

BINDURA UNIVERSITY OF SCIENCE EDUCATION



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**IMPACT OF CLIMATE CHANGE ON LIVELIHOODS: A CASE OF HWANGE
DISTRICT, MATABELELAND NORTH PROVINCE, ZIMBABWE**

BY

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DECLARATION

I, Mudavanhu Clive, do declare that everything that appears in this project is a result of my own personal work and effort. Any assistance whether material or conceptual, that I have incorporated in my work has been lawfully obtained and is appropriately acknowledged in the following research project.

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DEDICATION

To my mother, Valerie Wadzingenyama, a selfless, loving woman, and to my son Winstone Mudavanhu, my source of pride and joy.

ABSTRACT

The effects of climate change have been visible in rural communities, with some communities facing food insecurity, water scarcity and loss of livestock. This study aimed at examining the impacts of climate change on livelihoods in Hwange district, Matabeleland North Province in Zimbabwe. The objectives of the study were to determine livelihood activities found in the said rural communities, to identify key interventions implemented and to assess coping mechanisms used by households in Hwange district to survive. Quantitative and qualitative approaches were used in this study. A total of 312 respondents participated in this study. The findings of the study revealed that households acknowledged climate change has resulted in the reduction of agricultural productivity and affected their forms of livelihood. The major adaptation and coping strategies used are crop and livelihood diversification. However, the respondents expressed that the interventions are not sustainable. The study therefore recommends the need for more research, policy formulation on climate change adaptation, and programs that focus mainly on the grassroots level.

LIST OF ABBREVIATIONS

AGRITEX	Agricultural, Technical and Extension Services Department
FAO	Food and Agriculture Organization
IPCC	International Panel for Climate Change
SDG	Sustainable Development Goals
UNFCCC	United Nations Framework Convention for Climate Change
OPHID	Organisation for Public Health Interventions
JHWO	Jointed Hands Working Organisation
UNDP	United Nations Development Programme
FAO	Food and Agricultural Organisation
WFP	World Food Programme
SIRDC	Scientific and Industrial Research Development Centre
FNSP	Food and Nutrition Security Policy

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CHAPTER 1: INTRODUCTION

1.0 Introduction

Climate change is one of the biggest threats facing humankind today and it has already had an adverse impact on Zimbabwe. Kaswan (2013) posits that the impacts of climate change will be bad for everyone, but very bad for the weak, such as children, women and the disabled. Recent reports produced by the Intergovernmental Panel on Climate Change (IPCC) (2001, 2007, 2012) conclude not only that greenhouse gas emissions are already beginning to change the global climate, but also that Africa will experience increased water stress, decreased yields from rain-fed agriculture, increased food insecurity and malnutrition, sea-level rise, and an increase in arid and semi-arid land as a result of this process. Extreme weather events, notably floods, droughts and tropical storms, are also expected to increase in frequency and intensity across the continent (IPCC, 2007). These projections are consistent with recent climatic trends in southern Africa, including Zimbabwe. The effects of this exposure to changes in climate are exacerbated by the high levels of sensitivity of the social and ecological systems in the region. The limited capacity of civil society, the private sector and government actors to respond appropriately to these emerging threats is also a factor that compounds the situation.

1.1 Background

The public discourse of climate change, although shrouded in uncertainties by its multiple faceted impacts, which are real and unequivocal, has now been widely recognized and accepted by scientific communities (IPCC, 2007). According to Makate et al. (2018), recent literature has illustrated that communities in Sub-Saharan Africa significantly depend on subsistence rain-fed agricultural production for food security. The heavy reliance on rain fed agriculture renders many such countries vulnerable to negative consequences of climate change and variability. Increased occurrences of extreme events, such as droughts and floods are some examples of these consequences. As illustrated by Mashizha et al. (2017), Africa is one of the most vulnerable regions in the world, particularly because of widespread poverty and limited coping capacity.

Zimbabwe is particularly vulnerable due to its heavy dependence on rain-fed agriculture and climate sensitive resources. Dzvimbo et al. (2017) are of the view that studies conducted in

Zimbabwe show that negative impacts of climate change on crop yields and food production have been more common than positive impacts. This is as a result of poor implementations of strategies, mitigation measures and also ignorance of marginalized areas of the country as more focus of smart agricultural practices is on accessible rural areas, areas of the government's political influence, areas serviced by Non-Governmental Organizations (NGOs), and also urban areas.

Zimbabwe is a landlocked country with abundant natural resources and a population of 15.3 million. The country's rainy season historically stretches from October to March, while the dry season spans from June to August (World Bank, 2021). In addition to being affected by extreme weather conditions, such as cyclones, floods and droughts, the country has recorded significant climatic changes, including declining mean annual precipitation, late onset and early cessation of the rainy or growing season across all agro-ecological regions, and an increase in mean annual temperatures (World Bank, 2021). The Meteorological Services Department of Zimbabwe says the country has experienced its six warmest years on record since 1987, putting stress on the agricultural and water sectors. Rain is becoming unpredictable, and droughts are the most frequently occurring natural hazards in Zimbabwe (United Nations Development Programme, 2017; Frischen et al., 2020). In line with its ratification of the United Nations Framework Convention on Climate Change (Gumbodete, 2022), the government has crafted a National Climate Change Response Strategy to deal with issues of "adaptation, mitigation, technology, financing, public education and awareness" and to outline climate and disaster risk-management policies (Food and Agriculture Organization, 2015). This dispatch reports on a special survey module included in the Afrobarometer Round 9 questionnaire to explore Zimbabweans' experiences and perceptions of climate change. Findings show that while climate change is still an unknown concept to more than half of Zimbabweans, those who are aware of it overwhelmingly say that climate change is making their lives worse. Citizens expect far better action from both the government and their co-citizens in addressing the situation.

1.2 Statement of the problem

Climate change and extreme weather events present severe threats and erode essential needs, capabilities and rights of the population. This is more so, especially for the poor and marginalized, thereby redesigning their livelihoods. Several livelihoods are directly climate sensitive as they

heavily subsist on activities such as rain fed agriculture, seasonal employment in agriculture (for example fishing and pastoralism), and tourism. Rainfall is the primary driver of change, altering crop production from year to year and causing massive longer-term fluctuations in production.

These damaging effects of climate change on livelihoods in Zimbabwe call for the urgent need for research. Many studies have tried to understand the effects of climate change on agriculture, health and the economy. Some strategies to mitigate the challenges it brings have also been documented. However, there is little evidence that any studies have been dedicated to unearthing the effects of climate change on livelihoods in remote and hard to reach areas.

1.3 Objectives

- To identify the livelihood activities which are practiced in Zimbabwe.
- To examine the effects of climate change on livelihoods in Zimbabwe.
- To assess the level of success of climate change adaptation strategies in Zimbabwe.
- To identify key interventions being implemented in Zimbabwe.

1.4 Research questions

- Which livelihood activities are practiced in Zimbabwe?
- What are the effects of climate change on livelihoods in Zimbabwe?
- Which strategies are being implemented in Zimbabwe to mitigate to the negative impacts of climate change?
- What are responses or interventions are being implemented in Zimbabwe to address impacts of climate change?

1.5 Significance of the study

The future of any society depends on its ability to foster the health and well-being of the next generation. This may not be feasible if the agricultural sector, which is the backbone of food security, is crippled due to climate change. If we fail to provide for ourselves as a result of the negative impacts of climate change, we will not be able to build a strong foundation for healthy and productive lives. Thus, we put our future prosperity and security at risk. It is not debatable that addressing impacts of climate change brings considerable economic and social benefits. For

instance, good intervention reduces mobility and mortality, it leads to resource savings in health, improves education outcomes enhances productivity and increases incomes. Improved sustainable livelihoods will contribute to Sustainable Development Goals (SDGs), including zero hunger, food security, improved nutrition and promote sustainable agriculture. It will also ensure healthy lives and promote well-being for all at all ages, ending poverty in all its forms everywhere. To achieve this, climate change and its effects must be addressed and conquered by viable and realistic adaptive and mitigating strategies within the area under study.

This study will help the researcher gain further understanding of the concept of livelihoods. It will also assist in further understanding the threats that climate change poses to livelihoods, help anticipate the impact on the community's well-being, and advocate for viable strategies that will lessen these effects thus promoting better livelihoods. The study will also bring out knowledge gaps in our understanding of the impact of climate change on livelihoods, especially of those from the marginalized and hard to reach communities.

1.6 Delimitations of the study

Hwange district is situated in Matabeleland North province. The district is near the borders with Botswana and Zambia. This area is what is known as natural regions IV and V. High temperatures ranging between 25 and 35 °C are normal in this area. However, the annual rainfall is less than 450 mm. The potential for agriculture is low due to these adverse climatic conditions, poor soil and other limiting natural and socio-economic factors. The district is vulnerable to current and expected changes in climate, exacerbated by low adaptation capacity and climate change interaction with other stressors already being experienced in the area, such as food insecurity, poverty and ecosystem degradation (Hassan and Nhemachena, 2008).



Figure 1. Hwange district map.

1.7 Limitations of the study

- The researcher encountered problems in carrying out the study due to limited resources, which were at his disposal. Limited finances crippled extensive traveling which was carried out in the area located in Hwange District.
- Visits to the field was very time consuming and strenuous since the type of research required factual data in qualitative analysis.
- Some of the households were not very cooperative during data collection periods. Extra time and explanations had to be factored in.

1.8 Assumptions of the study

- A number of livelihoods are directly climate sensitive, such as rain fed agriculture, seasonal employment in agriculture (for example fishing and pastoralist) and tourism.
- Rainfall is the primary driver of change, altering crop production from year to year and causing massive longer-term fluctuations in production.
- These rural communities rely on dry land agricultural and natural ecosystem-based tourism activities.
- The livelihood portfolios of households are disrupted by climate change in Hwange district.

- These damaging effects of climate change on livelihoods call for the urgent need for research in this area.

1.9 Definition of key terms

- **Climate change** – Climate consists of the statistics of temperature, rainfall, wind, humidity, atmospheric pressure, and other meteorological elemental measurements in a given region over long periods. It is a change in the state of the climate that can be identified by using statistical tests, by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.
- **Climate change effects** -The impacts of climate change on natural and human systems (IPCC, 2007).
- **Livelihood** - comprises the capabilities, assets, and activities required for a means of living. It is deemed sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities, assets, and activities both now and in the future, while not undermining the natural resource base (Department for International Development (DFID), 2000)

1.10 Summary

Climate change has been a penitent issue in the development discourse. This may be due to the fact that its impacts are not generalizable. It cuts across the whole spectrum of the livelihood of rural communities particularly those who solely rely on rain-fed agriculture. The impact is therefore reduced by the adoption of effective mitigation and climate change adaption strategy. The lack of effective and concrete coping strategies has affected most rural communities in different ways and this cuts across every facet of their livelihood. Therefore, the main thrust of this research is to bring out an in-depth analysis of the impact of climate change on the livelihoods of the population in the area of study.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter will focus on the review of various works from different authorities on areas related to the research topic. The literature covers both empirical studies done by other researchers, as well as the theoretical literature from various information sources. This search was made from global, regional, and national perspectives on the impacts of climate change, adaptation, and how it has affected livelihood.

2.2 Global perspectives

Climate change poses a major threat to the semi-arid tropics. This geographic area is characterized by scanty and uncertain rainfall, infertile soils, poor infrastructure, extreme poverty and rapid population growth. These characteristics present serious threats to livelihoods of the population in the area. According to Banerjee (2014), climate change impact has become a major concern to communal livestock and crop farmers, researchers and policy makers in recent years. To enhance policy towards tackling the challenges that climate change poses to households, it is important to have knowledge on their perceptions of impacts of climate change on livelihoods, potential adaptation measures, effectiveness of adaptation strategies and factors affecting adaptation.

Adaptation in agriculture is the translation of the perception of climate change into the agricultural decision-making process. Farmers perceive that climate change will alter the quality and the quantity of water and with adverse effects on agriculture (Nelson et al., 2008). This has a negative impact on households with farming as a source of livelihood, when they fail to implement climate change adaptation strategies as a result of poverty.

According to Ford et al. (2015), rain fed farming in Ethiopia is the main contributor to crop production, but highly variable due to its exposure to rainfall variability. Farmers depend on rainfall as their source of water. This high crop yield variability characterizes the rain fed farming system in Ethiopia in general, and in the Central Rift Valley (CRV) in particular, (Conway and Hulme, 1993). However, a declining trend in rainfall and crop productivity in this area is also perceived by an overwhelming majority of the farmers in the CRV. Adimassu et al. (2014) state that as a result, various coping and adaptation strategies were employed by households as responses to the declining rainfall and crop productivity. Wandel (2006) states that coping

strategies are short-term and unplanned in response to unexpected crop failure and yield losses and just for survival, while adaptation strategies are long-term and planned responses to expected and continued decline or uncertainty in future crop productivity and food production.

Adimassu et al. (2014) state that the most important coping strategies applied by farmers in the CRV include selling livestock, accessing relief aid from governmental organizations (GOs) and/or non-governmental organizations (NGOs), obtaining credit (especially applicable to the well-to-do farmers), and migration to towns and more productive areas. Similarly, the most important adaptation strategies include changing crop varieties, adjusting planting dates, dry planting, diversifying income through off-farm activities and expansion, as is posited by Enset, Chat and Eucalyptus in Adimassu et al. (2014). All these strategies are crucial to coping with food and income shortage resultant from climate change as an effect of the variability of rainfall and crop productivity.

Consequently, this seems to suggest the need to create awareness among households and other stakeholders on the advantages and disadvantages of climate change coping and adaptation strategies. Le Dang et al. (2014) suggest that a better understanding of why farmers opt for certain coping and adaptation strategies is crucial for policies and programs that aim at promoting sustainable rain fed agriculture. Nevertheless, such information is very limited, particularly in the CRV of Ethiopia. In addition, climate change is perceived to cause more diseases, more pests, reduced crop yield because of lack of water, rural to urban migration, deforestation and livestock deaths.

On a global scale, there are several climate change adaptation strategies that are implemented. Murendo et al. (2011) argue that in Ethiopia, the ex-ante climate change adaptation strategies that are widely practised in the Awash River Basin include the storage of crop residues as fodder for livestock, the rearing of drought tolerant livestock, mixed cropping and the adoption of soil and water conservation practices. These results are similar to those found by Dinar et al. (2008), who report that households were switching to livestock types and breeds adaptable to drought in 11 African countries, including Ethiopia. Despite these coping strategies, the majority of households had to reduce food consumption during the drought period. However, lack of information on how to effectively implement the adaptation strategies is the dominant constraint affecting households

in the Nile Basin of Ethiopia. Climate change continues to negatively impact on their livelihood (Murendo et al., 2011).

In Asian countries climate change adversely affected the livelihoods of a lot of households. This is as a result of their dependence on agriculture as a form of livelihood. Climate change has resulted in migration, malnutrition diseases and other means of livelihoods in Asian countries such as India. As noted by Banerjee et al. (2014), in India the population of small holder farmers is about 700 million. These farmers have been coping with the impacts of climate change through their traditional farming methods. However, one of the biggest threats posed by climate change in India is water scarcity, both for agriculture as well as for domestic purposes. Water management is one of the key factors through which climate change has had an impact on livelihoods, especially agriculture. It is thus affecting many households, making it difficult for them to adapt to climate change.

According to Varda and Kumar (2014), based on their perceptions, households devise ways of adapting to climate variability. A survey that was conducted in the small village of Spiti in the Indian state of Himachal indicated that most households had been made aware of the changing climatic conditions by the problems they faced in their day-to-day life. As noted by Mwinjaka et al. (2011) even though households are adapting to impacts of climate change using their own capacities, there is further need to make them aware and get accessibility to new technologies in order to increase their adaptive capacities towards efficient adaptation strategies to reduce these effects of climate change. More so, in India a NGOs have been supporting households in a village in Orissa, to cope with impacts of climate change on their livelihoods since 1994 (Banerjee, 2014). He further posits that the support has been in the form of construction of check-dams, field-ponds and wells.

In order to strengthen the community involvement and their capacities, local institutions like water users' societies and women self-help groups were created (Pande and Ackerman, 2009). This clearly indicates the importance of social capital to negative climate change adaptation in India, which will help in alleviating problems of climate change on livelihoods. Households in the Gujarat in India have learnt to survive with the risk of climate change by using their indigenous

knowledge and improving their social networks, as is said by Mwinjika et al. (2011). The community helps themselves during such situations by sharing food, assets and their own savings.

2.3 Regional perspectives

Arid and semi-arid regions of Africa have consistently been identified as among the most vulnerable regions of the world with respect to climate change. Earlier studies in Africa have shown that farmers' perceptions of climate change relate more to the increased variability and uncertainty of specific weather parameters rather than long-term climate change (Gumbo, 2006). Some of these perceptions include late onset of rains, shorter wet monsoons, characterized by slight but intense rainfall, strong winds with excessive rains, more intense summer heat and unpredictability in the pattern of the seasons. A study conducted in South Africa observed that for farmers and other land users, drought and extreme rainfall were not necessarily sufficient to determine the characteristics of climate variability.

IPCC (2017) states that, in Sub-Saharan Africa, more than 60% of the economically active population and their dependents rely on agriculture for their livelihoods. Although the share of agriculture in GDP is decreasing, the share of agriculture in employment is still high. Climate change and extreme weather events present severe threats and erode essential needs, capabilities and rights more, especially for the poor and marginalized thereby redesigning their livelihoods. A number of livelihoods are directly climate sensitive, such as rain fed agriculture, seasonal employment in agriculture (for example, fishing and pastoralism) and tourism.

Mashizha (2018), is of the view that many studies have confirmed that food and livelihood security in Africa is severely threatened by climate change. Other studies also revealed that besides climate change, there are other elements such as rising population growth, consumption patterns and increasing urbanization that also threaten livelihood security. Africa is epitomised as the most vulnerable continent to climate changes (Bwalya, 2013; Masipa, 2017). The continent will experience increased water stress, decrease in yields and increased food insecurity and malnutrition because of climate change (IPCC, 2012).

The African continent is most vulnerable to climate change and variability, increasing the hardships experienced by vulnerable communities (O'Brien et al., 2008; Scholtz, 2011). By 2020, climate change will have impacted the lives and livelihoods of approximately 250 million people

in Africa (Scholtz, 2011). Extreme weather conditions such as droughts, floods and tropical storms are expected to increase in frequency and intensity across the continent (IPCC, 2012). The continent will be affected because of its global position, its vulnerable populations and its poor land-use practices. A study in South Africa shows a 23% reduction in gross domestic product (GDP) as a result of climate change with an estimated 1.6% annual loss according to Mthembu & Zwane (2017). South Africa will experience a 0.13 °C rise in day temperatures with dry land and farmer households being mostly affected. Also, reduction of rainfall will be extensive, ranging from 5% to 10% (Mthembu & Zwane, 2017).

In South Africa, households are producing and stocking fodder for feeding livestock in dry periods and growing drought resistant crops. Rearing of drought tolerant crops and livestock breeds was confined mostly to the Upper valley sub-basin that is drier. Some parts, especially arid and semi-arid areas have already started water harvesting and related projects to cope with water shortages. As noted by Archer, Oettle and Tadross (2008), in the Arid western South Africa in Suid Bokkevel, climate change strategies undertaken by households for the 2003 - 4 period comprised stock reduction, shifting cultivation and the shifting of stock to camps with a higher carrying capacity, supplemental feeding and water provision. For example, stocks were taken directly to the river in the canyon, or extra water was brought to the camps. In addition, DFID (2008) states that the South African Weather Services produce long-term seasonal climate forecasts for three and six months ahead, and these could be used by both crop and livestock farmers to adapt their management in response to anticipated wet or dry periods. This has reduced the impacts of climate change on livelihoods. However, in the late 2020s, the country has been affected by floods which has impacted on the strategies implemented, thus further exposing the people to the threats of climate change on livelihood.

Livestock and crop production is central to the livelihood of the majority of rural communities in semi-arid Botswana. Climate change has also affected crop and livestock production. This has resulted in commercial farmers resorting to growing drought resistant, and fodder crops, supplementary feeding, selective breeding, use of crop residues and early warning system. The farmers feed their livestock with the bulk of the livestock feed and residues from their crop yields. This is only feasible for commercial farmers. Conversely, ordinary households still suffer the vulgarities of drought caused by the changes in climate thus still impacting on their livelihoods.

Furthermore, climate change impact studies, although they are still uncertain on the frequency and severity of adverse weather events, have shown that the effects are significant for low-input farming systems such as subsistence farming in marginal areas. Also, because of socio-economic, demographic and policy trends, affected households have the least capacity to adapt to changing climatic conditions (Mutekwa, 2009). Climate change is a serious threat to development and poverty reduction efforts in Africa (Mugambiwa & Dzomonda, 2018; Mugambiwa & Tirivangasi, 2017). The continent is facing various health risks associated with climate change that threaten to reverse development efforts and subject the continent to long-term poverty. With a temperature increase of 3 °C alongside the global warming anomaly, about 250–550 million people may be at risk of hunger with more than half of these people concentrated in Africa (Kangalawe & Lyimo, 2013). Vulnerability of the African continent to climate change is a function of many factors including long-term poverty, illiteracy, political and ethnic conflicts, poor governance, lack of skills, weak technical institutions, poor and probably limited infrastructure and poor technological development (Ndaki, 2014).

2.4 National perspectives

Climate change scenarios across multiple general circulation models show increases in Zimbabwe's average mean temperature. Predictions show that the mean daily temperature will rise by 3–5 °C throughout the country and the mean annual temperature will rise by 2–4 °C (Mashizha et al., 2017). Climate change is destroying Zimbabwean communal farmers' agricultural activities, a source of living for most people. According to Campell & Mutamba (2003), rural households obtain livelihoods through agriculture, rural labour market and self-employment in rural non-farm economy, and others through migrating to towns, cities and other countries. Large numbers of rural populations are dependent on agriculture for their livelihoods. IPCC (2017) states that, in Sub-Saharan Africa, more than 60% of the economically active population and their dependents rely on agriculture for their livelihoods. Although the share of agriculture in GDP is decreasing, the share of agriculture in employment is still high. Climate change and extreme weather events present severe threats and erode essential needs, capabilities and rights more especially for the poor and marginalized thereby redesigning their livelihood. A number of livelihoods such as rain fed agriculture, seasonal employment in agriculture (for example fishing and pastoralism), and tourism are directly climate sensitive.

Mashizha (2018) indicated that rainfall is the primary driver of change, altering crop production from year to year and causing massive longer-term fluctuations in production. Households are unable to raise sufficient grain for their subsistence needs in one out of three years. Moyo (2012) posits that, climate change has been labelled as a new security threat to Africa. More recent researchers predict increases in civil wars as a result of climate change. Climate change will harmfully influence all the components of food and livelihood security (Kotir, 2016). The livelihood portfolios of households disrupted by climate change in the sub-Sahara include (but are not limited to) cropping, livestock, fishing, agriculture, labour, business and hawking/vending, non-agricultural labour, weaving, industry, and construction. These damaging effects of climate change on livelihoods call for the urgent need for policy makers to implement strategies to mitigate these negative impacts.

Most households in semi-arid parts of Zimbabwe usually engage in mixed farming, that is livestock and crop production, as an important component of their farming systems. The production of livestock in addition to crops is a strategy for households to raise their farm income and reduce the food insecurity that many rural households are experiencing due to the decline in the agricultural sector (Jera and Ajayi, 2008). However, the low quality and quantity of yields and feed resources for animals to maintain high levels of grain, milk and meat production is one of the greatest constraints to improving the productivity of livestock and crops in the country. Commercial watering and feeding supplements are not readily available or are too expensive for an increasing majority of households, especially following the downturn of the national economy since the early 2000s.

Ndaki (2014) states that Zimbabwe faces the risks associated with climate change and that the country is at a very high level in terms of vulnerability. Adaptive capacity among rural people is typically limited by poverty, poor public and environmental health, weak institutions, lack of infrastructure and services, marginalisation from decision-making processes and planning procedures. Further exacerbating the situation are cases gender inequality, lack of education and information, natural disasters, environmental degradation, reliance on rain-fed agriculture and climate-sensitive resources, and insecure tenure (UNFCCC, 2014). According to the International Fund for Agricultural Development (2015), poor rural households are highly exposed to shocks because their livelihoods depend on an increasingly deteriorating natural resource base and on

often-volatile climatic conditions. They are also particularly vulnerable to shocks because they have few assets to fall back on and have limited risk management strategies.

Climate change refers to changes in long-term weather patterns (climate) caused by natural or external forces – attributed directly or indirectly to human activity (IPCC 2001; UNFCCC 1992). There is documented scientific evidence indicating that Zimbabwe is experiencing adverse effects of climate change. Unganai (1996), contends that day temperatures soared by 0.8 °C from 1933 to 1993, whilst precipitation dropped by up to 10% during the same period. There have been severe dry spells, flooding, cyclones and heat waves linked to the impact of climate change (Ministry of Environment and Natural Resources Management 2013). As from 2000, tropical cyclones such as Cyclone Eline, which made land fall in 2000, Cyclone Hudah, Cyclone Gloria and Cyclone Idai of 2019 have wreaked havoc, destroying buildings and agricultural produce. There have also been long dry spells with the most notable being in 1982, 1992, 2002 and 2016. The negative impact of climate change on livelihood is worsened by the country's dependence on agriculture, for food security and as an economic pillar.

According to Mazvimavi (2008), perceived increases in the frequency and intensity of droughts may be based on a comparison of the 1980s and 1990s, which were drier than the 1970s. However, this argument may be true for old farmers and respondents and may not be true for many of the young respondents currently living in the rural communities who did not live through the wet 1970s and have only experienced the recent events, where recurring droughts have been a major phenomenon. Furthermore, the findings of Moyo et al. (2012), indicate that in the short term, rural communities are able to recall their experiences and can accurately tell the changes they have experienced in climatic conditions. The findings from the current study are generally in agreement with those of Moyo et al. (2012), and other earlier studies on short-term changes, especially in the past decade. However, for the long-term period, it is difficult to accurately relate rural community perceptions to changes in rainfall over time. Furthermore, Mazvimavi (2008) argues against attributing losses in crop yields and livestock production to decreasing rainfall. He asserts that the losses resulting from other factors, such as poor agricultural practices, for instance, growing unsuitable crop varieties, land and rangeland degradation.

Recent reports created by the Intergovernmental Panel on Climate Change (IPCC) (2001, 2007, 2012) settle not only that greenhouse gas emissions are already beginning to change the global climate, but also that Africa will experience increased water stress, decreased yields from rain-fed agriculture, increased food insecurity and malnutrition, sea level rise, and an increase in arid and semi-arid land as a result of this process. Extreme weather events notably flood, drought, and tropical storms are also expected to increase in frequency and intensity across the continent (IPCC, 2007). These projections are consistent with recent climatic trends in southern Africa, including Zimbabwe. The effects of this exposure to changes in climate are exacerbated by the high levels of sensitivity of the social and ecological systems in the region, and the limited capacity of civil society, private sector, and government actors to respond appropriately to these emerging threats. It is widely recognized that Africa is one of the most vulnerable regions in the world due to widespread poverty, limited coping capacity and its highly variable climate (Madzwamuse, 2010; UNFCCC, 2007).

Zimbabwe is particularly vulnerable due to its heavy dependence on rain-fed agriculture and climate-sensitive resources (Chagutah, 2010). Agriculture's sensitivity to climate-induced water stress is likely to intensify the existing problems of declining agricultural outputs, declining economic productivity, poverty, and food insecurity, with rural households particularly affected. Extreme weather events, notably drought, flood, and tropical storms, are also likely to threaten livelihoods and development gains across a variety of sectors and intensify existing natural hazard burdens for at-risk populations in both rural and urban areas. Consequently, climate change presents risks to lives and livelihoods at the individual level and to the economy and infrastructure at the regional and national levels (Hellmuth et al., 2007).

Zimbabwe lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations. Rainfall exhibits considerable spatial and temporal variability as shown by shifts in the onset of 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 of mid-season dry-spells (Unganai, 2009). Extreme weather events, namely tropical cyclones and drought have also increased in frequency and intensity (Mutasa, 2008).

Moreover, according to the Zimbabwe Meteorological Service, daily minimum temperatures have risen by approximately 2.6 °C over the last century while daily maximum temperatures have risen by 2°C during the same period. Changes in climate have resulted in more arid environments for agricultural production, which has shifted Zimbabwe's five main agro-ecological zones or natural regions. Rainfall patterns and crop production progressively deteriorate from Region I to V. For example, Chinhoyi and Chibero and their surroundings have shifted from natural region II to natural region III while Kwekwe and its surroundings have shifted from natural region III to natural region IV. In addition, natural region I has reduced in size, natural region II has shifted further east and natural region III has shifted to the north. Overall, the climate in Zimbabwe is regionally differentiated but is generally becoming warmer, with more erratic rainfall patterns and this has been happening in Hwange.

The potential for agriculture is low due to the unfavourable climatic conditions, poor soils, and other limiting natural and socio-economic factors. The Hwange District is highly vulnerable to climate change and variability, and this is worsened by the interaction of multiple stressors such as endemic poverty, limited access to capital including markets, infrastructure and technology, ecosystem degradation, occurring at various levels, coupled with a low adaptive capacity (Nhemachena et al., 2010; Hassan and Nhemachena, 2008). Furthermore, climate change is expected to reduce effective rainfall by 10 to 20% while temperature already at 35° will increase - thus further reducing effective rainfall to less than 300 mm while variability and incidence of extreme weather events of droughts and floods is expected to increase. Thus, maize-based mixed farming system will suffer a reduction in expected output per hectare, which will further reduce the number of years in which smallholder agricultural communities will be able to sustain themselves on the food and livestock production system.

The impact of climate change on the natural environment that is essential for growing food, particularly in vulnerable developing countries such as Zimbabwe can have considerable economic effects, especially for children whose families are dependent on subsistence farming. Mutasa (2008), agrees that climate change affects livelihood by reducing income from agriculture and livestock, and increase food prices and availability, causing diseases and malnutrition amongst

children. Declining agricultural yields and increased rural poverty in developing countries like Zimbabwe is already making it harder for parents to feed their children, and the impacts of climate change on livelihoods will intensify this trend.

According to Moyo (2015), during the 2015-2016 periods, out of 520000 cattle in Matabeleland North province 1 251 had died because of drought. The government is expanding the survival feeding programme to other district to save the remaining cattle. The president of Zimbabwe declared drought as a state of disaster with effect from 2 February 2016, following the drought which has severely affected some areas in communal and resettlement areas across the country (Moyo 2015). As noted by Murungweni et al. (2014), one approach that has been used to adapt to drought is water harvesting for improved livestock and crop yields in the semi- arid regions of Zimbabwe. However, recurrent droughts because of climate change have often resulted in severe crop damage, decreased livestock production and widespread food shortages. Drought impacts are outpacing the drought adaptation measures, therefore making it difficult for households to adapt to drought.

2:5 Theoretical framework

In order to grapple and integrate insights from the principal debates relating to climate change and sustainable development, the Sustainable Livelihood Framework was adopted as an appropriate and useful overarching conceptual framework. The sustainable livelihoods approach is a way of thinking about the objectives, scope, and priorities for development activities. It is based on evolving thinking about the way the poor and vulnerable live their lives and the importance of policies and institutions. It helps formulate development activities that are people-centered, responsive and participatory, multilevel, conducted in partnership with the public and private sectors. These development activities are dynamic and sustainable.

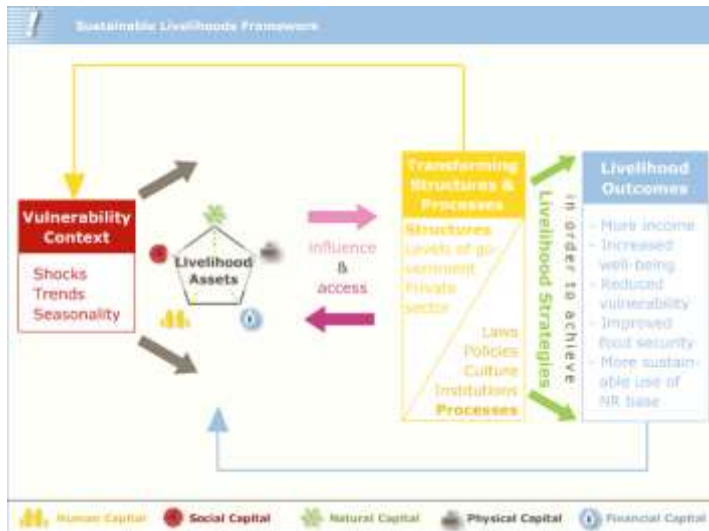


Fig. 2.1 The sustainable livelihoods framework.

Source Author: Carney (1999)

The sustainable livelihoods approach facilitates the identification of practical priorities for actions that are based on the views and interests of those concerned but they are not a panacea. It does not replace other tools, such as participatory development, sector-wide approaches, or integrated rural development. However, it makes the connection between people and the overall enabling environment that influences the outcomes of livelihood strategies. It brings attention to bear on the inherent potential of people in terms of their skills, social networks, and access to physical and financial resources, and ability to influence core institutions.

Appreciative inquiry—originally developed as a tool for industry to avoid negative approaches to problem solving—extends this constructive outlook. Appreciative inquiry is a highly inclusive process that maximizes the positive (as opposed to minimizing the negative) in which a community takes responsibility for generating and gathering information and then forms strategies based on the most positive experiences of the past.

2.5.1 Capital assets

The sustainable livelihoods framework helps to organize the factors that constrain or enhance livelihood opportunities and shows how they relate to one another. A central notion is that different households have different access livelihood assets, which the sustainable livelihood approach aims to expand. The livelihood assets, which the poor must often make trade-offs and choices about, comprise:

- **Human capital**, e.g., health, nutrition, education, knowledge and skills, capacity to work, capacity to adapt
- **Social capital**, e.g., networks and connections (patronage, neighborhoods, kinship), relations of trust and mutual understanding and support, formal and informal groups, shared values and behaviors, common rules and sanctions, collective representation, mechanisms for participation in decision-making, leadership
- **Natural capital**, e.g., land and produce, water and aquatic resources, trees and forest products, wildlife, wild foods and fibers, biodiversity, environmental services
- **Physical capital**, e.g., infrastructure (transport, roads, vehicles, secure shelter and buildings, water supply and sanitation, energy, communications), tools and technology (tools and equipment for production, seed, fertilizer, pesticides, traditional technology)
- **Financial capital**, e.g., savings, credit and debt (formal, informal), remittances, pensions, wages

2.5.2 Vulnerability context

Vulnerability is characterized as insecurity in the well-being of individuals, households, and communities in the face of changes in their external environment. People move in and out of poverty and the concept of vulnerability captures the processes of change better than poverty line measurements. Vulnerability has two facets: an external side of shocks, seasonality's, and critical trends; and an internal side of defenselessness caused by lack of ability and means to cope with these. The vulnerability context includes:

- shocks, e.g., conflict, illnesses, floods, storms, droughts, pests, diseases
- seasonality's, e.g., prices and employment opportunities
- critical trends, e.g., demographic, environmental, economic, governance, and technological trends

2.5.3 Policies and institutions

Livelihood strategies and outcomes are not just dependent on access to capital assets or constrained by the vulnerability context; they are also transformed by the environment of structures and processes. Structures are the public and private sector organizations that set and implement policy and legislation; deliver services; and purchase, trade, and perform all manner of other functions that affect livelihoods.

Processes embrace the laws, regulations, policies, operational arrangements, agreements, societal norms, and practices that, in turn, determine the way in which structures operate. Policy-determining structures cannot be effective in the absence of appropriate institutions and processes through which policies can be implemented. Processes are important to every aspect of livelihoods. They provide incentives that stimulate people to make better choices. They grant or deny access to assets. They enable people to transform one type of asset into another through markets. They have a strong influence on interpersonal relations. One of the main problems the poor and vulnerable face is that the processes which frame their livelihoods may systematically restrict them unless the government adopts pro-poor policies that, in turn, filter down to legislation and even less formal processes.

2.5.4 Livelihood strategies and outcomes

Livelihood strategies aim to achieve livelihood outcomes. Decisions on livelihood strategies may invoke natural-resource-based activities, non-natural resource-based and off-farm activities, migration and remittances, pensions and grants, intensification versus diversification, and short-term versus long-term outcomes, some of which may compete. (One of the many problems of development is that projects and programs, while favoring some, can disadvantage others). Potential livelihood outcomes can include more income, increased well-being, reduced vulnerability, improved food security, more sustainable use of the natural resource base, and recovered human dignity, between which there may again also be conflict.

2.6 Summary

Most of the existing bodies of knowledge indicated on this chapter focused on the quantitative analysis of the impact of climate change on agriculture and livelihood, rather than the qualitative, which is explanatory and diverse in findings. Climate change models have been used more often to interpret how climate change has impacted rural communities at macro levels in a number of ways and how they cope, but little has been done on the issue of their adaptation for food and nutrition security at grassroots level especially with household lenses. As their capabilities have been paralyzed the issue on climate change adaptation, coping of marginal communities and food and livelihood security cannot be taken lightly hence there is an extreme need for this study

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with the methodological procedures which were adopted to achieve the goals of the study. According to Dawson (2009), research methodology refers to the philosophy or the general principle which guides a research study. This chapter will discuss the research design, target population, data collection procedures, sample size and technique, data collection procedures and data analysis and presentation. After considering the objectives of the study, the research questions, the limitations and the scope, the researcher felt the appropriateness for adopting both the qualitative and quantitative data gathering techniques. In that light, there was the use of a questionnaire as the research instrument, supported by qualitative data obtained through structured interviews. A combination of this research design helped in the collection of accurate data. Hemming (2008) states that human geographers are also increasingly employing both approaches in their research. This is to summarise methods used to enact climate change and livelihoods in the rural communities in Hwange district.

3.2 Research philosophy

A research philosophy is a framework that drives how the research should be conducted based on ideas about reality and the nature of knowledge (Collis and Hussey, 2014). The two main research philosophies are positivism and interpretivism. These philosophies represent two fundamentally different ways that we as humans make sense of the world around us: in positivism, reality is independent of us and researchers can therefore observe reality objectively. In interpretivism, reality is seen as highly subjective because it is shaped by our perceptions (Collis and Hussey, 2014).

3.2.1 Research ontology

Ontology helps researchers recognize how certain they can be about the nature and existence of objects or phenomena they are researching. Crotty (2003) defines it as “the study of being”. It is concerned with what kind of world we are investigating, with the nature of existence. This helps with answering the question “What is there?” Snape and Spencer (2003) define ontology as the nature of reality and what exists.

3.2.2 Epistemology

Epistemology is a way of understanding and explaining how we know what we know, according to Crotty (2003). The epistemological assumption made about the kind of, and the nature of knowledge (Richard, 2003). It is how possible it is to find out about the world and making sense of it. Epistemology therefore is the nature of the knowledge and its possibilities of what is regarded as acceptable knowledge.

3.3 Research approach

Positivism originated in the natural sciences and focuses on scientific testing of hypothesis and finding logical or mathematical proof that derives from statistical analysis (Collis and Hussey, 2014). Positivists therefore tend to use large sample sizes and to produce precise, objective, and quantitative data (Collis and Hussey, 2014)

3.4 Research design

Research design according to De Vaus (2006) refers to the overall strategy that is chosen to integrate the different components of the study in a coherent and logical way. According to Leedy and Ormrod (2013), the research design is an outline that provides the overall structure of the steps that the researcher follows, the data collected and the data analysis the researcher conducts. The choice of the appropriate research design is derived from the aim and objectives of the research as well as cost and time constraints. In this study a descriptive case study design shall be used employing quantitative methods for data collection. Quantitative research is the common approach within the positivist research philosophy, whereas qualitative research allows for a flexible data collection process. For example, data can be collected in several stages rather than once and the researcher can adapt the process mid-way if necessary to establish the impacts of climate change on livelihoods in Hwange district.

3.5 Description of the population

The research will be conducted on the A1 farmers in Hwange District in Matabeleland North Province. Collins and Hussey (2003) define a population as any precisely defined set of people or collection of items which is under consideration. According to Murungweni et al. (2014), a target

population is the group or individuals to whom the research or survey applies. That is, groups or individuals who are in a position to answer the questions and to whom the results of the survey apply. The target population of this research is the A1 farmers of ward 11 of Hwange district.

3.6 Description of the sample

In this case quota sampling was used where the researcher stratified the households into small scale farmers with small livestock like goat, donkeys and cattle and crop production, farmers practising crop production only and those who do artefacts as a way of livelihood. Stratified sampling was used in which all the 9 villages in the district were listed and grouped into 3 classes from class A to C. Each class represented 100 households. This grouped villages according to their characteristics vis a vis impacts of climate change on their livelihoods which was uniform, and their ways of livelihood. This gave an equal representation of the population in rural Hwange in the sample. Purposive sampling was used to select agricultural extension workers (AGRITEX officers), veterinary officers from the village and a ward councillor as key informants to provide ward data. This means the total sample size for the village was made of 312 respondents.

3.7 Description of the sample approach

The researcher used both qualitative and quantitative research methods. According to Becker, (1996), qualitative methods are non-numerical data collection strategies. These methods were used to gather an in-depth understanding of human behavior and the reasons that govern such behavior. In other words, the qualitative method helps the researchers to answer the how, why, what, where and when questions.

Quantitative research is defined as a formal, objective, and systematic process where data is used to obtain information about study phenomena (Stubbs, 2005 in Nhlapo, 2006). Quantitative projects involve large sample sizes, concentrating on the quantity of responses, as opposed to gaining the more focused or emotional insight that is the aim of qualitative research approach. Quantitative research refers to the systematic empirical investigation of quantitative processes and phenomena and their relationships. The quantitative approach was used to supplement the qualitative method to account for the relationships, effects and interactions that take place in society. To this end, this study made use of a questionnaires, interviews and observation techniques

to collect primary data, and publications to collect and analyse secondary data. Due to Covid 19 and its spread, the researcher used schools in different villages to disseminate the questionnaires. Learners helped in the issuing and collection of the questionnaires to and from their parents through the school authorities. As for the local authorities the researcher personally administered the questionnaires and interviews maintaining social distance as per covid regulations. This ensured that data collection was successful during the Covid 19 lockdown.

3.8 Data analysis and presentation

The purpose of qualitative analysis goes beyond giving descriptions; it gives interpretation as well. This means that the study goes beyond what respondents said and interprets the meaning behind it and the attitudes and values that influence this meaning as according to Rodwell (1998). Therefore because of this, the researcher found it more appropriate to use thematic analysis in this study. Data analysis is a process of deducing meaningful information from the data obtained. This process involves consolidating, reducing and interpreting what has been said and what the researcher has gathered from respondents.

Larry (2015) postulates that data collected from the research participants needs to be analyzed logically and systematically to answer the research problem. Holmes (2012) defines data analysis as a process whereby systematic and logical techniques are applied to give a description, illustration, to condense, recap and evaluate data. In this study, a thematic form of data analysis was applied. Various themes that emerged from the study were identified and presented accordingly through the Miles and Huberman (2013) form of data analysis. This follows stages which are: Data reduction—capacious data will be reduced into major themes and sub-themes, and reactions associated with specific themes will be presented accordingly.

3.11 Reliability and validity

McMillan & Schumacher (2001) asserted that the measurement of validity should highlight the purpose, population, and environmental attributes. This was supported by Bryman & Bell, (2003) as well as Schwab (2005) who remarked that integrity and truth of the conclusion were part of

validity. This concurred with McMillan and Schumacher (2006) who stated that the interpretation which resulted in mutual meanings between the interviewer and interviewee was a sign of validity. Also, Creswell (2003) pointed out that validity was an indicator to determine the accuracy of the findings between the researcher, participants, and reader. On the other hand, McMillan & Schumacher (1989) explained that reliability referred to the consistency of the data analysis and interpretation of the data. Moreover, Suter (2006) said, reliability described how well the instrument measured whatever it was supposed to measure. This was echoed by Kumar (1996) who posited that if the instrument was consistent and stable, then it was reliable. Merriam (2002) stated that reliability highlighted the extent of the research findings until it could be replicated. Indeed, Morse & Richards (2002) remarked that reliability showed the same results if the experiment were to be done several times. Patton (2002) claimed that validity and reliability were significant under the investigation of the study.

3.12 Ethical issues

Informed consent was secured from each of the study participants prior to the distribution of questionnaires. In securing consent, selected households, the department of Agritex and other authorities were informed of the objectives of the study, the ethics to be afforded to them, what was expected of them and the amount of time their participation will entail. Participants were given introductory-consent letters bearing the contact details of the researcher, briefing them on the study. They were then asked to sign them to indicate that they had willingly given their consent.

The researcher will respect the information that was obtained from the respondents. It is unethical to disclose such information to unauthorized individuals. It was made clear to the participants that only the researcher and the supervisor will access this information. The issue of publication of the findings was also discussed with the respondents in order to get their permission. They were assured that the details of their participation will be kept confidential, with access to any identifying markers that could link observation to specific individuals being restricted to the researcher.

Privacy is defined as that which normally is not intended for others to observe or analyze. To ensure the protection of respondent's information, the researcher kept observational checklists and information related to the respondents' data in a safe place where no one had access them.

Persons being researched were not treated as objects, which is clearly disrespectful, but rather treated them as subjects. Winberg (1997) states that the researcher will treat subjects with respect and this allows for their voices to be heard. This way the researched outcomes become important contributors to the research process and research becomes richer and more beneficial.

3.9 Summary

In a nutshell, one can note that the researcher adopted a suitable and appropriate methodology to gather data from the participants. The chapter shows that the researcher used various instruments to collect the relevant information, which comprised of questionnaires, interviews, focus group discussions and secondary data. It also spells out well that to gather data the researcher used the qualitative research design. The interviews and questionnaire were administered to the sampled population. In addition to that, the researcher used interviews to cover the gap that had been left by questionnaires as some of the respondents spoiled the papers and others were illiterate. It also has the sampling section, which shows how the respondents were chosen and why. The use of the different instrument in data collection allows the validity and reliability of the data collected as they complimented each other.

CHAPTER 4: DATA PRESENTATION, INTERPRETATION, DISCUSSION AND ANALYSIS

4.1 Response rate

Table 4.1 shows the reaction pace of the members who responded on the survey. The researcher appropriated 320 surveys and 300 were returned, to give a reaction pace of 94 % to examine the effects of climate change on livelihoods in rustic Hwange District. Every one of the 12 key sources was met to give a respondent pace of 100%. Mugenda (2003) states that, a reaction pace of 72% and over is viewed as awesome and satisfactory for investigation and detailing. Considering this affirmation, 94% reaction rates are along these lines brilliant and palatable to make sensible and compelling ends for this study.

	N	%	N	%
Questionnaire respondents	320	100	300	94
Interviews	12	100	12	100

Table 4.1: Response rate.

Source: Field Data 2022

4.2 Demographic characteristics of the respondents

Results obtained in the field (Table 4.2), shows that females were 76.7% while males were 23.3% who are in rural Hwange District. The researcher found out that from all the sampled population, women constitute the largest percentage. The study also found that women are the most affected by climate change due to a plethora of reasons in this area. About 80 % of women in the district are largely affected by climate change because they are acting as de facto household heads after men have migrated to the nearby towns such as Bulawayo, Victoria Falls, Plumtree and countries such as South Africa Botswana, Zambia to make a living. This finding concurs with a study carried out in Zvimba District by Mashizha (2019). Participants indicated that in time of drought or extreme weather patterns, women stay at home with their families whilst men move away to look

for other alternatives. It is within this period that women, presented with few options, find ways to earn a living.

Sex of the respondents					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	70	23.3	23.3	23.3
	Female	230	76.7	76.7	100.0
	Total	300	100.0	100.0	

Table 4.2: Sex of the respondents.
Source: Field Data 2022

Zulu et al. (2012) described Malawi as a climate change hotspot whereby migration of men to South Africa has intensified the impacts against the women who bear the brunt of climate change. The differential impact of climate change on the livelihood of women and men is due to social norms, traditional roles and different power structures thus Malawi is such a country, according to Schalatek (2009). The research also found that households that had better forms of livelihoods were seen among female-headed households. According to Damji (2011), in most cases, the greater percentage in terms of care of the household is done by women, although men contribute to the upkeep of the family by bringing income and other materials. Thus, women are heavily affected by the vulgarities of drought as a result of climate change which affects livelihoods.

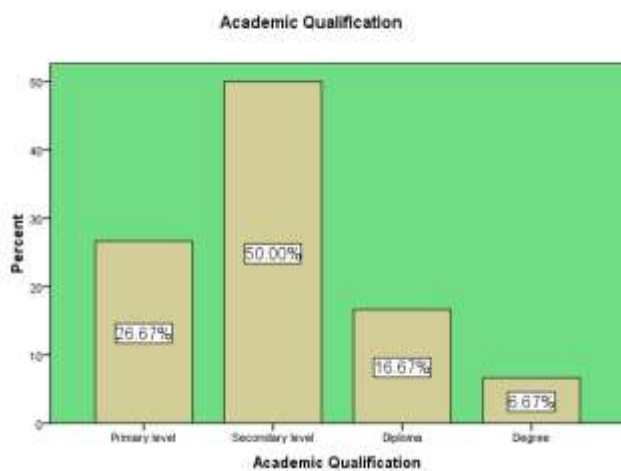


Figure 4.1: The academic qualification of the respondents.

Source: Field Data 2022

The outcomes in Figure 4.1 on scholarly capability show that respondents who had optional level were 50 %, 26.67% had essential level capability, 16.67% had certificates and 6.67% had degrees. The discoveries mirrored that most of the respondents had secondary schooling while fewer had degrees. Okerere (2012) posited that if most people have fundamental and discretionary school level preparing, they will overall have the capacity of their financial resources. Generally, people with a huge level of tutoring are likely going to upgrade their compensation sources since guidance opens new opportunities for country people to place assets into non-farm livelihoods.

The study results show that climate change and livelihoods have positive alliance. Farming is the source of livelihoods and is by and large affected by climate change. It is apparent that a large degree of tutoring has an immediate relationship with better livelihoods. The largest number of households whose livelihoods are negatively impacted by climate change are those households with fundamental preparing of tutoring, followed by helper level. The most negligible impacts are on those with tertiary guidance. Educated households get a chance to make free decisions and can change their standard of living. According to Roger (2003) apportionment of rustic headway has seemed to depend upon farmers' data. This is maintained by one of the key sources who exhibited

that the level of tutoring is of premier importance to households. Educated households can adjust well to the pessimistic impacts of natural change on positions; they conform to the issues of ecological change by growing small grains and drought safe harvests like millet. Additionally, during these seasons of detachment of precipitation, they can separate their wellsprings of jobs and this will enable them to place food on the table and deal with the impact of climate change on their livelihoods

4.3. Interventions being implemented in Hwange

Fig. 4.2 shows the rated sources of livelihood in Hwange rural. The respondents who had 66.67% survived on growing of crops only, 13.33% survived through mixed farming, 10% survived through fishing 6.67% survived through craft work and art while 3.33% survived through tourism. The findings revealed that the majority of the respondents survived through growing of crops while the least survived through tourism. Most of the key informants had mixed feelings over the forms of livelihood. Some key informants reported that most of the people in this area survive on farming. Those in animal rearing face challenges from disease outbreak from wildlife. There are a number of other activities that most of the people survive on. Some are in Art; others are in farming while others are in vending. People in this area have varied livelihoods. Most young people do not have formal employment. They live on selling artefacts while others sell agricultural products. They also indicated that most households are benefiting a lot from farming. It is a source of livelihood as it generates income. Livestock is sold to generate money to pay school fees, hospital bills and for basic commodities to those who practice both crop production and livestock rearing. One of the key informants said that “I usually sell cattle to pay for school fees for my son who is in form 6 at Fatima high school and I have been doing this for my other child who is at the University. I also exchange maize and millet for labor, chicken and sometimes even goats with those whose fields would not have produced anything.” This clearly indicates that livestock and crops are an important source of livelihood. It is also a form of employment for the village people since some young boys are employed in the fields and in cattle herding.

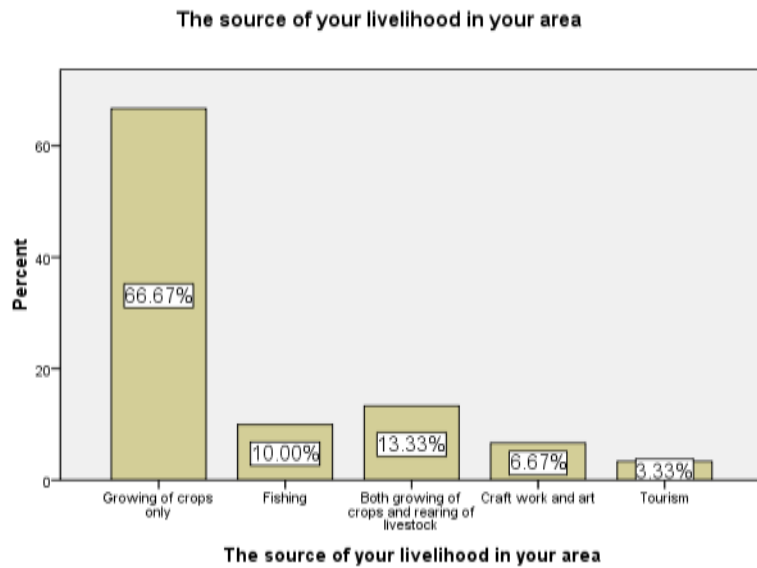


Figure 4.2: The source of livelihood in Hwange rural area.

Source: Field Data 2022

Furthermore, livestock is a source of food (meat and milk). People acquire meat and milk from goats and cattle. Hides from cattle are used for making ropes and are also used as raw materials for small scale shoe making industries. Manure is used as a fertilizer in gardens. Most of the households are also engaging in small scale cultivation of vegetables, therefore they used manure from cattle and goats as a fertilizer in their gardens. Cow dung is also used as floor polish in their huts. Small scale livestock household farmers trade with crop cultivators. They engage in batter trade, their livestock in exchange for the garden produce.

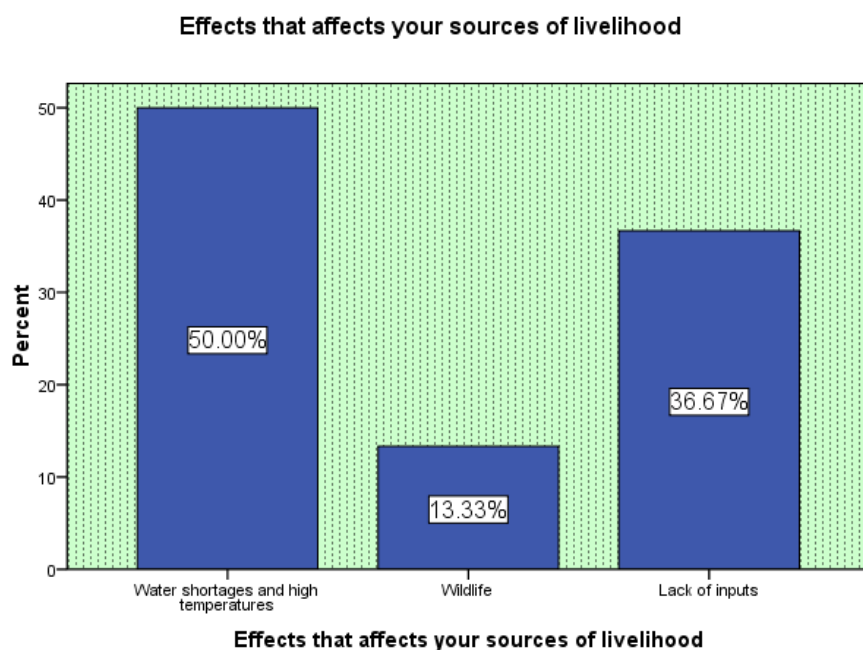


Figure 4.3: The effect that affects source of livelihood in Hwange rural areas.

Source: Field Data 2022

Fig. 4.3 shows the effect that affects source of livelihoods. The respondents who indicated that water shortage and high temperature affects livelihood are 50%, 36.67 % revealed that lack of inputs affect livelihoods and 13.33% indicated that wildlife affected them more. Some key informants were in agreement with the respondents. Key informants revealed that climate change is real and its occurrence in Zimbabwe is no longer debatable. Climate change is evident, the effects and impact are being felt and they threaten sustainable human development (Kurjia, Nanja & Stern 2011). Studies have shown that climate change is a global externality that negatively impacts households and communities and that its potential to dismantle economies is real; thus, its challenge at global, national and local levels can no longer be denied (Mashizha et al., 2017).

Zimbabwe is already experiencing the effects of climate change, notably, rainfall variability and extreme events. These conditions, combined with warming trends are expected to negatively impact the economy and the livelihoods of the poor as they depend mostly on rain-fed agriculture. Mashizha (2019) noted that one of the most significant effects of climate change is the impact on the global food system as it changes rainfall patterns, reduces agricultural yields and affects food security.

The research found that changes in extreme weather events, seasonality, and others climate variables, along with changes in ecosystems, biodiversity, and natural resources ultimately have considerable effects on food security and livelihoods in Hwange communities which are closely dependent on rainfall and natural resources for their livelihoods. This was supported by one of the informants who said *“we have been witnessing a reduction and poor harvest due to extreme temperatures and water scarcity. Most of the people do not have enough food to last even two months. for 2019 /2020 farming season there was over 95% cases of crop failure meaning to say there is no food at all in our district.”* Therefore, it is sufficing to conclude that climate change has negative effects on the livelihoods of rural communities in Hwange, as it results in four dimensions of food security which are food availability, food utilization, food accessibility, and food systems shortage.

A 75-year-old key informant reported that *“It is now a challenge to fend for the grandchildren, especially to us old people we no longer receive adequate rainfall and no food at where it available, I cannot buy it its expensive, whereas food is the first priority for human survival. She pointed food shortages are now a face of Hwange due to frequent or prolonged droughts which the area is experiencing. This season 2019/2020 was worse as we received below normal rainfall”*

Furthermore, the Intergovernmental Panel on Climate Change’s (IPCC) Assessment Report (2007) highlighted that agricultural production and access to food in many African countries is projected to be severely compromised by 2030. This would further adversely affect food systems and alter livelihoods activities. The study found out that households have faced agricultural losses caused by an increase in adverse weather patterns. This leads to food insecurity which translates to poor nutritional status. One of the participants said: *“weather patterns have changed and I did not*

harvest even a wheelbarrow from the previous farming season and as we speak we do not have food at home, now with little we have, we skip meals and at times we sleep without eating.”

An earlier study by IFRC and RCS (2017) found out that Zimbabwe experienced one of its most severe lean seasons in the last few decades due to the impacts of El Nino induced drought and this increased food commodities which made it difficult for households to access food resulting adverse impacts on livelihoods. Livestock was also affected by the poor rains as there was limited access to good pastures as well as water for consumption. This was supported by one of the key informants who said *“changes in weather patterns have led to reduced pastures for our cattle and there is no water for animal consumption hence some animals are dying and we are forced to sell them at giveaway prices so it will be difficult to get milk and other animal source foods for our children because will not have purchasing power at all”*

Earlier studies by Kinsey et al (1998) found out the major risk facing households in rural Zimbabwe is that of drought which results in crop failure leading to hunger and negatively affecting livelihoods. Frequent and recurrent droughts have led to water scarcity. Water scarcity is now a new problem facing rural people in Africa. According to UEA (2010) defines it as the unavailability of water resources to meet the required water usage within the region. This water scarcity is as a result of the prolonged droughts necessitated by erratic and sporadic rainfall. From the evidence collected in Chokumba in the ward, it shows that most of the water is a scarce commodity.

Mugabe (2012) posits that annual rainfall in Zimbabwe will decline by 60% by the year 2080. Currently, the country is already experiencing, the decline as the rainy season is now short, and this has contributed to the decline in water tables and water availability in Hwange district. The local leader of the area had this to say *“before the year 2000 we used to receive first rains in the month of October, but things have changed as we can now we can get mid to December without any drop falling. In the occasion that it rains, it’s not adequate to meet community needs hence we end up having water for domestic use from Somubhibhi dam.* Furthermore, this will have a negative bearing on the livelihoods.

4.4. Effects of climate change in Hwange

The level of understanding of climate change is shown in the Table 4.3. The respondents who agreed that they do not have an understanding of climate change were 73.3%, while 26.7% indicated that they have an understanding of climate change. The findings revealed that most of the respondents did not know about climate change. Most key informants had various opinions about climate change, as some perceived it as change in seasons while others did not know what it is. Some key informants noted that climate change brought about rains which used to be erratic in the area.

Level of understanding of climate change					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	80	26.7	26.7	26.7
	No	220	73.3	73.3	100.0
	Total	300	100.0	100.0	

Table 4.3: Level of understanding of climate change.

Source: Field Data 2021

Fig. 4.4 shows the effect of climate change. The respondents who reflected that hunger and water crisis were due to effects of climate change are 53.33%, 16.67% revealed that has caused poaching and pest and diseases each and 13.33 % noted that it that it cause migration of people to towns and other countries. The findings reflected that most of the respondents agreed that climate change caused hunger and water crisis in Hwange rural areas. Key informants have the same view with respondents. The principal key informant upheld this by showing the specialist archives that showed the recorded patterns of changes in that occurred from 1992. As an individual who had lived through the majority of his youth in Hwange, he even articulated that when he was youthful there used to be extremely moderate precipitation, unsurprising seasons as they infrequently

moved from sensibly cool winters and moderate temperatures across the country and generally warm summers seasons. The outcomes are like those of different investigations done in other semi-bone-dry conditions in Zimbabwe and different pieces of Africa (Moyo et al., 2012). For example, farmers' discernments in Hwange (Ndlovu/Kachechete and Jambezi) and Masvingo detailed changes in environment in the last 10–20 years, through changes in precipitation (particularly more sporadic just as decreased sums) and rising temperatures that antagonistically affected on yield and domesticated animals creation (Moyo et al., 2012). In an African examination including 11 African nations, Maddison (2007) tracked down that numerous farmers accepted that temperatures had risen while precipitation had diminished. Key source expressed that *“climate change has caused a few consequences for the illnesses in harvests and creatures. A portion of the things that were utilized to have like wild natural product have vanished.”*

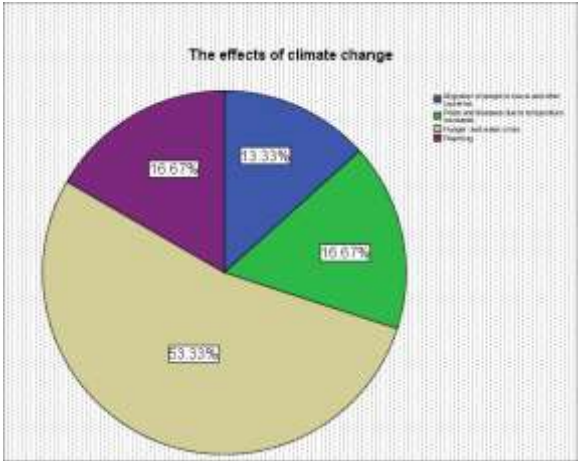


Figure 4.4: The effect of climate change.

Source: Field Data 2021

4.4.1 Migration as an impact of climate change

Members for this study demonstrated that more individuals were moving to nearby towns, for example, Bulawayo, Victoria falls and Hwange, and nations like South Africa and Botswana. These relocations are climate change-related. Hwange and its encompassing zones at this point don't get satisfactory precipitation that supports crop cycle; henceforth, farmers harvest less. In this way, individuals are moving to the closest towns. Youthful and lively individuals are going the extent that South Africa, Botswana and Zambia and their families rely upon settlements to enhance agrarian livelihoods and purchasing of food products during dry season periods. Other people groups and individuals have turned to poaching in Hwange National Park, in spite of the fact that they realize very well that the movement is illicit.

Impacts of climate change in your area on your livelihood					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Food and water shortages	130	43.3	43.3	43.3
	Loss of livestock	70	23.3	23.3	66.7
	Human animal conflicts	50	16.7	16.7	83.3
	Deforestation	50	16.7	16.7	100.0
	Total	300	100.0	100.0	

Table 4.4: Impacts of climate change in Hwange rural area on livelihood.
Source: Field Data 2022

Impacts of climate change in Hwange rural area on your livelihood was presented in Table 4.4 above. The respondents who indicated that climate change had an impact on food and water shortages were 43.3%, 23.3% revealed that it had impact on loss of livestock 16.7% reflected that

it had an impact on deforestation and human animal conflicts each. The findings noted that most of the respondents revealed that climate change had an impact on food and water shortages while the least indicated that it had an impact on loss of livestock, human and animal conflicts.

4.4.2 Water shortages

Commented [CTM4]: Correct numbering

Water scarcity is now a new problem facing rural people in Africa. According to UEA (2010), water scarcity is the unavailability of water resources to meet the required water usage within the region. This water scarcity is as a result of the prolonged droughts resulting in erratic and sporadic rainfall. From the evidence collected in Nyagara and Malonga communities in Hwange, it shows that most of the water is a scarce commodity. Mugabe (2012) posits that annual rainfall in Zimbabwe will decline by 60% by the year 2080. Currently, the country is already experiencing, the decline as the rainy season is now short, and this has contributed to the decline in water tables and water availability in Hwange district. The local leader of the area had this to say, *“Problems that were brought about by climate change are many. Most of our animals are dying; crops are affected by pest and diseases while we are being forced to relocate due to rains”*. However, on the other hand another key informant stated that, *“It is true some people are suffering due to climate change. Some have lost their houses due to heavy rains which is also a brainchild of climate change.”* In early 2021 the informants highlighted that some communities in Hwange received excessive rainfall and were in floods. This led to loss of property by other households.

4.5. Impacts of climate change on livestock

Commented [CTM5]: Check numbering

Drought has reduced the prices of livestock due to loss of value and quality of meat. The 2020 drought saw a massive decline in cattle prices as low as United States \$150 each and goats prizes as low as US\$20 each. One of the key informants was quoted saying: *“I am still hurting because I sold my two beasts, and I got \$300 which is not enough to pay for school fees for my daughter who is in form 3 at Fatima High and our outputs were so low that I could not sell in order not to sell my cattle.”* This clearly indicates that the sources of livelihoods are dwindling as a result of climate change. As a result of dwindling sources of livelihoods, drought has lowered agricultural production due to lack of adequate labor as many households use cattle and donkeys for ploughing. Research findings from householders indicate that drought is a climatic condition that results in poverty in Hwange rural communities. It causes death of livestock and poor yields which reduce income generation therefore people become poorer. Drought leads to the drying of rivers, dams

and boreholes which lead to inadequate water for people yields and livestock causing people and animal conflict. Livestock move long distances in search of pastures and water, causing the death of livestock and also poor quality as they will be thin. Research findings from the one of the key informants indicate that there were at least two cattle that died as a result of drought in Nyagara and Chidope village within two months in the beginning of the year 2020 due to lack of pastures. Drought has reduced the birth-rate of livestock during the 2019-20 seasons. Data from Chidope dip tank indicates that in the 2020 season only a few cattle gave birth to calves. A key informant said: *“This year (2021) I have only one calf as compared to the 17-20 new born calves in other better years, we are suffering due to lack of milk because we usually survive by selling sour milk (Amasi) and our grains are not doing well also.”* This means that the source of food like milk is also dwindling this farming season and the size of stock is reduced. Despite the heavy rains that were received late last year (2020) and early this year (2021) the grass and water sources are likely to dry up leaving households with no water for watering their gardens and for their livestock to drink.

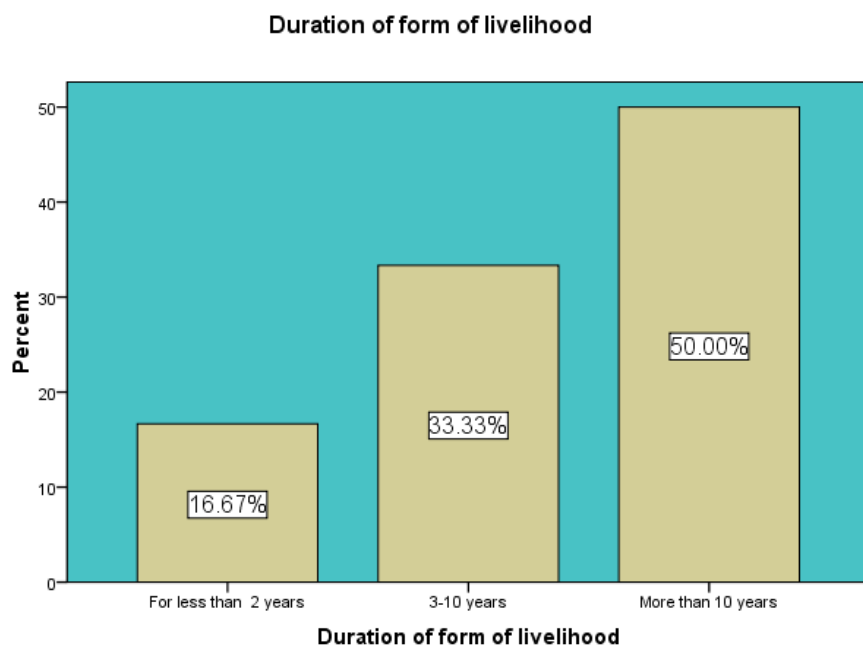


Figure 4.5: The duration of form of livelihood.

Source: Field Data 2022

The respondents who indicated that they survived for more than 10 years were 50%, 33.33% indicated that they survived for 3-10 years while 16.67% reflected that they survived for less than 2 years as shown by Fig 4.5. The findings revealed that the majority postulated that they survive for more than 10 years while the least survived for less than 2 years practicing their forms of livelihoods. This shows that many households even though affected by climate change still resist change to adapt to the current situations. This however causes the continuous dwindling of the livelihoods of the locals as a result of climate change.

Effectiveness for the forms of livelihood in meeting your basic needs					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very effective	50	16.7	16.7	16.7
	Partially effective	170	56.7	56.7	73.3
	Not effective at all	80	26.7	26.7	100.0
	Total	300	100.0	100.0	

Table 4.5: Effectiveness for the forms of livelihood in meeting basic needs.
Source: Field Data 2022

The effectiveness for the forms of livelihood in meeting your basic needs were presented in Table 4.5. The respondents who indicated that they were partially effective in meeting basic needs were 56.7%, 26.7% reflected that it has no effect and 16.7% indicated that it was very effective. The findings pointed out that the majority of the respondents revealed that forms of livelihood in meeting basic needs of the people of the Hwange rural people were partially effective while the least indicated that it has no effect. However, most of the respondents differed from most of the respondents who indicated that climate change has a number of effects on their livelihoods. One of the key informants said that *“Most of the people have altered their livelihood. Some people used to live on farming, and they have changed. Some people used to have animals, but these animals are dying. Some people used to work in formal employment, but they have now changed into vending.”* Another key informant also stated that, *“they are some changes in the livelihood of the people here in Hwange area. Some people are now living on sculpture but used to do farming.”* The researcher therefore found that the forms of livelihoods were not sustainable, thus households needed to change the forms of them to survive. Earlier studies by Kinsey et al. (1998) found out the major risk facing households in rural Zimbabwe is that of drought which results in crop failure leading to hunger and negatively affecting their livelihoods thus they try by all means to diversify

to survive. Droughts seriously reducing crop harvests but also by reduces grazing and fodder for livestock, thus lessening the availability of milk and meat.

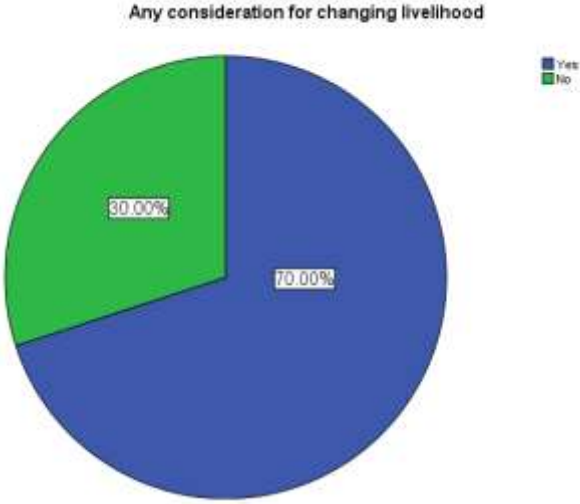


Figure 4.6: Any consideration of changing livelihood.

Source: Field Data 2022

Fig. 4.6 above illustrates whether the respondents are willing to change their livelihoods or not. The respondents who pointed out that they are willing to change their livelihoods were 70% while 30% are not willing to change their livelihoods. The findings pointed out that most of the respondents were willing to change their livelihood while the least were not considering changing their livelihoods. Most of the key informants were in agreement with the respondents as they all noted that most people have changed their livelihood as they try to make ends meet.

Ways to change forms of livelihood to be more sustainable					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Use of CAMPFIRE	40	13.3	13.3	13.3
	Migration for employment	90	30.0	30.0	43.3
	Market gardening	70	23.3	23.3	66.7
	Vending	100	33.3	33.3	100.0
Total	300	100.0	100.0		

Table 4.6: Ways to change forms of livelihood to be more sustainable.

Source: Field Data 2021

The ways to change forms of livelihood to be more sustainable was rated in the Table 4.6 above. The respondents who are willing to join vending were 33.3%, 30% indicated that they wish to migrate to look for employment, 23.3% indicated that they want to do market gardening and 13.3% want to do campfire. The findings revealed that most of the respondents have changed their livelihood into vending while the least respondents revealed that they have changed their livelihood into campfire. Most of the key informants noted that the majority of the people in Hwange had changed their livelihood and most men had also gone for greener pastures.

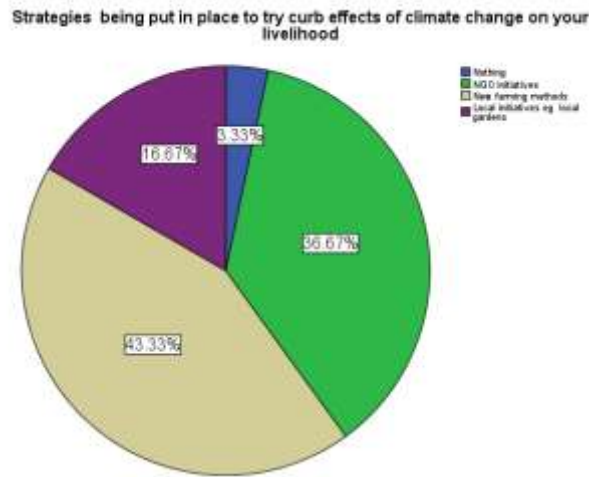


Figure 4.7: The strategies being put in place to try to curb effects of climate change on livelihood.

Source: Field Data 2022

The strategies being put in place to try to curb effects of climate change on livelihood were presented in the Fig. 4.7 above. The respondents who indicated that the strategy new farming methods had 43.33%, 36.67% had NGO initiative, 16.67% had local initiative like gardening and 3.33% indicated that no strategies are being put in place to try to curb effects of climate change on livelihood. The findings reflected most of the respondents indicated that new farming methods can be a method which can be used to curb effects of climate change while the least indicated that no strategy can be put in place to curb effects of climate change. One of the key informants was in support with the respondents and had the following sentiments:

The people of Hwange should adopt new farming technologies so as to improve their livelihood. They should look for ways to conserve water as it is one of the major challenges in the area. Education on climate change needs to be done. People should be aware of the effects and how to reduce the impact of climate change.

You received education from the local authorities, for example the Agritex					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	210	70.0	70.0	70.0
	No	90	30.0	30.0	100.0
	Total	300	100.0	100.0	

Table 4.7: Education from the local authorities, for example the Agritex.
Source: Field Data 2022

The respondents who agreed that they received education from the local authorities for example the Agritex were 70% and 30% disagreed. The findings indicated that the majority agreed that the respondents received education from the local authorities for example the Agritex while the least were in disagreement. Key informants were also in support with the respondents as they indicated that Agritex officers are education the community. However, they were concerned with the level of knowledge of the officers as there are no training going on from the government. They also noted that some officers are not willing to learn information on climate change.

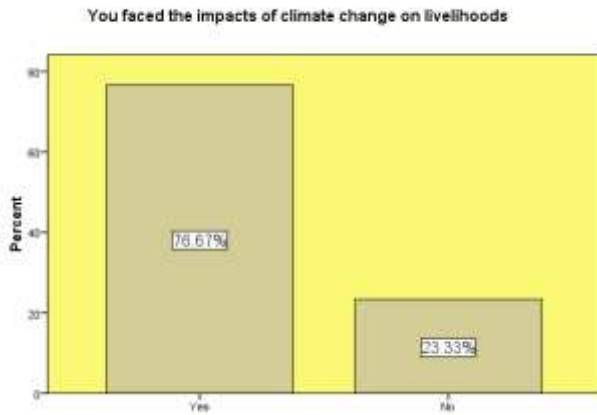


Figure 4.8: Impacts of climate change on livelihood.

Source: Field Data 2022

Figure 4.8 above presented whether the respondents had faced the impacts of climate change on livelihood or not. Those who agreed with the sentiments were 76.67% while 23.33% disagreed. The findings revealed that most of the respondents agreed that they faced the impacts of climate change on livelihood while the least disagreed. Most key informants were in agreement with the respondents as they pointed out that most if not all people in Hwange community are affected by climate change. Some key informants stated that, climate change does not discriminate anyone. The impacts are felt by everyone regardless of your status. All of us we are in a dilemma due to climate change. It's affecting our environment so you can't run away from this animal.

You received aid from the either the government or NGOs as intervention measures					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	170	56.7	56.7	56.7
	No	130	43.3	43.3	100.0
	Total	300	100.0	100.0	

Table 4.8: Aid from the either the government or NGOs as intervention measures.

Source: Field Data 2022

Table 4.8 presented whether the respondents received aid from the either the government or NGOs as intervention measures or not. The respondents who agreed were 56.7% while the 43.3% disagreed. The findings revealed that most of the respondents agreed that they received aid from the either the government or NGOs as intervention measures. Most of the key informants had different views on aid in regard to climate change and some had different views. Gonese et al. (2017) contend that families are confronted with a test of not having the option to get to long haul advances for carries out and different improvements because of absence of guarantee. It ought to anyway be noticed that couple of members who showed that they approach credits are important for a gathering that was set up through the impact of a nearby organization, Steward bank. The members demonstrated that the bank is giving credits to families nearby in an organization with DFID and FAO through a livelihoods and food security program (LFSP) that targets improving the vocations and food security to limited scope ranchers just as rustic networks in Zimbabwe.

The respondents further showed that the bank looks to improve monetary proficiency among ranchers and upgrade their admittance to back. Respondents have anyway shown that there is opposition among ranchers as far as being essential for a gathering and this obstruction exudes from generalizations and offbeat convictions radiating from doubt among family ranchers.

Families who have the right to approach state help have not been fruitful in getting it. Chisango (2018) places that with the point of improving agricultural profitability for smallholder farmers through giving freedoms to ranchers who don't approach credit because of shaky property rights, the public authority of Zimbabwe dispatched different activities that incorporate activity feed the country, the official info plot and the order agriculture conspire. The underlying projects neglected to yield the ideal aftereffects of improving horticultural profitability as the plans were mishandled by degenerate government authorities at the outset stage.

The outcomes in this examination likewise further demonstrate that order agriculture has additionally neglected to address the issues of the families consequently delivering as lacking the help given to the networks by the state, in the process obliging farmers from using imaginative methodologies, for example, protection cultivating. Smallholder farmers showed that they would have valued a circumstance where the public authority helps every one of the families without segregation dependent on political support. A key informant pointed out that in as much as the government has the responsibility to assist households, the farmers should not develop a dependency syndrome where everything should be done for them. The results from the study however continue to indicate that the government has not played its role in supporting the communities. Another key informant indicated that, *“there are a number of aids available in our community. Most of NGO are managing these programmes. We do not have much from the government side though the NGOs are accredited by the government”*. Thus there is an indication for the need by the government to implement viable policies and programs that help communities in Hwange to improve their forms of livelihoods.

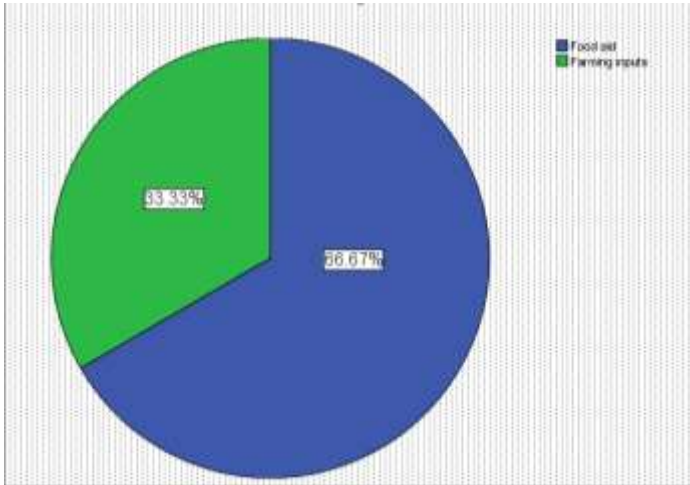


Figure 4.9: The kind of aid received.

Source: Field Data 2022

Fig 4.9 shows the kind of aid which the respondents received. The respondents who received food aid were 66.67% while 33.33% received farming inputs. The findings reflected that most of the Hwange rural community received food aid while the least received farming inputs. Most of the key informants were in agreement with the respondents as they indicated that food aid is available to the community. Some of the key informants noted that some food aid comes direct from campfire projects.

Aid helped to alleviate the problems of climate change on your livelihood					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nothing has changed	60	20.0	20.0	20.0
	It has helped to a greater extent	40	13.3	13.3	33.3
	It has partially helped	200	66.7	66.7	100.0
	Total	300	100.0	100.0	

Table 4.9: Aid to alleviate the problems of climate change on livelihood.

Source: Field Data 2022

Aid to alleviate the problems of climate change on livelihood was presented in Table 4.9. The respondents who indicated that it partially helped were 66.7%, 20% noted that it did nothing and 13.3% reflected that it helped to a greater extent. The findings pointed out that respondent who revealed that it partially helped were the majority while the least noted that it helped to a greater extent. The key informants were in agreement that there was partial assistance of programs which focus on climate change. Some of the programs which are available include climate change resilience programs and culling of animals to reduce overpopulation of animals.

Strategies are being implemented in Hwange district to adapt to the negative impacts of climate change

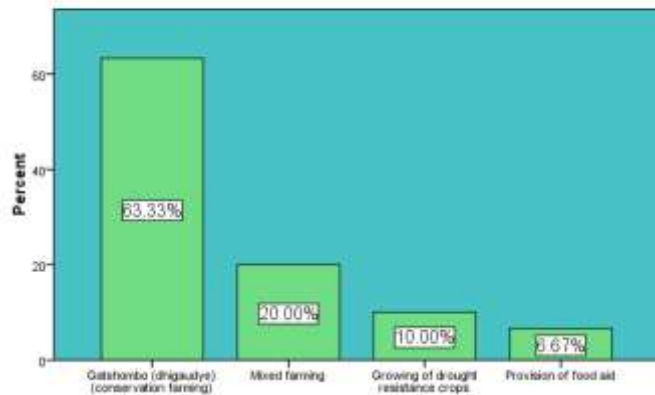


Figure 4.10: Strategies were being implemented in Hwange district to adapt to the negative impacts of climate change

Source: Field Data 2022

Fig. 4.10 presents whether the following strategies were being implemented in Hwange district to adapt to the negative impacts of climate change or not. The respondents who indicated that the strategy Gatshombo Conservation farming was being implemented were 63.33%, 20% indicated that mixed farming was being implemented, 10% reflected that growing of drought resistance crops was being implemented while 6.67% revealed that provision of food aid was being implemented. The findings pointed out that most of the respondents reflected that the strategy Gatshombo Conservation farming was being implemented while the least noted that provision of food aid was being implemented.



Figure 4.11: Gatshombo Conservation farming.

Source : Field Data 2021

A key informant indicated that even though households used Gatshombo this year it was not very effective to some households as their seeds rot as a result of the excessive rainfalls that were received. Some of the crops turned yellow which also resulted in poor growth. Many people also complained about Gatshombo as being strenuous as it takes a lot of time and manpower. Many households complained that even after trying this new conservation method nothing actually changed but the situation worsened. On the other hand, some households are happy that despite the heavy rains at least they are going to yield something,

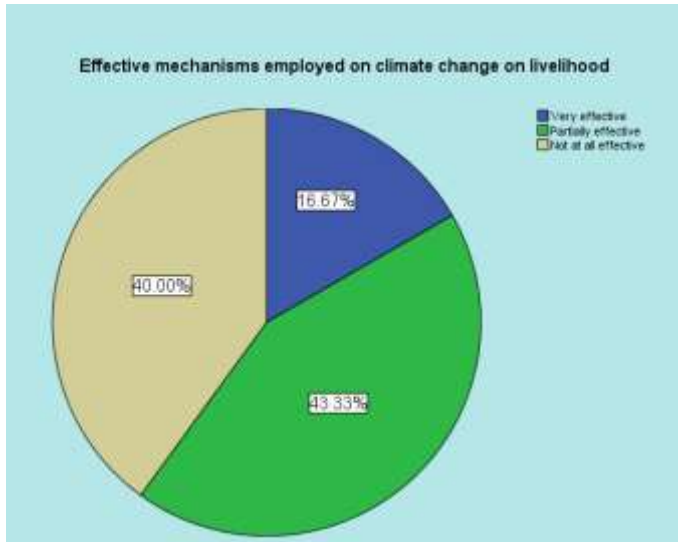


Figure 4.12: The effectiveness of mechanisms employed on climate change on livelihood.

Source: Field Data 2022

The effectiveness of mechanisms employed on climate change on livelihood was presented in Fig. 4.12 above. The respondents who indicated that there was partially effective were 43.33%, 40% reflected that it was not effective and 16.67% reflected that there was very effective. The findings pointed out that most of the respondents revealed that mechanisms employed on climate change on livelihood were partially effective while the least indicated that it was very effective. The study found that communities in Hwange have not only resorted to crop diversification to deal with the effects of climate change but also resorted into livelihood diversification in order to have improved livelihoods. Livelihood diversification is now an important aspect that minimizes the effects of climate change on food security and becoming an important adaptation strategy.

The hindrances of climate change on attaining sustainable livelihood					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No education	50	16.7	16.7	16.7
	No follow up by either the government or the NGOs/ support	180	60.0	60.0	76.7
	Lack of input e.g.stock feed	70	23.3	23.3	100.0
	Total	300	100.0	100.0	

Table 4.10: The hindrances of climate change on attaining sustainable livelihood.

Source: Field Data 2021

The hindrances of climate change on attaining sustainable livelihood were presented in the Table 4.10. The respondents who noted that there was hindrance of no follow up by either government or NGO support were 60%, 23.3% indicated that there was lack of inputs for example stock feed and 16.7% revealed that there was no education. The findings reflected that the majority of the respondents agreed that there was no follow-up by government and NGOs while the least revealed that there was no education.

In times of severe droughts, households rely on food aid from NGOs and the government. This is supported by Kangalawe and Lyimo (2013), who in their research findings in Tanzania argues that diversification and adaptive strategies such as water harvesting for small-scale irrigation, integration of livestock and crop production, and non-farm activities are crucial to ensure sustainable livelihoods in a changing climate. One key informant indicated that the government inputs are given to households but no follow up is done on what they would have been used for. He also stated that most households sell the inputs, and some wash the seeds and eat them thus this government scheme is not very successful.

CHAPTER 5 : CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

The researcher distributed 320 questionnaires in a bid to analyze the impacts of climate change on livelihoods in rural Hwange District. 300 were returned, giving a response rate of 94 %. All the 12 key informants were interviewed to give a respondent rate of 100%. The findings pointed out that there were more people who were in the age range of 31-39 years (36.67%) while the least were in below 20 years old (3.33%). The findings also revealed that they were more females than males due to migration. It was also noted that the majority of the respondents had secondary education (50%) while the least had degrees (6.67%).

The first research objective sought to identify key interventions being implemented in rural Hwange. The findings established that most of the respondents survived through growing crops only. This conclusion came from a 66.67% response rate, while the least, who survived through tourism, had a 3.33% response rate. The key informants were in agreement with the respondents as they indicated that vending, market gardening, craft and cattle ranching were also some of the activities which the rural Hwange community survive. It was also pointed out in the research that most of the respondents revealed that water shortage and high temperature affects livelihood (50%) while wildlife destruction contributed to the least; only 13.33%.

The second objective was to examine the effects of climate change in Hwange district. The findings revealed that most of the respondents do not know about climate change as was indicated by a response rate of 73.3%. It was also reflected that most of the respondents agreed that climate change caused hunger and water crisis in Hwange rural area. This was supported by the key informants who pointed out that climate change has caused floods and extreme temperatures. Most of the respondents revealed that climate change had an impact on food and water shortages while fewer indicated that it had an impact on loss of livestock.

The third objective was to determine livelihood activities found in rural communities of Hwange. The findings pointed out that the majority of the respondents revealed that forms of livelihood that met the basic needs of the Hwange rural people were partially effective while the least indicated that it has no effect. The findings pointed out that most of the respondents were willing to change their livelihood activities while the least were not considering changing.

The findings revealed that most of the households have changed their livelihood activities to vending, while the least respondents revealed that they have changed to campfire activities. The findings reflected most of the respondents indicated that new farming methods can be a method which can be used to curb the effects of climate change, while fewer indicated that no strategy can be put in place to curb effects of climate change. The findings indicated that the majority agreed that the respondents received education from the local authorities e.g. the Agritex, while a few were in disagreement. The findings also revealed that most of the respondents agreed that they received aid from either the government or NGOs as intervention measures. The research reflected that most of the Hwange rural community received food aid while fewer received farming inputs. Also, it can be concluded that those respondents who revealed that it partially helped were the majority while the least noted that it helped to a great extent. Respondents reflected that the strategy of the Gatshombo Conservation farming method was being implemented whilst only a few claimed that provision of food aid was being implemented. The findings pointed out that most of the respondents revealed that mechanisms employed to curb the impact of climate change on livelihood were partially effective while the least indicated that it was very effective.

5.2 Recommendations

Households need to depend on conventional methods which local people come up with a system to adapt constantly to the evolving environment. Zunde Ramambo is a customary social system intended to moderate food weakness as a method of adapting to the impacts of climate change. The Zunde Ramambo, as a social wellbeing safety net against food shortage for weak individuals from the local area, particularly those with young children under five years old. It guarantees food security for all. The responsibility for its administration lies with the local chief.

Zimbabwe is especially powerless against climate change because of its weighty reliance on rain fed farming. To adjust to the unfavorable effects of climate change advances, e.g., dry spell safe

yields, water systems, and early admonition frameworks are required in Hwange. In any case, considering the evolving real factors, policymakers in Zimbabwe should look to the private sector to convey appropriate advances.

New advancements are basic in improving agricultural efficiency of smallholder farmers. The public area has generally determined innovative changes in farming; ongoing patterns recommend that the public area's job may not be as huge later on. There has been an inability to carry out the fast and boundless exchange and dispersion of advancements important to address climate change in Zimbabwe. The private area has the ability to move new advancements that can upgrade the amount and nature of agricultural yields, despite climate change. However, the exchange of environment cordial innovations to smallholder farmers in Zimbabwe has been insignificant. Innovations, for example, improved yield assortments, human and livestock immunizations. Also, correspondences and data advancements can create incredible effects for smallholder farmers and guarantee food security, consequently improving livelihoods at the public, commonplace area and ward level.

Moving environment-strong activities requires financing, and the private area can advance finance and open doors in such matters and fabricate environment tough networks. It is fundamental that private areas significantly do so through systems, for example, like a public innovation reserve. Mechanical development and its related institutional changes is the way to overseeing climate change. Global and regional collaboration should be scaled up to supply real financing and to plan an arrangement instrument that invigorates environment shrewd development.

These outcomes demonstrate that there is a requirement for a huge degree of administration to improve the take-up of such practices and offer on-going specialized help. For instance, changes in crop planting plans, and assortments utilized, just as the broadening of harvests planted, are generally minimal effort choices for diminishing farming danger. This could be generally advanced through expansion administrations and correspondence crusades. Cautious screening of these methodologies and participatory activities arranged with farmers is prescribed to mutually recognize and carry out transformation alternatives that are viable

It is essential to help non-farming livelihood methodologies in the wards or regions of low agrarian potential on the grounds that a different arrangement of vocation systems upgrade a family's flexibility in their reaction to the effects of climate change. Casual business exercises should be evaluated and formalized. Commercialization of the conventional area can be improved through the advancement of more SMEs. Improving nourishment information among country families to upgrade dietary varieties is yet another recommendation that could work.

Flighty precipitation has truly been a main consideration restraining farming activities in Hwange District and the pattern of expanding precipitation differences and temperatures further compromises water security in the locale. Hence, there is a requirement for multi-partner interest in water reaping and protection arrangements if food accessibility is to be balanced out in the area in the medium to long future.

Across Hwange District there is an absence of mindfulness and information about climate change and its effects. The failure to perceive climate change will diminish the probability of versatile measures being made. Endeavors are needed to sharpen family awareness and to reinforce mindfulness and prod variation in intervention methods. Moreover, it is important to teach households on the most fitting changes they can make to adjust to the effects of climate change to expand their strength.

Low admittance to CISs negatively influences the capacity of families to settle on educated choices on the most proficient method to underwrite upon or plan for future conditions, expanding their weakness to environment stuns and food frailty. Should admittance to CISs be improved, discoveries propose incredible possible given the high paces of data use and sharing.

There is a need to focus climate change sensitization efforts on female headed households as they are less likely to have noticed changes in climate/weather patterns. Additionally, female headed household access to CISs through indigenous information systems and NGOs must be improved as they are considerably less likely to receive information from these popular information sources. Finally, there must be a focus upon improving membership of women in formal/ informal groups in their villages in order to facilitate fruitful collaboration.

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