

MIDLANDS STATE UNIVERSITY



**FACULTY OF ARTS
DEPARTMENT OF DEVELOPMENT STUDIES**

**RESEARCH TOPIC
COPING STRATEGIES TO REDUCE FOOD INSECURITY IN THE FACE OF
CLIMATE CHANGE: A CASE STUDY OF CHIREYA WARD 5; GOKWE NORTH**

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**DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS OF THE MASTER OF ARTS IN DEVELOPMENT STUDIES.**

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Our hands, our minds, our destiny

**RESEARCH SUPERVISION ACKNOWLEDGEMENT FORM
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the information in the Dissertation which is not my own has been identified and acknowledged. It is being submitted in partial fulfilment of the requirements of the Master of Arts in Development Studies at Midlands State University, Zvishavane Campus.

Signature

Date

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.....

DEDICATION

This work is dedicated to Denzel Siphon Taruberekera and native Zimbabweans who did not get this chance to get educated.

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ABSTRACT

This study focused on the effectiveness of the coping strategies to reduce food insecurity in the face of climate change, in Chireya ward 5 in Gokwe North Midlands Province, Zimbabwe. Using information from 64 participants that included 64 respondents mixed research approach was used, the research design was a case study that included residents, organizations A to C. The research made use of three data mining instruments which were Focus Group Interviews (FGDs), semi structured interviews, and observations. Findings revealed that agriculture production is on the decreased while food insecurity is on its rising limb. Preliminary results indicated that rainfall and temperature variability have negatively impacted the area under study negatively on their livelihoods, that left many relying on donations. Farmers in Chireya had different perceptions on climate change, the residents were blaming the people's divergence from traditional while the organizations A,B and C had the human activities like pollution and poor environmental management to blame. The study further revealed that households in Chireya ward 5 uses different coping strategies to cope with climate change in order to be food secure. However many of the strategies they use were reported to be ineffective since they do not have sustainability instead they worsen the livelihoods. The study revealed that the households that do not have the assets were finding it difficult to cope effectively, than those with better assets. The recommendations were that the government should bear with the rural communities in its annual planning and that the rural communities and women should be participating and have decision making in projects that benefit them. Income generating projects and water harvesting as well as changing planting dates were some of the recommendations given following the fact that they were one of the effective coping strategies to reduce food insecurity in the face of climate change

Key words: Climate change, food security, livelihoods, coping, assets, awareness

ACRONYMS AND ABBREVIATIONS

CC & V	Climate change and Variability
GoZ	Government of Zimbabwe
CRiSTAL	Community-based Risk Screening Tool Livelihood
LRRP	Land Reform Resettlement Program
GMB	Grain Marketing Program
ZDF	Zimbabwe Defence Forces
AMP	Agriculture Mechanization Programme
ZIMAsset	Zimbabwe Accelerated Sustainable Socio Economic Transformation
NGOs	Non-Governmental Organizations
ZFSO	Zimbabwe Food Security Outlook
GDP	Gross Domestic Outlook
CSO	Central Statistics Office
AGREX	Agriculture Research and Extension
IPCC	International Panel on Climate Change
UNFCCC	United Nations Convention on Climate Change
GHG	Grass House Gases
WHO	World Health Organizations
FAO	Food and Agriculture Organizations
TAR	Third Assesment report
WB	World Bank
SDGs	Sustainable Development Organizations
UN	United Nations
NMES	Nepal Ministry of Environmental Science
WECS	Water and Energy and Commission Secretariat
NCAR	National Centre for Atmospheric Research

NSIRO	Common Wealth Scientific and Industrial Research
HARDLEY	Hardley Cell
NR	Natural Regions
ZAPF	Zimbabwe Agriculture Policy Framework
NIB	National Investment Brief
UNDP	United Nations Development Programme
HDR	Human Development Report
HIV	Human Immuno Virus
AIDS	Aquired Immuno Deficiency Syndrome
IFPR	International Food Policy Research Institute

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Chapter 1

1.0 Introduction

This chapter provides the background of the study, statement of the problem, objectives of the study and the research questions. It also provides justifications, assumptions, and the limitations of the study and how they were solved as well as the description of the study area.

The research outline is also contained in this chapter

1.1 Background of the study

Climate change has posed serious threats to food security worldwide with developing countries more devastated. The shift in climatic conditions in Sub-Saharan Africa from better climatic conditions to semi-arid conditions has raised many questions about Africa's capacity to can feed itself or be able to employ innovative coping strategies for sustainable development. According to Skoufias, Rabassa, Olivieri, & Brahmhatt, (2011) the past three decades have been characterised by erratic rainfall patterns over Africa's sub tropics and a significantly affected agriculture and food production. Crops and livestock have failed to quickly adapt to these harsh climatic conditions and affected many people with women and children mostly affected.

Although rural people in Africa may not fully understand the concept of global warming or climate change they suffer from the negative effects of it. Such effects include a significant decrease of precipitation and humidity, increasing air temperatures, sunshine intensity and seasonal changes in rainfall patterns. These effects have serious negative consequences for food security particularly in developing countries where many countries like Tanzania, Ghana, Nigeria and Zimbabwe just to mention a few were devastated, and their decades of development have been knocked off. Skoufias et al (2011) argue that the poor are more

vulnerable to the effects of climate change and have little assets for resilience. Climate is relatively more important to the poor in Sub-Saharan Africa due to their heavy reliance on nature dependent agricultural activities. When the poor and rural farmers do not have enough information on climate change they would not be able to employ innovative coping strategies to reduce its related effects.

The poor especially the rural dwellers have no or little control over the state resources; they are poor in terms of decision-making, within the communities or at national politics, their voices are just but the empty hollows since nobody values their say. This makes them likely to have lower coping strategies to climate change or to employ strategies that make them more vulnerable to many shocks. Mudimu (2011) noted that marginalised groups have less access to and do not control over 80% of the resources, yet they are the ones making up more than 70% of the population. This scenario is better described as development in an unequal world. This contributes to their vulnerability due to the negative effects of climate change yet experience has shown that the rural dwellers are central to improving their lives because that is where the majority resides, and therefore they must play a pivotal role in community-based coping initiatives using unique indigenous knowledge.

According to Mudimu (2011) a number of initiatives have been undertaken to enhance the coping capabilities of communities in Africa. A case in point is the community-based Risk Screening Tool-Adaptation and Livelihoods (CRiSTAL) tool which was introduced in Mozambique in 2011. The strategies suggested by the tool are believed not to deplete economic assets and not to have potential to degrade the environment but improve it while enhancing livelihoods of populace. This model or framework helped farmers to adjust to seasonal changes on the onset and cessation of rainfall by changing their planting dates, for example coincide with the new rainfall regime.

In trying to reduce food insecurity the Zimbabwean government has introduced a number of blue prints to improve the livelihoods of people in rural areas. Some of the policies introduced include;

- Land Reform and Resettlement Programme (LRRP) of 2000, where more than 350,000 indigenous families were resettled under A1 and A2 models.
- Operation Maguta, of 2005 that sought to promote food production in agriculture and it was spearheaded by the Zimbabwe Defence Forces (ZDF) in collaboration of the Ministry of Finance
- Agricultural Mechanization Programme (AMP), that was launched in 2007 and it was to support farmers by equipping them with farming implements which suited their needs.
- Agricultural schemes 2000-2011, that was aimed at giving credits to new farmers to buy seeds, fertilisers, machinery and agro-chemicals to credit terms, coordinated by Grain Marketing Board (GMB).
- Zimbabwe Accelerated Socio-Economic Transformation (ZimAsset) pegged from 2013 -2018.

However, besides all these initiatives climate change is continuing to wreak havoc the rural populace, robbing them of their economic, physical, social and financial assets. It is therefore the intention of this research to come up with better coping strategies that would help the government policies to be viable at household level, through coping mechanisms that would sustain the living conditions and guarantee the sustainable development.

Like most Africa countries, Zimbabwe has also been affected by the effects of climate change. Due to climate change the average growth of agricultural output over the years since independence has significantly declined (Rukuni et al, 2003). This has put the country into a

dire food security situation and many households are now being fed by Nongovernmental Organizations (NGO), creating dependence syndrome.

Zimbabwe Food Security Outlook (ZFSO) (2013) notes that by 2008, agriculture contributed 15-20 per cent to the Gross Domestic Product (GDP), but this has been dwindling thereafter since the advent of the climate change and variability regimes. Mudimu (2011) observes that at least 70 per cent of the country's population depends on agriculture for their livelihood and their coping assets are from the agricultural sector through saving and investment. Mortimore and Adams (2001) has of the same view that, most of Zimbabwean's unfriendly weather patterns make it vulnerable to climate change. The unfavourable climatic conditions have negatively affected the rural livelihoods in Zimbabwe and there is need of effective coping strategies to reduce food insecurity for sustainable development.

According to Phiri, Ndlovu and Chiname (2014) climate change particularly affects negatively on the livelihood of rural people. The multifaceted environmental and agricultural crisis faced by these people through climate change is hard to bear. People in the rural areas especially women and children are crippled by reduced food reserves, water resources and depleting livestock. Women and children are also grappling with massive migration of men which is increasing their domestic tasks.

Efforts have been made to enhance the capability of rural dwellers to cope with the effects of climate change. For example, people in Tsholothso have adapted to the negative ripple effects of climate through various measures like planting drought resistant crops, contour ploughing and crop rotation among others (Phiri et al 2014). Coping with climate change is an important aspect of protecting the poor from its adverse effects. However, such coping strategies and efforts tend to be isolated, haphazard, inadequate and ineffective.

In light of the foregoing researches, there is a need to come up with measures to enable rural farmers and dwellers to cope effectively with climate change. Hence this study seeks to explore the effectiveness of the coping strategies used by the households in Chireya Ward 5 Gokwe North to reduce food insecurity incidences in the face of climate change.

1.2 Statement of the problem

Most of the debates on climate change have been on the impact of climate change rather than on how people should cope with climate change shocks to reduce food insecurity. More than 90 per cent of the households in rural developing countries are prone to serious food insecurity especially during the post-harvest season (Phiri et al 2014). With about more than two thirds of Zimbabwe comprising of arid and semi-arid land and receiving poor rainfall, coping strategies to reduce food insecurity in the face of climate change is a priority since most people in these areas depend of rain fed agriculture as a source of livelihood. Climate change negatively impacts on the capacity of the rural population to feed itself. Mahiya & Gukurume (2014) argued that widespread poverty and food insecurity in African countries are inextricably linked to low agricultural productivity aggravated by climate change and variability. Thus, with the vagaries of climate change already visible, considerable uncertainty surrounds the agricultural sector in many rural communities like Gokwe. More so, of note is the fact that due to the impact of climate change that causes food insecurity, which impacts negatively on the frequency of meals and health on all members of the household especially the under-fives, thus trapping many households in the vicious cycle of poverty reversing decades of development. Hence forth, this study seeks to explore the effectiveness of their coping strategies, unpacking the coping strategies that should be prioritised for the household to be food secure and for sustainable development.

1.3 Research objectives

The following specific objectives will guide the study:

- To identify the coping strategies employed by farm households in the face of climate change
- To explore the effectiveness of coping strategies used in sustaining livelihoods and ensure food security in the area
- To assess the challenges faced by households in the face of climate change

1.4 Research questions

The study seeks answer following questions

1. What are the coping strategies being employed by rural households to reduce food insecurity in the face of climate change?
2. What are the coping strategies can be prioritised to reduce food insecurity in the face of climate change?
3. What are the challenges that households face in relation to food insecurity induced by climate change?
4. What can be done to assist rural households in coping with climate change to achieve food security?

1.5 Justification of the study

There is a clear need for rural households to be able to understand and cope with the impacts of climate change. The key concern of the study was for rural livelihoods to be sustainable and benefit the future generation especially given the growing evidence of the adverse impacts of climate change. There is a clear need to be able to understand and manage climate change shocks. Such understanding helps to open up opportunities for improving overall

vulnerability since it forces many households to examine with conscience the multi-dimensional nature of global climate change and its local level impacts.

In terms of the knowledge gap, the research on the effectiveness of climate change at local community level particularly in Southern Africa are still very few and scarce. The findings of the study are anticipated to contribute to a body of knowledge to furnish academia, global leaders, policy makers, local authorities and planners with a comprehensive understanding of the local livelihoods dynamics to climate change impacts. According to Chagutah (2010) a comprehensive understanding of the local challenges and resulting livelihoods forms the basis for the effective designing of intervention measures to address given challenges in ways appropriate to the local circumstances.

The study seeks science-based strategic solutions that will help to enhance the adaptive capacity of agricultural and other rural land use systems to climate change for the peasant communities and policy makers to better manage land, the environment and food security in low income nations such as Zimbabwe. It is anticipated to provide a point of departure and reference for future researchers and practitioners in the field of local level climate change and associated impact trends.

1.6 Limitations

These are constraints or challenges that threatened smooth collection of data. These included physical and socio-economic challenges. Therefore this section covers the problems that the researcher faced and how he solved them.

The findings of the research may not be universally applicable, coping strategies vary between countries and communities reflecting differences between asset composition, government composition and availability of external assistance, culture and tradition. This

study mainly focused on the coping mechanisms, employed by households in Ward 5 Gokwe North. Therefore the study did not look on the coping strategies of other geographical locations in other districts and provinces.

Of the major concern, the researcher faced constraints on time management, which required him to balance time for the, research, studying and family commitments. However, the researcher used weekends and off hours to do the research.

The unavailability of the target household heads in the field was a big challenge. Since it was during the rainy season most of the respondents had other commitments such as farm work, personal errands like herding cattle and travelling to business centres to collect farm inputs. However, the researcher accompanied other respondents to their respective farms and interviewed them as they worked in their fields and changed the interview time from during the day to night. The researcher also used the days that they were not going to the farm like Thursday which is a sacred day for resting as well as interviewing some of them on Sundays.

The unavailability of public computer services was one of the major drawbacks, since it threatened the compilation of data. However the researcher opted to leave the field going to Gokwe North growth point, Nembudzia for the compilation of data.

The unavailability of transport services due to poor road infrastructure was a draw back as well. The roads in the Ward have potholes, are muddy and slippery. The researcher sometimes would source fuel and hire a motorbike which is conducive for the harsh terrain or walked on foot so as to curtail transport challenges encountered.

1.8 Study assumptions

It is assumed that the study respondents and participants were truthful and honest in reporting the application of coping strategies and its effectiveness when they suffer climate change

shocks. Despite the fact that the researcher was conversant with the local language there was always a risk of loss of information in the process of translation and analysis of data. It was assumed that the translations were accurate and faced no risk during the study.

1.8 Research setting

According to Central Statistics Office (2013) Chireya ward five is one of the eight (8) wards in Gokwe North, located in the Northern tip of the district, 70km from the nearest tarred road that connects the Gokwe centre and Sengwa Mine, under Kabuyuni constituency in Midlands province. ZimStat (2013) indicated that the ward has 30157 hectares of arable land. The area receives mean annual rainfall of less than 750mm concentrated in the rain season between November and March. In the hottest month of October, the mean temperature is 31 degree Celsius, and in the coldest month which is June, the mean temperature is 19 degrees Celsius. The population density ranges from 26 to 32 people per square km, (Central Statistics Office, 2013). The mean number of households is 6.5 of whom 3.9 are children. The terrain of the area is undulating and has no perennial river except one intermittent river called Ume. The area accommodates people mostly the shona speaking people.

The District constitutes of a highly productive populace with a micro economy driven largely by cotton farming and communal subsistence farming coupled with an elaborate and thriving informal sector. The micro-economy of the ward is largely reliant on subsistence farming. The department of Agricultural and Extension Services stresses that many of the households in the area rely mainly on agriculture to make their basic living and to be able to cope with shocks for survival. They mostly cultivate subsistence food and cash crops chiefly maize, cotton, tobacco and groundnuts as well as keeping cattle and goats.

Gokwe North is one of the impoverished and most remote districts where people rely on natural resources for their living. Ward 5 was chosen as the study area because the researcher

noted with concern that it is an under researched area where a high number of households are food insecure living at the mercy of the Non-Governmental Organizations (NGOs) for a living which is not sustainable because it creates dependency syndrome. The magnitude at which the crops and livestock production are impacted by climate change accompanied by poor service delivery by the government has prompted the researcher to try to explore how the vulnerable households are coping for food security. This study therefore seeks to explore the effectiveness of the various ways in which the households in Ward 5 are coping for sustainability.

1.9 Research outline

This study is made of five chapters:

Chapter One: presents the research problem and its setting. In it there are; background of the study, problem statement, objectives of the study and research questions. It also contains the justification of the study, research limitations and how they were solved, study assumptions and research setting.

Chapter Two: Reviews literature on climate change, food security, livelihoods and coping strategies. It presents also the theoretical framework that guided the study. Case studies on climate change and its impacts from Philippines, Nepal, Tanzania, Ghana and Zimbabwe are included.

Chapter Three: Presents and discusses the research methods used in this study and explains the process through which data were collected and analysed.

Chapter four: Outlines the findings of the residents (case study 1), and key informants that include agricultural department (case study 2), environmental management (case study 3) and local government (case study 4), group discussions, and analysis of these findings.

Chapter five: Gives a summary of the findings, conclusions and recommendations that emerged from the study.

CHAPTER TWO: LITERATURE REVIEW

Climate change is destroying our path to sustainability. Ours is a world of looming challenges and increasingly limited resources. Sustainable development offers the best chance to adjust our course.

Ban Ki-moon

2.0 Introduction

This chapter reviewed related literature from sources including books, internet, and circulars. The literature looked at climate change, food security issues and coping strategies.

2.1 Theoretical framework

The study was substantiated by the pioneering of Wisner et al (2004) on his climate change, food security and livelihoods framework. This framework serves to indicate the various aspects of a community that should be considered in an effort to characterize its vulnerability to changing conditions and its capacity to adapt, particularly as this relate to its food security. The framework serves in part as a ‘check list’ of relevant variables to consider in an analysis. It recognises that there are several dimensions of food security and there are embedded and interconnected with other livelihoods attributes and the natural resource base within which communities operate. The framework indicates key connections and interactions that represent important features of any assessment of the dynamic nature of a community’s food security. It provides an overall outline of the factors and interconnections that constrain and influence the nature and dynamics of a community’s food security. People in a village have a suit of assets and will be affected by biophysical (physical, biology, and ecological) and socioeconomic (social, economic, political and institutional) drivers but the specific assets will vary among individuals and households and their exposure to the drivers may also vary

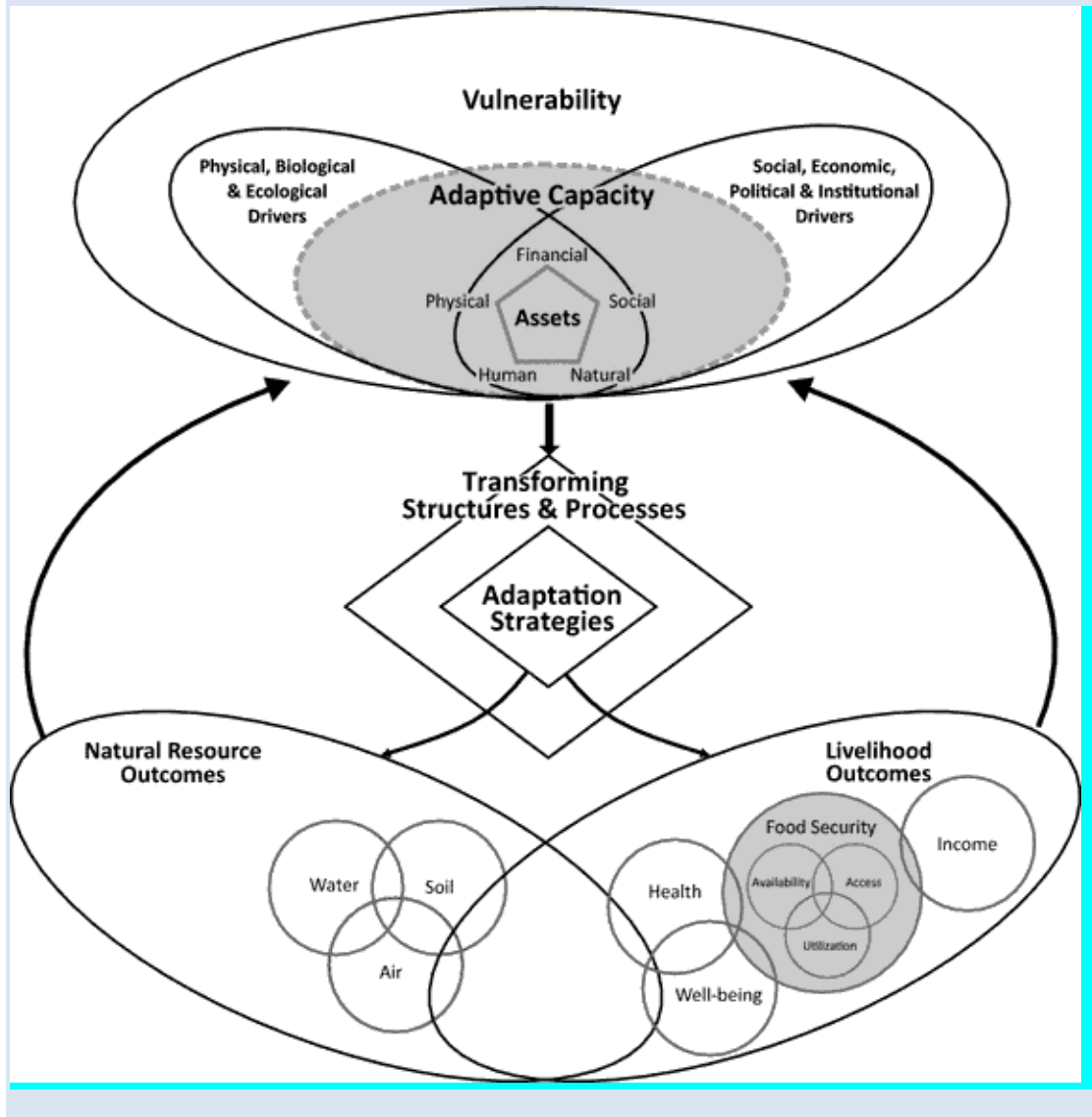


Fig. 1 shows climate change, food security and livelihood framework

As shown in the fig above, the vulnerability of a community is a function of the multiple and interrelated biophysical and socioeconomic drivers that act upon the community and shape its adaptive capacity.

The bundle of resources in Gokwe north Ward 5 like investments, stores and social claims thus determines their degree of coping and vulnerability to shocks. Therefore this study explored how households in Chireya Ward 5 can cope with reduce the food insecurity in the face of climate change using at their assets (resources) and entitlements.

2.2 Conceptual framework

2.2.1 Vulnerability

Quisumbing, (2003), coined that within the economic literature two main approaches to household vulnerability were proposed. In the first approach, vulnerability is defined as a decrease in consumption which can be attributed to an insured exposure to risks, or more generally to the lack of effective coping mechanisms.

The second approach looks at the decline in living standards below a certain threshold, such as poverty line. In both approaches, vulnerability reflects a down trend of living conditions. Drowning's (2008) research clearly shows that, these two approaches are of the same view that the poor are the most vulnerable and suffer the most from the changing environmental changes. The common denominator of definitions of vulnerability is that the key parameters of vulnerability are the stressors, to which the communities in Ward 5 Gokwe North are exposed. The definition of vulnerability in this study is the exposure of households to food insecurity by climate change and climate variability.

2.2.2 Coping

The term coping is sometimes used as a synonym for adaptation, but coping measures are regarded short term responses to avert immediate threats. Davies, (2003) treats coping as a response to an abnormal season over the years. In line with this Adger, (2007) describes coping strategies as short term adjustments or adaptations to extreme events which are

usually involuntary and almost invariably lead to a different subsequent state of vulnerability. In this study, the term coping is regarded as short or long term responses to disturbances such as reduced farm yields, livestock mortality that are a result of a climate change and variability. In this study households should be able to use their physical, human, social or economic assets to cope with the adverse impacts of climate change to reduce food insecurity. This provides the evidence that, despite being vulnerable to climate change impacts households and communities are not helpless victims.

It should be borne in mind that, coping strategies are relative. For example, selling chickens in the market may not be one household livelihood strategy, while for another it may be a coping strategy caused by harvest failure forcing the household to sell off its assets. So in this study anything done by the household to reduce the shock is regarded as coping strategy.

2.2.3 Climate change

Inter-governmental Panel on Climate Change (IPCC), (2007), defined climate change as the significant variation of the mean state of climate relevant variables such as the precipitation, temperatures, wind and pressure in a certain period of time usually over 30 years. These changes according to Mugandani (2009) can be physical resulting from climatic systems and its internal dynamics. Climate change however can also be induced through external influences like pollution. United Nations Framework Convention on Climate Change (UNFCCC) (2009) states in article 1 that climate change is a change which is attributed directly or indirectly to human activities that alters the composition of the atmosphere which is in addition to natural climate variability, observed over a comparable time period, ([http.unfccc.int](http://unfccc.int)). Generally the term climate change is usually made in reference to changes that are induced by human activities such as the emission of greenhouse gases (GHG) and aerosols which are shifting the atmospheric composition causing what is referred to as the

greenhouse effect. Climate variability on the other hand is used in reference to naturally occurring changes in global climate that is changes caused without human activity. In this study therefore, climate change is the general decrease of seasonal rainfall such that it leads to reduced agricultural production, soil fertility, vegetation and general increase of air temperatures that impact negatively on the general livelihood of people.

2.2.4 Food Security

According to Garwe (2008) food security exists when all people at all times have physical and economic access to safe and nutritious food which meets their dietary and food preferences for an active and health life. According to World Health Organization (WHO), (2012) food security is built on the three pillars which includes, food availability: sufficient quantities of food available on constant basis, food accessibility: having sufficient resources to obtain appropriate food for a nutritious diet, and food utilisation: appropriate use of the available food based on knowledge of basic nutrition and care as well as adequate water and sanitation. Food and Agriculture Organization (FAO) is of the view that food stability is another pillar of food security.

Garwe, (2008) reiterates that food security is concerned with fulfilling each individual's human right to food and it relates to issues of agricultural policy, economic development and trade. Brown et al (2012) argued that the availability of food within a country does not indicate that every citizen has access to sufficient and nutritious food. Food security at an individual level implies that people either have sufficient income to purchase food or they are capable of producing their own food through subsistence farming. There is a strong positive correlation between the poverty and food security where the poor are vulnerable to food insecurity. Sufficient income is therefore a crucial factor in guaranteeing food security. In this research food security is a situation whereby every household and individual has food that is

available and accessible for consumption and food availability and accessibility should be stable.

2.3 Trend in Climate change

Amongst the most environmental challenges affecting the 21st century families and their livelihoods is climate change. In its usage of the term Inter-governmental Panel on the Climate of Change (IPCC), (2009) defined climate change as any changes over time of climate whether due to natural variability or as a result of human activity. Brown et al (2012), and Schneider, (2007) pointed out that climate change is defined by a number of factors including temperatures, precipitation, humidity, air, wind and severe weather events.

Smith et al (2001) identified a couple of reasons why nations, communities and households should be concerned about climate change and showed schematically how their seriousness would increase with global mean temperature change. Archer, (2010), reiterates that far reaching damage to ecosystems and services upon which economies and human survival depends, the increasing frequency and severity of extreme climatic and other natural events, the unequal distribution of other climate change impacts, whereby low income populations, mostly the rural who make up the bulk of the population of poorly developed countries are the most vulnerable to climate change effects.

Desanker, (2001) adds that an increase in global mean temperatures of 2 degrees Celsius above 1990 levels or less would harm such ecosystems. Adger, (2004) and Grawal, (2005) further indicated that the frequency and magnitude of many extreme of weather related events will increase with a temperature of less than 2 degrees Celsius above 1992 levels. There is no indication that climate change will decrease any time soon, many families' livelihoods were already affected, and they even failed to cope up. The IPCC, (2007) points out that, the average temperature of the earth's surface has risen by 0.74 since the late 1800s and added

that it is expected to go up another 1.8 degrees Celsius to 4 degrees Celsius by the year 2100 if no action is taken. That is a fast and intense change in geological time. This will continue to adversely affect many populations especially women and children.

According to Christensen et al, (2007), eleven of the twelve years, (1995-2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850). The 100- year linear trend (1906-2005) of 0.74 (0.56-0.92) degrees Celsius is larger than the corresponding trend of 0.6 (0.4-0.8) degrees Celsius (1901-2000) given in the Third Assessment Report (TAR) of the IPCC (2007). This is a clear indication that the world is becoming warmer and dry due to high diurnal and annual temperatures that adversely impact on the agricultural production due to reduced yields. Livestock cannot survive in such environments, their life expectancy are greatly affected. Human diseases and sickness become the order of the day due to high temperatures accompanied by little or no precipitation.

2.4 Climate change; the global perspective

2.4.1 Climate change in Phillipines

A joint research by Fernanda , Rincón and Virtucio, Jr (2008) shows the climate change in the Philippines, adversely affects its national development due to its magnitude. Women and the rural populace are the most affected. Adger (2007) asserted that, geographically the Philippine is in the western rim of the Pacific Ring of Fire, this is the area known for common natural disasters that include volcanoes, typhoons, and earthquakes. In the entire world the Philippine is one of the nations heavily affected by disasters and now is considered to be very vulnerable.

Climate change's impact on the Philippines is most often associated with extreme weather disturbances such as typhoons and floods, which, in turn, affect many other sectors of

economic development reversing the decades of attaining the Sustainable Development Goals (SDGs). Most of these disasters have affected the country because it had to inject extra financial resources to cater for the victims of climate change (World Bank 2008). Elnino affected more than 3 million citizens especially women and children. The top ten provinces affected by such events are: Albay, Pampanga, Ifugao, Sorsogon, Biliran, Rizal, Northern Samar, Cavite, Masbate, and Laguna. In general, Central Luzon and the Bicol regions rank high to very-high on the risk scale.

Among the various natural hazards, typhoons have caused high mortality and destruction of human development in the Philippines not to mention the destruction of infrastructure which is the engine of development. According to the findings of the United Nations (UN) (2007) the country is hit by more than 20 typhoons every year of which five are expected to cause major damage to the physical, economic and social assets of the nation and/ or individual thus reducing their resilience power. The UN (2007) further claimed that more than 28,812 people were affected in the twentieth century which resulted to approximately US\$5,653 million in damages.

The study shows that from 1975 to 2002, floods and hunger claimed approximately 593 people and damage of property of more than US\$4.6 million. The government reported that the Philippines was hit by four extreme weather disturbances on a period between September 25 and December 1, 2006 as a result of climate change. Unganai (2009) asserted that climate change is mostly felt through temperature, precipitation and sea level variations, which, in turn, impacts agriculture through crop yields, irrigation demands; forestry by changes in forest productivity, forest composition; water resources through variability of water supply and quality; coastal areas by erosion of beaches, inundation of coastal areas; species and

natural areas through shifts in ecological zones, loss of habitat and species; as well as health impacts through infectious diseases, air quality-respiratory illnesses and water-related mortality. For the purpose of this study the agriculture section will be paid attention to.

According to the Republic of the Philippines (1999) between 1982-83 and 1997-98 El ENSO (El Niño-Southern Oscillation) events, induced prolonged wet and dry seasons, caused a large drop in agricultural production and contributed to the suffering of the vulnerable and a sharp decline in the Gross Domestic Product. On financial resources the estimated damage due to 1990-2003 ENSO-related drought was approximated to be more than US\$ 370 million (Lasco et al. 2008). According to Lasco et al typhoons, floods and drought caused 82.4 percent of total rice losses between 1970 and 1990. In 1973, 1983 and 1990 the country experienced rice losses of 65 percent, 81 percent and 52 percent respectively. In 2006 the storm Mesinyo wreck havocked the agricultural sector, and it caused the prices of many commodities to hike leaving many people with little assets to cope with (Lasco *et al.* 2007).

Many studies have shown the poverty has increasingly become a rural phenomenon. In Philippines the rural poverty incidence was estimated to be 41.5 percent in 2006 compared to only 14.4 in cities and towns. Most of the rural poor in Philippines are dependent on agriculture and natural resources for their livelihood. In the face of climate change their coping strategies resources are from the natural resources or from resources accumulated from agriculture. This literally means the rural dwellers are more vulnerable to climate change; therefore they need innovative coping strategies to cope to reduce food insecurity using their physical, economic and social assets. The aim of this study is to find the effectiveness of the coping strategies used in Chireya ward 5 to reduce food insecurity in the face of climate change.

2.4.2 Climate change in the agricultural sector of Nepal

Nepal has four seasons; winter, summer, autumn and spring and with a mean annual temperature of 15° Celsius. Studies conducted by the Nepali Ministry of Environment, Science (NMES) and technology, department of Hydrology and meteorology indicate that annual temperature increased between 1977 and 1994 is approximately 0.06°Celsius per year yet another study carried out in Dolakha district also revealed an annual temperature increase of 0.019°Celsius; 0.44° Celsius in summer (Dahal, 2006).

The study indicated that temperature increase of more than 2.5° Celsius severely affected crop production in Nepal because of increased evaporation and transpiration leading to increased heat stress on the soil and crops. Scoones, Chibudu, Chikura, Jeranyama, Machaka, Machanja, Mavedzenge, Mombeshora, Mudhara, Mudziwo, Murimbarimba and Zirereza, (2006) indicated that significant decrease in precipitation was the major into shortage of water for domestic and agricultural use especially noting that 80% of national water usage in Nepal is for irrigation. This impacted negatively on the livelihoods of the Nepalese. The study revealed their crops were damaged by the pests due to high temperatures, and these pests destroy their crops.

Over 75% of the country is mountainous geographically, with increased occurrences of intensive rains largely during the monsoon season and compounded by more occurrences of glacial lake outburst floods there has been increased soil erosion, floods and landslides (Srestha *et al*, 1999). This led to the significant reduction of soil fertility in the communities settled along the hills and mountains. Soil salinity has been reported to increase in the plain regions that lead to the destructions of agricultural fields and crops, threatening food security

of many Nepalese since more than 85.8% of its population resides in rural areas (Srestha *et al*, 1999).

Upadhyay (2004) asserted that many rural Nepalese rely on wood fuel to meet their domestic energy needs and currently fuel wood consumption is estimated at 12.5 tonnes per year and this will emit up to 5 metric tones of carbon into the atmosphere. Besides that, the high rural population led to deforestation as a result of clearing for settlement and agriculture use. Studies conducted by the Water and Energy Commission Secretariat (WECS) indicate that 80% of the population depend on forests for daily fuel requirement and 42% of fodder for animals is acquired from forests (WECS, 1997). As a result this affected crop yields significantly, threatened food security and livelihoods due to intensified solar radiation on the cleared land, intensified heat stress on the ground and increased loss of soil moisture. Usually the vegetation improves soil fertility indirectly, but in a sustainable way. The deforestation of vegetation in Nepal led to the reduction of soil fertility, and many farmers shifted to chemical fertilizer use to boost yields. However it was found that these fertilizers affected soil organic matter and many rural households cannot afford to buy fertilizers to cope up with the reduction of soil fertility.

2.4.3 Climate change in Tanzania

In Sub-Sahara Africa, agriculture plays a pivotal role in providing food security for the majority of the population especially in rural areas. A study by Mary and Majule (2009) on the effects of climate change on the livelihoods of Tanzania indicated that amongst the key economic development drivers agricultural sector is one of them. Just like other developing countries agricultural sector in Tanzania feed more than 70% of the population, and 80% of that population is in rural areas. Economically, Majule (2008) presented that economically agriculture contributes an average of 50% of Gross Net Product and about 66% of total

export earnings. This perspective demonstrates the general importance of agriculture to the population of Tanzania.

However Mary and Majule (2009) posited that, this sector is under attack by the Climate change and variability (CC & V) regimes, posing threats to human livelihoods. Climate change has affected many sectors in the republic of Tanzania and is considered as one of the most serious threats to sustainable development with adverse impact on environment, human health, food security, economic activities, natural resources and physical infrastructure (IPCC, 2007).

Yanda PZ, Olson J, Moshy P (2008) agreed that countries East African countries are already among the most food insecure in the world and CC & V has worsened crop yields. According to Rosenzweig, (2002), agriculture has been identified to be the second most vulnerable sector to the impacts of climate change. A study on vulnerability and adaptation to climate change impacts on other sectors in Tanzania clearly indicated that forestry, water, coastal resources, livestock and human health are also likely to be vulnerable to climate change. These sectors are closely linked to agriculture and therefore effects of CC & V on such sectors will further negatively affect both crops and livestock production systems. The impacts of climate variability are manifested by floods, droughts, erratic rains and extreme events. Mortimore, Adams (2001). revealed that famine resulting from either floods or drought has become increasingly common since the mid-1990s and is undermining food security. CC & V are likely to intensify drought and increase potential vulnerability of the communities to future climate change especially in the semi-arid regions (Hillel and Rosenzweig, 2002), where crop production and livestock keeping are critically important to food security and rural livelihoods.

A number of studies conducted recently in Tanzania have recognized that CC & V is happening and is coupled with significant impact on various natural resources including agriculture which is the main source of livelihood in rural areas (Majule et al., 2008; Majule, 2008; Agrawala et al., 2003). Various climate-related impacts such as floods and droughts regularly have substantial effects on economic performance and livelihood of communities in rural areas that depend on rain-fed agriculture. A study by Ngana (1983) on drought and famine in Dodoma District indicated that the presence of dry spells in critical periods for most crops contributed considerably to crop failure and famine. Given the over-dependence on rain-fed agriculture by the majority of people living in rural areas, CC & V has been one of the major limiting factors in agriculture production thus resulting in food insecurity and low-income generation.

For example, droughts and floods have been reported to cause failure and damage to crop and livestock leading to chronic food shortages (Liwenga et al., 2007; Kangalawe and Liwenga, 2005). The studies conducted by Rosenzweig et al. (2002) revealed that changes in rainfall patterns and amounts have led to loss of crops and reduced livestock production. Increasing impacts of CC & V in particular drought and floods on agriculture have been associated with various adaptation and coping mechanisms Mortimore, Adams (2001). These are based mainly on indigenous knowledge also referred to as indigenous knowledge which embodies a wide variety of skills developed outside the formal education system (UNFCCC, 2003). Such coping and adaptation mechanisms include increased exploitation of non wood forest products and increased wetland cultivation (Majule et al., 2008; 2005; Kangalawe et al., 2005; Liwenga, Mary and Majule 2007 2003), this indicates clearly how rural people adapt to climate change. Indigenous knowledge arises out of continuous experimentation, innovation and adaptation, blending many knowledge systems to solve local problems (UNFCCC, 2003).

Climate change is a global phenomenon while adaptation is largely site-specific. A common disadvantage for local coping strategies is that they are often not documented, but rather handed down through oral history and local expertise. As site-specific issues require site specific knowledge, experience has shown that identified adaptation measures do not necessarily translate into changes because there are context-specific social, financial, cultural, psychological and physiological barriers to adaptation (IPCC, 2007). It is very important to clearly understand what is happening at community level, because farmers are the most climate-vulnerable group. This research aimed at analyzing the coping strategies used by Chireya communal people to reduce food insecurity as a result of climate change. All barriers and way forward to have and maximizing the indigenous coping strategies to reduce were explored by the study.

2.4.4 Climate change in Ghana

Climate change caused the reduction of capital in Northern Ghana. The serious deterioration of natural capital as a result of climate change has caused the degradation of land that was once suitable for agriculture production. The study asserted that this was exacerbated by floods, deforestation, through the bushfires due to high temperatures which led to the destruction of biodiversity. In 2005 -2006 Ghana experienced low levels of surface water in the water reservoirs and this affected their irrigation activities and hydro electricity generation. The result was the suspension of rural electrification and major water supply because the Volta Lake had recorded a significantly low water level. This is the scenario that was described as serious reduction of social capital. This impacted negatively on the government's service delivery as the government failed to improve on the general infrastructure especially in the marginal periphery areas of Ghana.

Following climate change, destruction of vegetation and high temperatures in Ghana experienced serious and devastating floods in 2000 that resulted in many properties like houses, and other households assets destroyed. Many households were displaced and the result was the outright human crisis. There was a deterioration of people's financial, physical, social and economic assets, and their ability to maintain livelihoods were adversely affected and the resilience power was diminished.

Since many of the assets were destroyed, the able bodied households migrated to Northern Ghana rural areas in great numbers to urban areas in search of jobs to reduce food insecurity. As a result of massive rural urban migration the migrants exceeded the urban areas' carrying capacity, Unemployment and pressure on social services like houses and toilets became the norm. This further worsens the situation in Ghana and it end up negatively affected the whole country. Many households had their assets destroy and their coping strategies were impacted negatively. The aim of this research is to find out if the strategies used by the Chireya ward 5 residents are effective in reducing food insecurity induced by climate change.

2.4.5 Climate change in Zimbabwe

According to the Zimbabwe Department of Meteorological services, Zimbabwe has increasingly seen more warm and dry days between 1950 and 2000. Unganai, (2009), posits that an increase in the average temperatures by 2 degrees Celsius will likely to cause a decrease in Zimbabwe's wetlands from 9% to 2.5% and 4 degrees Celsius would reduce summer water surplus zones to less than 2%. Mugandani, (2008), coined that these changes in temperatures, will affect the agricultural production especially the crop yields and livestock production. Mudzonga E (2009) reiterates that an increase in temperature of 4 degrees Celsius will result in the decline of maize production by 20% in the north-east and 27% in the south region bordering Mozambique.

Global climate change simulation models which include the national centre for atmospheric research (NCAR) model and the Common Wealth Scientific and Industrial research Organization (CSIRO) have revealed that the onset, cessation and duration of effective rainfall seasons have become more variable and unpredictable. In Zimbabwe global warming has caused an increase in the average temperatures resulting in the shifting of the traditional farming seasons and agro ecological zones (natural regions). During 60s 70s 80s drought recurred after every ten years. However according to Mutasa (2008) this trend ceased due to the rapid changes in climatic that have made the rainfall pattern across the country more unreliable and difficult to predict. By mid 90s the frequencies of droughts and dry spells had increased to every 4-5 years and by the late 1990s towards approaching 2000s the country began witnessing alternatively wet and dry years every three years. Since the year 2000 the country's situation became worsened as droughts became more successive in 2002-2003, 2004-2005, 2007-2008 and 2014-2015. Hiffe (2009) argued that, the successive occurrence of these droughts affected food production significantly since the government had not adopted concise adaptation measures to mitigate the impact of climate change. NCAR (2015) Month on month rainfall patterns indicate that there will be a reduction in annual rainfall in summer (November to march) cropping season. It is the intention of this research to spell out the dire need for Zimbabwe's farming community to start adapting to the changes in climate change for sustainable livelihoods and curbing food insecurity.

Zimbabwe lies in a semi- arid region with limited and unreliable patterns and temperature variations. Unganai, (2009) argued that, rainfall exhibits considerable spatial and temporal variability characterised by shifts in the onset of the rains, increases in the frequency and intensity of heavy rainfall events, increases in the proportion of low rainfall years, decreases in low intensity rainfall events, and increases in the frequency and intensity mid-season dry spells. In the same vein, Mutasa, (2008), posits that extreme weather events, namely tropical

cyclones and drought have also increased in frequency and intensity. Moreover, according to the Zimbabwe meteorological Service, daily minimum temperatures have risen by approximately 2.6 degree Celsius over the last century while daily maximum temperatures have risen by 2 degrees Celsius during the same period.

Mugandani (2009) argued that, changes in climate change have resulted in more arid environments for agricultural production, which has shifted Zimbabwe's five main agro-ecological zones. Rainfall patterns and crop production progressively deteriorate from region 1 to V. For example, Chinhoyi and Chibhero including their surroundings have shifted from natural region 11 to natural region 3 while kwekwe and its surroundings Gokwe included have shifted from natural region 3 to natural region 4. In addition, natural region 1 has reduced in size, natural region 2 has shifted further east and natural region 3 has shifted northwards. Generally the climate in Zimbabwe is regionally differentiated, but is generally becoming warmer with more erratic rainfall patterns. Therefore it is the intension of this study to explore the coping strategies employed by the ward 5 households and its effectiveness to their livelihoods (ibid 2009).

According to Murwira et al (2007) the study by the department of geography and environmental studies at the University of Zimbabwe developed best and worst case regional climate change scenarios for 2020, 2050 and 2080 using the Common Wealth Scientific and Industrial Research Organization (CSIRO) and Hadley Cell (HADLEY) global climatic models. The table below demonstrates that the projected climate impacts are regionally differentiated and likely to adversely affect a variety of sectors. Overall warming trends and water stress caused by rainfall variability are likely to generally increase the vulnerability of communal households robbing them of their assets and entitlements. Land suitable for agricultural production is shrinking; water stress is also likely to adversely impact public

health, water availability, forestry and biodiversity, rangelands, human settlement and tourism.

Table 1; showing projected climate changes

General: predicted warming of around 20 C by 2080
Agriculture: General vulnerable of community agriculture to climate change and variability Agriculture suitable areas will decrease by 208. Generally in the South Western parts of the country, sorghum and maize will increasingly vulnerable to climate change
Water: Surface water is projected to be reduced significantly by 2080 irrespective of the scenario used. Western parts and Southern parts of Zimbabwe are projected to experience a drying up. Runoff and ground water will decrease significantly Many perennial rivers will lose their water resource
Human settlement: Any reduction in availability of water will lead to water scarcity and cause unnecessary migrations
Biodiversity: With decreasing rainfall and rising temperatures significantly lead to a decline in biodiversity are expected to occur in most parts of the country especially the Western regions where most of the park estates are located. Lower resilience of ecosystem to other global environmental changes.

Table 1.1 shows projected climate change to 2080. Adapted from Unganai (2009)

2.5 Drought in Zimbabwe

Serious droughts that hit Zimbabwe and Africa at large are mainly caused by moisture deficit. Drought is one of the common disasters in Zimbabwe, and the documented horrors associated with it date back to the pre-colonial era (Hiffe; (2009). The table below presents a history of droughts in Zimbabwe and the Southern African region.

Period	Decade or year of severe drought due to climate change
1800-1830	Southern rivers, and water ways dried up, and some well watered plains turned to semi arid vegetation the most severe decade was 1820-1830
1844-1849	Southern Africa experiences 5 consecutive years of severe drought
1861	Well documented drought in Zimbabwe, in Matebeleland region
1875-1910	Decrease of rainfall in Southern Africa Southern Africa, Severe drought in 1910

1911-1912	Zimbabwe receives less than average rainfall
1915-1916	Drought in Zimbabwe, average rainfall recorded a mere 394mm
1921-1930	Severe droughts in Southern Africa
1931-1950	Dry spells, alternating with wet conditions. 1933 considered the worst drought between 1930-1940 1946-1947 severe drought has stuck living memory
1967-1973	Dry period across Southern Africa
1981-1982	Drought in most of Southern Africa
1983	Africa experiences severe drought
1986-1987	Dry conditions resulting in drought
1991-1992	Severe drought in Southern Africa, Zimbabwe was severely hit.
1993	Although conditions improved communities still suffer from impacts of 1991-1992
1994-1995	Severe drought in some areas surpassing the impacts of of the 1991-1992 drought
1997-1998	Drought in Zimbabwe, though it was less severe than expected
2001-2002	Drought in most parts of Southern Africa
2007-2008	Severe drought in Zimbabwe, many people died especially children due to cholera outbreaks

Table 1.2 shows history of droughts in Zimbabwe and the Southern African region. Adapted from CEDRISA (2009), Hiffe (1990), NEPC, (1999), Matshalaga, (2000) and Unganai, (2009)

Looking at the table above, it is unarguable that Africa is vulnerable to climate change and variability. Besides all the efforts done by many governments and policies, it is not reversing the drought issue in Africa. As a result many households are food insecure and are relying on Non-governmental organization for survival. Therefore, more research is needed on the coping mechanisms that ensures sustainability to curb food insecurity in the face of climate change

2.6 Climate change and the Shifting of natural ecological regions

A study by Mugandani (2012) shows that shifting of the agro-economic zones is an indication that climate change is increasing at an alarming rate. Due to lack of research and efficient

agricultural extension services to advise farmers on what crops to grow, when to grow these crops and where to grow them. According to Mugandani, (2012) due to climate change many farmers have failed to cope up well with climate change regime, they have kept up with them the traditional practices which are no longer suitable taking into account the unpredictability of rainfall patterns across the country. Natural region 1 is found in the eastern part of Zimbabwe and is suitable specialised and diversified farming. According to the agro-ecological classification conducted by Vincent and Thomas (1960), this region contributed only about 1.8% of the country's total area but a recent study by Mugandani et al, (2012) has shown that the natural region has expanded now covers an area almost 4% of the country's total area. Farmers in region 1 grow a wide variety of high value crops which include coffee, tea and potatoes. The natural region increased by 106%, (Mugandani et al 2012) but this increase does not have a significant prohibitive influence on food production in Zimbabwe because region is relatively small compared to other major food producing regions such as natural regions two and three.

According to Mugandani (2012) area covered by region 2 has drastically decreased by 49 from its previous 15% to a mere 7.6% of the country's total area. In terms of the annual rainfall amount this means that 49 % of the areas which were receiving on average 700-1000mm are receiving less than 700mm. Natural Region 2 is one of the major farming regions in Zimbabwe which prides in intensive livestock production, maize, wheat, sugar, beans and soybeans production. This makes it a pivotal region in terms of its contribution to the country's economy and food production. The decrease in the size of this region has an unarguable direct adverse impact on food production and food security in Zimbabwe.

Natural region 3 which covered 72975 square km equating 18.7% of the country's total now covers 62,829 square km which translate to 16.1 of the country's total area, (Mugandani 2009). According to Mugandani (2012) the area now occupied Natural Region 3 has

decreased by 13%. Farmers in Natural region 3 concentrate on maize, tobacco, cotton, wheat and cattle ranching. Both NR2 and NR3 are pivotal in securing food for Zimbabwe as they account for a greater of the country's food production. It is unfortunate that both regions have seen a decreased in size owing to climate change and this has driven some that were once part of these regions to NRIV and V which are characterised by very low annual rainfall of less than 600 mm. According to Mugandani et al (2012) , significant increases in the dry regions of the country have been observed where NRIV now covers 155 707 square km showing alarming of 5.6% increase in the area. Generally in size of NR IV is quite a disturbing issue because region is characterised by a low rainfall of between 450-600mm and is relatively vulnerable to seasonal droughts and very long dry spells year by year.

To add, Mugandani et al (2012) further noted that NR V registered a significant increase in area and now covers 32.5% of the country's total area from its previous 26.7%. The increase in the size indicates that more than a third of the country is now marginally suitable for crop production due to the relatively arid conditions experienced in this region. Mugandani, (2012) clearly points out that this poses a serious threat to food security in Zimbabwe because people inhabiting this region are no longer able to engage in farming activities that can sustain their livelihoods. In 2012 a report from Matabeleland region which occupy large part of region V, indicated that people's livestock were dying in Matabeleland due to inadequate pastures and drinking water while crops such as failed dismally to thrive in the predominantly arid regions. A report from some rural areas of Midlands region in 2008 indicated that's food stocks were empty , and that people were spending at one meal per day, or dried maize grains for survival. According to Mugandani, et al (2012) this is attributed to drought conditions that are prevailing over the region due to climate change. Therefore, this analysis of climate change brings out the shocking truth that climate change is indeed a real threat whose devastating effects will undermine food security of the country if stiff mitigation action is not taken.

Hence forth, this research is important as it will enrich the households in Gokwe Ward 5 with better coping strategies to climate change and its effectiveness in this face of climate change to curb food insecurity for better livelihoods.

2.7 Climate change on Government of Zimbabwe's policies on food security production

The Zimbabwe Agricultural Policy Framework (ZAPF) for the period 1995-2020 identified achieving food security as one of the priority national target areas. In Zimbabwe, food insecurity was a household level concern among the poor and those without enough land to farm. However, according to Mugandani, (2012) food shortages at both national and household level have increased over the past two decades and the country has had to rely on food aid from Non-Governmental Organization (like Care International, World Vision International and Oxfam just to mention a few) and commercial grain imports to meet its requirements. Mugandani et al (2012) argued that these droughts have caused mainly by climate change and climate variability. The ZAPF set out the long policy objectives for the agricultural sector. Under this policy framework agricultural development was based on the following objectives

- Land and agrarian reforms to ensure productive use of land
- Institutional development focused on efficient delivery of service to farmers
- Increased production to ensure household food security
- Development of a public sector investment programme to support agriculture development, (National Investment Brief (NIB)-2008)

The following are some policies which were launched by the government of Zimbabwe (GoZ) under ZAPF;

- Land Reform and Resettlement Programme (LRRP) OF 2000, where more than 350,000 indigenous families were resettled under A1 and A2 models, main aim was to de-congest the marginal communal areas, however besides the Government of Zimbabwe's effort the project was a fiasco due to continued decrease of precipitation that left many communities stranded, without hope to survive except waiting for the government to feed them.
- Agricultural schemes 2000-2011, that was aimed at giving farmers credits to new farmers to buy seeds, fertilisers, machinery and agro-chemicals to credit terms. It was coordinated by Grain Marketing Board a parastatal of Zimbabwe. Reduced precipitation especially in 2002-2003 and 2007-2008 crippled the GoZ's efforts to increase production on farms and ensure sustainable livelihoods.
- Operation Maguta, of 2005 that sought to promote food production in agriculture and it was spearheaded by the Zimbabwe Defence Forces (ZDF) in collaboration of the Ministry of Finance. Here farmers were given fertilisers, seeds and herbicides in order for them to grow targeted crops like maize and wheat, and it targeted A1 farmers and communal farmers. According to Mudzonga and Chigwada (2009), under this scheme each beneficiary was getting 300 kilograms of compound D, 200kg of ammonium nitrate fertiliser and 25 kilograms of maize seed. Though the programme lacked coordination, Mugandi et al (2012) concluded that climate change, and climate variability (low precipitation, high diurnal temperatures, long dry spells and pests and diseases) caused the project not to achieve its intended goals.
- Agricultural Mechanization programme, that was launched in 2007 and it was to support farmers by equipping them with farming implements which suited their needs.

(Manyeruke and Hamauswa, (2012). Though Mudzongah and Chigwada, (2009) points to corruption, and shortages of critical resources as the main cause of the project not to meet its intended outcome, Manyeruke and Hamauswa (2012) and Mugandi et al (2012) argued that climate change was the cause because even those who got all the resources did not get adequate yields that would sustain the family to the next season. Mugandani, (2012), posits that many did not apply their ammonium nitrate fertilisers, due to long dry spells and high temperatures.

It is therefore the intention of this research to come up with better coping strategies that would help the government policies to be viable at household level, through coping mechanisms that would sustain the living conditions and guarantee the sustainable development.

2.8 Climate change and development

Climate change will have a substantial impact on the pace of development progress in many regions and is likely to affect the attainment of the much talked Sustainable Development Goals. Bals, Harmeling and Windfur, (2008) state that developing countries will need economic human development to overcome current shortages of basic goods and services. The Human Development Report (HDR) 2007/2008 of the Development Program of the United Nations (UNDP), which analyses the connection between climate change and human development, comes to an alarming result that in the long run climate change will be a massive threat to human development and in some places it has already undermining the international community's threats to reduce extreme poverty. The report according to Bals et al (2008) highlights the fact that the world is a heterogeneous place, where people have unequal incomes and wealth, and that climate change will affect regions, and individuals differently. Therefore according to Bals et al (2008) adaptation to climate change will be

relatively easy in regions with lesser effects and sufficient resources (assets), whereas poor regions, with higher risks and vulnerability, will be disastrously affected. Existing income gaps risk being increased and deepened especially in the poor regions of the World. Hellmuth, (2007), reiterates that Africa's viable climate is already contributing significantly to its development ills. According to Bals et al (2008) key factors for the development of agriculture, very important sector in African economies, such as water, energy, transport, and health, are all particularly sensitive to climate variability and the increase of weather related disasters. He further noted that other sectors of the economy like tourism are at high risk due to climate change and water shortages. Bals, et al (2008) pointed out that vulnerability of economies to climate shocks is unequally distributed, and the risk increases dramatically as poverty increases.

It will be the poor who suffer most from the effects of climate change. For Bals et al (2008) poor people will be confronted with substantive changes in their livelihood and many will be at the fringe of their coping strategies. They will have relentless challenges dealing with weather extremes and other shocks. The United Nations reported that, some 262 million people were affected by climate disasters annually from 2004, over 98 per cent of them in the developing world, (UNDP, N2011). It remains unfortunate poverty stricken people who never contributed to climate change are most vulnerable and heavily affected by climate change. According to Bals, (2008), the right to development for the poor is seriously threatened.

The process of human development is increasingly going to be influenced or hindered by climate change. Bals et al, (2008) coined that the fight against poverty and fight the effects of climate change must be seen as interrelated issues. Climate change is expected to substantially affect the realisation of most Sustainable Development Goals (SDGs), in Africa. In addition investments in coping mechanisms will require more financial resources than it is today, which in turn would bind resources needed to invest poverty reduction. The addition

challenges of climate change thus require additional resources. The Human Development Report (HDR) summarizes the challenge quite well

“How the world deals with climate change today will have a direct bearing on the human development prospects of a large section of humanity. Failure will consign the poorest 40% of the world’s population, some 2.6 billion people, to a future of diminished opportunities. It will exacerbate deep inequalities within countries. And it will undermine efforts to build more including pattern of globalization, reinforcing the vast disparities between the haves and the have nots, (UNDP, 2007, cited in Bals et al 2008).

Therefore climate change effects will further compound to the woes of the developing nations. Bals argued that, where Human Immuno Virus (HIV) and Acquired Immuno Deficiency Syndrome (AIDS), corruption, cholera among other factors have stifled development efforts in the developing world climate will further add to these troubles. It is undeniable that many African countries will not meet the SDGs and with the advent of climate change, this puts the continent in a dire state. This research therefore will try to reduce the adverse impact of climate change to development through employing the appropriate coping strategies in the face of climate change.

2.9 Coping strategies to curb food insecurity in the face of climate change

With regards to the future outlook of climate change and its potential impacts, there is agreement and much evidence that with current change mitigation policies and related sustainable development practices. According to IPCC, (2007) related sustainable development practices; global greenhouse gases (GHG) emissions will continue to grow into the next century. Even if the concentrations of all GHG and aerosols had been kept constant at year 2000 levels, further warming of about 0.1 degrees Celsius per decade would be expected. IPCC,(2007) and Mirza (2003) coined that based on the foregoing conclusion that

anthropogenic warming and sea level rise would continue for centuries due to the time associated with climate processes and feed backs even if GHG concentrations were to be stabilised. According to Chagutah (2010) this precarious climate change future calls for innovative livelihood strategies to cope with and adapt, which is the main focus of this research.

Unganai, (2009) and Ashley et al, (2011) posits that in specific context of climate change, adapting therefore means taking action to adjust to a new set of climatic attributes, either different from those already existing, or changed or parameters of existing attributes. Skinner, (2002) reiterates that with increasing awareness of detrimental human impact on the environment as cause for risk to humans, adaptation has since shifted from being a natural wildlife process in revolution in response to environmental changes, to being promoted as a concept for guiding to ensure sustainable development, reduce vulnerability and minimise risk to humans from climate change.

The IPCC, (2007) defines coping strategies as adjustment in ecological, social, or economic systems in response to actual or expected climatic stresses and their effects or impacts. This definition includes reference to both anticipatory and reactive adaptation. Most importantly the definition accommodates both climate change and climate variability. Unganai, (2010) concur that adaptation to climate change is the process through which people reduce the adverse effects of climate on their health and well-being and take advantage of the opportunities that their climatic environment provides. Ayers (2011) points out that it is important to note that successful adaptation to a changing environment is a function of the means available to the affected community and this is to do with adaptive capacity.

IPCC, (2007) defined the term adaptive capacity as the 'ability' of a system to adjust to climate change to moderate potential damages, to take advantage of opportunities, or to cope

with the consequences. Adger, (2004) reiterates that adaptive capacity is considered to be one of the characteristics (or determinants) of a system that would influence the occurrence and nature of adaptations. Other determinants include sensitivity, vulnerability, susceptibility, coping range, stability, resilience, and flexibility (Chagutah 2010). He added that developing countries are often regarded as having the lowest adaptive capacity, as they tend to have the least access to technology, the least degree of development of social institutions, as well as the highest historical and existing stresses associated with climate change. In this case adaptive capacity is seen as being inversely correlated with vulnerability. Therefore, in theory a community with high adaptive capacity experiences successful adaptation and low vulnerability to climate change. Downing, (2001) suggest formal indicators of both vulnerability and adaptive capacity to determine vulnerable situations and these include factors such as income infrastructure, education, and state of civil society among others. UNFCCC, (2009) identified other potential indicators of adaptive capacity, including: insurance mechanisms, access to public health facilities, community organizations, existing planning regulations at national and local levels, institutional and decision making frameworks, and existing warning and protection from natural hazards.

Globally societies have adopted various coping mechanisms. From traditional practices to modern practices, coping mechanisms have existed in many societies historically. This has seen in some instances traditional knowledge being integrated with modern knowledge to come with effective strategies and techniques to cope up with food security. This section reveals a number of studies done to establish coping mechanisms in different parts of the world.

According to Thompson, Berrang, and Ford, (2010) across Sub Saharan Africa, communities have extensive experience dealing with climatic uncertainties and food security implications. Thompson et al, (2010) reiterates that subsistence livelihood have evolved a number of

mechanisms to manage weather variability, including drought years and low crop yield seasons. Orindi, (2009) added that the impacts of climate change requires measures that will mitigate losses or to take advantage of the opportunities presented referred to as adaptation. Food and Agriculture Organization (FAO), (2007) advances that adapting small- scale and rain-fed agriculture to seasonal climatic variability can be ensured through effective quick-fix responses strategies that are often the answer to short term impacts of climate variability. Bounoua et al, (2000) who postulate that autonomous coping may take several forms in terms of soil and land management, water management, and conservation of agro- biodiversity support this. Autonomous adaptation to climate change will rely mainly on technological progress, irrigation, and land use according to agricultural suitability.

Thompson et al, (2010) advanced that commodities in coping are evident across diverse regions, involving a complex hierarchical decision making process of sacrifice and use of support network to endure periods of food insecurity. These strategies include responses including alterations to diet to include more famine foods, and during times of acute and, or prolonged stress borrowing from kin selling productive assets and eventual migration. Stock, (2004) cited in Thompson et al, (2010) posits that as famine and hunger progresses, survival strategies thus becoming more desperate, whereby domestic resources are increasingly committed and potential for reversing the strategies become more constrained.

A study done by Lobel, Burke, Tebaldi, Falcon and Naylor, (2008), shows that communities can cope with climate change, for example, by switching from producing corn to producing sorghum whose lower water requirements and higher temperatures tolerances are better suited to a warmer and drier climate. Lobel et al (2008) pointed out that the coping strategies may be difficult to implement in many parts of the developing world. For example it assures

markets for millets in regions where only maize is eaten, and technology and expertise about how to process and consume in maize zones.

A study that was done in Canada by Bryant R.C, B.Smith, M. Brklacich, R.T. Johnson, J.Smithers , Q.Chiotti, and B.Singh, (2000) of Canadian farmers showed that farmer's responses vary when faced with same climate stimuli even within the same geographical area. Garwe (2008) reiterates that responses vary given the different agricultural systems and markets systems in which farmers operate as well as different individual characteristics and context such as personal managerial style, and entrepreneurial capacity and family circumstances. This reflects a broad nature of coping mechanisms to curb food insecurity is employed in different scenario. Nhemachena and Hassan (2007) reiterate that, this clearly shows that there cannot be a one size fits all coping mechanism. Supporting the notion that personal characteristics and conditions influence adaptation, several studies find that farming experience, socio-economic position and access to resources (assets), credit, and extension services increase the probability of uptake of coping of measures to climate change. This indicates that the nature of household's response to climate change and variability also depends on the socio economic position of the household-poor households are likely to take measures to ensure their survival while wealthier farmers make decisions to maximize profits enriching themselves at the expense of the poor households. A study done in Ethiopia, by Ringler, Bryan, Hassan, Alemu, and Marya Hillesland, (2011) shows that there is a need to cope following temperature and rainfall variability. Ringler et al, (2011) concludes that households in Ethiopia cope by use of different crops or crop variety, soil conservation, changing plant dates and irrigation using water from the flood plains.

Another study by Gbetibuo, (2009) for the International Food Policy Research Institute (IFPRI), examined the coping strategies employed by farmers in the Limpopo basin of South Africa. The study found out that, farmer's main coping strategies are switching to more

drought tolerant crops, such as millet, and switching to different varieties of the same crop, such as more drought tolerant maize. Gbetibouo, (2009) further enlighten that, households are also changing planting dates, increasing and building water harvesting resources, changing the amount of land under cultivation and buying livestock feed supplements. This is quite different from the study by Paul, (2008), in North Bengal, Bangladesh, on the coping mechanisms practised by drought victims, because the indications were that when a drought occurs and domestic food stocks become exhausted or very low, efforts to raise cash through sale of assets assume more importance. The survey data revealed that 88% of all respondent households had sold belongings to reduce their vulnerability to the 1994/5 drought, other resorted to changing planting dates, changing the amount of land under cultivation, and supplementing animal feeds, selling their land food for work programmes. Other indicated that they defer the purchases of clothing and luxury items during the drought period, and migration to neighbouring in search of employment. Therefore this research will explore various coping strategies of the Ward 5 Gokwe North households and evaluate its effectiveness towards sustainable livelihoods.

Ngigi, (2009) identified a number of adaptation strategies employed in various places. The use of shallow wells and hand-dug wells along the flood plains or in the already dried dams to supplement the shortfall in water for dry-season irrigation, livestock and domestic use is a potential adaptation option rural households. This is coupled with the use of moisture improvement techniques such as mulching, and winter ploughing which are practised in Ghana, Burkina Fasso, and Mali as coping strategies.

Coping remains a key factor in the battle against in the battle against climate change. Thompson et al (2010) noted that coping responses can be in responses to the three dynamics of food security, which are food availability, access, and adequacy. He further noted that the major relation to food availability and intensification are the major options documented to

improve crop yields to curb food insecurity. According to Thompson, et al (2010) one estimate suggests that agriculture extension could increase cereal production in Africa by 47% by 2020. According to Tompson, (2010) poor agriculture has future retrogressive implications, for creating further environmental dilapidation, with land coverage changes, and deforestation and deforestation found to contribute Carbon dioxide emissions. For Thompson et al (2010), intensification of agricultural land is seen as the most viable solution. This would require improving the quality of soil and maximising usage of water resources, which often require greater inputs. Edward, (2007) argues for the benefits of organic manure, whereby compost is utilised as a natural fertiliser (cited in Tompson et al, 2010).

A project in Ethiopia has shown much higher yields, both in comparison with no inputs and with chemical fertilisers. Manure is regarded as an input that could improve soil quality, and thus permit intensification. There remains debate, however, as to the potential for organic fertilisers to meet demands in soil fertility, and more traditional approach has been the use of chemical fertilisers while very common and quite heavily ones used in the developed world, these are relatively absent in Sub Saharan Africa, (Thompson et al 2010). Thompson et al (2010) further noted that while valuable for improving agricultural yields, increased use of fertilizer may also contribute climate forcing through the introduction nitrous oxide emissions from soils. Climate change has an adverse impact on water resources, creating potential agriculture al challenges as well as affecting livestock. Crop irrigation has seen some success, and it is argued by come that it should be more widely implemented. Brown, (2009) and Tingem, (2009) cited in Tompson, (2010) suggested that small scale and affordable solutions would be more beneficial. The Genetic modified seeds has become an important aspect in adaptation efforts in the light of boosting food security. According to Tompson et al, (2009) to better take advantage of limited water resources, certain crop varieties are also identified as important components of adaptation strategies. Genetic modified is one possibility in terms of

the creation of drought resistant or high heat tolerance crops. Thompson, et al (2010) noted that high yielding seeds are additionally seen as possibility to increase crop productivity and certain crop varieties have been identified and classified as underutilized based on their potential value as being both highly productive in poor soil conditions and nutritionally beneficial.

A final coping strategy for improving yields is modifying practices more directly. Thompson, (2010) argue that crop diversification is one possibility, whereby dual land use agricultural systems may be used to grow some of the more staple crops for a specific region, along with an insurance crop in case crop failure or shocks. This has the advantage of reducing food insecurity, whereby there is always at least one crop to fall back on. No tillage farming is additionally seen as less disruptive to the soil helping to maintain soil nutrients and water availability. According to Thompson et al (2010) in terms of accessibility the primary adaptive approach to reduce susceptibility of financial capital, and thus improved market access when subsistence crops are not plentiful enough to provide food security, is livelihood diversification. This is assumed to allow for sources of income that are not fully reliant upon the natural environment, and thus less vulnerable to climate change. Thompson, et al (2010) argued that off farm employment is considered particularly viable for youth, who could earn money to send back to their families. According to Ngigi, et al (2009) the beginning of water shortages in some areas has impelled for more efficient use of water through drip irrigation and the choice of high yielding and high value crops. He also advocates on the use of drought resistant crop varieties and the improvement of on farm irrigation efficiency using better water application technologies are all methods that have been tried by small holder farmers In as coping strategies to climate change in Nigeria, Senegal, Burkina Faso and Ghana. He further noted that the use of bunds, agro forestry, crop rotation and rain water harvesting have all been effective adaptation strategies to climate change and variability. Ngigi, (2009) posits

that agriculture diversification such as the integration of livestock and crops (mixed farming) has a long being practised in some of the countries with good results. The waste water for irrigation in peri-urban schemes is another strategy for adaptation to climate change as well as migration to wetter regions. Non-farm activities are an important strategy. According to Ngigi, (2009) engagement in off farm activities like small scale gold mining proved to be beneficial in some areas in Ghana.

CHAPTER THREE

Research Methodology

3.0 Introduction

In this chapter the researcher describes the research approach, design, sampling procedure, the process of data collection, analysis and dissemination. The instruments which were used to collect data and the procedures which were used to assess reliability and validity as well as the ethical considerations which were used before data collection are included.

3.1 Research Methodology

According to Polit and Beck (2014) research methods are approaches to conducting a study that is collection of data, analysing data and dissemination including sampling methods. A mixed approach using case study research design will be described in full details and why it was chosen.

3.2 Mixed Method

According to Cresswell (2014) there are three main research approaches namely Quantitative, qualitative and mixed methods. The researcher made use of mixed research approach to conduct the study because according to Newman and Benz (1998) including only quantitative or qualitative methods falls short of the major approaches being used today in the social and human sciences. Borg and Gall (1989) were of the same view that both quantitative and qualitative approaches have strength and weaknesses, using them in a supplementary manner results in a more comprehensive study. The researcher employed mixed research to have a

more comprehensive study on the effectiveness of the coping strategies used to reduce food insecurity in Chireya ward 5. Neumann, (1997) reiterates that both approaches have their place in the research because both have strength and weakness so they fill each other's gap. Therefore both (qualitative and quantitative) afford a partial solution in this study that is why the researcher employed a fusion of both quantitative and qualitative approaches since they were a complementary.

Creswell,(2005) indicated that mixed method research is research in which the researcher uses the qualitative research paradigm for the phase of a research study and the quantitative research paradigm for another in order to understand a research problem more completely. Greene et al (1989); Tashakhori and Teddlie, 1998) were of the same perspective that when qualitative and quantitative methods are used in combination in one study, they complement each other and allow for a more complete analysis of the research problem. The researcher used the two methods in harmony of each other as proposed by Baum, (1995) that the approaches are complementary rather than competitive. The decision by the researcher to use both methods in a single study were based on the nature of the actual research problem and the research questions (McKinlay, 1995). The aim of the study was to determine the coping strategies used by people in Chireya ward 5 to reduce food insecurity when faced by shocks in the face of climate change regime.

3.3 Research design

Polit and Beck (2014) defined research design as an overall method or procedure of how the researcher collects, analyse and disseminate results. The chosen method should be in a position to answer the research questions and should comprise of sampling procedure, data collection, instruments used in collecting data means of analyzing data, conceptual theory and how the participants are protected. A case study, research design was applied to answer the

research questions. The researcher adopted a cross-case analysis from each case study to analyse the data in order to answer the research questions in detail.

3.3.1 Case study research design

Case study research design refers to the collection and presentation of detailed information about a particular participant or small group, frequently including the accounts of subjects themselves. Mays., et al (1996) coined that a case study looks intensely at an individual or small participant pool, drawing conclusions only about that participant or group and only in that specific context. In this research the case study was used to collect data from the residents, environmental department, agriculture department and the local government. A case study was considered because this was a mixed research, as argued by LoBiondo-Wood & Haber, (1990) that case studies can be considered as a qualitative or quantitative research study. The purpose of the study was typically on understanding the coping strategies of people to reduce food insecurity in the face of climate change and how they behave (Denzin, N. K., & Lincoln, Y. S. (2005). According to Ibid, et al (2005) data are often collected that relate not only to the person's present state but also to past experiences and situations relevant to the problem being examined. In this study therefore the researcher used case study in order to find out more on the climate change, food security and livelihood of the past, present and projections.

The researcher assumed the possibility of a depth research because of the inclusion of a small number of entities (Pole, C. and Lampard, R. (2002) and because they have the knowledge of people's feelings, actions (past and present), intentions and environment concerning the coping strategies, climate change, food security and livelihoods of people. Benner, (1993) had of the view that case studies help to formalize experimental knowledge and to generate

hypotheses. This research therefore developed and formalised new knowledge through case study design that will contribute to quality and sustainable coping strategies to reduce food insecurity in the face of climate change.

However, the case study according to Potter, J. (1997) is time consuming and may be quite costly. He further asserted that case study participants may drop out during the research as a result of disappointments from the group members (if they arise) or that a participant may move from the locality. However, besides these limitations the researcher decided to use the case study design.

3.4 Ontological Assumptions

According to Creswell (2010:7) humankind, strives to know more about their environment and understand the meaning of situations occurring. The study obtained information from participants on Ingenious Knowledge practices in their environment concerning the use of coping strategies as there was little known about the sustainable coping strategies to reduce food insecurity in the face of climate change.

3.5 Epistemological

The assumption is that there is an association between the use of coping strategies to reduce food insecurity and the outcome concerning their livelihood. Researcher strived to explore what coping strategies people possess, how they acquired the knowledge and practices on the way they apply those strategies using the structured interviews, focus groups and observations to bring objective data (Tashakkori & Teddie 2006). The participants were given chances to respond to the interviews in the way they best understood without the influence of the researcher to avoid producing researcher tailored results.

3.6 Axiology

The researcher used controlled stratified random selection in selecting participants which allowed every men and women to have a chance of being selected. Systematic random sampling was used to select the participants from the environmental management personnel, village heads, and agricultural departments in order to give each every potential participant a known non-zero chance of selection. Purposive sampling was also used to select the participants from the department of local government due to the nature of information and experience they posses (Polit & Beck, 2014).

3.7 Population and sample

3.7.1 Population

According to Kumar (2004) population is the aggregate membership of a distinct class of people, objects, or event. Catterall et al (1997) also argues that “population is a combined word used to define the total quantity of cases of the type which are subject of your study”. The best way to research any population “is to gather from every element within it and in order to do this there is need to conduct an in depth research on small, defined and accessible population” (King 2004). The acceptable minimum size is 10% of the target of the target population (Qureshi, (1992). In this study the population included the residents of Chireya Ward 5 Gokwe North, from various departments. Therefore in order to study; the researcher selected a sample from the population

3.7.2 Sample

A sample is regarded as representative of the whole population Fisher, R. A. (1935).. In most cases, groups being studied are too large for all members to participate, hence the need to select manageable number as a sample from which data be collected, studies and the results are generalised to the whole population. Catterall et al (1997) stated that the basic idea of

sampling is that, through the selection of members of the population, the researcher may draw conclusions regarding the entire population, where sampling refers to the process of selecting elements to observe. The table below shows the sample size.

Table 1.3 sample size

Category	Population	Sample	Sampling technique
Management- Agriculture department	6	2	Systematic random sampling
Management- Environmental Organization	3	1	Systematic random sampling
Management- Local government department	1	1	Purposive sampling
Management-Village heads	9	3	Systematic random sampling
Elders/Household Heads	481	57	Stratified random sampling
Total/n	498	64	13% sample size

3.8 Inclusion and exclusion criteria

3.8.1 Inclusion criteria were:

- Both men and women who were be between the ages of 50-75 years;
- Men and women who were both indigenous farmers and household head.

- Men and women who were have more than 3 years residing in the study area.

3.8.2 Exclusion criteria:

- Any person previously or currently diagnosed with a mental illness.

3.9 Data collection method

There are many types of data collection methods which can be used in data gathering, depending with the nature of the study and the study adopted. Being guided by the mixed research design this study used three main data collection instruments, which included, focus group interviews, face to face interviews, and documentary analysis.

3.9.1 Focus group discussions (FGDs)

Focus group discussions were chosen as an effective data collection method. Catterall et al (1997) asserted that FGDs provide a wide scope of the population with perceptions of the coping strategies to reduce food insecurity in the face of climate change which would provide data from different perspectives. Accordingly, focus groups translate everyday experience within the community. Focus groups also provided the researcher with direct access to the community's experience, thereby reflecting the social realities of a particular cultural group and understanding of attitudes and opinions regarding their coping strategies for sustainability. Although focus groups may not "easily provide access for the researcher into individual biographies, they allow observation and understanding of how knowledge and ideas both develop and operate within a cultural context" (Kitzinger (2007). The participants of the focus group discussions were the local elders who were selected as part of the research respondents.

According to Kitzinger, (2007), focus groups are advantageous as they widen the range of responses; assist other participants in remembering forgotten details, and release inhibitions that may discourage participant disclosure of information concerning the coping strategies, climate change, food insecurity and livelihoods. Therefore the researcher used this advantage, to employ the focus group discussions as one of the data mining instruments.

However, there are some limitations in using focus groups as a means of data collection. Although they may promote discussion amongst participants, they may also threaten the possibility of open discussion by all participants, and prevent any deviation from the accepted focus group, (Kitzinger, 1994). There is a possibility of a “groupthink” phenomenon- where it becomes difficult to extract individual perceptions and opinions from that of the group, and individual responses may be contaminated by the group. However, despite this limitation, focus groups are found to be appropriate for this study because the method allowed the researcher to explore consensus around the ideas and opinions expressed by the groups.

During the focus groups discussions, some members of the group are likely to be more vocal than others and, as a result, the researcher, through the help of the research assistance encouraged those who were not participating to do so. As a means of engaging all group members, the follow up questions were directed to those who were not directly involved in responding or contributing to the initial round of questions. According to Kitzinger (1994) focus groups helps those who do not participate actively during the discussion to memorize during the follow up session. The focus groups were able to give the rainfall pattern history, as well as project it, as well as other activities taken in a year with regard to agricultural production and other off farm activities to curb insecurity for sustainable livelihoods reminding each other.

The discussions were audio recorded by means of a voice recorder, transcribed and then translated into English. Care was taken to ensure that written verbatim recording was very accurate. After the discussion, both the ‘translators’ records were reviewed and compared to see whether there were discrepancies on how interviews responses were recorded. The researcher interviewed two groups per day, and each discussion lasted for 45 minutes to 1 hour. Prior to each focus group, consent forms were given to all participants and confidentiality was explained to them. The participation was on voluntary basis (this means the participant were choosing whether to participate in the study or not). The ethical issues were covered verbally and in the consent form.

3.9.2 Interviews

According to Chiromo (2005) interviews comprise of questions to individuals selected for their knowledge and experience on a certain subject. They were used to gather information face to face from individuals. In this study the key informants interviews involved the village heads, agriculture department, environmental management department, local government department, and other elders. They were selected due to their knowledge and experience concerning the life style of the residents in the communities, concerning their coping strategies and whether they were sustainable or not. These were the departments that were on the ground working with communities for rural development.

The questions of the interviews in this study were specified, but the interviewer was free to probe beyond the answers to seek more clarifications and elaborations for the good findings of the research. These types of interview according to Mays N, Pope C (1996) allow the respondents to answer more on their own terms than the standardized interview permits. Therefore all the interviewed respondents were given a room to probe more to seek more clarification to answer the research questions.

Like the focus group discussions, the semi-structured interviews present both advantages and disadvantages. Individual interviews are a data-gathering method that is generally well accepted by the people and is particularly well suited to populations that are not literate, Kitzinger (2007). These therefore helped the researcher to smoothly gather the data within the participants who were mixed in their educational background.

The disadvantages of the semi-structured interviews include the fact that they do not necessarily provide access to reality as, in many instances; there can be a gap between what the respondents say and what they do. Another limitation is that a single interview cannot be applied to the wider communities it represents an individual view which may be different from other members of the same community. An individual interview may be also difficult to carry, because people must be convinced to participate in the study and requires long time to be conducted, (Fisher, Brennan and McCauley, 2002). However, besides these limitations the semi structured interviews were regarded as the appropriate instruments to gather data from the key informants.

3.9.3 Observation

The researcher considered the direct observation as a reliable method to establish resources that were available to the villages and communities under study; this is supported by Benard and Russel, (1994), who echoed the direct observation as the reliable method to establish resources available to the communities. Observation involved establishing how communities do their farming methods, from land preparation; using what resources; store their maize, sources of water, livestock production, and means of income generation.

3.9.4 Pilot study

A pilot study which is a miniature of the actual study was done to assess face and content validity and the test-retest was done to assess reliability of the interviews the researcher had

structured. Pilot & Beck (2014) argued that the pilot study enabled the researcher to modify other parts of the interview guides, by adding and removed other questions in order to ensure the feasibility of the study.

3.10 Reliability

According to Perakyla, A. (1997) reliability addresses accuracy of the research methods and techniques to produce data and the degree to which the interviews which bring the expected results collect the intended data. Reliability assesses data quality, and was ensured in the consistency the interviews measured what was supposed to measure. It is concerned with accuracy of the interviews. In order to test reliability the researcher had to test the three aspects of reliability which are stability, internal consistency and equivalence (Polit& Beck 2014:202). To test stability the interview guides were tested to 15 participants who comprised of 8 men and 7 women with the same characteristics as potential participants. The researcher accepted the reliability of 80% (Polit& Beck, 2014:212). By administering the interview guides to 15 research participants the researcher was assessing whether the guide brings out same results thus assessing internal consistence. Same participants of the pilot study responded to the interviews twice then results were compared thus minimising errors. (Pilot & Beck, 2014:205).

3.11 Validity

According to Leedy (1989) validity is concerned with the soundness and effectiveness of measuring instruments. According to Kitzinger, (2007), there are two different dimensions to the concept of validity, namely internal and external validity. Internal validity ensures that the

researcher investigates what he claims to be investigating. External validity is concerned with the extent to which the research findings can be generalised to wider population.

The researcher undertook mixed method to investigate the problem from different angles and strengthen the validity of the findings. Four different case studies were selected to cover the entire issues related to the study and increase the probability of generalization. The researcher linked all the questions on the interview guides to the researcher's objectives and all the questions were the same. Finally, all secondary sources of data used were initially assessed to determine the validity of the information given.

3.12 Ethical Considerations

Permission for access to the research area and to conduct research was conducted from the local government department, and on entering the research area the traditional leaders like the village heads were contacted (this was successful through the research assistants). Both to the local authorities and to the traditional authorities, a briefing on the research's objectives and its potential benefits for the local community was done.

3.12.1 Right of self-determination (Autonomy)

Human rights of participants were protected by affording them the right to do voluntary participating in the study with no coercion and may withdraw at any time from the study. All participants were asked to sign an informed consent form before data collection takes place as an indication that no coercion was used and participation was merely voluntary, (Polit & Beck, 2014).

3.12.2 Respect for persons

The participants were free to participate independently and this was considered also to those with reduced personal freedom. The researcher addressed beneficence and justice in order to show respect for persons as follows:

3.12.3 The process to be followed to obtain informed consent

Participants who met the eligibility criteria were invited to participate in the study. Written informed consent was obtained from each participant prior to participation (Johnson & Christensen, 2008:109). Transparency was upheld in terms of the objectives of the research, types of data to be collected as well as the benefits to the participants. The potential participants went through the consent process with the researcher before participating responding to the interviews. The consent form was read out to the potential participants in such a way that the researcher was assured that the participants have understood the study procedures. A consent to participate from participants in the study and permission to be audio taped while explaining the coping strategies used to reduce food insecurity were prepared. All these were conducted in either English, or Shona (Polit&Beck, 2014:87).

3.12.4 Informed Consent

Johnson & Christensen (2008:109) asserted that participants should be on voluntary basis. Participants involved in the study on voluntary basis and had the right to decline to participate. Participants were included in the study without their knowledge and agreement. The researcher provided adequate information in a clearly understood way so that the participant chose on whether to take part or not.

3.12.5 Beneficence

According to Polit and Beck (2014) it is the duty of the researcher “to minimize harm and maximize benefits”. Basing on the assertion, the researcher had an obligation to protect the participants from unnecessary discomfort and harm. The researcher attempted to build a relationship of trust with all participants prior to the data collection through having an attitude of respect, being open to alternative views and using facilitative communication techniques. Participation was voluntary and withdrawal was without penalty. The overall benefit of the research was the contribution it has to the development of the rural populace.

3.12.6 Justice

Johnson & Christensen (2008) stated that the third broad principle articulated in the Belmont Report concerns is Justice. The participants were honored their rights to treatment and privacy. The researcher asked the permission from the participant to observe their assets and resources as well as visits to the crop fields. The right to privacy was practically expressed as confidentiality (Polit & Beck, 2010) by the researcher. The researcher showed respect for the beliefs and lifestyles of people living in Chireya ward 5 Gokwe north.

The rights to privacy were observed through use of codes instead of participant names and there was no name of participant or organization that appeared on any interview guide. All participants were informed that all the information they gave was to be gathered, collated and stored in locked cupboards.

3.12.7 Confidentiality

Confidentiality was ensured by keeping information from participants in confidence as it was and/or is their right (Polit & Beck, 2014). The scripts were locked in the Researcher’s office

in the cupboards for safety and no identifiable information was kept in the researcher's personal computer (Poilt& Beck, 2014).

3.5 Conclusion

The researcher described the methodology that was followed in conducting research. In the description was the research approach, design, sampling method, data collection, data collection tool, ethical consideration and dissemination of results.

CHAPETR FOUR: DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.0 Introduction

This chapter is a presentation of data and discussion of the findings on the effectiveness of the coping strategies to reduce food insecurity in Chireya Ward 5 Gokwe North in the face of climate change. The findings and data presentation are in accordance with the research questions and objectives outlined in chapter one (see page 6). The data was gathered through the group interviews and key informant interviews; it is of the major concern to mention at this stage that the non-formal interviews and direct observations were also some of the instruments employed by the researcher.

4.1 Participants

In terms of the response rate, the data survey was reasonably successfully as pre-planned. A total of 64 respondents participated tirelessly out of 64 target respondents (see chapter 3 page 52), which means 100% of the target population was reached and interviewed. Due to the information needed by the researcher to answer the research questions, stated in chapter one the researcher noted with concern that the sample size chosen was feasible and optimally representative of Chireya Ward 5 population and its biophysical and social economic characteristics.

Before addressing major results of the study findings, the data of the sampled population was presented in order to provide the socio-economic background of the study. In this study verbal description substantiated by the graphs and tables were mostly used to present data. It is of the major concern to note that the study findings will be discussed in accordance with the literature reviewed in chapter two.

4.2 Background information of the respondents

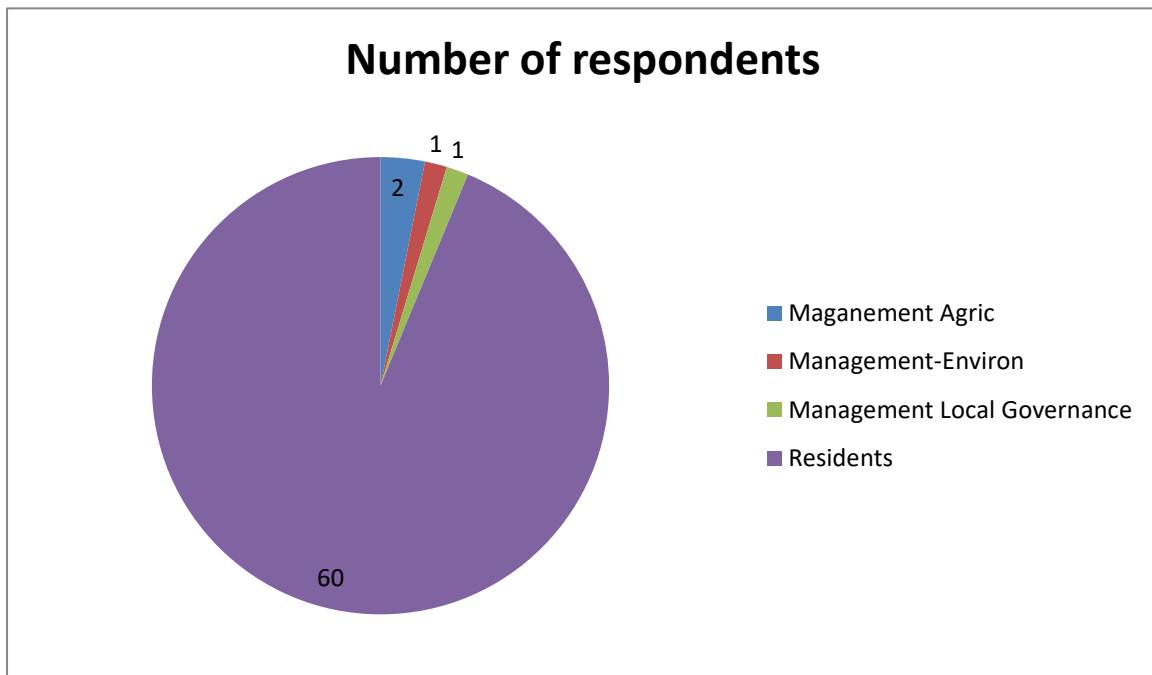


Fig 1.2 shows number of respondents

Among the 64 total sample size, 60 were the residents that included the village heads, and the elders who were both the indigenous residents and household heads. They were also between the ages of 50 to 75 of age. As indicated by the graph above, the management included 2 representatives from the agricultural department, 1 representative from the management-environmental department and Local Governance respectively.

4.2.1 Duration of stay in the area

Given the fact that the study subjects were required to have significant duration of stay in the study area in order to provide an informed historical profile of the climate change knowledge and experience of the area, the duration of stay was an important measure among respondents in the survey. The following bar graph shows the duration of stay in the area

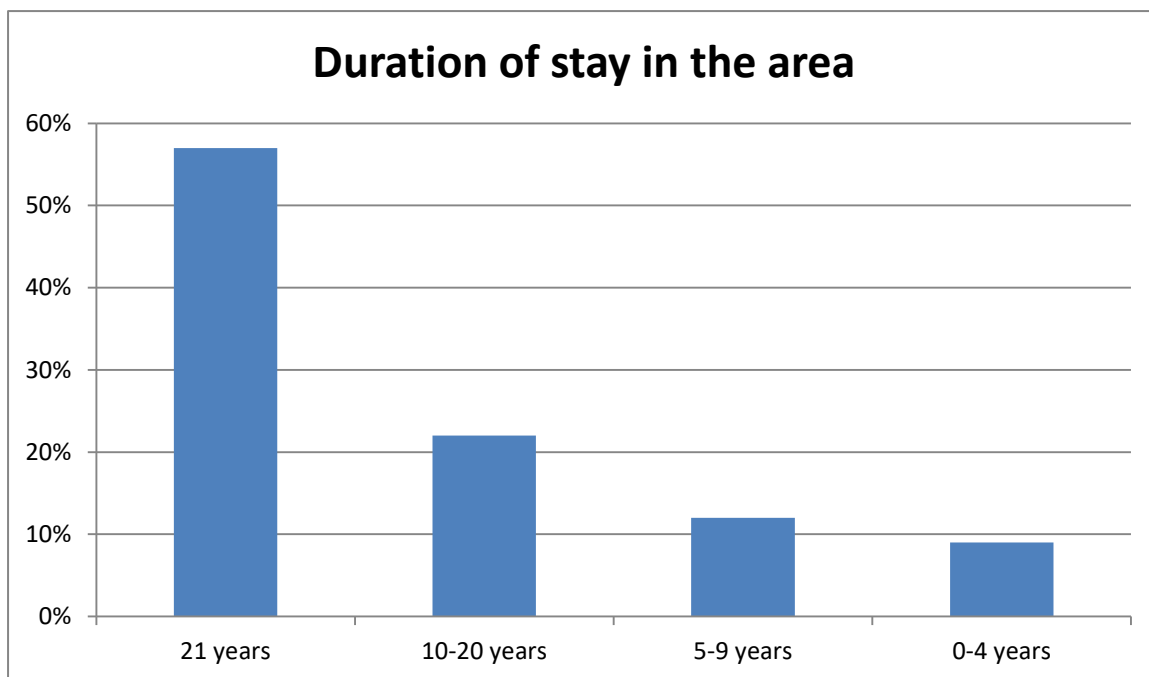


Figure 1.3 shows duration of stay for the participants

As shown by the bar graph above, 57% of the interviewed residents started to reside in the area for the past 21 years, followed by a 22% who reported that they have between 10 and 20 years in the area. Only 12 % and 9 % reported that they have between 5-9 years and 0-4 years in the area respectively. Many indicated that they came in the area from areas like Masvingo and Mberengwa in search of good rainfall patterns and good pastures following the drought of 1992.

4.2.2 Family size of the residents

The researcher saw it fit that when examining the effectiveness of the coping strategies to curb food insecurity, family size is one of the critical measures that determines the degree of coping

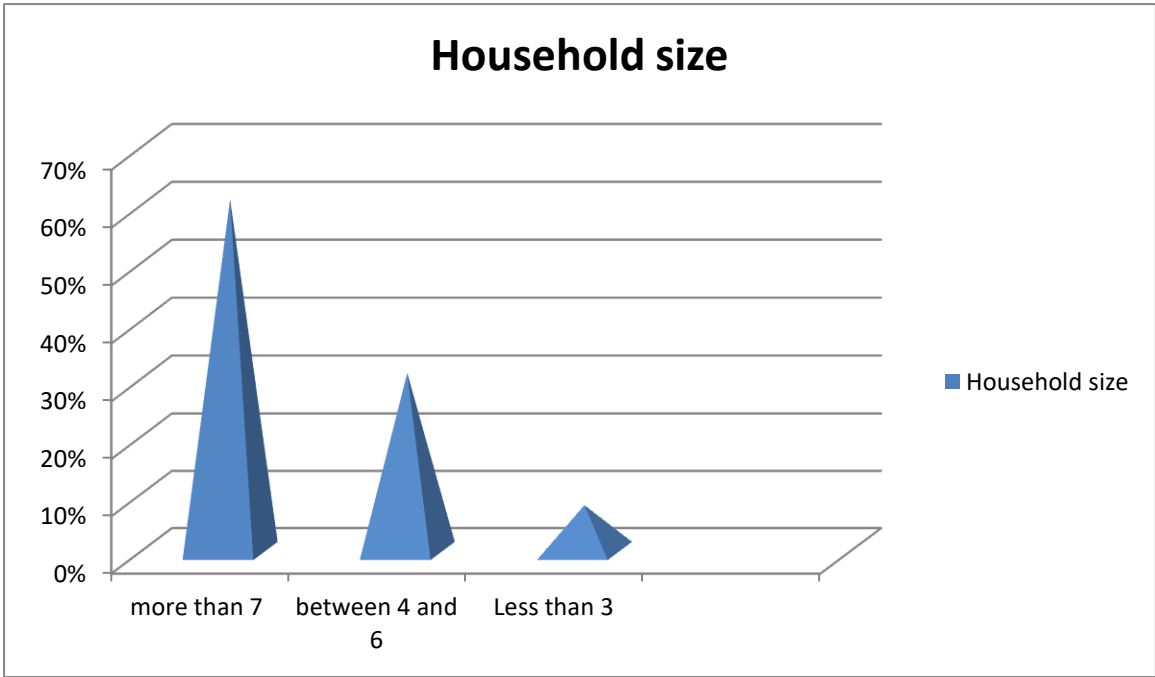


Figure 1.4 shows household size of the residents

As shown by the graph 61% of the respondents’ households had family size of more than 7, followed by the family size of between 5 and 6 which occupied 31%, whilst only 8% of the interviewed households had a small family size of less than 4 members.

4.3 Respondents from Case study 1; residents

4.3.1 Climate change concepts and the indicators in Chireya ward 5

The residents reported that reported that climate change is the reduction of rainfall and an increase of temperatures. Among those who participated in the focus group discussions, they agreed that climate change is taking place in the area. Those who were interviewed individually, 90% admitted that climate change is taking place in the area, while 10% clearly indicated that they were not sure if the reduction of precipitation was climate change or an indication that God was angry at his people.

All the residents reported that they are no longer receiving rainfall types they used to receive therefore they could not predict which rains can they use to plant their crops. They narrated the common rain names they used to receive that include *gukurahundi* (the rain that washes away the chaff), *mvumiramutondo* (the rain that facilitates the blooming of the trees), and *munhuruka* (the rains that gives the signalling the starting of the rainy season). They reported that they now receive only one type of rain, and that things have changed because there is no signalling rainfall that tells them when to plant.

They reported that usually the communities in Chireya Ward 5 and other communities in *Shangwe* area were starting to prepare their lands after receiving the last rain called *Munhuruka*. One of the elders narrated that “*ikozvino hatichaoni mvura dzaisimbonaya makare kare tichangogara muno. Tava kungodyara nemvura dzese dzese nyange payanaira. Saka iyo climate change iri kuitika nokuti mvura iri kuramba ichipera mudenga umo* (Now we are not receiving the types of rains we used to get in this area long back, therefore we are now making use of every raindrop, regardless of when it falls).

About 60% of them reported other indicators were the heavy infestation of most tree species especially Mopane tree by caterpillars during spring time, and that *mikute* trees always bear their fruits late or do not bear fruits in some years. They further indicated that there is heavy population of crickets on the ground year in year out which is an indication of reduced precipitation.

The residents reported the significant reduction of trees in the area as another indicator of climate change. They reported, “*honai miti yakapera, takasvika muno miti yakapfekana, musingafambiki mumatondo, izvozvo zvinoratidza kuti denga ririkusanduka*”(See now trees have been finished, when we arrived here there were many tree species, such that you could hardly move across the tress or bushes. Such things show that there is climate change).

4.3.2 Effects of climate change to the livelihoods

The following graph shows major effects that were explained by the residents as a result of climate change.

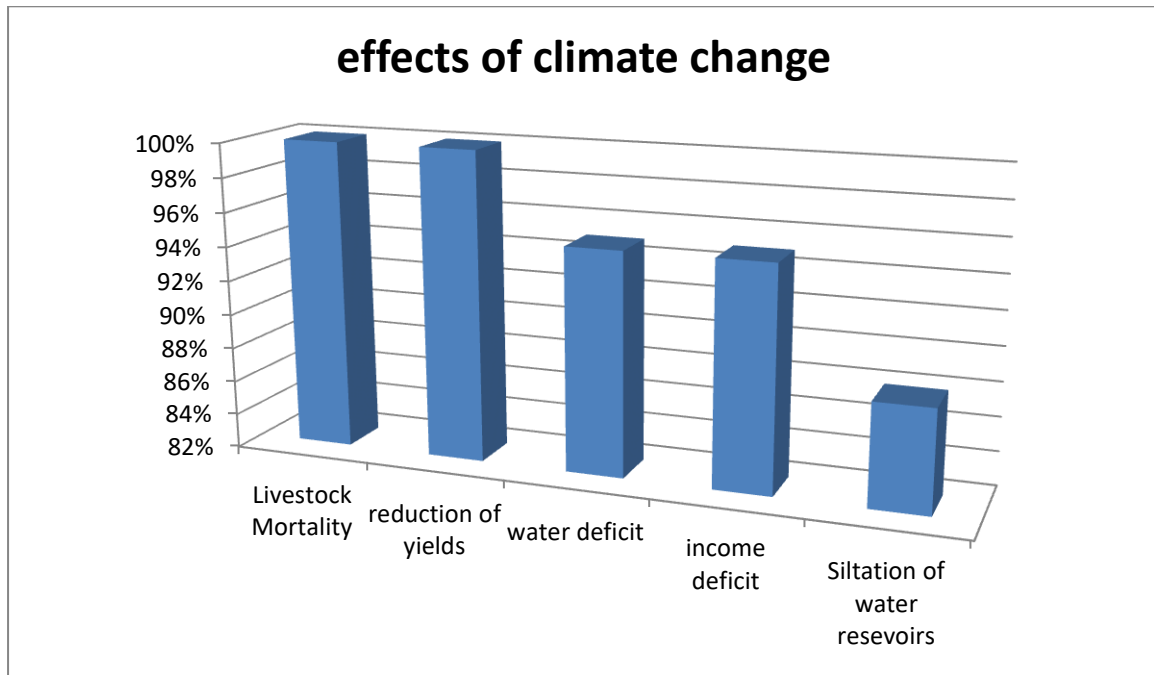


Figure 1.5: Effects of climate change to the livelihoods

As indicated by the graph above 100% of residents reported the effects of climate change as the reduction of yields and livestock mortality respectively. Water and income deficit were both reported by 95% of the interviewed respondents while 88% reported siltation of water reservoirs.

The reduction of yields like maize was reported to have been caused by high temperatures and a significant reduction of precipitation. They narrated that since the year 2000 maize production in the area has been adversely affected, up to the extent that some farmers do not get enough maize grains to feed their families up to the next season.

The reduction of crop yields was reported to have worsened by high livestock mortality (due to shortage of drinking water and food in the dry season) that was reported by 100% of the

interviewed households as the other effect of climate change. They narrated, “*tinongotarira nokuti mombe dzakafa, todyara chibage chedu, tisina kuvundukura minda yedu. Kana mvura yonaya shoma iyoyo haimwiriri muvhu inongomhanya yoenda, mbeu dzinobva dzakurumidza kuoma panguva inombomira mvura kunaya.* (We just put our maize seeds without ploughing because our cattle died, due to lack of pastures, when rains come they do not infiltrate, it runoff. As a result crops become quickly dried up especially during the dry spell and many households get poor crop yields and continue to impoverish the community. They reported that this causes food insecurity and reduction in the living conditions of people.

About 95% reported the water and income deficit as the effects of climate change, while 88% reported the siltation of water reservoirs as the other effect of climate change. In their reports they narrated that, “*vanhu vanorima mumadhaikombi/makuvi kana mvura yonaya yokukura ivhu riya yonokanda mumadhamu edu, obva avhutsira patakambochera, mombe dzedu dzoshaya mvura dzofa.* (People grow their crops along the flood plains when rains come they wash away the soil and deposit it in our dams, destroying work that was done, as a result our cattle struggle to get water and eventually die).

At least 60% of them highlighted that when dams are about to dry up the water becomes very smelly and it causes many diseases like red water to animals like cattle and goats that increases its mortality. As a result they struggle for draught power and for cattle to sell to buy food when they are unhealthy because buyers need healthy cattle.

100% of the respondents narrated that, “*mombe dzinomwa kamwe pamazuva maviri kana matatu muchirimo, saka zhinji dzinofa, mvura inozosara yonaya idzo dzatofa kare kare., naizvozvo vamwe takatopfiga matanga* (our cattle drink water once per every two or three days during the dry season, as a result many cattle would have died already by the time the rains falls. Some of us do not have even one, they all died).

They further reported during the interview that most of the areas have no grass especially the dry season and that little grass is found along Katamba river flood plain. They further highlighted that they do not keep their cattle in the kraals during the nights because they would want them to graze during the night to avoid high temperatures during the day. They reported that it is this time thieves come at night and drive cattle away until they make sure they steal it in darkness. As a result they reported that this affects their livelihoods, because cattle play a pivotal role in their day to day living.

The residents also highlighted on the issue of poor soil fertility. They reported that they used to spread cattle manure to improve the soil fertility, but now because they do not have cattle anymore it is difficult and their soil fertility has been significantly reduced. So even the times when the area gets rainfall, the crops do not grow fast and/or produce better yields because of poor soil fertility. They narrated, “*chibage chinoverenga mazuva, kunyange chisati chadarika mabvi, kana mazuva acho akwana chinongotumbuka saka hachizopi goho rakanaka*).(Maize has its own days of maturity, if the days are near end it flowers even if the days it is below the knee level, therefore it will not give good yields). They reported that this causes many households to be food insecure and impacts negatively on their livelihoods.

They further informed in the interview that their poor livelihood was not entirely blamed to high temperatures and low rainfall alone but to wild animals also. They reported that *nemhaka yekupera kwemichero mhuka dzemusango dzakaita semakudo nenguruve dzinouya dzoba chibage chedu usiku. Dzimwe nguva nzou dzinopaza kwadzakavharirwa dzoparadza minda yedu tosara tisisina chokudya*. (Due to the reduction of wild fruits and natural vegetation, wild animals like baboons, wild pigs and steal the maize cobs at night. Sometimes the elephants come during the night and steal the maize field only to leave us without food).

The residents also reported that their livelihoods are already affected because their incomes have been affected way back. They reported that their money was from selling their agriculture produces, like chiefly cotton, tobacco (which they started to grow few years ago), and maize surplus. They further reported that their purchasing power was reduced since the advent of this climate change regime, because crop yields have been dwindling there after. This was accompanied by the buyers offering very little on their produces, they reported that since the year 2000, it was only in 2010 when cotton was bought for US\$1 per kg. There after the cotton prices and maize prices per tin was reduced to an uneconomically price, with cotton pegged at US\$0.3 per kilogram and maize at US\$2 per 20kg of grains, cattle beasts as low as between US\$100 to US\$180 depending with the weight and health of the beast and goats as little as below US\$14 each.

4.3.3 Coping strategies to reduce food insecurity in the area

Research question 2 of the study (see section page) required the researcher to look at the coping strategies adopted by the households in Chireya ward 5 Gokwe North, to reduce food insecurity. The coping strategies were described in this study as the adjustments that households employ in order to reduce food insecurity in the face of climate change, both on farm and off farm adjustments. The table below shows the coping strategies employed by the households to reduce food insecurity in the face of climate change

Coping strategy	Quantity
Digging deep wells along the flood plains	60%
Change planting dates	90%
Switching to drought resistant crops (sorghum)	88%
Depend on donor organizations	67%
Migration to towns and neighbouring countries like South Africa, Botswana, Zambia and Namibia	56%
Buying from credit and return after harvests or sell an asset	70%
Borrowing food from friends, kins and from the chief	90%
Food for work and money for work programs	36%
Casual work (<i>maricho</i>)	80%
Bartering cattle and assets for grains	70%
Help from friends	20%
Transferring children (temporarily) to relatives whom are better off like in-laws	26%
Supplementing with wild fruits	70%
Reducing the number of meals per day	80%
Reducing the quality and quantity of meals	60%
Consuming grains left aside as seeds	26%
Barter pieces of land for grains	80%
Marrying off their daughters	12%
Illegal mining activities	70%
Illegal selling of firewood	72%
Selling their domestic animals like cattle and goats, as well as domestic birds like chicken	90%
Selling assets like ploughs, harrows, a and cultivators	100%
Selling wild fruits at growth points and in towns	50%

Table 1.4 Coping strategies to reduce food insecurity from case study 1: residents

100% of the residents reported that they sell off their assets, while 90% reported that they borrow food from other, change planting dates, and selling their livestock to reduce food insecurity. 72% reported that they illegally sell firewood, while 70% narrated that they resort to wild fruits to supplement their food, barter their livestock for food and buying food from the local markets on credit respectively. The digging of wells along the flood plains and reducing the quantity of food was reported to be adopted by 60% of the residents while 69% resorted to donors. At least 56% and 50% reported that they coped by migrating temporarily to the urban areas and to neighbouring countries and selling wild fruits to get cash respectively. 36% of the residents narrated that they do food and money for work, while only 20% reported that they do not have other means except to transfer their children temporarily to better off relatives. 12% of the residents reported that they marry off their daughters to the better off people who would be able to feed them during the time of need.

4.3.4 Effectiveness of the coping strategies

The effectiveness of the strategies was to investigate if the coping strategies employed by the households in Chireya ward 5 do sustain their livelihood.

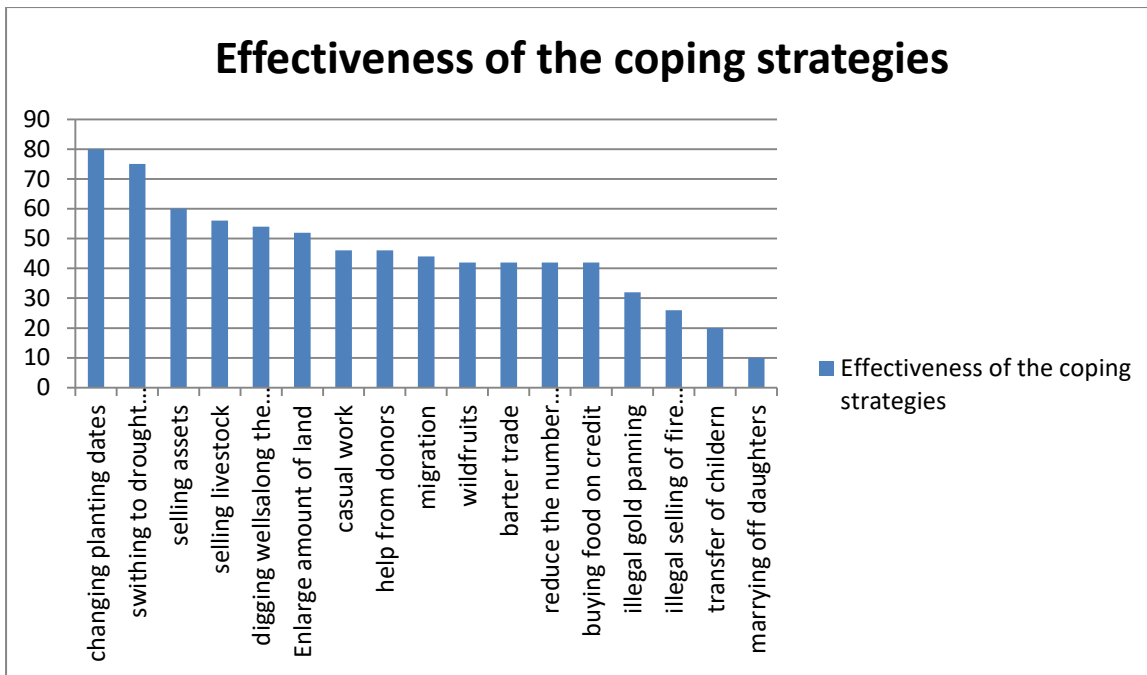


Figure 1.6: Effectiveness of the coping strategies

As shown by the bar graph above changing the planting dates was reported to be effective by 80% of the residents, while 78% reported that switching to more drought tolerant crops was more effective. They reported that those who had already switched off to drought tolerant crops were better off as to their counterparts.

60% and 56% of the residents reported that selling assets and livestock was more effective respectively in reducing food insecurity, while 54% reported that digging wells along the flooding plains and in the already dried dams was more effective. 42% of the residents reported that help from donors and enlarging the amount of cultivated land was also effective. They explained that those who were planting large amounts of cultivated land were better off and even helping those who were hungry. Doing casual work, migration, supplementing with wild fruits, barter trade, reducing the amount and quantity of food and buying food on credit was reported by 42% that they were effective in reducing food insecurity. Only 32% and 26% reported that illegal mining activities and illegal selling of firewood to the local markets were

effective respectively, while 20% and 10% reported that transferring their children and marrying off daughters were effective also.

Other residence explained that food aid from the donor organizations was not effective because they only give people food instead of training them new methods of having better yields in the climate change regime. They reported, “*kupiwa chikafu kunobatsira nguva pfupi, hatisi zvirema, tinoshanda dai vachiuya vachitidzidzisa tozvishandira pane kuuya vopa vanhu chikafu chisingatori mazuva chiripo. Rubatsiro rwavo rwakanaka asi harwuendi kure,*” (Being donated food is good but it is for short time, we are not crippled we work, it would be better off if they can come and train us on how to get such produces. There is no sustainability in their donations).

They also reported that they end up fighting and hating each other during food distribution. This is because donors always bring very little food as compared to the people who are supposed to get it. On the issue of borrowing and buying food on credit residents reported that conflict and hatred always erupts on the event that the borrower failed to return the food on time. On the issue of food aid from the donors they reported that those who fail to get food, due to some circumstances have a tendency of hating the community leaders that end up lead to witch craft and permanent hatred.

They further highlighted that casual work (*maricho*), was not effective because employers and the employers alone benefit a lot since sometimes they (residents) just work to get food to eat. They clearly indicated that they are the net losers. They further indicated that they are always cheated, by their employers or those who hire them. They are given areas that are never cultivated to remove weeds from fields that are not cultivated well, which make them to finish small hectares. This literally means they always get very few returns that do not feed their families.

4.3.5 Stakeholders assisting the communities to cope with the effects of food insecurity and their effectiveness

The table below shows the stakeholders that were reported to be assisting with the coping strategies to reduce food insecurity in the area.

Stakeholder	Duties	Effectiveness
Local Government	<ul style="list-style-type: none"> • Department that is near the people in terms of service delivery • It assisted to construct the dip tanks to manage livestock well • Assisted with schools and clinics • Managing the local shopping business centres 	67% Effectiveness but they argued that it does not do sustainable development projects. It concentrates on projects that itself benefit
Agritex (reported by 80%)	<ul style="list-style-type: none"> • It links the research science and technology to the needs of the farmers • Farmers trainings • Assists farmers with the seed type (hybrid) to plant • They introduced <i>dhiga udye</i>/use of bunds • Introduced gardening projects at Zumba shopping centre • Assists in livestock management 	65% effective They reported that their trainings are scarce.
Grain Marketing Board (reported by 76%)	<ul style="list-style-type: none"> • the government of Zimbabwe's grain trade and marketing company • it ensures that a number of households receive maize inputs at the onset of the season every year • They reported: that they stock maize grains and sell at an affordable; distribute inputs of maize to the households 	Reported 60% effective
Women affairs was reported by (66%)	<ul style="list-style-type: none"> • They reported that it assists with initiating and monitoring women projects for sustainable development 	40% effective reported that it

	<ul style="list-style-type: none"> • Women empowerment • Coordinates all donor organization that are ito women and girl projects 	was in-active
NGOs 60%	Food and money distribution during the period in food insecurity situation	38% effective. They; reported that it causes dependence syndrome
Social welfare	<ul style="list-style-type: none"> • Assist the more vulnerable populations • Distribute money to the vulnerable like the elderly and crippled to buy food, clothes and sending children to school. 	34% effective. They reported that it does not any projects.
Environmental Managenent (45%)	Protect the environment from being exploited. They reported that it helped to mitigate the following veld fries; land degradation; siltation; deforestation	28% effective

Table 1.5 shows Stakeholders assisting the communities to cope with the effects of food insecurity and their effectiveness.

4.3.6 Suggestions towards sustainable coping strategies to reduce food insecurity in the face of climate change

The residents were asked to give the suggestions towards sustainable coping strategies to reduce food insecurity since they had indicated more than half of the coping strategies were not effective and that some of the stakeholders were not effective in assisting the households to cope with climate change effects that would sustain the community under study for the present and future generation. The pie chart below shows the residents' suggestions

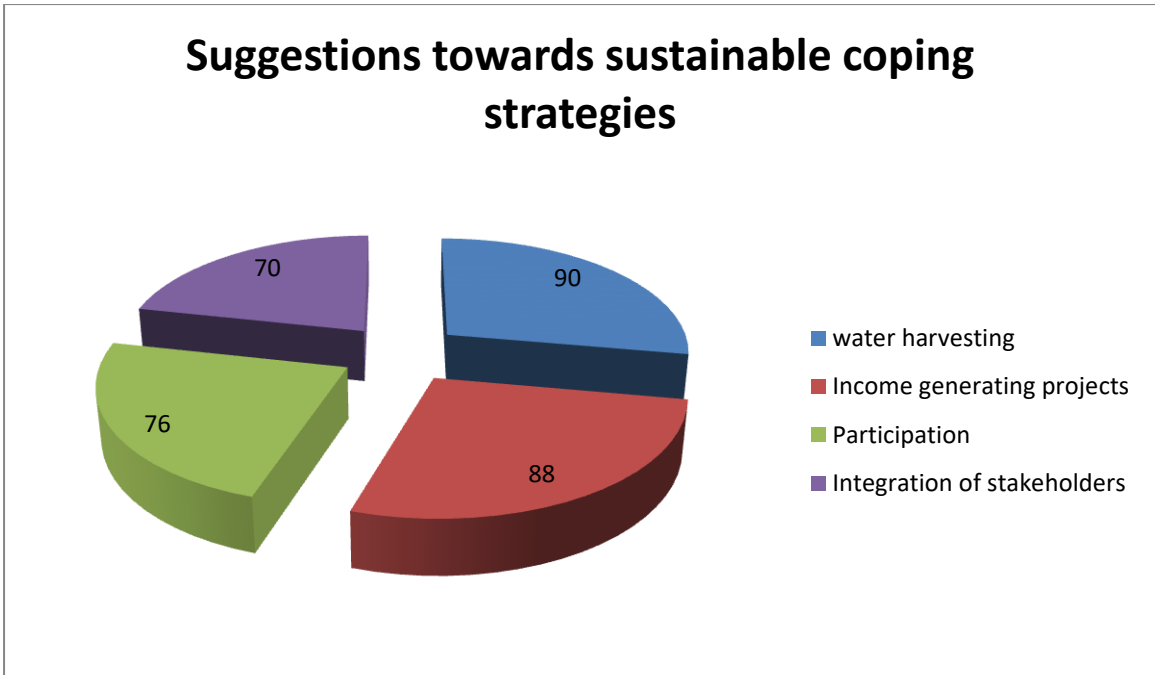


Figure 1.7 Suggestions towards sustainable coping strategies

As indicated by the pie chart above 90% of the residents reported that water harvesting would be a more effective coping strategy while 88% of them reported the Income Generating Projects (IGP). 76% and 70% reported that they need participation of the communities for nay project to benefit the community and integration of stakeholder respectively.

4.4 Responses from Case study 2: organization A

4.4.1 Climate concepts and its indicators

Organization A is an organization that is into agriculture, helping and influence farmers to adopt the improved practices in crop and livestock production, management, conservation and marketing. They reported their main role is not on training only, but on changing the general outlook of farmers to the point where they will be receptive to, and their own initiative. They continuously seek means of improving the farm business and home of the farmers and households where they operate. Such that there is an element of sustainability in their activities, and able to cope with any shocks that threaten food security. The organization

train and teach farmers how to save and invest in agriculture, such that during the dry years they would at least get assets to cope with.

Organization A views climate change as long term average weather conditions that are recorded or taken over a long period of time of at least more than 20 years. However, the organization added that climate change is all about having a reduced rainfall amount and increased daily temperatures such that the farmers find it difficult to grow crops and get better yields without irrigation. Organization A argued that the human activities are the major causes of climate change; they mentioned chiefly air pollution from industries, deforestation and poor farming methods like stream bank cultivation that causes siltation of water reservoirs.

Organization A informed in the interview that there is a progressive warming of temperatures yearly and a reduction of mean annual precipitation. The organization reported that according to their records the district including the research area has a reduction of mean annual rainfall of 2% yearly and a general increase of temperatures that deter agricultural activities. Besides that the organization added that the prolonged dry spells of more than three weeks. The organization added that most of the rains are always accompanied with thunder, lightning and windy with high intensity which is an indication of climate change.

4.4.2 Effects of climate change to the livelihoods of people

The organization A indicated in the interview that climate change causes a signification reduction in crop yields that traps households vicious cycle of food insecurity. It further stressed that the reduction of crop yields was exacerbated by high mortality of livestock caused mainly by water deficit. On water deficit the organization inferred that water reservoirs were becoming smaller every year and some have become totally dry. In their response they reported that dams no longer keep water for at least more than 6 months after

the rain season, this was because the ground has no cover due to massive deforestation in the community. So the runoff water carries the soil and other load and deposits it in the dams and become silted. This literally means they are no longer able to harvest more water.

On livestock production the organization through the interview reported that when precipitation declines, livestock production declines also. The organization A stresses on the importance of water to livestock production that water helps in the digestion process of all animals. It reported that “if animals do not get enough water the mortality rate increases because for digestion to occur water is a very important requirement. They further noted that drying grass without enough water for animals like cattle becomes gradually unappetising that that causes animals to decrease in its weight and eventually die. The organization further indicated that the most affected livestock are women cattle and calves. They noted that, women cattle and calves become so tired of travelling to and from the water source which is several km away from the research area. The organization indicated that this results in many households loosing many livestock which are essential to their livelihoods, because this is the same livestock used as draught power for domestic errands like farming and pulling scotch carts for collecting water during the dry season.

The organization further pointed out that, since 1991 the area has experienced at least more than ten years of drought due to poor rainfall. The table below shows the seasons the area experienced severe drought as a result of climate change as reported by the organization.

1991-1992	Severe drought in Southern Africa, Zimbabwe was severely hit.
1993-1994	Drought in most parts of Zimbabwe though not severe as the previous season
1994-1995	Severe drought in some areas surpassing the impacts of the 1991-1992 drought
1997-1998	Drought in Zimbabwe, though it was less severe than expected
2001-2002	Drought in most parts of the rural Zimbabwe
2007-2008	Severe drought in Zimbabwe, many people died especially children due to cholera outbreaks
2013-2014	Poor maize yields, due to drought
2014-2015	Poor yields, drought due to climate variability
2015-2016	Elnino drought in many parts on the country

Table 1.6: years of severe drought in Chireya Ward 5 Gokwe North

The organization reported that more than 70 per cent of the household are food insecure because they rely on rain fed agriculture. The organization argued that many did not even get green maize cobs to eat due to poor rains received for the past three consecutive years since 2014.

The organization reported that, food insecurity in the areas is exacerbated by poor land preparation. The organization reported that, “the farmers to get better yields they have to do winter plough, this needs draught power therefore they can not do it because around October most of the cattle are not fit for the hard and strenuous job. Many households have lost their cattle due to shortage of grass and water for upkeep. Therefore even if they think of selling cattle to buy food some of the cattle are so unhealthy such that no one can buy it”.

4.4.3 Household coping strategy and effectiveness

Research question 1 of the study (see section page) requires the researcher to look at the coping strategies adopted by the households in Chireya ward 5 Gokwe North, to reduce food

insecurity. The graph below shows the coping strategies and their effectiveness to reduce food insecurity in the face of climate change.

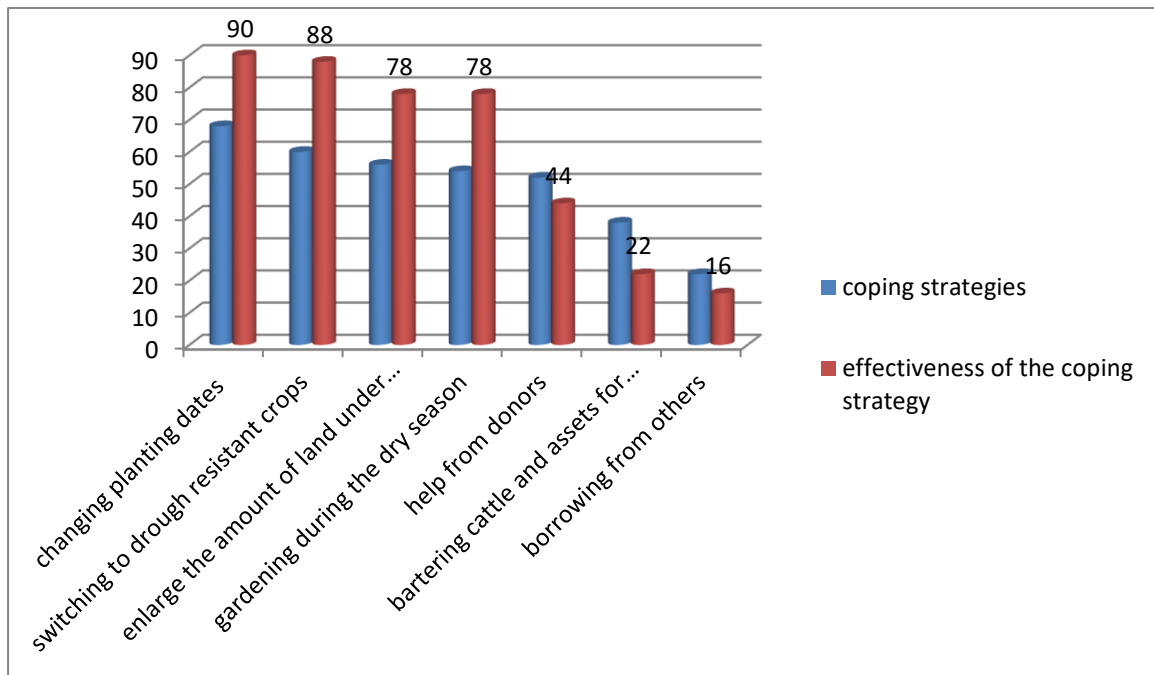


Figure 1.8: coping strategies and their effectiveness to ensure the reducing food insecurity in the face of climate change

As shown by the graph, 68% and 60% were reported by the organization that they cope by changing the planting dates and switching to drought tolerant plants like sorghum with the effectiveness of 90% and 88%. 56%, 54% and 52% reported to be doing gardening or growing vegetables, get help from donors and bartering their livestock and available assets for food and maize grains respectively. The effectiveness of the coping strategies was 78% for the former two and 44% on help from the donors. The organization reported that only 38% reduce food insecurity borrowing from others with the effectiveness of 16%

4.4.4 Stakeholders/ partners in the Ward assisting the community with coping strategies and their effectiveness

The organization A reported that there were NGOs, various government departments, and parastatals, that assist in rural development but it reported that their effectiveness differs. The organization mentioned NGOs as the most prominent stakeholder that is always on the ground when there is a need. It reported that NGOs distribute food in the communities every year during the post harvests season from September to February when many households' food baskets are dry. They provide food like small grains, cooking oil and beans to eat during the post-harvest season. However, the organization narrated, "instead of giving people the fish lines, the NGOs give people fish and try to sway people's thinking towards sustainable livelihoods". The organization clearly reported that the NGOs have no sustainability because they create a dependency syndrome.

The organization added that these NGOs have no continuity in their projects. It explained the NGO that was into Water and Sanitation (WASH) that drilled at least two boreholes in the ward that help with drinking water for people and animals. However the boreholes since stopped working because when they drilled no one within the community were trained to fix it when they stop working. Therefore the organization reported that their effectiveness was questionable since people are still starving whilst they (NGOs) have more than 20 years operating in the same area.

4.4.5 Suggestions towards sustained coping strategies to reduce food insecurity in the face of climate change

The organization A reported in the interview that, sustainable water harvest is needed. It reported that, “dams should be constructed such that more water is harvested and communities would be able to utilise that water for domestic and commercial purposes. For example sustainable kitchen and commercial gardens can be constructed along the dams that would supplement the diet of many. The livestock production can be boosted by the availability of water in the community. The organization also reported in the interview that the government should start to focus on the service delivery in rural areas. It reported that the government should inject money for the trainings of various projects for women and youths. It reported that projects like goat farming, and poultry would assist households if done properly in a sustainable manner.

4.5 Responses from case study 3: organization B

4.5.1 Climate change concepts and its indicators

It was noted during the interview that organization B is a network of environmental management and environmental friendly. The organization is a statutory body that is responsible for ensuring the sustainable management of national resources like trees, soil and water as well as protection of the environment, the prevention of pollution, and environmental degradation. The organization reported that it creates awareness to the communities to be in friendship with the environment and appreciate the roles it (environment) play to sustain their livelihoods. The organization understands climate change as any increase of temperatures, reduction of precipitation or reduced humidity over long time whether due to natural variability or a result of human activities.

The organization protect the water reservoirs from siltation by training farmers not to deforest trees and to use scotch carts to their ploughs to the field rather than pulling it causing erosion such that the water reservoirs would act as a water harvesting mechanisms and use it during the post rainy season.

The organization B informs that according to their records rainfall and humidity have been significantly reduced by nearly 2% every year and that air temperatures are rising by more than 0.01% every year. The organization further explains that in their findings, the rate of evapotranspiration is very high since the advent of the 2000s regime. The organization further reported that this causes water in dams to quickly evaporate and natural vegetation and crops to dry up quickly. The organization indicated in the three decades that the environment used to have a variety of trees, some wet lands that were a habitat to a variety of species and the bushes were growing yearly but now all these are things of the past. The organization argues that fruit trees and other important trees are hardly found which, is an indication that climate change is taking place in the community.

4.5.2 Effects of climate change to the livelihoods

Question that guided the study required the answers to the effects of climate change to the livelihoods of people in the community. The table below presents the information reported by the organization.

The table showing the effects of climate change to the livelihoods of people

Effect	Causes	How it affects livelihood
Reduction of crop yields	<ul style="list-style-type: none"> • Reduction of precipitation • High temperatures • Prolonged dry spells 	<ul style="list-style-type: none"> • Food insecurity • High school drop outs due to hunger • Reduction of life expectancy due to malnutrition
Income deficit	<ul style="list-style-type: none"> • Reduction of crop yields • Reduction of demand for livestock and assets • Hiking prices of food stuffs 	<ul style="list-style-type: none"> • High school drop outs • Reduction of the general standards of living
Water deficit	<ul style="list-style-type: none"> • Reduction of precipitation • Siltation of water reservoirs • Deepening of water table 	<ul style="list-style-type: none"> • High livestock mortality • Shortage of water for drinking and domestic use • Diseases like cholera
Reduction of natural vegetation cover	<ul style="list-style-type: none"> • Reduction of precipitation • Deforestation (by people trying to cope up) 	<ul style="list-style-type: none"> • Shortage of food for livestock • Livestock mortality • Reduction of soil fertility that lead to reduced crop yields • Reduced wild fruits (used as food)

Table 1.7: effects of climate change to the livelihoods of people

4.5.3 Coping strategies to reduce food insecurity in the face of climate change

The organization A reported in the interview that many ways done by the households to save the available food, to bring food to the household, to reduce the shocks are coping strategies.

Coping strategy	% of effectiveness	Reasons
Help from the donors	70%	<ul style="list-style-type: none"> • Help people in food crisis

		<ul style="list-style-type: none"> • Help to ensure food availability to those in needy • Distribute cash to those without the means • However, they cause donor dependency syndrome
Supplemented by wild fruits	68%	<ul style="list-style-type: none"> • It reported that they do not need cash • They supplement the available food during the day and they cook at night only • However the organization reported that the coping strategy causes girl children to drop out of school
Illegal mining activities	60%	<ul style="list-style-type: none"> • It reported that it give people cash to buy food and sending children to schoold • However, it was reported that it causes land degradation that later causes siltation of dams and rivers
Illegal selling of firewood	56%	It reported that it gives people cash for domestic purposes but argued it is deforestation that causes the ecosystem to be unbalanced.
Food for work	45%	It reported that those without the assets use food for work to cope. It gives people food and money for w purposes but the organization argued that it was not effective
Reducing the amount of food eaten per day	36%	It reported that it saves the amount of food available but it causes malnutrition.

Table 1.8: Coping strategies to reduce food insecurity in the face of climate change

4.5.4 The stakeholders/ partners in the ward assisting the community with coping strategies and their effectiveness

The organization reported that there were quite a number of stakeholders but it was interested in the ministry of women affairs, social welfare department and donor organizations.

The organization reported that the ministry of women affairs does the projects that benefits women through empowerment and income generating projects. It coordinates the donor organizations that have anything to do with women and girls in development and education.

The organization reported that, “the ministry of women affairs’ effectiveness is still

questionable since there are no tangible income generating projects they have done for women so far. Women are still struggling not in the community only but in many rural communities, their lives have not improved for better but getting worse”. The organisation further highlighted that the ministry is under funded by the government, so it ends up coordinating the donor organizations like World Vision and Camfed as their main objective.

On the Social welfare department, organization B reported that it (social welfare) is a statutory body that oversees the vulnerable populations in these communities. It further informed that it assists the old age population and the crippled with cash to buy food, clothing and sending their children to school. The organization further reported that social welfare department is very effective as a stakeholder; however it does not have any income generating projects to help the current generation to be able to cope when they get older.

The organization reported that the donor organizations bring harm than good in the ward, because they cause donor dependency syndrome and that there is no continuity in their projects because they are donor driven. The organization narrated, “People have been given food stuffs for more than two decades now by many donor organizations, but no improvement. Instead they should bring the skills to the people such that there is sustainable development. If they are given food today, tomorrow they wait for them to bring it for them to eat and wait again”. The organization argued that the donor organizations were colonizing people psychologically, and makes them depend on them.

4.5.5 Suggestions towards sustained coping strategies to reduce food insecurity in the face of climate change

The table below shows the suggestions reported by the organization for the communities to cope with climate change to reduce food insecurity.

Reviving the environment; arguing that there was a lot concerning sustainable livelihoods that would come from the natural vegetation if it can be revived in a sustainable way.
Strong community participation from the problem identification up to the closure of the projects for sustainability
Integration and coordination of stakeholders under pinned by the national government policies for rural development
Construction of dams for sustainable water harvest to be used for domestic, commercial purposes and for livestock.
Women empowerment in the community, because it reported women and girl children as the most affected individuals
Table 1.9: Suggestions towards sustained coping strategies to reduce food insecurity in the face of climate change

4.6 Responses from Case study 4: organization C

4.6.1 Climate change and the indicators

Organization C is an organization which is near people and attend to their challenges and development issues peculiar to their areas of jurisdictions. Local government gives provision and maintenance of public services and infrastructure at local levels utilising funds generated from the local communities in addition to grants and loans from central government and other sources. The department is related to the establishment of participatory and democratically elected structures that can identify the needs of people at grassroots level and ensure the translation of those needs into actual programs and projects and maintenance of essential services.

It was noted during the interview that Organization C is responsible for the construction and management of dip-tanks, to prevent livestock from ticks, flies, mites, lice, blowfly strike and

other parasite on cattle, sheep and goats to reduce its mortality. They also build schools and hospitals that assist people within their sphere of influence.

The organization C saw climate change as the reduction of rainfall and increase of temperature as a result of human activities like air pollution and deforestation, poor farming methods.

4.6.2 Effects of climate change to the livelihoods of people

The organization C reported that rainfall and temperatures have been reduced and this causes the area to become warmer almost every year. The organization further reported that they are now feeling the global heat waves even in rural areas than the previous years.

The organization C informs that water in the dams does not last for more than 6 months after the rainy season. It further reported that that many boreholes that were drilled by donor organizations were dried up meaning that the water table has changed.

It reported an increase in the number of donor organizations that are into food relief program. It also reported a reduction in natural vegetation population and a reduction of yields in many communities. It narrated that, “Trees are now sparse, and there is no chance of revival and surface water in some areas is nowhere to be found which, is an indication of climate change”.

Effect	Causes reported
Poor harvests	<ul style="list-style-type: none"> • Reduction of precipitation • High temperatures and prolonged dry spells • Shortage of draught power due to livestock mortality • Poor soil fertility

	<ul style="list-style-type: none"> • Shortage of fertiliser as a result of income deficit
Livestock mortality	<ul style="list-style-type: none"> • Shortage of water in post rainy season • Shortage of grass for food • Diseases
General reduction of living conditions	<ul style="list-style-type: none"> • Poor yields • Water deficit

Table 1.10: Effects of climate change to the livelihoods of people

4.6.3 Coping strategies to reduce food insecurity in the face of climate change

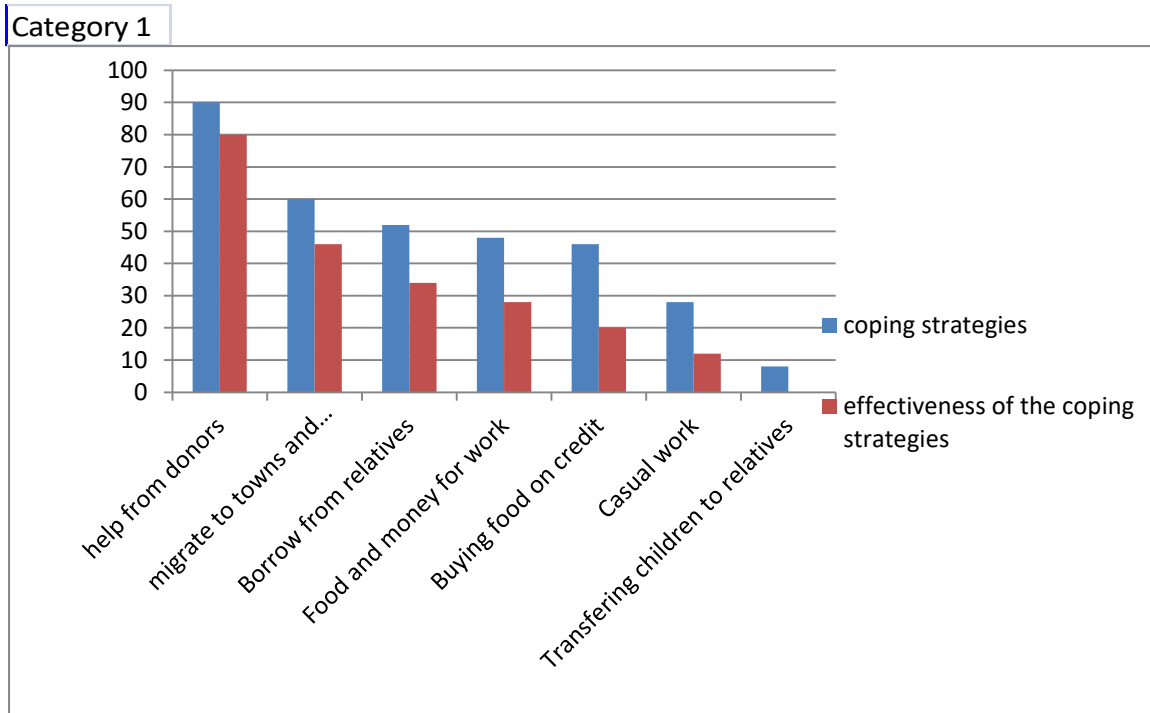


Figure 1.10: Coping strategies to reduce food insecurity in the face of climate change

As indicated by the graph above, the organization reported that more than 90% of the residents get help from donor organizations, followed by migration to town and other countries. Both were reported to have an effectiveness of 30% and 46% respectively. The organization also reported that those who borrow were about 52% with the effectiveness of 34%. It also reported that buying food on credit, casual work, and transferring children to relatives were employed by 46%, 28% and 8% respectively.

4.6.4 Stakeholders assisting community with coping strategies to reduce food insecurity

Stakeholders	Effectiveness	Reasons
NGOs	80% effective	It reported that NGOs assist people in food crisis
Social welfare	70% effective	It reported that the stakeholder assist the vulnerable like the elderly and crippled with cash for domestic use and buying food
EMA	66% effective	Reduces the degradation of the ecosystem and protection of the general environment, however they lack funding and not on the ground
AGRITEX	56% effective	56% training farmers on innovative agriculture and livestock management, however they lack funding
Women affairs	54% effective	Women income generation projects and women empowerment, however they lacked funding
Ministry of youth	20% effective	Income generating projects for the youth and youth economic empowerment, however it lack funding

Table 11: Stakeholders assisting community with coping strategies to reduce food insecurity

4.7 Discussion

This section presents the cross-case analysis of the research findings. It specifically discusses issues that were drawn from three organizations and from residents (village heads and village elders). Cross-case analysis is a research method that can mobilize knowledge from individual case studies. Khan, (2008) coined that authors propose that mobilisation of case knowledge occurs when researchers accumulate case knowledge, compare and contrast cases, and by so doing, produce new knowledge. Conclusions and recommendations will be presented after the discussion.

4.7.1 Climate change concepts and its indicators

Climate change has been viewed as a threat to human life and livelihoods of many. Intergovernmental Panel on Climate Change (IPCC), (2007), defined climate change as the significant variation of the mean state of climate relevant variables such as the precipitation, temperatures, wind and pressure in a certain period of time, usually over 30 years. On the general causes of climate change UNFCCC, (2009) states in article 1 that climate change is

attributed directly or indirectly to human activities that alters the composition of the atmosphere which is in addition to natural climate variability observed over a comparable time period. All respondents were of the same view that climate change refers to the reduction of rainfall and increase of temperatures, although organization B added that climate change include the reduction of humidity (the amount of water vapour in the atmosphere).

On the general causes of climate change human activities were reported by both the residents and the three organizations. Unlike the UNFCCC, the organizations specified that pollution; deforestation, poor farming methods and veld fires were the major causes of climate change. However, the residents put much blame on the divergence of people from their traditional culture like *mikwerera* (rain making ceremonies), non-respecting of chiefs as the root cause of climate change. Though they mentioned veld fires, deforestation and siltation of water reservoirs but their emphasis was that they were happening because they diverged from their traditional culture. However, all the despondences were of the same view as the IPCC (1997) and UNFCCC (2009) that human activities cause climate change.

All the three organizations and residents admitted that climate change is taking place in Chireya Ward 5. The three organizations all mentioned a decrease in mean annual rainfall, with organizations A and B giving statistics of 2% reduction of rainfall and only organization B giving statistics on the increase of temperatures (0.01%) every year. However, even though organization C did not give statistics, it mentioned that the community had started to experience the heat waves which are indications of increasing air temperatures. Organization B also mentioned the disappearance of the wetlands and fruit trees. These findings were of the same view by the findings of Desanker (2010) and Archer (2010) who argued that climate change causes an increase of global temperatures. Chishakwe (2010) also had the same observance when he observed the Southern Africa region having the warming trend and a general reduction of precipitation.

Unlike the three organizations, the residents admitted that climate change is taking place, they did not clearly mention the reduction of rainfall as their indications of climate. Instead they mentioned the disappearance of the rainfall types that used to follow each other, these were *Gukurahundi* (the first rains that removes chaff), *mvumiramutondo* (the rain that facilitates the blooming of the trees), and *munhuruka* (the rains that gives the signalling the starting of the rainy season). They also mentioned the caterpillars attacking trees especially Mopane trees, and many crickets on the ground as well as the blowing of wind from East to West during the day and night which is an indication of reversal of rains. The findings were in line with the findings of Mugandani (2010) and Mutasa (2010). Although this was not mentioned by other organizations the researcher noted this as the indigenous knowledge that is unique and that should be appreciated. However, they also indicated the disappearance of wild fruits as the other indicator of climate change.

4.7.2 Effects of climate change to the livelihoods of people

All the respondents, (three organizations and residents) reported that climate change affects their livelihoods in a number of ways that contribute to the communities in Chireya being vulnerable to food insecurity. Generally they all reported that reduction of rainfall accompanied by high temperatures causes poor yields of mainly food crops like maize. All the organizations and residents reported that dams no longer keep water for at least more than 6 months after the rainy season and this leaves many people without water for domestic use

and for animals. However, only the residents reported that this made people in the community to go fetch water some 6km away from the village.

They indicated that this also made some communities on the eastern part of the community to travel long distance to Zumba clinic to collect water from the clinic's only borehole, which they reported that its water is salt like and hard to drink. They also reported that women and children suffer the most in this climate change regime because they (women) wake up just after midnight and travel very long distances of more than 6km to the water source. When they get there they have to wait for considerable length of hours in the queues waiting for their turn and that by the time young women return from Zumba, their children would already be up, crying for hunger and their mothers to breast feed them.

All the interviewed organization reported that climate change undermines productivity, social wellbeing and household food security. Organization B and the residents were of the same view that when water is about to get finished it becomes very smelly and causes many diseases to animals like cattle and goats that increases its mortality and impoverish the households. All organizations reported the reduction of natural vegetation and grass for cattle that lead cattle to become unhealthy and eventually die, and further expose families to shocks.

All organizations reported a significant reduction of crop yields especially food crop production. Organization A gave a trend of drought due to reduction of crop production as a result of climate change. It reported that from 1991 to 2016 more than half of the years were marked by severe drought; however, from its trend it shows that the years 2013 to 2016 were consecutive years of drought and hunger. The residents did not give specific years but admitted that from 1992 to present the frequency of drought years are becoming closer and closer. The findings were of the same view with Unganai (2010), when he posited that from

the year 1800 to 2008 the frequency of climate variability was increasing and the projections were that by 2080 temperatures and precipitation will be more severe. This however, shows that there is a significant reduction of crop yields in the study area.

School dropouts were reported by both organization A and B and the residents, due to shortage of income. They reported that the prices of commodities like livestock, and their assets like ploughs, cultivators, drops together with the cotton prices. The residents highlighted that they end up selling their livestock at an uneconomical price and as a result they end up failing to keep their children at school due to income deficit. This point was argued strongly by Mugandani (2009) when he stressed that one of the detrimental effects of climate change is that households end up unable to keep their children at school especially the girl children.

4.7.3 Coping strategies of the households to reduce food insecurity in the face of climate change

Research question 2 of the study (see section page 6) requires the researcher to look at the coping strategies adopted by the households in Chireya ward 5 Gokwe North, to reduce food insecurity. The coping strategies were reported by all organizations as adjustments that households employ in order to survive in the climate of food insecurity, both on farm and off farm adjustments.

Table showing coping strategies for food security of Chireya Ward 5 households

Coping strategy	Organization reported
Digging deep wells along the flood plains	Residents and Organization A
Change planting dates	Residents and Organization A
Switching to drought resistant crops	Residence and Organization A
Food aid from donor organizations	All organizations and Residents
Migration to towns and neighbouring countries like South Africa, Botswana, Zambia and Namibia	All organizations and Residents
Buying from credit and return after harvests or sell an asset	Residents, and organization A and Organization C
Borrowing food from friends, kins and from the chief	Residents, and all organizations
Food for work and money for work programs	Organizatio A C
Casual work (<i>maricho</i>)	Residents and organization C and A
Bartering cattle and assets for grains	Organization A
Help from friends	Residents and Organization B
Transferring children (temporarily) to relatives whom are better off like in-laws	Residents and Organization C
Supplementing with wild fruits	Organization B
Reducing the number of meals per day	Residents and Organization C
Reducing the quality and quantity of meals	Residents
Consuming grains left aside as seeds	Residents and Organization A
Barter pieces of land for grains	Residents and Organization C
Marrying off their daughters	Residents
Illegal mining activities	Organization B
Illegal selling of firewood	Organization B
Selling their domestic animals like cattle and goats, as well as domestic birds like chicken	Residents, Organizations A and B
Selling assets like ploughs, harrows, a and cultivators	Residents, Organizations A and B
Selling wild fruits at growth points and in towns	Residents, Organizations A and B
Get cash from Care International through Cash Transfer Project (CTP)	Residents, Organizations A and B

This shows that residents in Chireya Ward 5 Gokwe north employed different coping strategies depending with the available assets social, economic or physical assets. A study by Bryant (2000) in Canada showed that farmer's responses vary when faced by the same stimuli within the same geographical area. Nhemachena and Hassan (2007) agreed that there cannot be a one size fit all coping strategies. Which means its not new that the residents of Chireya ward 5 were adopting different coping strategies to reduce food insecurity. They had different assets, so they had to employ different coping strategies. However the study showed that at least the households in Chireya were using at least one coping strategy to reduce food insecurity, and it shows that they do this every time they face a shock.

4.7.4 Effectiveness of the coping strategies

Residents reported that changing planting dates was effective since the dates they receive first rains changed also. Organization A supported the position of changing planting dates but with a different perspective that the strategy would be effective if early maturity drought resistant crops adopted. The research conducted by Ringler et al (2011) in Ethiopia also found that households in Ethiopia cope by the use of changing crop varieties and changing planting dates. The conclusion also drawn by Gbetibou (2009) for IFPRI indicated that the coping strategies employed by farmers in the Limpopo basin of South Africa include adopting shifting planting dates from November to December. Therefore, both Ringler (2011) and Gbetibou (2009) concluded that this strategy was more effective when implemented in Ethiopia and Limpopo basin respectively.

The organization C reported that donor organizations are helping a lot (80%) in terms of food security and development. They donate food stuffs during the post rainy season and help people with cash to buy food, clothes and send children to school. These findings however differs from other organizations and residents, they all reported that donor organization causes donor dependency syndrome. They all reported that food aid from the donor organizations was not effective because they only give people food instead of training them new methods of having better yields in the climate change regime. Organization B clearly stated that the coping strategy impoverish the community, because it creates the dependency syndrome due to donor fatigue. While organization A reported that when households go to their fields they plan to grow crops, that sustains them only for the period of between March to August knowing that between September and February NGO feeds them. A more critical position was inferred by Thompson et al (2010) who posited that, “NGOs bring more good than better, their positive contribution is dimmer than the negative and that they do not have sustainability in their projects”

Both the residents and organization A reported that the use crop rotation, especially with the use of leguminous crops was so effective. They argued that crop rotation improves soil fertility and fixes the nitrogen when leguminous crops are used. A study in Ethiopia by Thompson et al (2010) was of the same view that crop rotation have for long time benefitted farmers in Ethiopia. This strategy was addressed by Ngigi (2008) when he stressed that besides the improvement of soil fertility, crop rotation also maintains the soil moisture and facilitates plant growth, thus boosting crop yields.

The residents and organization A also reported the effectiveness of the use of manure and crop diversification as positive if sustainable livelihoods are to be ensured for the present and future generations. Organization A argued that the former improves soil fertility in a sustainable way while the later ensures that at the household get something because it is

difficult to lose all crops, if they are diversified. Ngigi (2008) was of the same view that if households are to cope with climate change to reduce food insecurity, the use of manure and crop diversification are to be prioritised rather than relying on one crop type, in the same field.

All organizations and residents reported that the deferring purchasing of clothes and luxury items benefits them a lot. However the residents raised the view that, they end up risking buying the second hand clothes from other countries at cheap prices because drought is now a thing of every year. A study by Paul (2008) in North Bengal, Bangladesh found out that deferring from buying clothes and luxury items was employed by more than 60 per cent of the residents in 1994-1995 droughts in Bangladesh.

Residents and the Organizations A and B both reported that increasing the amount of land under cultivation was effective. The residents clearly highlighted that in their communities those who have planted large pieces of land were better off than their counterparts. The same perspective was demonstrated by Paul (2008) when he reported that in 1994-1995 droughts in Bangladesh, those who had large pieces of land under cultivation had better yields as compared to those who had small pieces of land.

All organizations and the residents reported that digging of wells along the flood plains and in the already dried dams were effective in supplementing water for domestic use. Residents reported that they use the water from these wells to irrigate vegetables they erect along the flood plains and watering their livestock. This was foreseen by Ngigi (2008) when he revealed that hand dug wells along the flood plains to supplement the shortfall in water in the dry season for irrigation, livestock and domestic use is a potential coping strategy for rural development. He further surmised that the rural households in Ghana, Burkina Fasso and Mali implemented the same coping strategies and it was effective.

The residents and all organizations reported that borrowing food from the neighbours and buying food with credit were not effective because it causes conflict and hatred that erupts on the event that the borrower failed to return the food in time. Conclusion drawn by Gbetibouo (2009) indicated that borrowing and buying food on credit can be effective if implemented correctly in a beneficial way. However the residents clearly highlighted that, the shop owners double the prices when selling on credit, thus impoverishing households. These findings therefore were opposed to the joint research findings by Munhande et al (2013) who concluded that about 9.3% of the interviewed households in Chivi borrow food from others without any problem reported.

On the issue of casual work, all the organizations argued that, it is a horse and rider relationship. The organizations reported that the employers benefit a lot since sometimes employees just work to get food to eat. This clearly indicated that they are the net losers. The residents indicated that they are always cheated, by their employers, where some times they are given areas that are never cultivated or not cultivated well to remove weeds from fields. While the organizations C and B were of the same view that the employers benefit more than their employees. A notation to this effect was included in Nhemachena and Hassan's (2007) research conclusion that poor households were likely to take measures to ensure their survival while wealthier households made decisions to maximise profits enriching themselves at the expense of poor households. A study undertaken by Bryant (2000) in Canada concluded that some households used casual work as a strategy when they faced a shock, but did not give its implications. However, it shows that casual work was a strategy used by many households interviewed, without the assets to cope with.

Eating the grains that they set aside for seeds, was reported by both the residents and organization A that it adversely impacts households in that the households lack seeds inputs, which creates a vicious cycle of poverty. The findings were of the same view with the

indications of Nhemachena and Hassan (2007) some households end up consuming the grains set aside as seeds, there cannot be a one size fit all coping strategy. However the households indicated a zero effective on the coping strategy.

The illegal mining and massive cutting down of trees for sale was reported by the organization B that it causes land degradation and expose the land to agents of erosion that causes gullies and potholes everywhere. The organization also reported land degradation due to gold panning and massive deforestation causes of water reservoirs that later affect the availability of water and the future generation.

On the issue of wild fruits, all organizations were of the same view that the strategy would be effective if it were done by school leavers. The exercise is regarded as little girl's job, therefore it leads to high girl children school drop outs. The organization C asserted that the girl child ends up feeding the community through gathering wild fruits and deter their future by dropping out of school. Therefore the strategy was reported to be not effective due to its negative effects. On the research conducted by Rangler et al (2008), wild fruits were found to be more effective in Ethiopia. The study conducted by Gbetibou (2009), concluded that though wild fruits assisted many households in the Limpopo basin, he agreed with all organizations that it's not the parents who do the job but the school girl children. This causes them to end up having no choice except to drop out of the school helping their mothers to gather food for the family.

Organization A clearly stipulated that there is no sustainability in more than 90% of the coping strategies that are used by the households to reduce food insecurity except that for gardening during the dry season but only for communities around the water sources. The organization reported that the gardening project benefit the members by getting vegetables to eat, and sell to reduce income deficit. It reported that some dry their vegetables and eat them

during the rain season while going to the fields which is beneficial. The residents were of the same view arguing that the strategy helps in ensuring food in the community.

Organization A together with the residents shared the same idea that switching to sorghum from maize was beneficial and more effective. In the study of Gbetibou (2009) the coping strategy of adopting the drought resistant crops in their agricultural activities was considered. The contention by Changutah (2010) was that the precarious climate change future calls for innovative livelihood strategies like switching to drought resistant crops like small grains whose lower water requirements and high temperature tolerances are better suited to warmer and drier climates. The residents reported the same that the strategy was so beneficial, when they argued that more than 90% of those who have shifted the planting dates in their communities got better yields as compared to those who had not changed the dates. They reported that maize quickly wilt when there are prolonged dry spells which causes famine, so switching to drought resistant crops was more beneficial. Therefore the strategy proved to be more effective to reduce food insecurity in the face of climate change.

All organizations argued that selling assets like livestock, ploughs and pieces of land was not effective since they argued that more than 90 per cent of the households were unable to return the sold assets; instead they continued to sell other assets to cover other gaps. For example they bought their cattle for more than USD \$400 a beast but when they face a shock they may sell it at less than USD \$200, which means that there is no sustainability in their coping strategies. Even the residents admitted that their livestock were getting finished as a result of the strategy. This possibility was explored by Nhemachena and Hassan (2007) when they noted that though farmers' responses vary when they face the same climate stimuli in the same environment, selling assets is not the non-optional strategy. However, many households reported that they really use the strategy. The table below shows coping strategies that are effective to reduce food insecurity

Changing planting dates
Switching to early maturity drought resistant crops
Crop rotation and diversification
Increasing the amount of land under cultivation
Digging the wells along the flood plains
Gardening (growing vegetables) to supplement diet
Water harvesting/ dams construction
Income Generating Projects (IGP) for both men and women

Table 1.12: Effective coping strategies

4.8 Conclusion

The chapter presented, analysed and discussed data that was obtained from different organizations and the residents. The cross-case analysis showed that more than 80% of the coping strategies employed by Chireya ward 5 households were not effective since they carry with them more costs than benefits.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter provides the conclusion of the study. It will also give a brief of the recommendations drawn from the research findings.

5.1 Conclusions

The study sought to investigate the effectiveness of the coping strategies in Chireya Ward 5 in the face of climate change. This chapter provides conclusions to the study and the recommendations. The objectives of the study were to: assess the challenges faced by households in the face of climate change; to identify the coping mechanisms employed by farm households in the face of climate change; to explore the effectiveness of coping strategies used in sustaining livelihoods and ensure food security in the area and to determine how climate change has impacted on people's socio-economic livelihoods. The chapter will commence by answering the research questions, followed by conclusions and a plethora of recommendations.

The research sought to answer the following questions: 1. what are the challenges being faced by households in Chireya Ward 5 in the face of climate change; 2. How households in Ward 5 cope with the challenges of food insecurity and 3. Are the coping strategies employed to sustain livelihoods and ensure food security effective? Appropriate research methodology was used to secure answers to the research questions. In order to form the backbone base of

the study and ensure where the research fits into existing body of knowledge with regards to effectiveness of the coping strategies to curb food insecurity in the face of climate change in Chireya Ward 5, the researcher reviewed related literature first. The research was guided by the climate change, food security and livelihoods theoretical framework. The research was limited to Chireya Ward 5 in the northern tip of the Midlands province. For a more comprehensive analysis or study the researcher used the mixed approach.

The research instruments employed were key informant interviews, focus group interviews that involved and observation. 55% of the respondents were female (35) and 45% were males (29) out of 64 sample size. Out of the total of 64 sample size, 13 participated in key informant interviews and 51 participated in focus group interviews, three groups were in sevens and the other three were in eights.

The first research question required the researcher to find out the challenges faced by Chireya ward 5 households in the face of climate change, the research found out that there was a significant dwindling of precipitation amount and high diurnal temperatures. Its variability was also found as a challenge. The survey revealed that climate change happening in Chireya Ward 5 has caused so much destruction to the local environment like trees, water, and soils. The forests have been degraded, and exposed to all agents of soil erosion. The study further revealed that the population in Chireya Ward 5 have their livelihood depending on rain fed agriculture, and local natural resources. Therefore climate change regime has exposed many households to food insecurity (availability, accessibility and stability), diseases like persistent headaches, stomach pains and HIV and AIDS.

Reduced precipitation has caused high cattle mortality and reduction of soil fertility. The study found out that this was catalysed by the destruction vegetation, grass and pastures. Climate change did not only affect people, but wild animals also. The study revealed that

wild animals like baboons, monkeys, and wild pigs encroach into their (ward 5 residents) fields during the day and night stealing their maize cobs for survival. On social and economic implications the study revealed that climate change has caused diseases, Gender Based violence, school dropouts of children and destruction of culture and marriages.

The study found out the following coping strategies effective:

- Changing planting dates
- Switching to early maturity drought resistant crops
- Crop rotation and diversification
- Increasing the amount of land under cultivation
- Digging the wells along the flood plains
- Gardening (growing vegetables) to supplement diet
- Water harvesting/ dams construction
- Income Generating Projects (IGP) for both men and women

The last research question that guided the study regarded the effectiveness of the coping strategies employed to sustain livelihoods and ensure food security. From this perspective, the study found out that food aid is creating dependency syndrome in the community of Chireya Ward 5. The study revealed that conflict arises during food distribution and causes households to fight and bewitch each other. The disruption of the social culture, marriages and Gender Based Violence were found to be the deadly effects of the coping strategies employed in Chireya Ward 5. Children end up dropping out of school especially the girl child helping their parents to gather food. This clearly shows that the coping strategies employed

by the households in Chireya Ward 5 are not in any way effective since the coping strategies they employ have deadly effects that hinders sustainable development and sustainable livelihoods

The study found out that, many households do not have assets because they either sell them or barter for cash and food respectively without any means of replacing them. The study further revealed that, bartering assets, cattle and land is impoverishing many households in Chireya Ward 5. Borrowing from neighbours and kins, as well as buying food with credits proved to be one of the worst coping strategies that cause tensions, and hatred within the communities. Besides this coping strategy impoverish the already poor and enrich the already better off. The study found out that, the coping strategies like gathering fruits and marrying off daughters are causing girl children to drop out of school, thus violating their rights to education and marriage. Reducing the number of meals per day, its quality and quantity causes malnutrition especially to the under fives.

5.2 Recommendations

From this study (effectiveness of the coping strategies to curb food insecurity in the face of climate change) various challenges have been revealed that leaves many households employing coping strategies that are not sustainable; therefore the study gives the following recommendations.

- There is need of awareness to farmers on the detrimental effects on environment that are caused by deforestation, veld fires, stream bank cultivation, over use of inorganic chemicals. The government institutions responsible for that should go to the villages giving them awareness, and there is need of an integration and comprehensive framework for capacity building. Government institutions like Ministry of

agriculture, Environmental Management Agency, Local government should integrate on training farmers on the detrimental effects of the environment destruction.

- Self-sustenance enterprises are to be prioritised especially by the donor organizations
- Community members need to form the Self Help Groups (SHGs) and engage in Internal Savings and Lending (ISAL) so that they create the Enterprise Incubation Funds (EIC) to start and grow their enterprises.
- The Agriculture Research and Extension Services (AGRITEX) need to be enhanced to give information on types of drought tolerant crops like sorghum, and animals like donkeys, importance of organic manure (*murakwani*) in a participatory way, to be able to cope with precipitation and temperature variability. Also there is need to engage indigenous knowledge system to cope with climate regime.
- The government institutions with full participation of the communities should launch better water harvesting mechanisms that would help communities with domestic water and drinking water for people and animals during the post rain season. The same water would be used for gardening that would supplement their food baskets and diet.
- The Early Warning Systems, using effective Information and Communication Technology that would quickly disseminate information to the village level in rural areas. Effective training of farmers on how to cope with different diseases is also recommended.
- The study revealed that many household have income deficit. This scenario is indicative of high rural household vulnerability to shocks and hazards associated with agriculture. Efforts to improve and stabilise rural household income should therefore not only focus on improving agricultural productivity but also encourage diversification and strengthening of non agricultural sources. This can be done

through, Income generating projects, to develop the skills and raise the standards of living of many are needed, for households to be able to cope with the effects of climate change

- Livestock diseases are accounting for a high percentage of cattle losses. Efforts to address this production constraint should be urgently strengthened to minimise livestock losses and bolster productivity. The need for more veterinary extension services and retraining of those already stationed is strongly recommended to reduce livestock mortality and boost production
- The survey shows that farmers use significant amounts of retained seed for their maize crop this is part of the reasons why productivity of this crop enterprise is generally low amongst communal farmers. The reason behind was lacking of credit for inputs like seeds and fertiliser encouraging use of improved seed varieties in good quality condition can go a long way in improving yields of maize crop and enhances food security at household level. There is need for strong high breed seeds that suits the ecological region and introducing other small grain varieties like sorghum. In pursuit of this, the green revolution in the 1980s emerged because of strong government policies that supported maize production. Therefore, it is suggested that if similar policies are replicated in communal areas more households will be food secured.
- More research is also needed that advances fundamental knowledge about the agricultural technology that would be implemented to reduce food insecurity in the face of climate change. Research is the source of new scientific ideas and ways of thinking about the world; therefore it is anticipated to bring new ideas in the agricultural sector. Pure research generates new ideas, principles and theories, which may be utilized by many farmers for their benefit because it lays the foundations of

modern progress and development in different fields. Pure research nourishes the expansion of knowledge that would improve the living standards through increased agricultural yields

- Ministry of women Affairs together with its stakeholders need to give awareness, on the importance of the girl child, and reducing Gender Based Violence.
- For further research, it is unquestionable that the subject concerning human-environment interaction is still a state of continuous interaction; there are some challenges and opportunities that arise as a result of precipitation and temperature variability will ever require further research by other scholars and experts of climate change globally for the good of the communities.
- The research's case study was Chireya Ward 5 in Gokwe North Midlands, and only three departments (AGRITEX, EMA and Local government) were examined their contribution in helping communities to cope. There is need for further research to fight climate change and its effects, as well further research to have frameworks that would assist rural communities to cope better with issues of food security and climate change.

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LIST OF APPENDICES

Appendix 1

My name is Taruberekera Zivengwa. I am a student with Midlands State University, student number R15788Z doing a Master of Arts degree in Development Studies. I am doing a research on the effectiveness of the coping strategies to reduce food insecurity in the face of climate change in Chireya ward 5 in Gokwe North in Midlands Province in Zimbabwe as required by the university. I am asking for your total participation for this research.

Procedures

If you agree to participate, I will talk to you for about 45 minutes to an hour and your conversation will be audio recorded. If you are not comfortable of being recorded please let me know such that I write on the paper using a pen in a vernacular language. Your participation in this interview is voluntary (this means you and only you can choose whether you like to join the study). You are free to refuse to answer any question if you feel uncomfortable and there is no reason to give when you are not comfortable to answer any question. You can decide to stop participating any time and no reason concerning quitting need to be given. There is no wrong answer, the researcher just want to hear your opinion and ideas. The researcher anticipates a zero risk to you during the study.

Privacy and confidentiality

Your real name will not be written in any way, all the conversation will be recorded and hand written and it (the conversation) will be deleted after. After translating the spoken conversation into written conversations the tapes will be destroyed after some period.

Feel free to participate, thank you in advance

Yours faithfully

Taruberekera Zivengwa

Appendix 2: Interview guide for the village Heads

1. What is your age?
2. What is your duration of stay in the village?
3. What is your understanding of climate change concepts?
4. What are the indicators of climate change in Chireya Ward 5?
5. What are the other environmental changes occurring in responsible to climate change, particularly on natural vegetation cover, water resources, and animal resources?
6. How much effects has the climate and related environmental changes have on the local livelihoods? (crop yields, livestock production, food security, household income and welfare)
7. Are there any major climatic events (and their years) that have caused community sufferings over the years?
8. How are households coping with the effects of climate change to ensure food security?
9. Are the coping strategies effective?
10. Are there other stakeholders/partners in the Ward assisting the community to cope with the effects of climate change?
11. Are their contributions effective to ensure communities are coping with the effects of climate change

12. What would you suggest towards sustained climate change coping strategies for Chireya Ward 5?

Appendix 3: Interview Guide for the Local Elders (who are also farmers)

1. How old are you?
2. What is your duration of stay in this village?
3. What is your understanding of climate change concepts?
4. What are the indicators of climate change in Chireya Ward 5?
5. What are the other environmental changes occurring in response to climate change, particularly on natural vegetation cover, water resources, and animal resources?
6. How much effects has the climate and related environmental changes have on the local livelihoods? (crop yields, livestock production, food security, household income and welfare)
7. Are there any major climatic events (and their years) that have caused community sufferings over the years
8. How are households coping with the effects of climate change to ensure food security?
9. Are the coping strategies effective?
10. Are there other stakeholders/partners in the Ward assisting the community to cope with the effects of climate change?
11. Are their contributions effective to ensure communities are coping with the effects of climate change

12. What would you suggest towards sustained climate change coping strategies for Chireya Ward 5?

Appendix 4: Interview Guide for Organization A

What are the roles of your department in ensuring that rural communities are coping to curb food insecurity in the face of Climate change?

1. What is your understanding of climate change concepts?
2. Is there any climate change taking place in Chireya Ward 5?
3. What are the indicators of climate change in Chireya Ward 5?
4. What are the other environmental changes occurring in responsible to climate change, particularly on natural vegetation cover, water resources, and animal resources?
5. How much effects has the climate and related environmental changes have on the local peasant livelihoods?(crop yields, livestock productivity, food security, household income, health and welfare)
6. How are households coping with the climate change-related changes? (increasing water scarcity, crop failure, food shortages, livestock mortality, reduced income, health challenges)
7. What are the households coping strategies to curb the challenges?
8. Which coping strategies you think are effective? Explain giving reasons
9. What role do AREX play to make sure communities are coping with the effects of climate change?

10. Are there other stakeholders/partners in the Ward assisting the community to cope with the effects of climate change?

Appendix 4: Interview Guide for Organization B

1. What are the roles of your department in supporting rural livelihoods and coping strategies to reduce food insecurity in the face of climate change?
2. What is your understanding of the concept of climate change?
3. Is there any climate change taking place in Chireya Ward 5 (Gokwe North District)?
4. What are the indicators of climate change in Chireya Ward 5?
5. What are the other environmental changes occurring in responsible to climate change, particularly on natural vegetation cover, water resources, and animal resources?
6. How much effects has the climate and related and related environmental changes have on the local livelihoods? (crop yields, livestock production, food security, household income and welfare)
7. How are households coping with the effects of climate change to ensure food security?
8. Are the coping strategies effective?
9. Are there other stakeholders/partners in the Ward assisting the community to cope with the effects of climate change?

10. Are their contributions effective to ensure communities are coping with the effects of climate change?
11. What would you suggest towards sustained climate change coping strategies for Chireya Ward 5?

Appendix 7: Interview Guide for Organization C

1. What are the roles of your department in supporting rural livelihoods and coping strategies to reduce food insecurity in the face of climate change?
2. What is your understanding on the concepts on climate change?
3. Is there any climate change taking place in Chireya Ward 5 (Gokwe North District)?
4. What are the indicators of climate change in Chireya Ward 5?
5. What are the other environmental changes occurring in responsible to climate change, particularly on natural vegetation cover, water resources, and animal resources?
6. Does climate change have environmental effects on local livelihoods? (crop yields, livestock production, livestock mortality, food security)
7. How are households coping with the effects of climate change? (increasing water shortages, poor yields, scarcity of food, livestock mortality and household income and welfare
8. How are households coping with the effects of climate change to ensure food security?
9. Are the coping strategies effective?

10. Are there other stakeholders/partners in the Ward assisting the community to cope with the effects of climate change?
11. Are their contributions effective to ensure communities are coping with the effects of climate change
12. What would you suggest towards sustained climate change coping strategies for Chireya Ward 5?

Appendix 8: Interview Guide for Focus Groups

1. What are the causes of poor yields?
2. Are there any changes occurring in the District (Gokwe North) pertaining to climate change?
3. If the change is there, what are the indications concerning rainfall and temperature?
4. What are the indicators of climate change in Chireya Ward 5?
5. What are the other environmental changes occurring in response to climate change, particularly on natural vegetation cover, water resources, and animal resources?
6. How are households coping with the effects of climate change? (increasing water shortages, poor yields, scarcity of food, livestock mortality and household income and welfare
7. How are households coping with the effects of climate change to ensure food security?
8. Are the coping strategies effective?
9. Are there other stakeholders/partners in the Ward assisting the community to cope with the effects of climate change?

10. Are their contributions effective to ensure communities are coping with the effects of climate change
11. What would you suggest towards sustained climate change coping strategies for Chireya Ward 5?