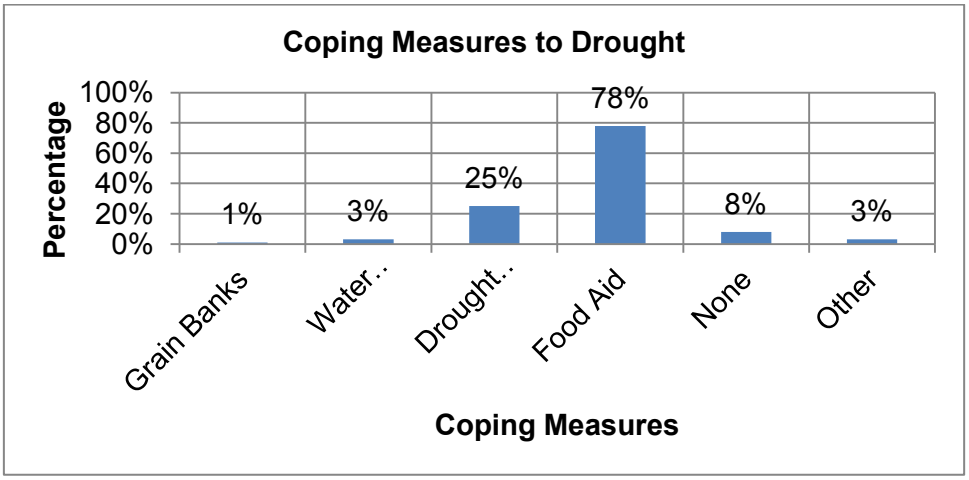

Figure 4.34: Coping measures of the households to drought

The popular coping measure according to this data, which is food aid, is a risk to rely on given the fact that NGOs operations are regulated by government. It can be affected by political differences between government and the organisations responsible for donation of food aid leading to discontinuation of the food aid programmes. Figure 4.34 above shows the coping measure of the sampled households.

4.18. **Government Services**

The data collected included the services provided by government and other organizations like education and training, health programmes, projects, farming inputs, food aid and exchange of labour for food. The analysis shows that 68% of the households benefit from services provided by government, 27% said they do not benefit from government services and 5% were not sure of whether they benefit or not from government serves. This generally shows that most people benefit from the services provided by government although the balance of 32% comprising of some not sure and those who do not benefit is still a larger percentage which puts the community at risk of drought. Figure 4.35 below shows the percentages of households' perception on government services.

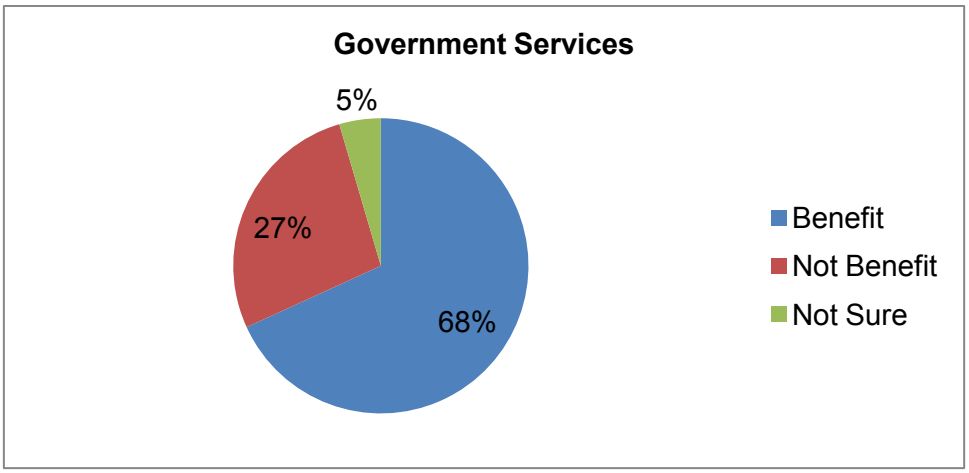

Figure 4.35: Households' perceptions about benefiting from government services

Information was processed concerning other organizations that provide services in the community to aid the efforts of the government. The collected data revealed that 85% of the households say local government provides them with services, 88% of the households said NGOs provide them with services, 13% of the households said CBOs cater for them on services whilst 3% said no one is providing services.

The discrepancy is attributed to complaints by households that, if a household benefits from a service provided by an NGO, the same household should not receive help from government, although a household who has not benefited, should be given an opportunity. This does not rule out corruption hence we find other households that which say they do not benefit from services provided by any organization. Households like these one are exposed to drought risk and may fail to cope in the event that a drought has occurred.

Figure 4.36 below has a graph showing the percentages of households on service provisions.

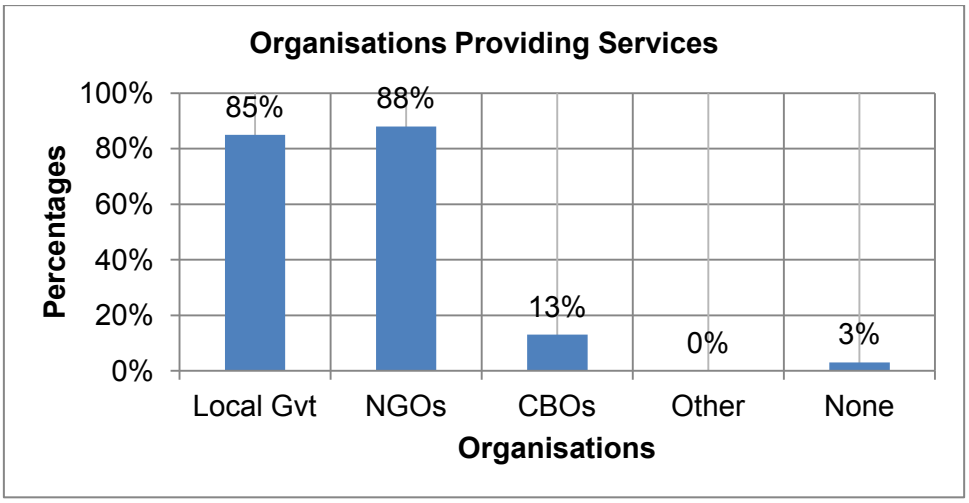

Figure 4.36: Service provisions by organizations and percentage of households

Data was also collected about the presence of Agricultural Extension Officer who assist farmer with information and training to promote yields in agriculture. The data showed that 95% of the households agreed that Agritex officers are available in the communities whilst 5% of the households said they do not have them. However, the response shows that the officers are there, maybe those who say they are not there is a concern that they have never seen them in their area although they are there.

Effectiveness of the Agritex officers reduces the risk of households to droughts and their ineffectiveness worsens the situation when a drought approaches. Table 4.9 below shows the response of household on presence of Agritex officers.

Table 4.9: Agritex Officers presence in the Community

Agritex Officers & EHTs Presence in Community	Yes	NO	**Total**
Percentage	95%	5%	**100%**

4.19. **Types of Services Benefited from.**

The data shows that 78% of the households benefit from education and training; 43% of households get agricultural inputs; 41% of the households get food aid; 29% benefit from health programmes and community projects whilst 25% of the households benefit from other programmes like food for work where they help to renovate the roads and get a 50kg of maize meal per month.

The community benefits from services like education and training, health programmes, community projects, agricultural inputs and food aid. The programme of food for work is said to benefit old people who can no longer migrate to towns looking for employment. However, the old people are subjected to hard labour of repairing roads. Figure 4.37 below shows the types of services that are provided in the community.

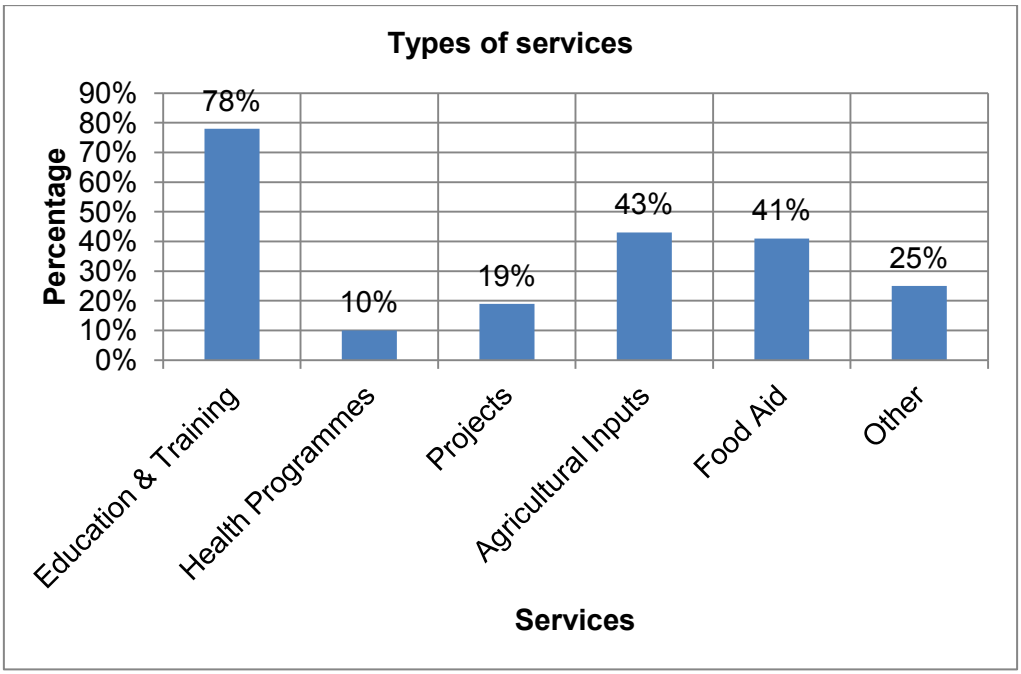

Figure 4.37: Services provided in the community and percentages of beneficiaries

4.20. **Involvement in Decision Making**

Data was also collected about the involvement of household members in the decision making procedures of the community about droughts. The analysis shows that 55% of the households agreed that they are involved in decision making on things affecting the community; 37% of the households indicated that they are not involved in decision making whilst 7% of the households were not sure if they are involved in decision making. A greater part of the community is involved in decision making and it was also necessary to check the level of decision making that those who agreed that they are involved take part in. Table 4.10 shows the percentages of households who take part in decision making.

Table 4.10: Percentages of households who take part in decision making

Involvement in Decisions	Yes	No	Not Sure	**Total**
Percentage	55%	37%	7%	**100%**

The level at which those who take part in decision making were also analysed and the results showed that 64% of the households take part at village level; 18% take part at ward level; 1% take part at national level and 16% do not take part at any level whilst no one is involved in decision making at district and provincial level. The community has an advantage that they have a smaller proportion at national level but absence of representatives at district and provincial level present a bad scenario to their fate. The chart in Figure 4.38 below shows levels at which households make decisions.

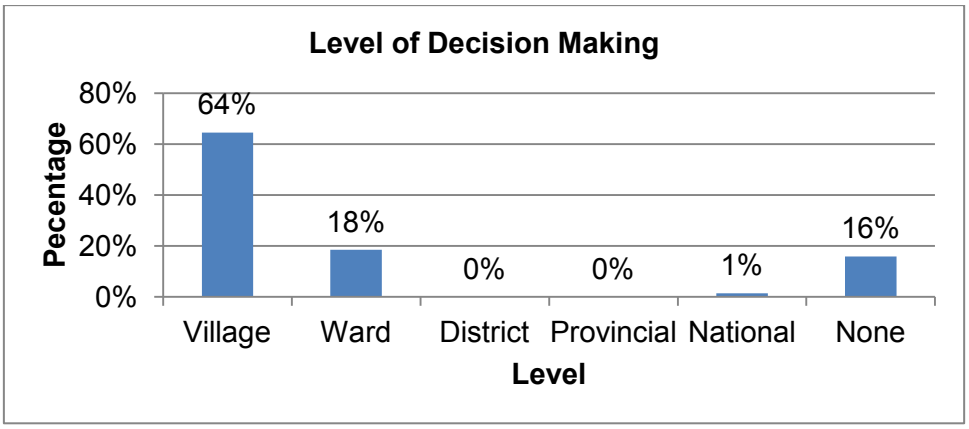

Figure 4.38: Levels of decision making and percentage of households

4.21. **Quantity Harvested in the past ten years**

The quantities harvested by the households in the past ten years were also analysed and results reflect that 93% of the households did not harvest enough; only 5% of the households said they harvested enough; 2% said they did not harvest anything whilst no household harvested surplus for sale.

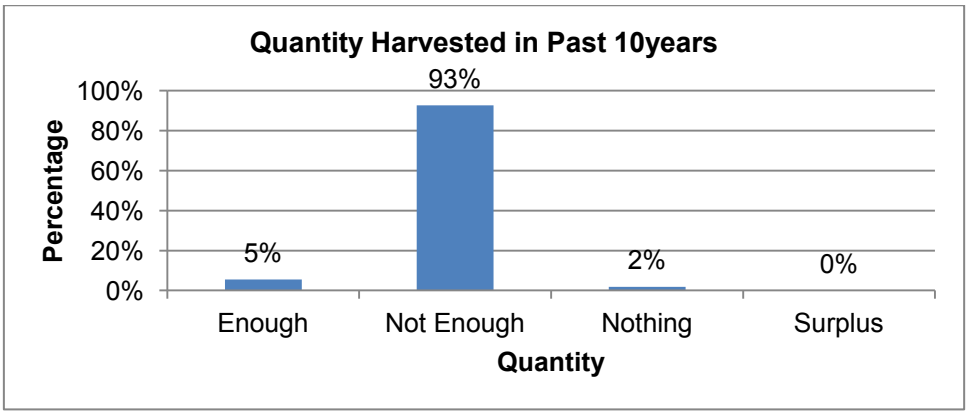

Figure 4.39: Quantity harvested in the past ten years by households

This shows that the community experienced a series of years with most households not harvesting enough for their own use, meaning every year they end up buying to feed their families. "*This is particularly so because communal people, or the poor in general, are always affected by drought despite bumper harvests in previous years*" (Chigodora, 1997). This is a challenge which they are living with and it presents serious risk to the community.

The responses on quantities harvested are displayed in Figure 4.39 above. This information is also supported by results of whether the households rely on their farm produce or not which is shown in Table 4.11 below.

Table 4.11: Households reliance on farm produce

Reliance on Farm Produce	Yes	No	**Total**
Percentage	14%	86%	**100%**

4.22. **Source of drinking water**

The sources of drinking water were also analysed and this showed that 51% of the households use borehole water; 44% of the households use unprotected wells; 2% of the households use tap water whilst 1% of the households get their water from the river. The results show that a greater proportion of the community is drinking unsafe water and this makes the group amount to 45% altogether.

"*Maintenance of the bush pumps has largely been done by the District Development Fund (D.D.F.) and, in few instances, by the local community. Due to severe budget cuts, D.D.F is failing to maintain boreholes fitted with bush pumps and has led to a poor level of service*" (Mombeshora, et al., 2001, p. 50) . This community is at high risk and if a drought occurs it causes water level to dwindle forcing more people to opt for unsafe water.

Rural households find it easier to fetch water from unsafe sources, such as rivers or unprotected wells. In addition, there is limited involvement in maintenance of boreholes by the communities (Mombeshora, et al., 2001). The results of sources of drinking water are shown in Figure 4.40 below.

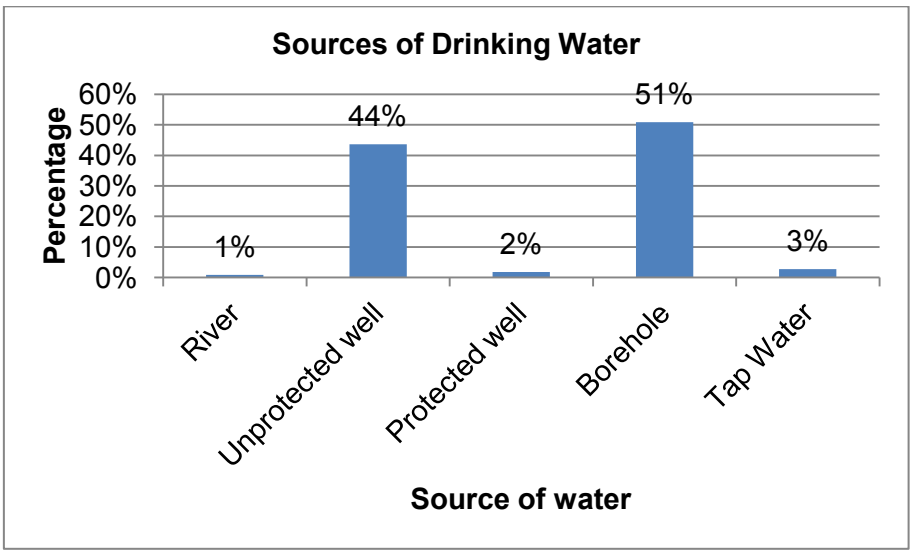

Figure 4.40: Sources of drinking water and percentages of households

4.23. **Number of Meals per Day**

The number of meals that households have per day were also analysed and the results revealed that 85% of the households take two meals per day; 7% of the households take one meal per day; 6% take three or more meals per day whilst 2% of the households sometime fail to have a meal in a day.

Generally, most households are failing to afford three meals, which is breakfast, lunch and supper. This shows that the community is really facing the effects of drought, resulting in deciding to compromise food in order to meet other needs. Figure 4.41 below shows the percentages of households for different number of meals per day.

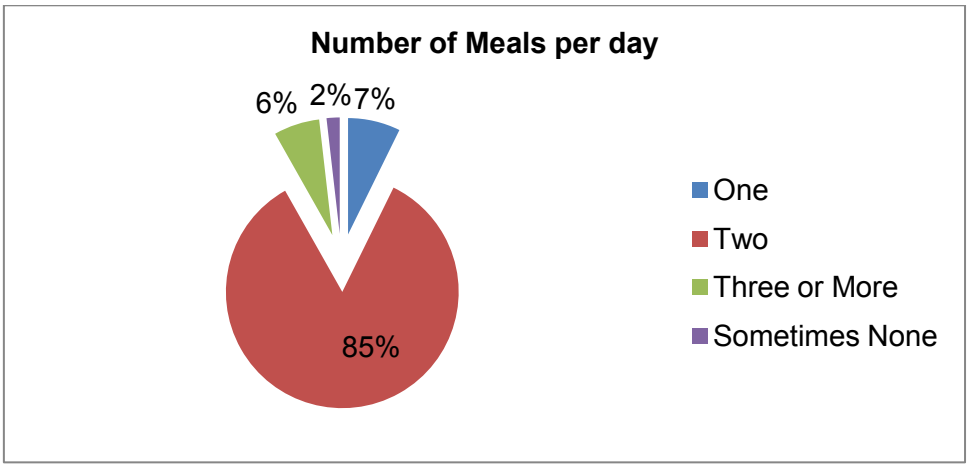

Figure 4.41: Number of meals per day and percentages of households

Quantity of produce from the farm and number of meals also have a relationship which is shown by the results that 78% of the households did not produce enough and they were having two meals per day and 7% of the households with not enough produce had one meals per day. This shows that the amount of produce tends to influence the number of meals that a household can afford as shown in figure 4.42 below.

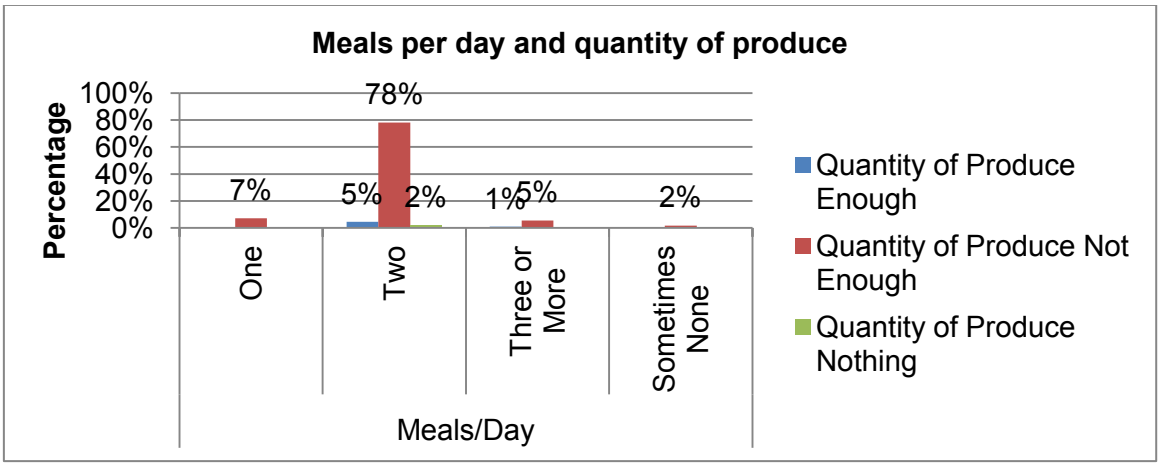

Figure 4.42: Meals per day and quantity of produce for households

4.24. **Nutritional Status**

Data on nutritional status of the households was analysed and lead to 39% of the households indicating that they are malnourished; 55% of the households said they are fairly nourished whilst 1% of the households indicated that they are well nourished and 5% of households were not sure about their nutritional status. The fact that only 1% is well

nourished means that the community is at risk of all turning to be malnourished if drought prolongs. Figure 4.43 below shows the percentages of households per nutritional status.

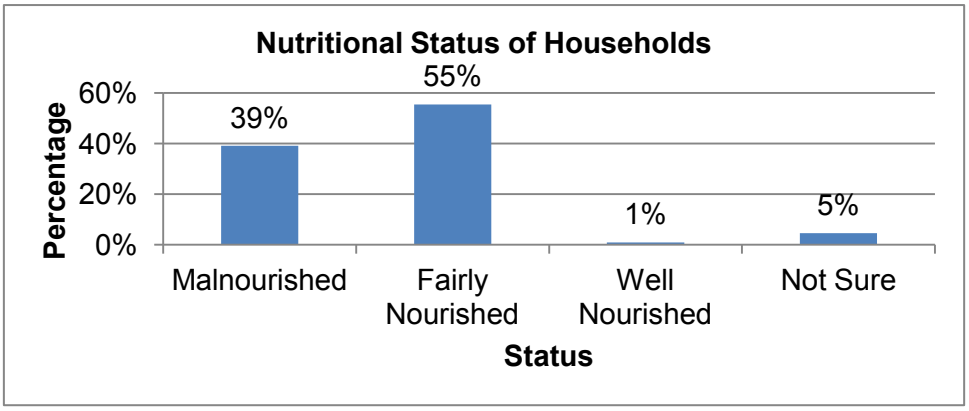

Figure 4.43: Nutritional status and percentage of households

This data was analysed again with the quantity of produce by households and there happened to be a link between the two. It showed that 52% households that did not produce enough were also in the fairly nourished group whilst 39% of the households which did not produce enough were in the malnourished group. Figure 4.44 below shows the relationship between nutritional status and the quantities produced by households.

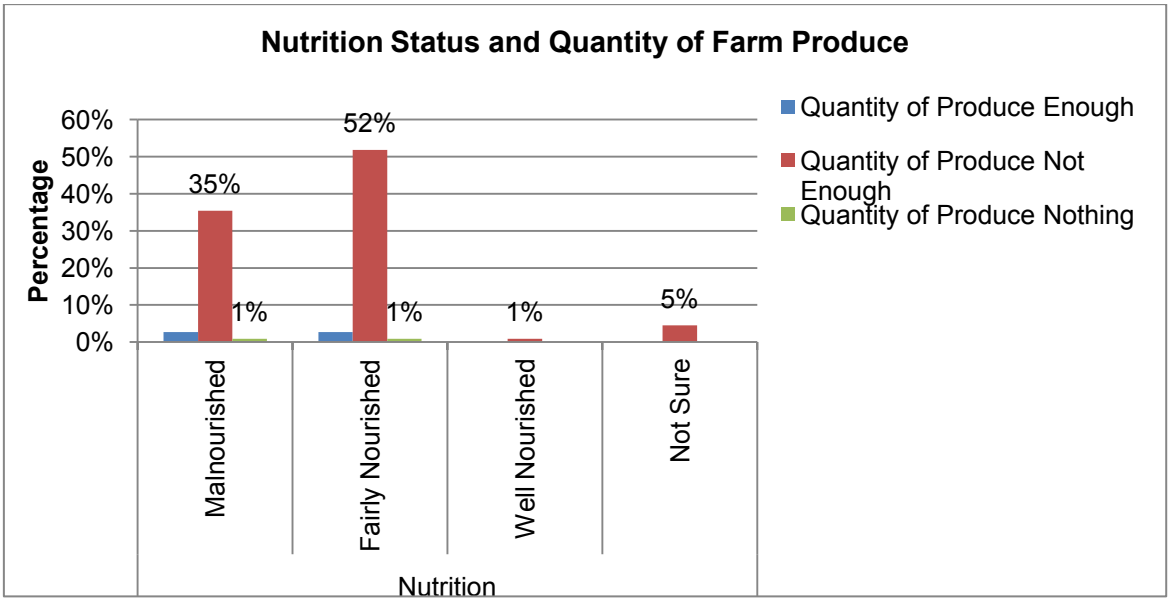

Figure 4.44: Nutritional Status and Quantity of farm produce

There is a close link between these variables and as time goes on with continuous drought conditions it is most likely that a higher number of the fairly nourished households are likely to join the malnourished households thereby increasing the number of households at risk of drought effects.

4.25. **Balanced Diet**

The diet of the households was also analysed and 82% of the households indicated that they are not getting a balanced diet; 15% of the households said they have a balanced diet whilst 4% of the households were not sure about their diet. This reveals that majority of the households are eating one type of food which makes their bodies lack vital minerals and vitamins as well as foods like proteins which build the body. This increases the risk of the community to drought. Table 4.12 below shows the percentages of households on different diet status.

Table 4.12: Diet of households and percentages

Diet	Balanced	Not Balanced	Not Sure	**Total**
Percentage	15%	82%	4%	**100%**

Nutritional status was also seen to be related to the number of meals per day where 47% of the households were fairly nourished and had two meals per day whilst 35% of the households said they are malnourished and have two meals per day. This shows that having two meals per day and the diet is not balanced, hence households are likely to be malnourished. Prolonged drought may cause all the people who are fairly nourished, to reduce meals and add to the malnourished group. Figure 4.45 below shows nutritional status and number of meals per day.

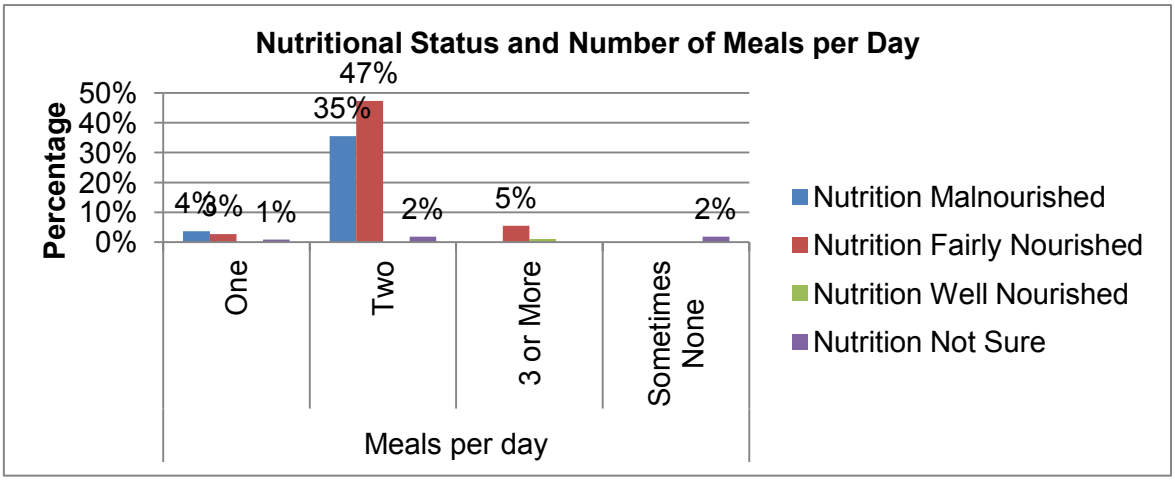

Figure 4.45: Nutritional Status and Number of Meals per Day

All that has been discussed in this analysis will assist to draw conclusion on the risks that are associated with drought on livelihoods of households in Chipinge South. The conclusion will lead to recommendations according to the picture presented by this research which are not exhaustive since there is still room for other views in future researches.

4.26. **Observed Conditions in Villages.**

4.26.1. **Unprotected Well**

Figure 4.46: School children fetching water from an unprotected well in Matsuro area

Figure 4.46 above shows school children fetching water at an unprotected well. The water is for use at school. The shortage of water in the area made people resort to using water from unprotected wells. "*The drought has also led to water scarcity for both human and animal consumption, and drought-affected communities are using unprotected water sources, increasing the risk of waterborne illnesses*" (USAID, 2016, p. 1).

Children are at high risk because they may drink the water without boiling when they are thirsty walking from school. The holes of unprotected wells are also a hazard to animals and human beings since they can fall into the pit unaware. Abandoned wells also which are no longer in use are also a hazard to people and animals.

4.26.2. **Borehole Water**

Figure 4.47: Community member fetching water at Tingi Borehole in Vadzimu area Photo by Jane Masiyatsva.

Figure 4.47 above shows people waiting to fetch water from a borehole called *Tingi* which is known to be very hard to pump water to fill just one 20litre bucket. Also villagers prefer to help each other to pump water taking series of breaks to allow water level to rise in the pipes.

Villagers indicated that if a person fails to wake up early to fetch water, he or she may spend hours in a queue for water because the borehole is not easy to get water from.

4.26.3. **Dry River Channels**

Figure 4.48 below shows the river *Dambarare* without water. This river used to have water throughout the year in the previous years. Recurrent droughts and below normal rainfall contributed to the drying of the river. People who used to have gardens along the river could not continue with their gardening because there is no water.

Figure 4.48: Dambarare river without water in Vadzimu area

Photo by Jane Masiyatsva.

"*Musirizwi River is almost dry while water in Save is very low. I have approached NGOs to help drilling boreholes in the area and I am expecting a response this month*," these were words of Prosper Mutseyami, a legislator for Musikavanhu constituency in Chipinge district (Mambondiyani, 2016).

4.26.4. **Lack of Grazing Land**

Figure 4.49 below shows a cattle grazing on a barren land in Vadzimu village. The picture shows that there is no trace of previous harvest since the fields are bare and dusty. This is a sign that it did not rain for a long time. Animals are bound to eat soil and poisonous plants since there is hardly any grass to graze or leaves to browse.

Figure 4.49 : Cattle grazing on barren land

Photo by Jane Masiyatsva.

"In Zimbabwe's ongoing drought, the constituency of Chipinge South in Manicaland Province is one of the worst-affected areas. There, only hardy domestic animals like goats have been able to survive the drought that has hit the southern African country" (Chaunza, 2016). The report also indicated the report of government which reported that as of February 24 2016, people across the country have lost 19,300 herds of cattle because of drought. This exposes livelihoods of households to high risk since some of them depend on livestock as bailout from drought conditions.

CHAPTER FIVE

5.1. **CONCLUSION**

This chapter consolidates all the arguments from chapter one to chapter four and shows the connection between the objectives in chapter one, the study of literature presented in chapter two and the results of data analysis in chapter four of the research. The extent to which the objectives were achieved will be outlined and concluded. Recommendations will suffice based on the conclusions guided by the findings or results.

Generally, drought risks are evident in Chipinge south and are related to livelihoods of communities to a greater extent. Most households in the community of Chipinge South are communal subsistence farmers who depend on rainfall on their farms. There are a lot of challenges which are linked to drought experienced in the community as shown by the results of data analysis.

This scenario allows rejection of the null hypothesis and accept the alternative hypothesis based on the vast evidence from the analysis of data. The reasons for arguing that there is significant evidence to support a relationship between drought risks and the livelihoods of Chipinge South community are elaborated in this chapter.

5.1.1. **Demographics**

The community of Chipinge south is composed of households that are headed by mature people who are above 30 years of age, majority of them are female headed either because men are at work or the woman is a widow. The analysis showed that only 35% of the households are headed by men, which means most of the activities of the household are run by women in the community. Challenges of drought risks need concerted decision making. It may not be possible to make effective decisions when the woman is alone or the man is alone.

This does not mean that there is no confidence in women, but critical decisions need men and women of the house to help each other when it comes to things affecting their main source of livelihood. The single-headed household dominance on its own coupled with lack of education results in a bad combination to tackle the effects of drought risks on livelihoods.

The analysis showed that 48% of the households have primary education or nothing and if coupled with those that have ordinary level it goes up to 88% who have low education level, drop-outs or never went to school. On the other hand, women who dominate the community show that 37% have primary education or never went to school and also including those who went up to ordinary level the percentage goes up to 60%.

The size of the households show that the community is dominated by an average to large household sizes supported by the analysis that 88% of the households have four or more than four people in the household. Families with four people amounted only to 15%, hence most of them are large families. This is another contributing factor which worsens conditions when faced with drought. A big family is good for labour in the fields but is a risk when drought hits the family.

5.1.2. **Drought risks**

Low yields

The analysis of yields of households show that 93% do not have enough for their own use and 93% could not sell surplus because of poor harvests. This shows that there is high risk of low yields caused by drought in the area and this affects their livelihoods because 85% of the households indicated that their main source of livelihood is farming. This is supported by other authors when they argue that climate change is expected to increase the frequency and severity of droughts, worsening the likelihood of poor yields, crop failure and livestock mortality (Morton, 2007) (Kevan, 1999). The success of their livelihoods will always be hindered by the effects of drought. They need to address this problem to improve their sources of livelihood.

Livestock Mortality

Drought does not only affect crops, it also disturbs the breeding cycles of livestock and most of them succumb to drought because of lack of fodder and drinking water. From the focus group discussions, one of the villagers indicated that they wake up early to travel a distance close to 10km to go and water the animals. They wake up early to make sure they have to get clean water for their livestock.

Goorimwe is the only area around *Muumbe* that still has water and people are travelling the same distance to do gardening there to aid their income. Another villager in the *Vadzimu* Village indicated that their headman announced that they can no longer go to the borehole to water their animals, the borehole is reserved for human consumption. Anyone who is seen watering animals at the borehole will be severely punished or fined if not chased away from the village because water levels are critical.

This shows that it will be difficult for livestock to survive such conditions where they drink water early in the morning before they graze. Another villager in *Mavhikenduku* village indicated that the current drought provides them with free meat from animals that are collapsing as a sign of giving in to the challenges of shortage of water and grazing land.

Villagers in Matsuro also confessed that they are buying feeds from the *Checheche* growth point at National Foods Limited to supplement the animals to keep them alive in the hope that the rain will come soon and replenish the grazing lands. They also elaborated that if drought conditions continue, they will just accept that they lose their livestock because they cannot afford the prices of the cattle feeds.

Cattle are the most affected and they are dying at alarming rates. It is a high risk because they are the most valued type of livestock in the villages where they can sale them for better value to solve other problems. Cattle prices range from $300 to $500 depending on size and weight. The value of cattle during drought goes down because of poor healthy as they lack feeds and butchery people take advantage of the situation to lower the price.

Lack of drinking water

Drought leads to the depletion of water bodies and the ground water level declines to the extent that some boreholes and wells become dry. A villager in *Matsuro* village indicated that their borehole is no longer producing enough water in some cases they wake up at 3am to go and fetch water before more people wake up. They have a borehole nicknamed *Tingi* because it is hard to pump water. It is alleged that this is caused by the depth at which the water was found. Villagers also elaborated that it takes 30 minute to fill a 20 litres bucket with water.

The analysis done in chapter four also shows that 45% of the households get their water from unprotected wells and rivers and only 1% of these households have access to water from the river. This means quite a number of households are at risk of contracting water borne diseases which affects their well-being and will fail to work effectively on the fields resulting in poor harvests because they would have failed to plant in time due to poor health. Water is life and people cannot do without water.

Crop Failure

Crop failure is in most cases related to inadequate rainfall during the planting season and it is necessary to note the importance of drought as a barrier to successful crop and livestock production because most communities in Zimbabwe depend on rain-fed subsistence farming in the communal areas (Unganai, 2014). The communities in Chipinge South are also depending on rains in their livelihoods and they are always found wanting during droughts.

The analysis showed that most households fail to sell surplus and majority would have planted maize, which fails dismally when there is below normal rains. It is also clear that farmers who opt for small grains realize a better harvest and manage to sell more than

maize growers. This shows that choice of crops is vital to curb risk of crop failure when droughts occur.

Villagers in the sampled wards indicated that, in the previous farming season of 2015/2016, which stretches from October to march, almost all households did not manage to harvest anything since this current drought is the worst ever seen. The situation in the fields also could tell that there was nothing in the fields because there were no stalks of dried maize plants and most households did not have piles of stalks (*mahlanga*) which they put on top of cattle kraals reserving them for feeds during the dry spell.

High Poverty Rate

Results from the analysis of data show that 97% of the households have an average income of less than US$1 000 per annum which translates to US$83.33 per month. This is US$2.78 per day if calculated using a month of 30 days. This is well below the current poverty datum line in Zimbabwe which shows that Total Consumption Poverty Line (TCPL) for an average of five persons per household stood at $481.00 in April 2016 (ZIMSTAT., 2016).

This shows that the community find themselves in severe poverty and impacts any stance that they may think of in line with improving their livelihoods. The likelihood of a chain of poverty being inherited from generation to generation is very high and chances of improvement will seem very difficult for the community without government or other organizations chipping in to rescue them.

Poverty itself becomes a ripple effect of drought on the livelihoods of the rural communities. They end up failing to afford modern methods of farming, failing even to have the draught power to ease the preparation and planting process in the fields. This is shown by the results of analysis where 38% of the households are still digging using hand hoes and 62% are using draught power. Moreover, loss of cattle may result in an increase on the percentage of households that dig using hands since most cattle were lost in the 2015/2016 drought.

Unreliable Drought Early Warning Systems

The results of the analysis of data showed that 90% of the households view the drought EWS as not reliable and sometimes reliable. Sometimes reliable means most of the times not reliable and this is a drought risk which affects the livelihoods of the community because their lives depend on farming. Drought warning information failing to get to households in time or with correct meaning implies the livelihoods of the community are at stake.

"*Drought early warning systems are the least developed systems due to its complex processes and environmental and social impacts. The study of existing drought early warning systems shows that only a few such systems exist worldwide*" (Grasso, Undated, p. 27). This argument shows that most countries fail to manage droughts because of lack of effective drought EWS which can equip communities with the right knowledge at the right time to curb effects of drought risks on their livelihood.

Physical Well Being

The fact that results show 39% of the households being malnourished and 85% of the households only having two meals a day coupled with 82% of households not getting a balance diet depicts a serious problem which is another risk caused by drought which impacts on the livelihoods of the community. A malnourished person, eating an unbalanced diet comprised of only two meals a day raises the likelihood of an inefficient labour force in the fields.

Depending on the time of the day when households consume the meals, some will work in the fields on empty stomachs and be expected to deliver their best without eating or not knowing whether they are going to have the next meal because some indicated that they sometimes go for a day without a meal.

5.2. **RECOMMENDATIONS**

5.2.1. **Water Harvesting**

Water harvesting can be of help where the government or NGOs initiate the project where households are encouraged to have their own water source in the form of protected deep wells. This will ease the pressure on public boreholes and also reduce distances that people walk in search for safe drinking water. The same water from deep wells can be used to water gardens at homesteads with a variety of vegetables to supplement their diet. This will reduce the rate of malnutrition, improve the number of times households have meals in a day.

5.2.2. **More Drought Resistant Crops**

The promotion of drought resistant crops can also improve the livelihood of communal farmers since they can still harvest surplus for sale even if the rainfall is below normal. When they harvest they can sell and use the income to buy the food of their choice. The agricultural inputs programmes run by the government and NGOs should supply households with the small grains and other cash crops which are drought resistant like cotton and sunflower to ease the problem of low harvests. The agricultural inputs programmes should also be followed by monitoring programmes to see if communities are

really implementing the small grains programme with more AGRITEX officers deployed in the communities.

5.2.3. **Diversification of Livelihoods**

Communities need to be exposed to other forms of livelihood which can assist in the event that yields from the fields are not sufficient. This can be promoted through art and culture at school so that children graduating into adults will have skills to generate an income by using their talents. Crafts, weaving and fruit harvesting are among the forms of livelihood which are carried out in other areas.

5.2.4. **Subsidised Education or Free education for the Poor**

Education should be promoted in rural areas since it is believed to be the major driver of the economy. The level of education can be improved by educating the rural poor children at highly subsidised rates so that everyone can have access to education. Incentives can also be availed to teachers for scarce skill subjects such as Mathematics and Science, in order to lure them to rural areas. This will improve the education quality in rural schools and the successful candidates can improve on their households' livelihood to avoid the chain of poverty and drought risks.

5.2.5. **Rural Electrification**

Projects such as rural electrification, initiated in the 90's, should be supported financially so that the rural population is provided with electricity at their homesteads. This will avail more chances of diversifying livelihoods and stop rural to urban migration which reduces the number of men in rural communities. With electricity people can engage in welding or metal work, carpentry and other forms of livelihood which need power to support them. Electricity will also assist in pumping water from deep wells and boreholes.

All the suggestions presented above are believed to improve the conditions of the Chipinge South community, provided there are thorough consultations with the community. The community has many ideas which can help them if they are refined and implemented to the benefit of the community.

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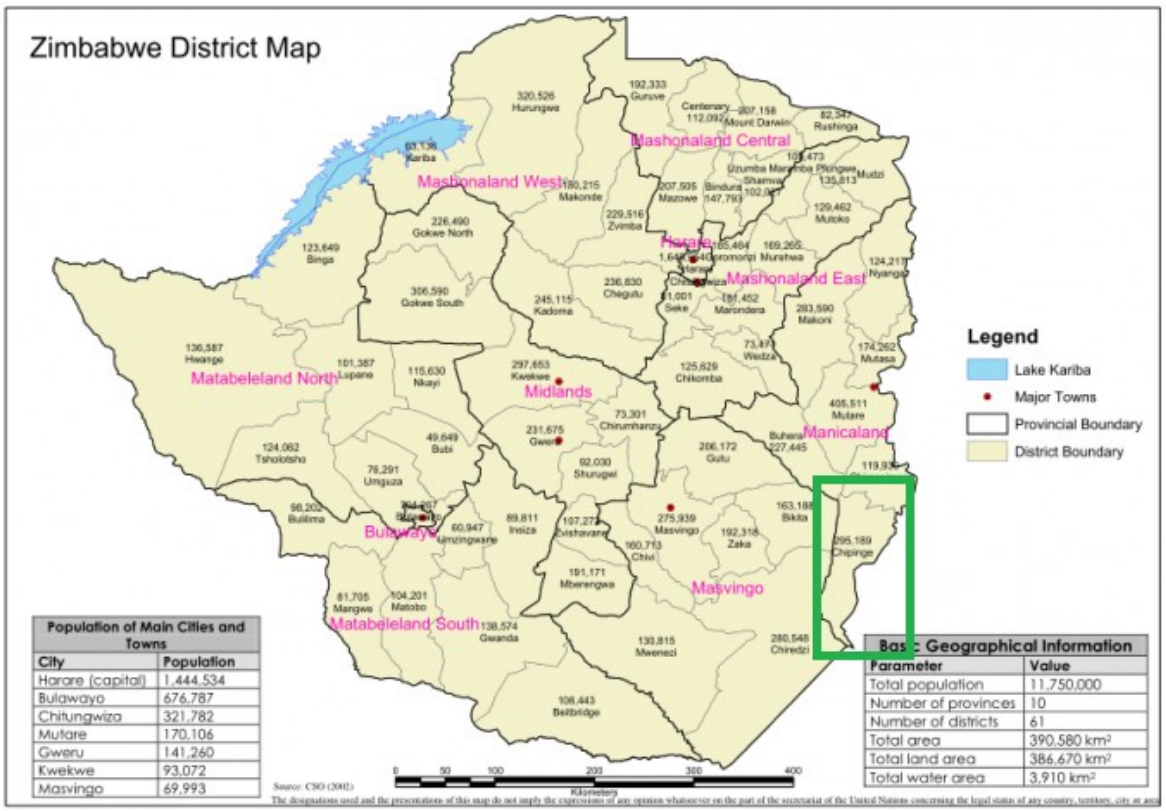
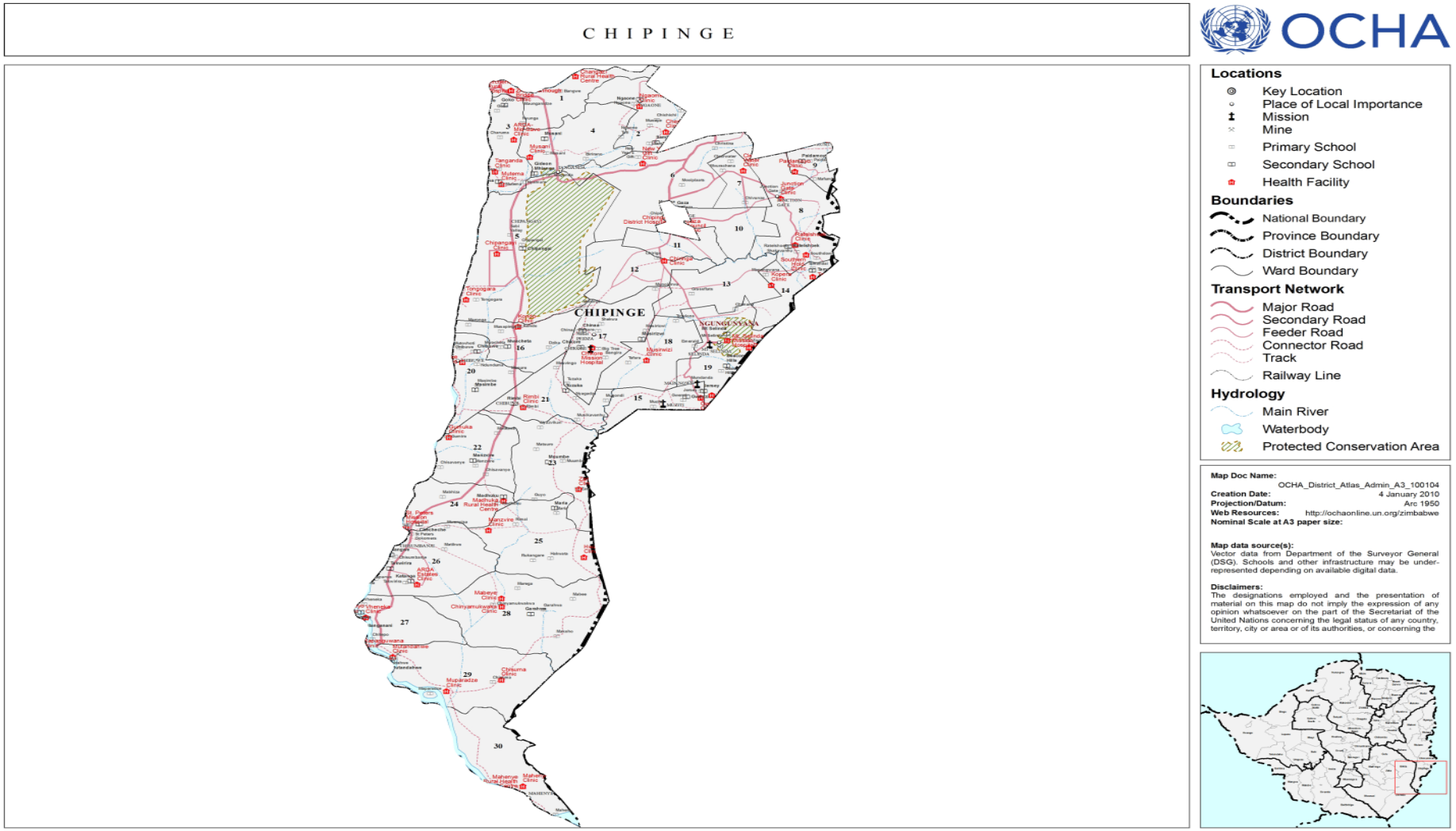
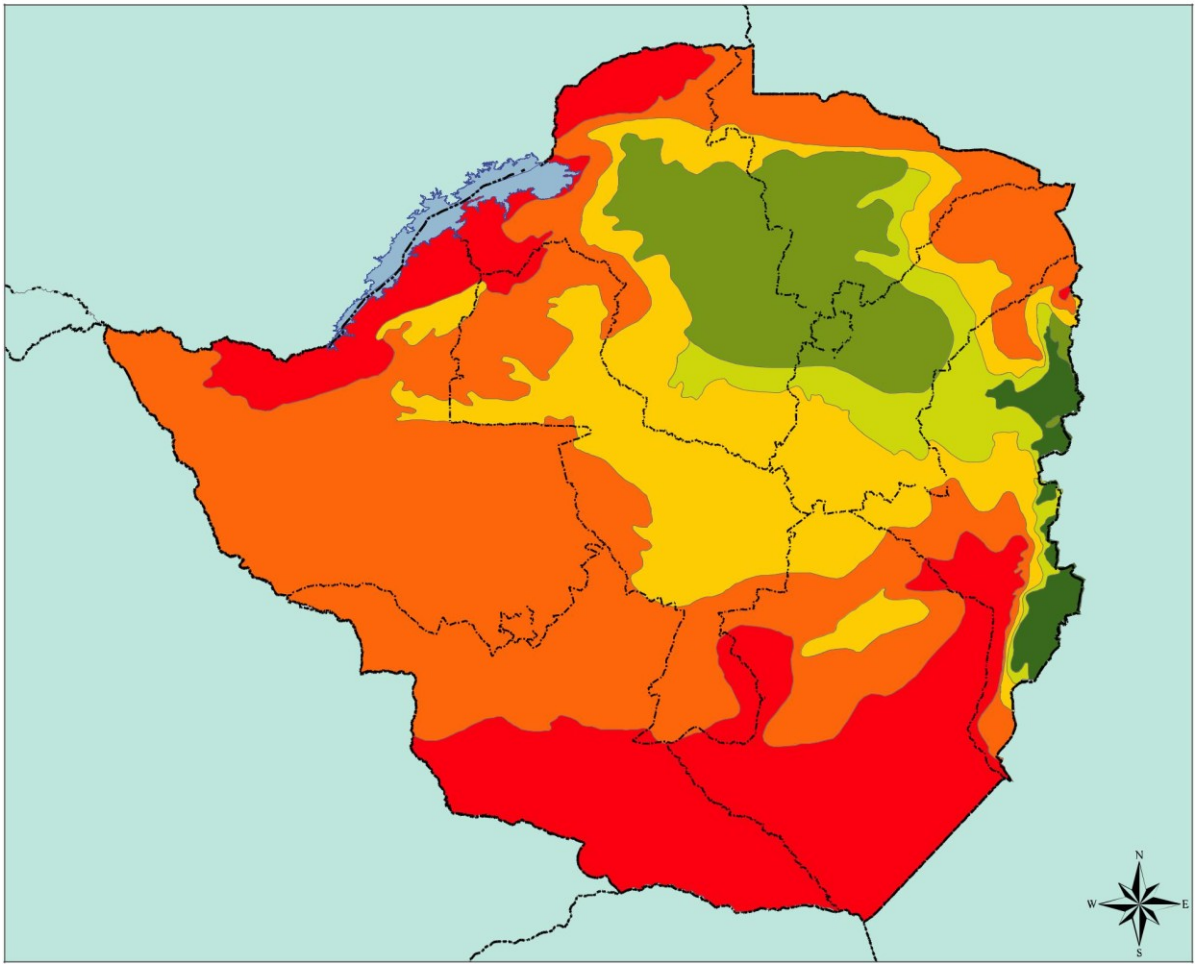
ANNEXURE A: Map of Districts in Zimbabwe



ANNEXURE B: Map showing Chipinge District Wards



ANNEXURE C: Zimbabwe Agro-Ecological Regions (Ecological Natural Regions)



OCHA

Legend

International Boundary

Province Boundary

Natural Farming Regions

I - Specialised & Diversified Farming Region (>1000 mm)

IIA - Intensive Farming Region (750 - 1000 mm)

IIB - Intensive Farming Region (750 - 1000 mm)

III - Semi-Intensive Farming Region (650 - 800 mm)

IV – Semi-Extensive Farming Region (450mm – 650mm)

V – Extensive Farming Region

Lake/Waterbody

Map Doc Name:

ZWE008_Zimbabwe_AgroEcolZones_v2_A4_05102009

GLIDE Number:

Creation Date: 5 October 2009

Projection/Datum: Arc 1950

Web Resources: http://ochaonline.un.org/zimbabwe

Nominal Scale at A4 paper size: 1:4,507,665

Map data source(s):

Vector data from Department of the Surveyor General (DSG) and Central Statistical Office (CSO). Agro-ecological zones data from Agritex.

Disclaimers:

The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or

ANNEXTURE D: Structured Questionnaire

Disaster Management Training and Education Centre for Africa

Structured Questionnaire.

1. Introduction.

DiMTEC,is a Disaster Management Training and Education centre for Africa. A Masters' Student at the University of the Free State is conducting a survey on "**effects of drought risks on the livelihoods of rural communities in Chipinge District, a case study of Chipinge South Villages in Zimbabwe**". The data collected will be kept strictly confidential and findings will be used for academic purposes and if need be, will be availed to the community to help to improve livelihoods of the households and build coping capacity to deal with droughts in future.

1.2. Section A: Identification.

Date : ..... Interviewee Number :.....
District : ..... Name of Interviewer :.....
Village : ..... Ward :.....

1.3. Section B: Demographics.(Encircle one answer on each question)

Q1. What is your Age?

1	Less than 18yrs	2	19yrs – 25yrs	3	26yrs – 30yrs
4	31yrs – 40yrs	5	41yrs – 55yrs	6	Over 55yrs

Q2. What is your gender?

1	Male	2	Female

Q3. What is your marital status?

1	Living together	2	Married and living together	3	Married and not living together
4	Never married	5	Widowed	6	Divorced or separated

Q4. If Married, What type of marriage? (Encircle possible options)

1	In community of property	2	Out of community of property
3	Polygamous marriage	4	Monogamous marriage

Q5. What is the size of your household?

1	1 person	2	2 people	3	3 People	4	4 People	5	5 People
6	More than 5 People								

Q6. How Many children are below 18 years in your household?

1	1 child	2	2 children	3	3 children	4	4 children	5	5 children
6	>5 children	7	None						

Q7. Do you have orphans living in your household?

1	Yes	2	No

Q8. If yes, how many are they?

1	1 Orphan	2	2 Orphans	3	3 Orphans	4	4 Orphans
5	More than 4 orphans						

Q9. How many children are of school-going age in your house hold?

1	1 Child	2	2 Children	3	3 Children	4	4 Children
5	>4 Children	6	None				

Q10. How many children in your household are going to school?

1	1 Child	2	2 Children	3	3 Children	4	4 Children
5	>4 Children	6	None				

Q11. What is your highest qualification?

1	Ordinary Level Certificate	2	Advanced Level Certificate
3	Diploma	4	First Degree
5	Post Graduate Degree	6	Other. (Specify).....
7	None		.....

1.4. Section C1: Livelihoods.

Q12. What is your main source of livelihood/ income? (Encircle only one answer)

1	Formerly employed	2	Farming and Gardening
3	Piece jobs	4	Weaving and / or craft
5	Remittances from family and friends	6	Other. (Specify).....

Q13. If you chose farming, answer this question. Encircle all possible options.
Do you do farming for family consumption and /or for sale?

1	Yes	2	No

14. How big is your land for farming?

1	Less than 1 hectare	2	1 hectares – 2 hectares
3	2.1 hectares to 3 hectare	4	3.1 hectares – 4 hectares
5	4.1 hectares – 5 hectares	6	More than 5 hectares

15. What types of crops do you usually grow?

1	Corn or Maize	2	Small grains
3	legumes	4	Bulbs
5	Cotton or Sunflower	6	Other (Specify).....

Q16. Which crops chosen above produce more surplus for sale?

1	Corn or Maize	2	Small grains
3	legumes	4	Bulbs
5	Cotton or Sunflower	6	Other (Specify).....
7	None		

Q17. If you fail to sale most seasons, what is the reason?

1	Low prices	2	Low harvest	3	No Transport
4	Expensive Transport	5	Theft	6	Other (Specify and use space below)

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Q18. How much is your average income per annum in United States Dollars (US$)?

1	Less than 1000	2	1001 - 2500	3	2501 – 5000	4	More than 5000

1.5. Section C2: Beliefs and Practices.

Q19. What do you use to till the land?

1	Tractor	2	Ox-drawn plough	3	Hand digging hoes	4	Other

Specify for other.....

.....

Q20. Which weeding method do you use?

1	Herbicides	2	Manual labour	3	Both	4	Other .....

Q21. Which additional farming inputs do you use?

1	Fertilisers	2	Manure	3	Both	4	Other (Specify below)	5	None

Specify for other.....

Q22. Which Livestock do you keep on your farm? (Encircle possible options).

1	Cattle	2	Goats	3	Sheep	4	Pigs	5	Donkeys
6	Chickens	7	Dogs	8	Other(Specify below)	9	None		

Specify for other.....

Q23. Which methods of farming do you use?

1	Modern	2	Traditional	3	Both	4	Other (Specify).....

1.6. Section C3: Drought Mitigation, Preparedness and Coping Capacities.

Q24. What type of drought mitigation measures do you use?

1	Irrigation	2	Food Reserves	3	Food Aid	4	Drought Resistant Crops
5	Selling Property			6	Selling Livestock	7	Other (Specify below)
8	None						

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Q25. What types of early warning systems are in place in your community?

1	Local Meteorological Stations	2	Community leaders
3	International Media	4	Local Media
5	None	6	Other (Specify).....

Q26. Which organisations supply the drought early warning?

1	Radios	3	Newspapers	5	Other (Specify).....
2	Televisions	4	Phone SMS's	6	None

Use this space to specify for other information?

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Q27. Do the Selected organisation(s) own the system/ information?

1	Yes	2	No

Q28. How reliable are the early warning systems for drought?

1	Very reliable	2	Sometimes reliable
3	Not reliable	4	Other (Specify)…….....

Q29. Which coping measures to droughts are in place in your community?

1	Grain banks	2	Water harvesting for irrigation
3	Drought resistant crops	4	Food aid
5	None	6	Other (Specify).....

1.7. Section C4: Policies and Structures.

Q30. Do you benefit from services provided by local government or national government?

1	Yes	2	No	3	Not sure

Q31. Which organisations provide services to your community? Encircle all possible options.

1	Local government	2	Non-governmental organisations
3	Community-based organisations	4	Other (Specify).....
5	None		

Q32. Do you have an Agricultural Extension Officer for the area?

1	Yes	2	No

Q33. Which services do you benefit from organisation(s) chosen above?

1	Education and training	2	Health
3	Income generating projects	4	Agricultural inputs
5	Food aid	6	Other (Specify).....

Q34. Do you think you have influence on decisions about problems affecting your community?

1	Yes	2	No	3	Not sure

Q35. If yes, at which level?

1	Village	2	Ward	3	District
4	Provincial	5	National	6	None of the above

1.8. Section C5: Drought risks.

Q36. How do you rate your produce or harvest in the past few years?

1	Enough to feed family	2	Not enough to feed family		Other (Specify).....
3	Did not get anything	4	Got surplus for sale	5	.....

Q37. Do you rely on sales from farm produce to send children to school?

1	Yes	2	No

Q38. What is your source of drinking water?

1	River	2	Unprotected well	3	Protected well
4	Borehole	5	Tap water	6	Other (specify).....

Q39. How many times do you have a meal per day?

1	Once	2	Twice	3	Three or more	4	Sometimes none

Q40. What do you thing is your nutritional status?

1	Malnourished	2	Fairly Nourished	3	Well nourished	4	Not sure

Q41. Do you have a balanced diet?

1	Yes	2	No	3	Not sure

Any comments you think may help in this research?

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