Perspectives on adaptation to water scarcity and drought of small-scale farmers in Masvingo, Zimbabwe

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Supervised

BY:

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A thesis submitted to the University of the Witwatersrand, Johannesburg, in fulfilment of the Doctor of Philosophy requirements in the Department of Geography and Environmental Studies.

DECLARATION/ PLAGIARISM

I, Thandiwe Annastacia Mpala, declare that the tables, figures, and information is my original work. Where I have used sources that are not my initial ideas, I have appropriately referenced them.

The thesis carries my writing. In areas where I have used another author's ideas, I have rightfully acknowledged them. I considered the concepts that I read and used from other authors, and in sections where the ideas have been applied word for word, I have employed quotation marks and referenced, respectively.

The thesis is being submitted for the award of the degree of Doctor of Philosophy to the Faculty of Science at the University of Witwatersrand. It is my first attempt at acquiescing this thesis for examination and the degree accordingly. The thesis will not be conferred in whole or in section to another university for the award of any degree.

Date: 9th of December 2021.

Signature



DEDICATION

To my parents, Victoria Mpala and Patrick Mpala, my siblings, Kimberly Mpala, Antony Mpala, and Tichaona Mpala.

ABSTRACT

The study investigated the impacts of climate change on rural agricultural productivity, precisely focusing on how rural farmers adapt to the brunt of adverse weather conditions. The focus was to understand the asset combinations rural farmers employ to build adaptive capacity against climate change. The rural areas in Zimbabwe, just like every other place on earth, suffer significantly from climate changes, and a great deal of work was conducted on this phenomenon. However, there has been little attention paid to rural farmers in the Zaka district in Zimbabwe. Therefore, this study was relevant for we wanted to understand the implications of climate change on Zimbabwean rural households, particularly in drought-prone areas.

The research focused on four areas; the impacts of climate change and its effect on Zaka farmers' livelihoods; the resources farmers used and the access conditions in acquiring them; the additional barriers the farmers faced in adapting to climate change; and the systems and structures in place that foster adaptation in their livelihoods. Interpretivism influenced the philosophical nature of this research. The study employed a qualitative research design to conduct investigations in wards 1-3 and 15 in Zaka district, Masvingo province, south-eastern side of Zimbabwe. Interviews with key informants and subsistence farmers, focus groups, participant observations, and the literature review were employed to collect the data. The study collected information from farmers, organisation officials, and other climate change professionals. The research contributed to the knowledge gap by identifying assets and their combination that play a cardinal role in building adaptive capacity and resilience of rural farming communities to secure sustainable livelihoods in the face of increased environmental change.

The analysis showed that the combination of high temperatures, erratic rains, and pest outbreaks had increasingly made it difficult for Zaka rural households to engage in meaningful agricultural production. Irrigation and rainfed farmers were susceptible to increased climatic conditions and increased crop failure. The development had created income instability, job insecurity, and intensified household and farming expenditures, exposing farmers' households to high levels of poverty and food insecurity. This relationship had indeed affected their ability to generate income to access the procurement of different services. The results showed that Zaka farmers had used human, natural, and physical capitals

combination to improve their crop productivity and used the social and financial capitals combination to attain income to access services that included food, transport, personal use, medicals, emergencies, agrochemicals, water payments, and livestock. The research found that the farmers' resource accessibility is subject to institutional factors, affordability, land policies, and limited crop diversification and financial infrastructure. The Zimbabwean socio-economic climate (2019-2020) and the COVID-19 restrictions were additional obstacles to the farmers' adaptation. The barriers weakened their asset combinations making it difficult for both irrigated and rainfed farmers to engage in meaningful production and attain income. These developments did indeed make rural households in Zaka susceptible to high-level poverty incidences. The study recommends measures to improve the adaptive capacity of rural farmers. These include improving social protection and safety net interventions, fixed price controls, increasing small-scale farmers' access to microfinance, increased innovations on CSA technologies, intelligent design, and implementation of IWRM and IPMS.

Keywords: *Asset portfolios, Climate change, Adaptation, Farmers, Masvingo, Zimbabwe*

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LIST OF ABBREVIATIONS

AEZ	Agro Ecological Zones
CBA	Community Based Adaptation
CSA	Conservation Smart Agriculture
FAO	Food and Agricultural Organisation
FLTRP	Fast Land Track Reform Programme
GEF	Global Environment Fund
ICRISTAT	International Crop Institute for Semi- Arid Tropics
IMC	Irrigation Management Committees
MSD	Meteorological Services Department
RTGS	Real Time Gross Settlement
SADC	Southern African Development Community
SDC	Swiss Development Cooperation
SLAF	Sustainable Livelihoods Analytical Framework
UDI	Unilateral Declaration of Independence
UNDP	United Nations Development Programme
ZERO	Zimbabwe Environmental Regional Organisation
ZINWA	Zimbabwe National Water Authority
ZNCP	Zimbabwe National Climate Policy
ZNSA	Zimbabwe National Statistics Agency
ZELA	Zimbabwe Environmental Law of Association
ZMSD	Zimbabwe Meteorological Services Department

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CHAPTER ONE

FRAMES OF REFERENCE

'*The most important thing is to not stop questioning .*
Curiosity has its own reasoning for existing'-
Albert Einstein.
(1879-1955)

1.1. Introduction

Climate change introduces preeminent challenges and risks to the future of humanity (Haden et al., 2012; Shikuku et al., 2017; Jamshidi et al., 2018). As Varela-Ortega et al. (2016) and Jamshidi et al. (2018) examined, climate change affects all sub-sectors of the economy. One of the affected and most vulnerable sectors of the economy to climate change is agriculture (Menike and Arachchi, 2016). Many sub-Saharan African countries are rainfed dependent, providing livelihoods and incomes for the rural populations (Lindoso et al., 2012). The impacts of climate change which include, higher temperatures, the drying up of soils, increased pest and disease pressures, increased droughts, and occasional flood episodes, have combined to erode the abilities and asset portfolios of rural households, making it difficult for them to engage in any meaningful agriculture and food production practices (Besada and Sewankambo, 2009; De Trincheria et al., 2016). The common notion is that rural populations have low adaptive capacity to climate change because of inadequate resources. The lack of assets has reduced the competence of households to combat drought impacts and acquire food surplus (Jiri and Mafongoya, 2018).

In Zimbabwe, approximately a 1.5million people are food insecure due to low crop yields, high livestock death, prolonged droughts, and inadequate access to resources that would equip the poor households in being disaster prepared (Clark, 2015; Africa News, 2016). Additionally, rural households have low adaptive capacity to climate change due to socio-economic challenges that include high food prices, poor water accessibility, poor market accessibility, inadequate water infrastructure, ecosystem degradation, and low education that are difficult to overcome (Hassan and Nhemachena, 2008; Nhemachena et al., 2014; World

Food Programme, 2019). Food and Agriculture Organisation (FAO, 2016) suggests that one of the challenges rural households face in building adaptive capacity to climate change is the lack of access to livelihood resources. Studies show that rural households, specifically subsistence farmers, lack sufficient access to resources that include agricultural extensions, access to credit services, and water infrastructure, and are thus highly vulnerable to food insecurity, extreme poverty, and livelihood collapse (Hertel and Rosch, 2010; Akinnagbe and Irohibe, 2014; FAO, 2016).

1.2. Thematic Considerations

Subsistence farmers from rural districts in Masvingo province, particularly Zaka District, continue to experience the negative impacts of drought and water scarcity (Frischen et al., 2020; Zimbabwe Humanitarian Appeal Revision, 2020). The combination of climate change-induced weather events has increasingly made it difficult for rural households to engage in meaningful agricultural productivity. It is because agricultural activities in Zaka District are highly dependent on rainfed agriculture. In the face of increased climate change, increased crop failure, and livestock death, the development has exposed several rural households in Zaka District to high levels of extreme poverty, food insecurity, and low nutrition (Zimbabwe Humanitarian Appeal Revision, 2020:7).

Furthermore, the development is affecting their ability to generate incomes for the procurement of different services. The services include agricultural extension services, education, and health. The situation is making rural households of Zaka District susceptible to high-level poverty incidences. Despite this situation, the people of Zaka District are not passive actors but are actively looking for ways of how to adapt to the impacts of climate change-induced weather events (Brazier, 2017). However, because of the frequency of drought episodes and water scarcity, their ability to build their adaptive capacity and resilience is highly compromised (Abdul-Razak and Kruse, 2017). Given this, the study is particularly interested in investigating how small-scale farmers who are vulnerable to extreme weather conditions in the form of increased water scarcity and frequent drought episodes are acclimating to these challenges by deploying different asset portfolios to obtain their livelihoods. The study aimed to understand the assets that increase adaptation to water scarcity and frequent drought episodes in the Zaka district. Asset adaptation and farming livelihoods are poorly understood in the Zimbabwean context. There is very little detailed

substantive information regarding the past drought and flood impacts, local perceptions of droughts and floods, anticipated climate change, and related impacts and viable adaptation options for drought flood-prone areas in Zimbabwe (Brazier, 2017). Furthermore, there are very few qualitative studies that speak about the perspectives of adaptation from a community and institutional standpoint. Numerous adaptation investigations done in the Zaka district studied household vulnerability indexes, farmer-led agricultural innovations, and the production and policy challenges with drought-resistant seeds. These investigations employed quantitative scientific observations and experimentation. Some studies only focused on the adaptation barriers from a farmers' perspective. Thus, this study intended to address asset adaptation and small-scale livelihoods using qualitative methodology. The study proposed to comprehend adaptation from the farmers' and institutions' perspectives. It is also why the study is interested in understanding what institutional frameworks and policies exist within Masvingo province to instigate adaptive capacity and resilience for these communities. Exploring this provides a picture of how the small-scale farmers and Zimbabwe Super Seeds of Zaka district use assets to build adaptive capacity against drought and water scarcity episodes. The scenarios presented provide a picture of the areas that need improvement in Zimbabwe's adaptation policy. At this point of the research, the construction of asset portfolios needs to be examined and considered with the institutional, economic, social factors that influence the adaptation of societies (Gallopin, 2006:294; Jalayer et al., 2015).

1.3. Main research question

In view of the above observations, 1.3 presents the broad research question that the study is going to answer at the end. The main research question is:

I. How do water scarcity and drought episodes affect the livelihood outcomes for small-scale farmers in Zaka District in Masvingo province?

1.3.1. Subsequent Questions

The subsequent questions presented below aim to support and help answer the main research question. The subsequent questions are:

I. What livelihood assets are accessible for small-scale farmers in adapting and sustaining their livelihood outcomes against water scarcity and drought?

II. What other constraints do small-scale farmers face in adapting to water scarcity and drought?
III. What institutional systems, structures, and processes are in place in which the small-scale farmers' adaptive capacity and resilience in Zaka District can be pursued?
IV. What are the implications of the findings of this study in the broader context, particularly in Southern Africa?

1.4. Research Aim and Objectives

The study aimed in identifying assets or their combination which, play a cardinal role in building adaptive capacity and resilience of rural farming communities in Zaka in terms of securing sustainable livelihoods in the face of increased environmental change.

In view of this research aim, the objectives of the study were to:

I. Identify the impacts of climate-induced hazards on small-scale farmers' household livelihoods portfolio.
II. Establish ways and means through which small-scale rural farmers adapt and build their resilience against water scarcity and climate extremes.
III. Identify the barriers that affect small-scale farmers in building adaptive capacity against climate change and water scarcity.
IV. Identify the institutional and policy framework through which adaptive capacity and resilience of poor rural people can be promoted with interpretation measures for small-scale rural farmers.

1.5. Theoretical Perspectives and Literature Review

In this section, the theoretical perspectives and the literature review were combined to briefly explain the theory of assets and their significance in adaptation in community livelihoods literature. The study links the theory of assets to Zimbabwe’s case studies to form the literature review. The following paragraphs explain assets and their relationship with adaptation in community livelihoods.

According to Prowse (2008:1), 'the assets available to the poor may determine their ability to adapt to climate change.' How communities adapt to climate change is now at the forefront of climate change policy. However, the measures to mitigate the impacts of climate weather-induced events have been belated and inadequate. The governments in developing countries are demanding a greater focus and funding for asset adaptation (Prowse, 2008).

In Zimbabwe, development practitioners construct adaptation projects to enhance the asset portfolio of rural households. During the past decade, some schemes have been successful. Although, some were short-lived, and only a few communities benefited (Brazier, 2017). Several systems lacked adequate finance to provide the communities with significant assets that guaranteed long-term sustainability. Some projects suffered from the lack of a reliable asset adaptation sustainability strategy where top-down procedures were not cost-effective due to corruption and mismanagement of funds (Brazier, 2017: 109).

There are important lessons to be considered. Kureya (n.d) argues that there is a need to consider a broad spectrum of assets available to households that reflect high vulnerability indices. As Prowse (2008) highlighted, the level of resources in a household determines the household's ability to adapt. Therefore, any adaptation programs implemented by the government have to consider the needs of the rural family homes, including those with diminished capital assets and the community's perspectives of the hazards they face. Furthermore, the government needs to consider the availability of funds to allow the continuance of the projects. Constructive actions are required to design more flexible asset adaptation systems that foster strong disaster risk management and solid indigenous practices.

When local development practitioners implement effective asset adaptation practices, households have resources that are accessible and stable, and it often indicates that their livelihood strategies are functional and operative during times of vulnerability. The level of access to resources demonstrates which household is likely to remain vulnerable and likely to be adaptive (Moser et al., 2010; Hallegatte et al., 2014). The effectiveness of asset adaptation systems in rural households to climate-induced hazards shows their capacity to function as self-supporting units.

Several local development practitioners use the Sustainable livelihoods Analytical Framework (SLAF) to diagnose the level of vulnerability a community is susceptible to and

their level of asset capacity. The limitation to the framework is that the build-up of asset portfolios differs in each livelihood (Chambers and Conway, 1991). The asset portfolios are also dependent on the environment surrounding the livelihood. Studies on asset adaptation to climate change in Zimbabwe suggest that each community has different levels of vulnerability and resilience (Brazier, 2017). Each situation is different (Chambers and Conway, 1991). For instance, vulnerability experiences and adaptation measures in Zaka district may not be the same for livelihoods in Chiredzi district in Zimbabwe. They may be distinctive depending on the different disasters in distinct regions. It is difficult to generalise that the internal vulnerabilities observed, and coping strategies adopted by livelihoods that face floods will apply to livelihoods that suffer from drought. It is simply not possible due to the different regions that each livelihood is situated, and the different disasters embedded in the regions. Adaptive capacity differs across rural households. It is dependent on the type of stresses and risks experienced and the type of assets available (Prowse, 2008). Several researchers applied the SLAF framework to livelihoods in different environments to outline what communities view as assets, vulnerabilities, capabilities, and outcomes to build adaptive capacity. We need to understand the meanings and purpose that resources do for communities' livelihood as it outlines the actions required in building adaptive capacity to internal and external shocks (Morse and McNamara, 2013). It is even recommended in the literature that an analysis of asset portfolios used by different households in different contexts is a good starting point for scaling up early adaptation schemes against future climate changes (Mphande, 2016).

Developing countries in Africa pay attention to the impacts of climate change and the effectiveness of asset adaptation frameworks in sustainable development. Although, their story of having successful adaptation systems is pulled back by lack of funding, climate change, corruption, lack of technology, and poor infrastructure (Ngcamu and Chari, 2020). Poorer nations have neither the wealth nor strategic capacity to impose their preference on climate change negotiations and sustainable development (Besada and Sewankambo, 2009). For instance, climate-induced hazards on agricultural productivity are a national concern in Zimbabwe. It is worrisome because of the low success rate of resilient adaptation systems in rural areas. Two-thirds of rural livelihoods in Zimbabwe come from agriculture (Rukuni et al., 2006), and the people are directly involved in the generation of seed and livestock production for income (Maiyaki, 2010:4060). Some livelihoods evolve from integrating people into out-grower schemes, acquiring a small plot of land and farming crops, and rearing

livestock for household use. The national government is concerned about the severe livelihood collapses from rural communities dependent on agriculture. There is already evidence of extreme poverty and hunger present in drought areas of the country (Chingono, 2021). What is more frightening is the introduction and impacts of COVID-19 on rural households. The national government fears that with limited funding and technological infrastructure, rural family homes may not have the sufficient technical and resource capacity to bounce back from the effects (Brazier, 2017).

Drought and water scarcity intensify existing risks (Brown et al., 2012). Risks include soaring and volatile food prices, livestock and plant pests and disease, resource-based competition, internal conflict, and civil insecurity (FAO, 2016). These are the common risks in rural livelihoods. African countries fail to address these risks at national, provincial, state, district, and local levels because their policies do not specifically address how to avoid and address them. There is a lack of a detailed national climate change-adaptation framework that addresses risks outlined by FAO (2016) into the policy (Brazier, 2017).

In Zimbabwe, there are national climate change frameworks that address risks, and livelihood vulnerabilities (Ministry of Environment Water and Climate, 2017). However, the drawback is the limited public funding and corruption to implement the adaptation initiatives on the ground, and thus the policies act as incompetent documents. The literature review argues that we need more research on adaptation to climate hazards in rural areas. Such studies should include a detailed assessment of current household vulnerabilities, coping strategies, future climate-related risks, and adaptation strategies.

1.6. Methodology

The methodology applied in the study was purely qualitative. The study adopted qualitative research techniques to explore and describe how Zaka small-scale farmers in Masvingo use their asset portfolios to defend their livelihoods against drought and water scarcity extremes. The qualitative methods included focus group discussions, interviews, key informant interviews, and participant observations. The researcher focused on small-scale farmers from wards 1-3 and 15 in the Zaka district, explicitly focusing on dryland and irrigation farmers. The researcher adopted stratified sampling to acquire the study population of sixty participants.

Wards 1-3 and 15 are in the Zaka district. The areas are known as drought-prone areas in Masvingo province. The wards categorically fall in the IV and V agro-ecological zones comprised of erratic rainfall and high temperatures. Zimbabwe Super Seeds scheme is a governmental company that assists small-scale farmers in Masvingo. The company aims to aid small-scale farmers who face extreme poverty and hunger. Communities in these areas struggle to access the market to earn a decent income for their crop production.

Small-scale farmers from wards 1-3 specialised in rainfed agriculture, and farmers from wards 15 specialised in irrigated agriculture. Both practice subsistence agriculture and are dedicated to cash crop farming. Zimbabwe Super Seeds (ZSS) is a governmental institution that manages the wards. The researcher worked with ZSS in the sites to obtain the participants. The researcher collected data on farmers' daily experiences with drought and water scarcity episodes and how they used their current resources to manage the stresses and risks they faced. The study used focus groups and interviews to collect data from small-scale farmers about their resources, access conditions, challenges in their farming and household routines, and livelihood strategies.

For both techniques, the study used open-ended questions. Interviews with key informants from the institution were also adopted to acquire data regarding the scheme's origins, the current institutional systems in place, institutional challenges, and their action and adaptation plans on climate change, food, and livelihood security. The data was assembled, recorded on the computer, and kept secure with a password. The evidence was only accessible to the researcher. The researcher used an audio recorder and camera to catch the interviews, participant observations, and focus groups. The study made use of secondary information. The information included reviewed policies, reports, visuals, and peer-reviewed material, and both primary and secondary sources were analysed using qualitative content analysis. The process involved applying a deductive approach. The study developed codes and grouped them into themes. The study matched the emerging themes to the SLAF theoretical framework.

The qualitative content analysis involved:

I. Investigating relationships between themes, specifically between assets, shocks, livelihood strategies, and livelihood outcomes in the theoretical framework.

II. How different asset combinations shape up adaptation in livelihood strategies, using the case study of the small-scale farmers in the Zimbabwe Super Seeds scheme in the Zaka district.

1.7. Scope of the study and Limitations

The study only focused on four areas, which were:

I. The impacts of climate change and its effect on Zaka farmers' livelihoods.
II. The resources farmers used to manage the risks and the access conditions in acquiring them.
III. The additional barriers the farmers faced in adapting to climate change.
IV. The systems and structures in place that encourage livelihood adaptation for small-scale farmers.

The study selected the Zaka district because it is an area that was receptive to frequent drought and water scarcity episodes. The study chose the Zimbabwe Super Seeds company because it is an institution that sets up the rural farmers' systems and structures in the Zaka district. Interviewing members of the ZSS company provided data on the current institutional frameworks and policies in Masvingo province.

It is important to note that the study was only limited to wards 1-3 and 15. It focused on the maize farmers that specialised in irrigation and rainfed agriculture. The study focused on the rainfed and irrigated farmers because it provided a vulnerability analysis on which farmers were more sensitive and adaptive to climate change. The other wards under Zimbabwe Super Seeds scheme in Zaka District were not investigated and left out for future research.

In the climate change literature, researchers focus on either adaptation or resilience. In some cases, researchers investigate both, but here we only examined adaptation. The study was explicitly looking at the farmers' agricultural activities and livelihoods and evaluating whether they were sustainable for the sake of income security. Secondly, climate change is a phenomenon described differently by various communities. Therefore, investigating Zaka farmers' interpretations of it was imperative.

It is essential to state that the results cannot be applied to generalize Zimbabwe or any other country, as each community is distinctive and will differ in effects experienced, culture, strategies used, and values. The findings are essential as they present the subtleties and truths regarding adaptation to drought and water scarcity, including shedding light on the institutional policies and reforms implemented. With the sample size and the COVID-19 restrictions, it is not safe to suggest that the report was complete and exhaustive in-depth. Regardless, the researcher made every effort to present the emerging findings. However, with changes taking place, the information presented in chapter five may no longer be applicable.

The researcher incurred challenges visiting the irrigation farmers from ward 15. It was a challenge because of the national fuel shortages in February and April 2020 and the COVID-19 global pandemic lockdown. Only individuals classified under essential services could obtain letters from the government to travel during the lockdown. The researcher had to resort to interviewing the participants over the phone.

In the first phase of the fieldwork process between January and February 2020, several participants did not make it to the meetings due to family priorities and transport costs. The researcher collected information from the participants who volunteered for the focus group and interview sessions. The researcher performed telephonic interviews for the participants that did not make it.

Another limitation the researcher encountered was gaining trust from the participants. The researcher explained that the meetings were only for research purposes with no monetary gains involved. In the first phase of the fieldwork, some people attended the focus group meetings thinking they would have their problems solved that day. Some of the participants assumed the researcher was a donor or sponsor. The participants asked the researcher how she would help them after conducting the study. The researcher carefully described the scope of the research to the participants and carefully explained her role as the researcher. She also elucidated how much their contribution was of great value to the study.

1.8. Ethical Considerations

In social science research, ethical matters, including informed consent, collecting data from participants, dealing with confidentiality and anonymity, had to be consigned. Before conducting the study, the researcher issued out participant information sheets and consent forms to the participants during the first phase of the research. The study only began when the participants had given their formal and informal consent.

The researcher kept audio recordings and visuals on her laptop using a secure password, both during and after the research. The details of the participants were kept confidential. In presenting the data in chapter five, the researcher used codes to represent the participants for the sake of anonymity. There were only two individuals that could access raw data, the researcher, and the principal supervisor. Data collection only commenced once the researcher received an ethical clearance number (H19/05/15)(see appendix 1) granted by the Human Research Ethics Committee Non-Medical of the University of Witwatersrand in 2019.

1.9. Structure of the thesis

This section briefly presents an overview of each chapter presented in the document**. Chapter One** has provided background information on climate change and its impact on rural livelihoods from a general and national perspective. This chapter has set the entire study by establishing the problem with climate change on rural livelihoods in the Zaka district, Masvingo. The chapter also provided the research questions along with the research aim and objectives. **Chapter Two** conferred the image of the area. The chapter characterised Zimbabwe's history, Zaka's climate, and socio-economic profile and the current adaptation measures and ZNCP policy for rural livelihoods. **Chapter Three** described the theoretical issues and considerations. The chapter described the major issues of sustainable livelihoods, climate change, and adaptation from a global, regional, and national perspective. It described the sustainable livelihoods analytical framework, which the study used for analysing the data for the study. **Chapter Four** presented the methodological issues and considerations. It presented a detailed description of Zaka District, as well as the research design and data instruments. It also presents the methodology reflections**. Chapter Five** described the empirical evidence. It presented the findings in order of the research questions, with brief

discussions. **Chapter six** presented the analysis and discussion of the findings, and lastly, **Chapter Seven** presented the conclusion, recommendations and areas of future research.

CHAPTER TWO

PHYSICAL AND SOCIO-ECONOMIC PROFILE OF ZAKA DISTRICT

'The sun never knew
how great it was until it struck the side of the building'-

Louis Kahn

(1901-1974).

2.1. Introduction

This chapter aims to provide a general introduction to the climatic and socio-economic characteristics of the Zaka district. However, there are certain aspects of Zimbabwe that we need to highlight that explain the properties of the Zaka district. It is essential because the Zaka district's environmental and socio-economic attributes are exclusive because of Zimbabwe. This chapter provides the readers with the background information to the empirical evidence presented in chapter five.

Now that we have established the purpose of having a physical and socio-economic profile of Zaka district for the study. These sections shall describe the following:

I. Section 2.2.1 briefly describes Zimbabwe's country profile. The section provides very brief information on its history, geographical location in Southern Africa, and population data.
II. Section 2.2.2 discusses Zimbabwe climate profile. There is a detailed description of Zimbabwe's rainfall and temperature characteristics. The section also discusses Zaka district as a drought-prone areas in Zimbabwe. Discussions of food insecurity and climatic impacts on rural livelihoods in Zaka district is presented.
III. Section 2.2.3 provides a detailed account of Zimbabwe's unique socio-economic features. The section discusses Zimbabwe's Fast Track Land Reform Program, the hyperinflation trends, and the Real Time Gross Settlements (RTGS) currency, price

volatility, and primary goods scarcity. This aspect is of significance to Zaka district because it provides a picture of the economic struggles Zaka farmers face in their farming livelihoods.

IV. Section 2.2.4 discusses the Zimbabwe National Climate Policy document as it is one of the policies that describe the governance and implementation of adaptation measures in Zimbabwe.

2.2. Zimbabwe : Climate and Socio-economic Profile

This section starts by providing a detailed climate and socio-economic description of Zimbabwe. These sections are vital in the study because Zimbabwe is a unique country. We must understand its climate and socio-economic profile because the attributes are uncommon in other countries.

2.2.1. Zimbabwe : Country Profile

Zimbabwe is a landlocked country located in Southern Africa with a total area of 390 760km². The country borders Mozambique in the east, Zambia in the north, Botswana, and Namibia in the west, and South Africa in the south. Zimbabwe has four major relief regions.

These four are recognised based on their elevation:

I. The Lowveld (< 600m above mean sea level)
II. The Middle veld (600- 1200m)
III. The Highveld (1 200 – 2000m)
IV. The Eastern Highlands (2000 – 2400m), the highest point in the country.

Mount Nyangani lies at 2592 m along the eastern border of Mozambique. The agricultural area is approximately 16.2 million ha, of which 4.1 million ha is cultivated, and 12.1 million ha are permanent pastures. The total population is approximately 14.6 million, of which 60% is rural. The average population density is 37inhabitants/km². Around 80% of the population resides in areas where rainfall is scarce. Figure 2.1 presents the map of Zimbabwe and its location in Southern Africa.



Figure 2. 1 Map of Zimbabwe

Source: Ingham, Sanger and Bradely (2020).

The country became independent from British rule on the 18th of April 1980. There are two major cities in Zimbabwe: Harare, the capital city, followed by Bulawayo, the second largest.

2.2.2. Zimbabwe : Climate Profile

Zimbabwe is in the sub-tropics. Zimbabwe's rainy season lasts for about four months between October and March. The country has a dry spell that lasts for about six months (Brazier, 2017:20). The cold, dry season relatively lasts for about three months, from May to July (Brazier, 2017).

I. Rainfall Patterns

Zimbabwe has one of the most erratic rainfall patterns in terms of its distribution across time and space. Dry spells and droughts are part of the normal cycle. According to Mushore (2013), Brazier (2017), and Zimbabwe Meteorological Services Department (ZMSD) (2019), Zimbabwe has experienced wide fluctuations in average seasonal rainfall over the last century. The current average rainfall to date is gradually declining. There are wide variations in the rainfall distribution within the country (see Figure 2.2. and Figure 2.3). The higher altitude districts along the central watershed and the eastern highlands generally experience high amounts of rain (above 1000mm per season) than the low-lying veldts and in the west

(350-450mm per season) (Brazier, 2017; Kassie et al., 2017). The western parts of the country receive the first rains. The southern and south-eastern tend to experience drizzle or light rain brought by cool, moist south air. Zaka district is located in the south-eastern region of Zimbabwe whereby the areas receive rainfall that is less than 450mm.

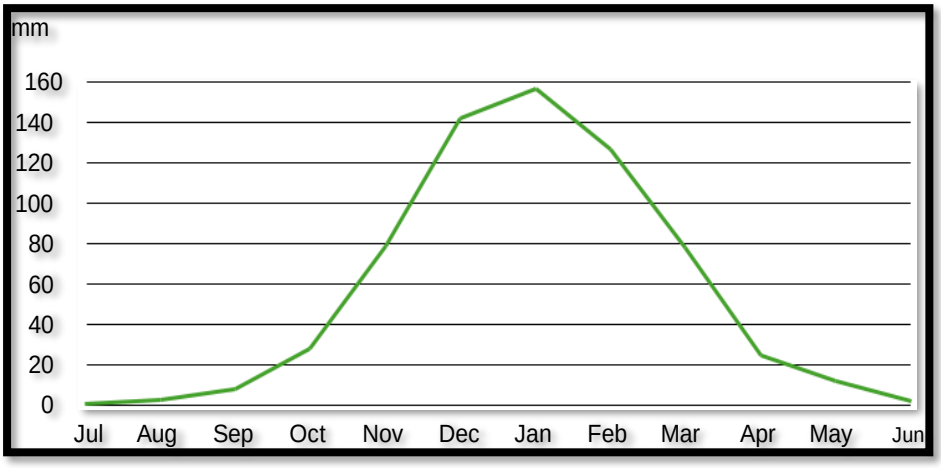


Figure 2. 2 Zimbabwe Average Monthly Rainfall Distribution

Source: Adopted from Brazier (2017) and ZMSD(2019).

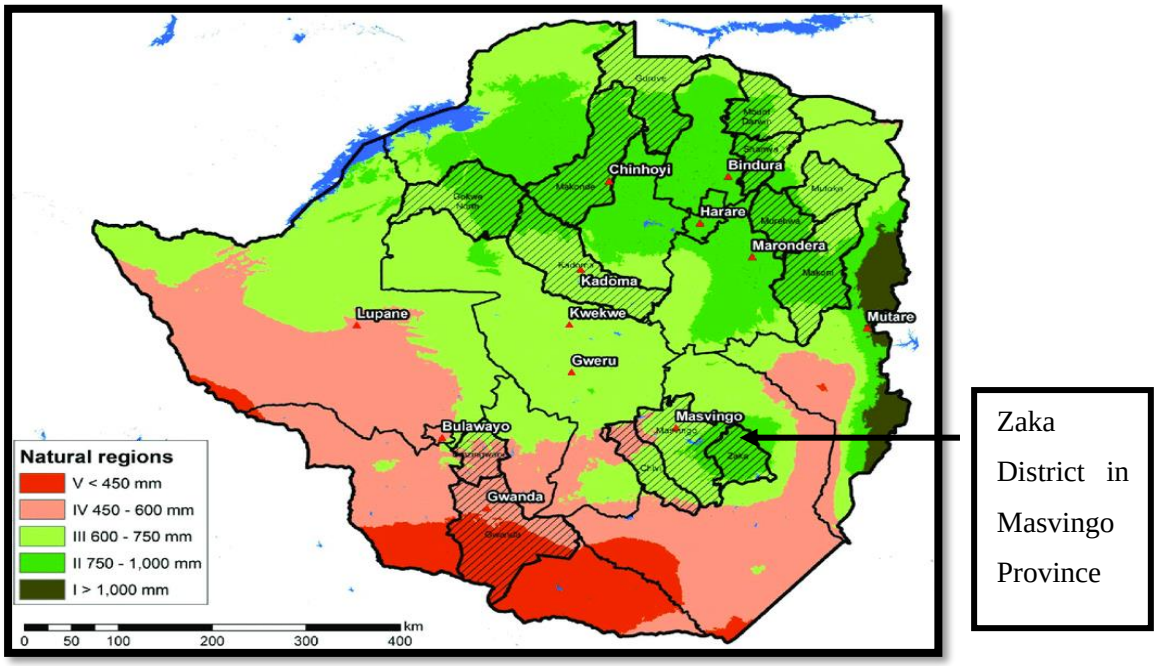


Figure 2. 3Rainfall variations across Zimbabwe's agro-ecological regions

Source: Kassie et al. (2017).

Figure 2.3 shows the different rainfall variations across Zimbabwe. The south-eastern and south-western parts of the country are considered areas that receive rainfall less than 450mm, with the north-eastern and north-western parts of the country having the highest amount of precipitation with an average of 750mm and more. The study's focus is centered on Zaka district, in the south-eastern part of Zimbabwe (see Figure 2.3). This area is known for experiencing recurrent episodes of water scarcity and drought. It is either the areas have too much or too little rainfall. Thus, the study found it necessary to investigate how such livelihoods in Zaka district are coping with these adverse rainfall variations.

II. Temperature

Temperatures differ in Zimbabwe. It is mainly due to the differences in altitude. The central watershed and eastern highlands experience lower temperatures than low-lying areas in the west and south. The lowest minimum temperatures in the eastern highlands and the hottest in the low-lying areas of the west and extreme south. Zaka district is located in the extreme south side of Zimbabwe (see Figure 2.4). This region has a daily temperature range that is low before sunrise and temperature increases by more than 10°C by mid-afternoon. Current studies show that farmers in Zaka district perceive climate change by pointing out the number of hot days they have had in the decade compared to the cold days. This temperature increase is prevalent in the October- December dry season with the highest recorded at 40°C. The 'five hottest years on record have occurred since 1987' (Moyo and Nangombe, 2015; Brazier, 2017:64). With high-temperature changes, there are high chances of crop failures and pest proliferation in Zaka district. These changes could foster severe negative impacts on communities' income stability and food security.

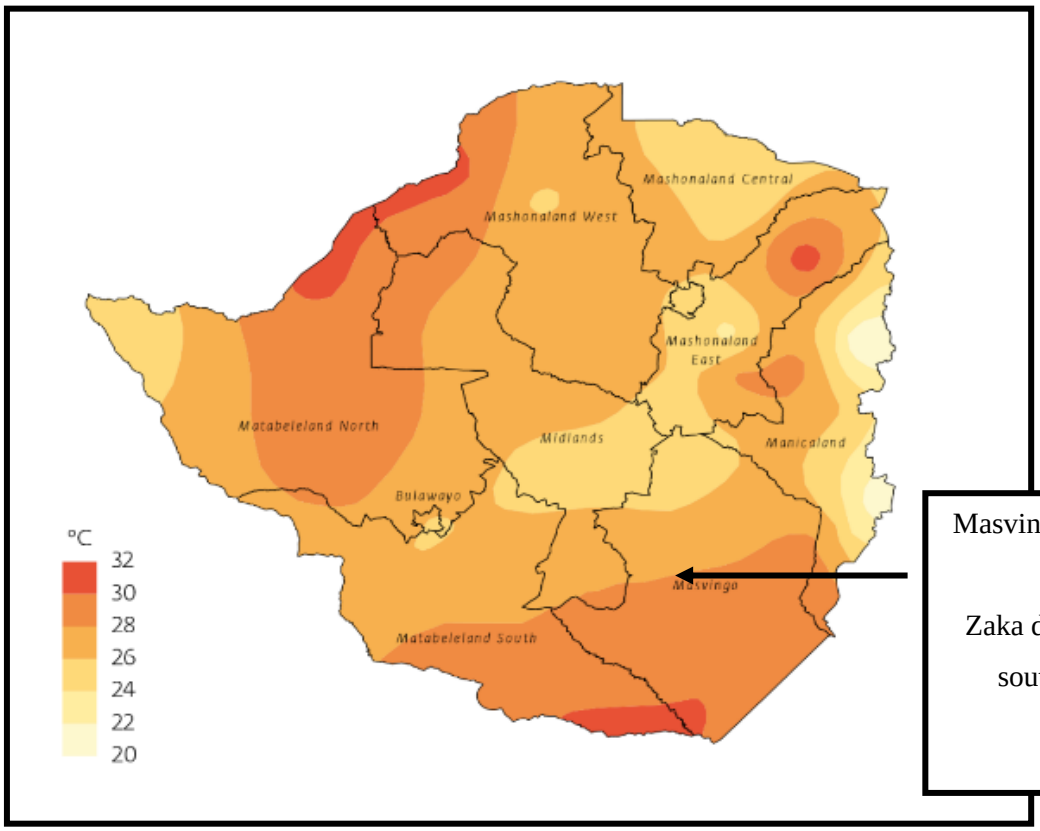


Figure 2. 4 Zimbabwe Average Minimum Temperatures Map 1980/81 to 2009/10

Source: Adopted from Zimbabwe Meteorological Services Department cited in Brazier (2017:28).

Masvingo province is where Zaka district is located. The province has temperature characteristics that range from 28°C to 32°C. This temperature range is considered a drought-prone area in Zimbabwe, where there is a high possibility of rural household vulnerability.

III . Drought Prone Areas in Zimbabwe

Figure 2.5 displays the drought areas of Zimbabwe. Extreme temperatures can cause heatwaves, especially during the hot season and they generally last for three years (Brazier, 2017 :28). Zaka district is one of the areas that experiences at least three droughts every five years, and the rate of their recurrence still increases because of climate change(Brazier, 2017).

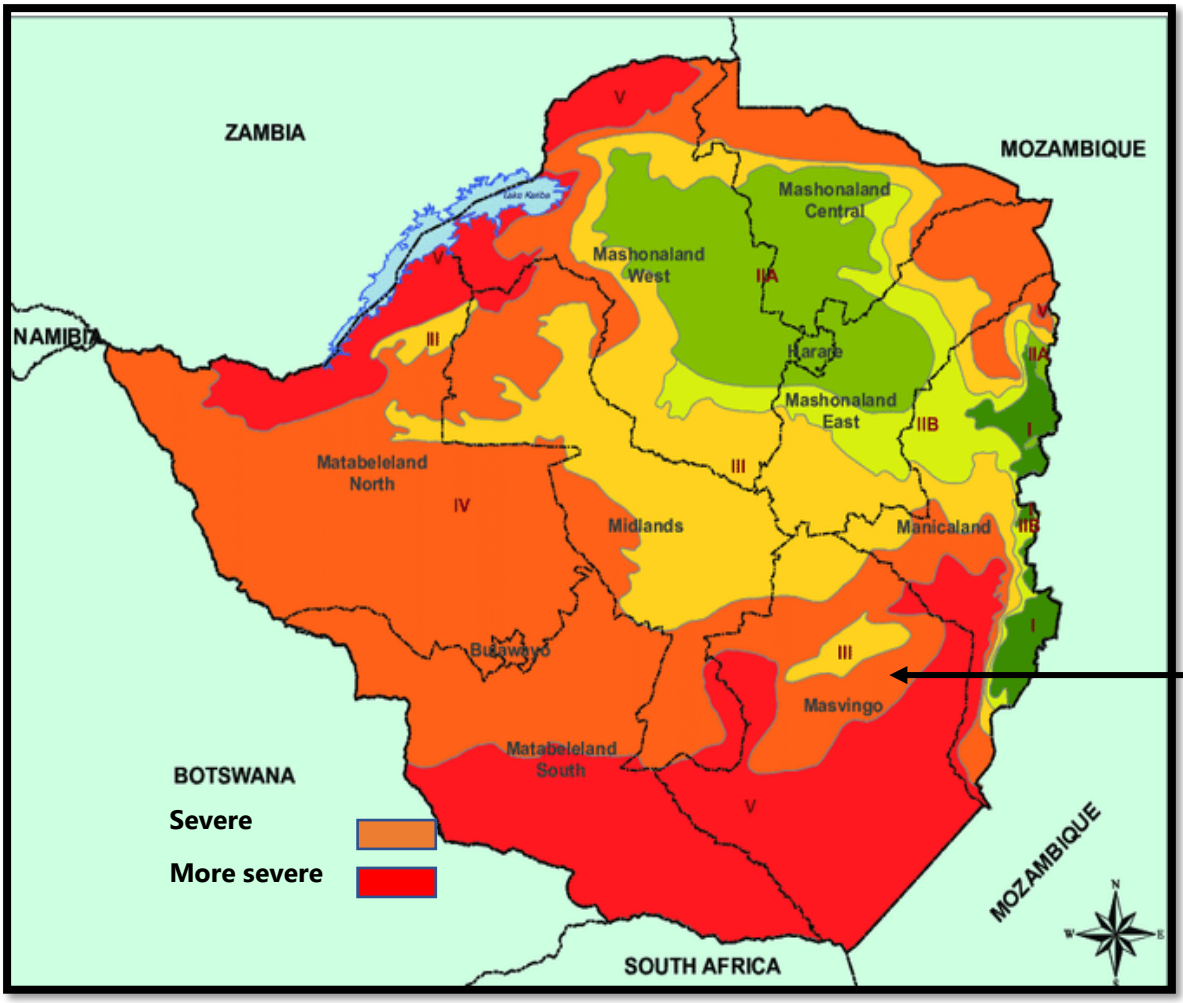


Figure 2. 5 Drought Prone Areas in Zimbabwe

Source: Adopted from Kirubel (2018).

2.2.2.1. Impacts of Climate Change on Zaka District

I. Climatic Impacts

Rural communities in the Zaka district form livelihoods in areas where climate change impacts are the strongest. The foreseen and proposed increase in rainfall variability in the Zaka district makes it greatly difficult for communities that depend on rainfall, surface, and groundwater resources- particularly those involved with agriculture to plan their activities

(Davis and Hirji, 2014). Zaka rural communities already suffer from economic hardship and diseases and find it hard to cope and recover from climatic-induced hazards. The majority of the rural communities depend on natural resources that are currently suffering from overexploitation and degradation. The increase in water and land use is driven by the economic demand from industries and agriculture. Zaka district is an environment with widespread poverty, malnutrition, and health problems (Chanza and Gundu-Jakarasi, 2020). The communities do not have the means to develop early preparedness measures and practice risk reduction procedures to counter climate change effects.

Mugabe et al. (2011) and IPCC (2015) (as cited in Brazier, 2017:63) all suggest that by 2050 there will be:

I. Reduced annual rainfall between 5% and 18% with the highest reduction seen in the south and west of Zimbabwe.
II. Delayed onset and early ending of the rainy season.
III. More frequent and long mid-season dry spells.
IV. Reduced groundwater recharge.
V. Erratic rainfall distribution across the country.
VI. More droughts and floods that may recur in successive years.
VII. A temperature increase of 3°C-6°C by the end of the century.

How are rural family homes in Zaka district expected to survive these negative conditions outlined by Mugabe et al. (2011) and IPCC (2015)?

Mutekwa (2009) and Manyeruke et al. (2013) suggest that rural communities in the agriculture sector in Zimbabwe will continue to exploit the natural resources to cater to food production. The two-decade drastic food production decline created the high demand (Mutekwa, 2009). The 2015/2016 droughts brought about low crop yields and pest outbreaks that caused a drop in food supply for the region (Mutekwa, 2009; Dinesh et al., 2015). The exploitation of water and land resources will continue to increase to make up for crop failures and production declines because of future changes in precipitation patterns (Nelson, Lamboli, and Arendse, 2008:8). Brazier (2017) suggests that there will be a further increase in the loss of plants, animals, and other species. Soils become degraded as vegetation loss and erosion increase due to the changing rainfall patterns, droughts, floods, and wildfires. As climate change increases food insecurity and disturbs agricultural livelihoods, people will scout for

resources in protected forests, wetlands, and parks to defend their livelihood outcomes. The situation will gradually intensify the social conflict amongst communities.

Davis and Hirji (2014) and Brazier (2017) produced a report predicting that the decreased precipitation will cause a decrease in water quantity in catchments. Both authors (Davis and Hirji, 2014:27; Brazier 2017:68) suggest that the most significant decline will be in Runde and Mzingwane catchments and Siya, Manjirenji, and Nyatare dams, where average rainfall could decrease between 12% and 16% by 2050. The authors also point out that climate change will also reduce the recharge rates of wetlands and rivers. The climate change threat on water resources in Masvingo will have severe implications on Zaka rural farmers. There will be less water prepared for irrigated and dryland agriculture, putting livelihoods at the risk of poor sanitation, income instability, and food insecurity.

Chigwada (2005:103) claims there is already a 30-40% decrease in water yield per dam. The World Bank report suggests that there is likely to be a 38% decline in national per capita water availability by 2050 (Davis and Hirji, 2014:33) due to high evapotranspiration. The poor communities in the Zaka district could face severe water shortages. The report further adds that the water shortages might cause an uprise in social conflict and water-borne disease proliferation (Chigwada, 2005; Davis and Hirji, 2014). The predictions suggest an urgent need for strategic governance on water resources to meet water security objectives, including transparency, accountability, accuracy in recording catchment data, and trust amongst the affected water stakeholders.

II. Zaka Agriculture

Zaka district falls within zones IV and V. These areas are characterised by low rainfall, with low-lying areas known as the low veld. Some drastic climatic changes have occurred in zones IV and V, becoming drier than usual (Mugandani et al., 2012). The small-scale farmers are marginalised and live in remote areas with low and highly variable rainfall, high temperatures, and poor soil fertility. The communities live genuinely far away from tarred roads and the main service centres (Tekere and Hurungo, 2003; Juana and Mabugu, 2005). Communities in Zaka district rely on basic aging infrastructure and suffer from a backlog of bad harvests (Mutekwa, 2009:241; Brazier, 2017).

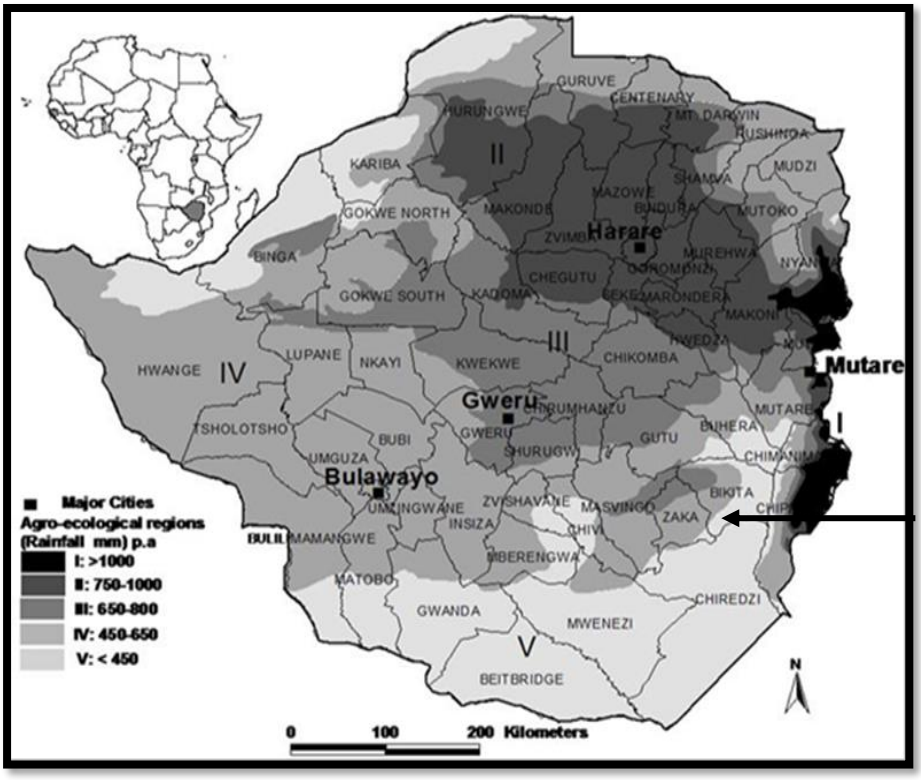


Figure 2. 6 Agro-ecological Zones (AEZ) of Zimbabwe

Source: Musiyiwa et al. (2014).

Table 2. 1 Current characteristics of the agro-ecological zones in Zimbabwe

A.E.R	Area Covered	Physiographic Region	Agricultural Production	Rainfall Variation
I	7000km²/ 2%	Eastern Highlands	Specialised and Diversified Farming	<1000mm
II	58600km²/15%	Northern Highlands and South Eastern Middleveldt	Intensive Farming	750-1000mm
III	72900km²/19%	Kalahari Sandeveldt Sanyati Sengwa Basin , South Eastern	Semi Intensive Farming	500-750mm

		Middleveldt		
IV	**147800km²/38%**	**Northern Eastern Middleveldt and South Eastern Middleveldt**	**Semi Extensive Farming**	**450-650mm**
V	**104400km²/27%**	**Zambezi Valley South Eastern Lowveldt Sanyati Sengwa Basin**	**Extensive Farming**	**<450mm**

Source: Adapted from Chidzoki et al.(2013).

This information shows that Zimbabwe's climatic conditions are transitioning towards arid conditions that are inapt for agriculture. Climate change poses threats to Zaka's food security, employment stability that plays a crucial role in the economy. During the 2011/12 phase, Zimbabwe had to rely on imports over 50% of its maize requirements (FAO 2019:2) because areas like Zaka, Masvingo, and Bikita failed to meet the food security requirements because of the erratic rain seasons. It is expected that the maize growing areas will shift and cause a decline in yields.

Maize is a staple crop of Zimbabwe. It is the crop that will be severely affected by climate change. Studies show that climate change has already forced communities in the Zaka district to spend heavily on pesticides, herbicides, and veterinary drugs. Maize and sorghum are sensitive to heat, particularly temperatures above 30°C (Brazier, 2017; Manyeruke et al., 2013). The rainy season delays last for four to six weeks. Farmers would have to consistently change the planting and harvesting dates, the length of the growing season, and the types of crops and livestock to avoid production failure (Brazier, 2017). The IPCC projects yield losses of between 18% and 30% for maize in the southern region by 2050 (CDKN, 2014:20 as cited in Brazier, 2017) and that the areas suitable for growing maize such as the Zaka district will shrink in size by 2080 (Brazier, 2017:73). Zimbabwe's southern and western regions will have difficulties farming maize (Brown et al., 2012).

One of the most critical forces of climate change in Zimbabwe is the outbreak of pests and diseases on crops and livestock. Two recent studies in Zimbabwe suggest that the Monochamus Leuconotus -white stem borer- the coffee pest, will continue to expand amongst coffee crops because of the 50% reduction in rainfall (Kutywayo et al., 2013, as cited by Brazier, 2017:74). The other pests are the Smut disease and Fall armyworm (Spodoptera frugiperda) (FAO, 2021), which are well-known to barrage sugarcane, sorghum, maize, and other grains. These kinds of pest threats are likely to expand during periods of hot seasons. In the 2016/17 seasons, the fall armyworms eroded approximately 130000 ha of maize(Brazier, 2017:74). This pest caused crop losses of more than 70% (Brazier, 2017:74). Dinesh et al. (2015) and IPCC (2019) suggest that if there are no effective pest management strategies to cater to the uprise, increased climate change in Zaka will bring in a series of events that include an increase in new pest invasions, an increase in pest outbreaks, an increase in pesticide residues in food, and a change in the prevalence of crop pests.

III. Zaka Rural Communities

Climate change will test the levels of resilience in Zaka rural communities. Women, children, the elderly, and the disabled will feel the social effects. In the Zimbabwe climate change literature about vulnerable groups, there is more emphasis on women and children. Women have caregiving responsibilities to fulfill. The tasks include providing food, storing water, cooking, and taking care of the children (Namubiru-Mwaura, 2014). The effects of climate change will imply that the women in Zaka will have to work harder, as they will have to walk long distances to collect water, find firewood, create additional adversity in food production (Babugura, 2010; UNDP, 2017). Several men leave their farms for better employment opportunities, leaving the household problems on the women (Potts, 2010; Brazier, 2017). The children and the elderly are also highly vulnerable to the harsh effects of climate change. In some cases, it is well-known that the children run to the growth points in Zaka district and Masvingo city center for food and money, leaving the elderly behind to take care of themselves (Brazier, 2017).

IV. Food Security in Zaka District.

According to the UNDP (2017:1) report on human development, the Global Hunger Index shows that Zimbabwe's food insecurity has a high score of 28.8 (zero represents 'no hunger,'

and 100 is the worst form). Food insecurity in Zaka district is due to a lack of investment in the agricultural sector (Tawodzera et al., 2012).

According to the IFPRI (2020), 'food security means that all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life.' Some scholars (Sibhatu and Qaim, 2017) suggest that Zaka's rural family homes do not have the physical, economic, and social access to adequate nutritious food to maintain their well-being. Zaka's key cash crops are millet, maize, sorghum, and wheat, with maize yielding 89% of the production (UNDP, 2017:3). However, maize is responsive to temperature and precipitation changes. Its progress is seriously affected by the increased droughts and other climate-related risks. Current maize production lines and consumer consumption trends reflect that Zimbabwe is transitioning towards food insecurity because of the gradual production decline (Cohen and Garett, 2010; UNDP, 2017; Sibhatu and Qaim, 2017). Thus, the national government has resorted to importing maize from other Southern African countries such as South Africa and Botswana and relying on food aid to provide one-third of the total maize production (Mudzingiri and Chidoka, 2014) as immediate alternatives.

Price volatility is another factor that curbs food security in the Zaka district. Zaka's food prices are highly volatile, with a 30-40% increase in a season (UNDP, 2017:2). Price volatility in the Zaka district implies that certain foods are unaffordable. It affects the household's nutrition and health. Informal market sites have become well-known areas where the rural poor obtain food, and most of their goods are packaged into small reasonable portions.

2.2.3. Socio-economic profile of Zimbabwe

Section 2.2.3 describes Zimbabwe's socio-economic features. This section is essential to the study as it provides context to the findings presented in chapter five. Zimbabwe's socio-economic attributes are one of the main driving forces behind income discontinuity in Zaka rural livelihoods. Examining the economy provides insight into the financial complications that rural farmers experience in Zaka District. The Fast Track Land Reform Program is the root cause of Zimbabwe's economic problems today. It is the very heart that determined the success and failure of agricultural productivity since 2000 and the formulation of economic

policies. This section presents the background to the current economic challenges rural farmers face today.

I. Fast Track Land Reform Program 2000-2002

Zimbabwe was once known as the 'breadbasket of Southern Africa' (FAO, 2016). However, in the early 2000s, there had been a decline in yields and the global production of key crops (Munangagwa, 2009:113). Agriculture and mining are the main cornerstones of the Zimbabwean economy. In 2000, agriculture used to contribute 18% of the country's GDP, but it declined due to the political 'Fast Track Land Reform Program' (FTLRP) (Nyawo, 2014), the recurrence of droughts, high prevalence of HIV/AIDS, and high unemployment (Maiyaki, 2010; Mkodzongi and Lawrence, 2019). The economy's performance dropped by 50% from 1997 to 2008 (Munangagwa, 2009:116; OECD, 2009).

The FTLRP was the fast acquisition of white-owned farmland without compensation to the European settlers to be disseminated to the black Zimbabwean people in the rural areas. It began on the 31st of July 2000 and ended in March 2002 (Thomas, 2003). In between those years, 4874 farms covering 9.23million hectares were listed for acquisition (Thomas, 2003:701; Zikhali, 2008). The FTLRP was devised to increase the productivity of Zimbabwe's black rural farmers. The program was seen as an opportunity to reclaim unclaimed land that had been seized from indigenous peoples. When Zimbabwe was a British colony, white farmers were allowed to possess land after the FTLRP, but not numerous or large properties (Thomas, 2003). Self-financing plans for agricultural inputs like seeds and fertilisers were implemented by the government, but such measures were impeded by escalating international sanctions (Mkodzongi and Lawrence, 2019). The country's international credit lines were terminated, resulting in serious foreign exchange issues (Thomas, 2003). Due to the piling of sanctions and the internal economic crisis, large-scale commercial farming was interrupted, while small-scale agriculture was hampered by relative support (Thomas, 2003).

Some scholars believed that FTLRP was a stimulus to make more money for former President Robert Mugabe's regime (Thomas, 2003; Zikhali, 2010). Critics of the FTLRP, donors, foreign agencies, foreign media, opposition (Movement for Democratic Change) contended that the program was to financially uplift Mugabe's regime (Thomas, 2003;

Zikhali, 2010). Millions of farmland were traded on the private market. The government bought eight estates and they were managed by Agriculture and Rural Development Authority (Thomas, 2003). The farms were distributed and leased to wealthy members of the regime. However, in 1999, Msika, the former prime minister who was coordinating the program argued in his interview that the program did not exclude the government and its officials from the buying of farmland (Thomas, 2003; Mlambo, 2005). But these circumstances exposed Zimbabweans to severe sanctions, and to make matters worse, Zimbabwe was already in international debt to the British partners, who are the IMF, the United States of America, the commonwealth countries, and the European Union (being led by the United Kingdom) and thus looked towards the East empires for foreign aid. Zimbabwe's economy continued to worsen from spiralling inflation and economic stagnation. The country was excluded from international financial markets and foreign direct investments.

Food shortages were on the rise. The program had replaced experienced farmers with less experienced ones who only knew subsistence production. Capacity constraints faced by public extension agencies made it difficult to cater to the growing demand (Mkodzongi and Lawrence, 2019). Bread, cereal crops, mealie meals were scarce. The drought and sanctions had led to poor harvests that could only provide 45% of the Zimbabwean people's dietary needs (Relief web, 2021). The economic crisis in 2007/2008 had even forced some farmers and bakers to close down or downsize their operations (Relief web, 2021). Food was scarce in the retailers. There were long queues of consumers buying bread. Basic commodities were sold on the parallel market at a premium, and the exchange rate in 2008 was currently sitting at Z$500,000 to US$1 on the parallel market (Relief web, 2021). It was a food crisis and availability crisis. The national government resorted to maize imports from Malawi, South Africa, Botswana, and Mozambique to lower the food scarcity and chronic hunger levels that were increasing in the rural and urban areas.

II. Introduction of Multicurrency Regime and Adoption of Macro-economic policies.

In 2009, the country introduced a multicurrency regime and macro-economic stabilisation of policies (Kramarenko et al., 2010) to settle the 2007/2008 crisis. To some degree, this increased the country's GDP. The Government of National Unity fostered it in February 2009

(Kramarenko et al., 2010; Kayenze, Chitambara, and Tyson, 2017). Despite the increase in agricultural production, 33.5% of the population remained undernourished in 2015 (FAO, 2016: 3). Relatively, 72% of the population lived below the national poverty lines in 2011 (FAO, 2016:4) due to the FTLRP program. Most of the population resides in areas where climate change impacts are severe. However, to yield economic stability, the national government introduced the United States dollar (USD) currency in 2015 as the trading currency, and it steadied the economy (Hwayerera, 2016). The currency had kept most rural families afloat from chronic poverty and hunger as the money provided them with financial mobility to invest in farm inputs and travel to other Southern African countries to buy goods for their families and sell in Zimbabwe.

Nonetheless, that chapter came to an end in 2016, when the Reserve Bank of Zimbabwe announced the introduction of bond notes to approach the USD cash deficits in the economy. Cash shortages in Zimbabwe emerged because of the tight liquidity and externalisation of the US dollar (Hwayerera, 2016:2; Southall, 2018). This forced government to release stringent measures that included capping cash withdrawals, restrictions on offshore investments, and suspension of unrestricted funds to curb the illicit money market flows (Hwayerera, 2016:2; Gudhlanga and Madongoda, 2019; Zikhali, 2020).

III. Introduction of Real Time Gross Settlement (RTGS) as Zimbabwe's local currency.

On the 20th of February 2019, the Reserve Bank of Zimbabwe introduced the Zimbabwe Real Time Gross Settlement (RTGS) currency, comprised of bond notes and bond coins (Zimbabwe Ministry of Finance and Economic Development, 2020). The government announced that the new currency's rate against other international currencies would be floated on the Interbank Foreign Exchange Market and introduced that same day. The Interbank Foreign Exchange Market had been unstable. It had resulted in an increase in commodity prices and a slow transaction of money between banks (Southall, 2018; Gudhlanga and Madongoda, 2019). This development had negatively affected all the sectors in the economy, specifically the agricultural sector. Zimbabweans were required to pay for the goods using bond notes and electronic currency, but the money had no value outside the country. Importing goods and services proved to be a difficult challenge.

The sectors and the people had to use the USD from their previous earnings to buy the goods, and acquiring the USD meant catching the currency at a high premium in the domestic market (Southall, 2018:391). Several rural households in the Zaka district suffered from purchasing goods from the market because of the high price volatility and scarce commodities (Zikhali, 2020). There was difficulty with the Zimbabwean people receiving their income in cash due to cash shortages within financial institutions. The Zimbabwean people could not withdraw all their income, as the banks reduced the daily limit withdrawal per person- of which for the rural labourers, the daily limit was inadequate to meet most of their livelihood needs.

As we have seen here, Zaka's economic attributes are unique. Such attributes are rare in the livelihoods debate, and we find them here in Zimbabwe's context. In line with these arduous economic developments, we question the coping capacity of rural farmers in the Zaka district. Is this type of climate an additional barrier to their coping capacity against climate change? Or, in this context, is climate change an aggravating factor in the economic circumstances that Zaka rural farmers already face in Zimbabwe? It is one of the ideas for why this study was needed. How are Zaka rural farmers of Zimbabwe coping with climate change and the effects of the socio-economic climate? It is what the study wanted to investigate. Understanding this story would add value to the way we interpret the vulnerability-adaptation complexities in sustainable livelihoods.

2.2.4. Zimbabwe National Climate Policy (ZNCP)

The next section discusses the Zimbabwe National Climate Policy (ZNCP) document that guides the nature of adaptation measures in Zimbabwe. Understanding the ZNCP policy tells us about the country's goals in dealing with climate change. The policy explains how institutions and communities work together in increasing adaptation against climate change. This policy are essential as it provides answers to the fourth objective of the study. It describes the current measures government and non-government institutions abide by when working with rural communities in the agriculture sector in combatting climate induced hazards. There are other policies which include the National Determined Contribution (NDC) Policy, and National Adaptation Plan (NAP). However, for this study, we focus on the ZNCP

policy as it touches on adaptation matters for small-scale farmers in agriculture and for the institutions governing them.

The Ministry of Environment, Water and Climate, the Ministry of Energy and Power Development with the influence of the Office of the President and Cabinet, developed the National Climate Change Response Strategy (NCCRS) to facilitate national response measures in addressing the effects of climate change. Its purpose is to 'mainstream climate change adaptation and mitigation strategies in economic and social development at national and sectoral levels through multi-stakeholder engagement' (Ministry of Environment, Water and Climate, 2017:5; Brazier, 2017). The document has specific strategies for the agricultural sector.

ZNCP is one of the policies that institutions and local governments use to develop practices to combat climate change for vulnerable communities. It was formed in 2014. It has been updated and revised in 2021. The policy provides potential practices and interventions on climate adaptation that non-governmental and governmental institutions adopt in governing agricultural schemes. The Zimbabwean government is aware that climate change is a threat to its people, especially the vulnerable populations in remote areas and that its effects can undermine developments made in pursuing the various sustainable development goals. It also emphasises the need for a policy framework under which the strategy and subsequent divisions will operate.

Furthermore ,the Ministry of Environment, Water and Climate (2017) state in the Zimbabwe National Climate Policy calls for:

I. The climate proofing of other policies and socio-economic infrastructure.
II. Strengthening of climate change governance.
III. Increased education and awareness improved early warning and climate services.
IV. Research to inform planning and future policy orientation as well as the robust climate finance sustainable framework.

The policy lays a basis for increased coordination and participation of all stakeholders in response to the climate challenge. The purpose of the policy is to guide the management of climate change in the country. The main idea is to enhance national adaptation capacity,

scale-up mitigation action, facilitate domestication of climate-related global, and ensure compliance to the global mechanisms (Ministry of Environment, Water and Climate 2017:4).

I. ZNCP for the Agricultural Sector

For us to understand the climate adaptation initiatives implemented in Zaka district, it is crucial to understand the background to the policy initiatives guiding the agricultural sector in reducing their vulnerability to climate change and variability. Remember, one of the study's main objectives is to identify the systems and structures in place that support adaptation for rural farmers. The ZNCP presented here addresses this objective, and we are going to investigate which systems are present in the context of the rural farmers in the Zaka district. The ZNCP stipulates the systems and structures that would aid the agricultural sector in adapting to climate change.

According to the Ministry of Environment, Water and Climate (2017), the government shall:

I. Periodically review and update the agro-ecological region map of Zimbabwe in line with the changing climate.
II. Conduct assessments on possible climate-related shifts in the viability of farming systems, including positive effects such as carbon fertilisation.
III. Ensure that relevant sectoral master plans integrate climate change.
IV. Promote irrigation and water use efficiency in agriculture, including adequate assessment of irrigation potential and irrigation demand under climate change.
V. Encourage the use of efficient irrigation technologies, including precision irrigation and setting appropriate water prices.
VI. Promote sustainable land-use systems in line with principles of climate-smart agriculture.
VII. Strengthen capacity to generate new forms of knowledge, technologies and agricultural support services emerging development challenges arising from increased climate change and variability.
VIII. Strengthen relevant early warning systems on cropping season quality, rangeland condition, droughts, floods, diseases/pest outbreaks and wildlife movement to enhance farmer preparedness.
IX. Strengthen the capacity and identify and promote adoption of improved seed and crop varieties that tolerate climate-related stresses.

X. Undertake comprehensive analyses to understand barriers to adaptation to climate change, including human, institutional, and financial barriers.
XI. Ensure that mitigation and adaptation measures enhance agriculture-based livelihoods by promoting food security and poverty alleviation.

Many of the adaptation measures applied in Zimbabwe are not specially related to climate change but are fundamentally sustainable methods that improve the management of resources and rural communities. The measures are in line with the Sustainable Development Goals, Africa's Agenda 2063, The SADC Industrialisation strategy, and many objectives of ZIMAsset- which is the blueprint for sustainable economic development (Ministry of Environment, Water and Climate Change, (2017). Adaptation in Zimbabwe can occur at many levels, whether it be individuals, households, communities, civil society, the local and national departments, and the private sector. Studies in Zimbabwean adaptation to climate change conclude that every community has its different levels of vulnerability and resilience and that each situation should be treated differently.

In managing and mitigating the climate change impacts, the government and supporting institutions have implemented adaptation strategies that speak to enhance social, physical, human, and natural assets.

According to the Ministry of Environment, Water and Climate (2017), the adaptation strategies are namely:

I. Indigenous Knowledge Systems and Community Based Adaptation.
II. Expanding Irrigation.
III. Implementation of Smallholder schemes.
IV. Climate-smart agriculture.

Each of these strategies is effective in enhancing adaptation for small-scale farmers. However, each measure has its challenges in practice.

II. Indigenous Knowledge Systems and Community Based Adaptation

According to Davis and Hirji (2014), social and human capital are assets that rural communities in Zimbabwe use to cope with climate change. The rural people use indigenous

knowledge systems. The local people have the wealth and knowledge to cope with the environmental changes because of the social institutions they are actively engaged in (Brazier 2017). Community-based adaptation (CBA) is a form of enhancing human capital within Zimbabwean rural communities. Using this method implies having the government agencies and NGOs train rural communities about climate change in Zimbabwe. Rural communities are trained on soil and water management practices, to encourage good productivity (Davis and Hirji, 2014; Brazier, 2017). The community is trained on hazard predictions and recovery and proactive strategies to ensure resilience.

For the past decade, Zimbabwe conducted several adaptation programs. There have been some cases of success. However, there were some drawbacks. Brown et al. (2012) suggest that the duration of the projects was short-lived, not sustainable and that only a few communities gained financial assistance. Brown et al. (2012) further added that some of the projects lacked an effective sustainability plan, whereby the top-down or the technologies applied were not cost-effective.

III. Expanding Irrigation

Water from rivers and dams and rainfall are precious natural resources for small-scale farmers in Zimbabwe. Although, rainfall is unreliable. The government resorted to expanding irrigation to lessen the risks of crop failure and income discontinuity for small-scale farmers. Expanding irrigation would ensure farmers would have a constant water supply in periods where rainfall is scarce, particularly for rainfed farmers.

Rainfed crop production is not reliable in Zimbabwe, yet it is what most subsistence farmers practice. Most small-scale farmers acquire good yield in only three out of five years, particularly in semi-arid areas (Nyamudeza, 1998). Zimbabwe has a small, medium, and large dams, although most have low water dam levels from the intense effects of drought, and some are not used effectively for irrigation (Malanco et al., 2018). The other options used to extend irrigation are wells and boreholes and sand abstractions from dry riverbeds (Woodhouse et al., 2017).

Expanding on irrigation ensures that the crops have water during periods of extreme dry spells, and it promotes a series of outcomes that are beneficial to the farmers' well-being. The outcomes are increased crop yields-which nourish their income security. Farmers can then

use their money to improve their living standards. Farmers can sell their cash crops at the market during the dry season and use the money to pay for food, education, health, and farm inputs. Although, this system is only sustainable when there is effective management of resources. Zimbabwe does not have a good track record on the management of catchments as there is loss of water abstraction data, poor recordings, lack of transparency and accountability regarding water licensing and abstraction from stakeholders. There is a need to manage catchment areas properly. It includes proper monitoring of water abstraction from dams and rivers, constructive management, and efficient water-conserving techniques (Nyoni, 2013; Woodhouse et al., 2017).

Despite the benefits Zimbabwe has received from irrigation, Moyo et al. (2015) observed some barriers affecting productivity in irrigation. These include undependable and insufficient water delivery because of weak water management, power cuts, remote markets, low water availability, scarce inputs, old and degraded irrigation infrastructure, indigent land tenure policies that do not promote a favourable environment for effective irrigation schemes (Jacobs, 2009; Moyo et al., 2015). These productivity barriers in irrigation still exist in some forms, and it was within the study's interest to investigate if these particular barriers were present with the small-scale farmers in the Zaka district.

IV. Implementation of Smallholder Schemes

To improve food security and unemployment in regions, the government developed smallholder schemes. The three types are farmer-managed, government-managed, and jointly managed (FAO, 2016). The Department of Agricultural Technical and Extension Services (AGRITEX) runs the bulk of the schemes. The government creates and controls farmer-managed programs and adds Irrigation Management Committees (IMCs) and Farmers Associations to manage the farmers' water and resource usage interests (FAO, 2016). For jointly managed schemes, the farmers and the government equally share the financial responsibility for the operation and maintenance. The government is generally responsible for the headworks, while farmers take accountability for the infield infrastructure.

Concerning scheme numbers, 50% of the smallholder schemes are farmer-managed, 32% are government-managed, and 18% are jointly managed (FAO, 2019). However, in terms of area coverage, the government still manages a larger hectarage, as farmer-managed schemes tend to be relatively small. Meeting the costs of potential irrigation technology is still a problem.

The private sector irrigation companies were traditionally involved with the commercial sub-sector, and as such, they have limited education on the planning, design, construction, and provision of services to the smallholders (FAO, 2006). Unfortunately, the company branches are limited to major city centres, which are not close enough to communal areas to deliver backup services to smallholders (FAO, 2019). Irrigation technologies include surface irrigation, which comprises 68% of the schemes, and sprinkler irrigation, which makes up 32% of the programs (FAO, 2000). Regardless, the figures represent a reasonable adoption rate of water-saving technologies. However, there have been numerous irrigation breakdowns such as broken pipes, leaking valves, improper installation, and aged pipelines. Some agricultural schemes failed to continue due to limited public funding to repair the damages and farmers' reluctance to pay maintenance costs. The study wanted to know whether these problems existed with the irrigation farmers in the Zaka district and how they sustain their agricultural productivity.

V. Strengthening adaptation in rural livelihoods

For rural communities to be adaptive, they need to have the capacity to function as self-supporting units (Brooks et al., 2005; Conant, 2009). Zimbabwean rural communities used to have tight social networks with a strong sense of cooperation. Traditional leadership and indigenous knowledge are favoured and highly respected, and the rules that govern human behaviour and the protection of natural resources are strictly followed (Brazier, 2017:133). However, over the years, the social systems have gradually diminished. Other groups within the community had focused on pursuing their own needs and wants. As a result, it led to high levels of overexploitation and degradation of joint resources.

More strategic adaptation plans are needed to aid areas prone to high poverty, malnutrition, poor sanitation, and social safety nets. The aim is to create more diversified livelihoods that foster climate resilience and build on indigenous practices and new scientific approaches (Ministry of Environment, Water and Climate, 2017).

VI. Climate Smart Agriculture

Climate-smart agriculture is designed to enhance natural capital, particularly with land and soil because, agriculture constitutes the majority of land use activity in Zimbabwe (Poulton et al., 2002; Mutami, 2015). Agricultural institutions have been encouraged to train and promote climate-smart agriculture to small-scale farmers. The techniques include intercropping,

conservation agriculture, crop rotation, integrated crop-livestock management, improved grazing, and better water governance (World Bank, 2012; Venema and Armstrong, 2015). The techniques act as coping strategies for farmers to increase crop production and sustain natural capital. Additionally, the adaptation strategy covers some forms of human and financial capital, using innovative practices that include better weather forecasting, early warning systems, and risk insurance. The benefits of these practices yield more stable crop yields, increased system resilience, reduced production risk, and overall enhancement of farmers' well-being.

Although, the adoption of CSA has been negligible (World Bank, 2012). Some farmers who adopted CSA techniques had greater crop yields and better income levels than the non-adopters (Turnbull and Turville,2012; Davis and Hirji, 2014). However, those who adopted tended to be younger, had more knowledge, and had a better combination of assets, including livestock and land. Turnbull and Turvill (2012) recommended that development practitioners educate the farmers on the CSA techniques to improve the adoption rates.

2.3. Conclusion

It was imperative to understand Zaka district's climate and socio-economic attributes because we recognise the potential implications that the characteristics have on rural livelihoods. This section has provided insight as to why this case study requires investigation. Climate change affects Zaka district and every other district in the world. However, each area is different in how they deal with climate change. There are specific characteristics that each state has that are uncommon in other states. Zaka's climate and socio-economic attributes are indeed extraordinary, and it is what makes the study special. Exploring climate change and its impacts on Zaka rural livelihoods will give us interesting, knowledge-worthy insights on the vulnerability and adaptation complexities from a different angle.

CHAPTER THREE

THEORETICAL PERSPECTIVES AND CONSIDERATIONS

'*To know that we know what we know, and to know that we do not know we do not know, that is true knowledge' –*
Nicolaus Copernicus
(1473-1543).

3.1. Introduction

The purpose of presenting the theoretical perspectives and considerations chapter is to get a critical recap of what other scientific researchers have investigated on the topic. It highlights the specific arguments and ideas of the subject. Presenting the theoretical perspectives and considerations demonstrates what is known or studied on climate change and sustainable livelihoods from a global, regional, and national perspective. The main reason for writing this chapter is to identify the flaws and gaps in knowledge. It is where we present the originality of this research. We used this section to demonstrate the importance of researching this topic. Why is this study needed? What do we know, and what is it that we do not know? This chapter answers these questions.

The section commenced by discussing the concepts and constructs that apply to the study. Concepts and constructs are essential because it helps the readers understand the technical language. There is a technical language that scientific researchers use to describe the investigation surrounding the climate change-livelihood-adaptation phenomenon.

This chapter discusses the phenomenon by engaging with the historical background regarding the birth of sustainable livelihoods in the 1990s and how the evolution and foundation of the sustainable livelihoods framework became the forefront analytic tool in addressing rural vulnerability and adaptive capacity for governments and institutions in developing countries. The framework illustrated in Figure 3.1 addresses the internal and external relationships between assets, adaptation, and vulnerability, and the segment further highlights the significant arguments within the relationships that have not been explored or identified for

further investigation. The chapter discusses the impacts of climate change on farming livelihoods with the resources farmers have access to, resource accessibility conditions, and the barriers to their adaptive capacity from a global, regional, and national perspective.

3.2. Research Conceptualisation

It is essential to introduce concepts and constructs that apply to the study. They are the building blocks of the theories presented in section 3.3. The concept is a 'word that has different meanings depending on where it is applied, who is using it or creating it, and it can appear in the form of an object, process, event, or relationship' (Davis, 2014:8). Some of the concepts are described in section 3.3. Although, it is good to provide definitions of the study's concepts now in discussing the investigation.

The first concept is adaptation. **Adaptation** is 'the process through which societies increase their ability to cope with the uncertain future, which involves taking the appropriate action and making adjustments and changes to reduce the negative impacts of climate change' (Brazier, 2017:102). The second concept is **adaptive capacity**. The concept is similar to adaptation, but here we look at adaptive capacity 'as the ability of a community to adjust to climate change in both variability and extremes' (Brazier, 2017:236). The third concepts that need to be understood are assets and access**. Assets** are the 'resources (both intangible and tangible) that communities or individuals use to the best of their ability to improve on their current living conditions' (Chambers and Conway, 1991:7). **Access** is defined 'as the ability to derive benefits from the use of resources' (Ribot and Peluso, 2003:153). The fourth concept is **climate variability** which, is viewed 'as the non-permanent and shorter-term changes (that occur on a daily, seasonally, annually, inter-annually or over several years), including the fluctuations associated with El Niño (dry) or La Niña (wet) events' (Brazier, 2017:4). The fifth concept is **climate change**, which is termed 'as a long-term change in the Earth's climate caused by the release of greenhouse gases- notably carbon dioxide, methane that traps the heat in the atmosphere. The gases are released into the atmosphere through natural causes or human activities. Climate change brings about changes in temperature, rainfall, and wind patterns that can occur several decades or longer' (Brazier, 2017:2).

The sixth concept is **vulnerability**. Vulnerability is 'the degree to which a system, or part of it, may react adversely during the occurrence of a hazardous event' (Adger, 2006:270).

Vulnerability implies a measure of risk associated with the physical, social, and economic aspects and implications resulting from the system's ability to cope with the resulting event (Proag, 2014:369). According to Chambers (1995) and Phillip and Rayhan (2004), it has an external and internal side. The external side is the risks, shocks, and stresses that the community experiences. The internal side is the defenceless or the lack of means to cope without damaging loss. The loss is seen as economically impoverished or psychologically harmed (Phillip and Rayhan, 2004: 5). When we analyse vulnerability in this study, we identify the hazard, but we also assess the communities responsiveness in exploiting their resource opportunities and recovering from adverse effects. This thesis talks a lot about coping capacity, and the reason for that is because we look at the community's risk of the inadequate capability to mobilise resources to deal with the hazards and risks.

The seventh concept is **Poverty**. It is important to note that we are not conducting the study to investigate poverty, but it is a concept that is associated with the vulnerability that we cannot ignore. Poverty is either absolute or relative. Absolute refers to the subsistence below the minimum, usually below the human well-being standardised requirements (Phillip and Ryan, 2004). With relative poverty, we use income data as a quantitative measure (Phillip and Rayhan, 2004). Several scholars view it from an objective or subjective line, depending on the nature of their investigations. For this study, we mention it from an objective manner whereby we take Chambers (1995) normative judgements as to what makes poverty and what would be required to get communities out of that deprived state. The eighth concept is **food security.** Food security means 'that all people have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life' (International Food Policy Research Institute, 2020). The ninth concept is **water scarcity**. UN definition (2013:4) of water scarcity is understood 'as the lack of sufficient water in both quantity and quality to meet the demand due to physical shortage, failure of institutions to ensure regular water supply, and lack of adequate infrastructure. The study adopted constructs, and they consist of a combination of concepts that form the theoretical definition to share meaning to understand the study (Davis, 2014:109). They are indicators or variables. For this study, the focus is one construct- livelihoods. **Livelihoods** are the capabilities, assets (including both social and material resources) and activities required for a means of living' (Chambers and Conway, 1991:2; Carney, 1998:15) (see Figure 3.1). We pay particular attention to the variables specifically: the assets, shocks, access conditions, capabilities, and outcomes.

3.3. Theoretical Perspectives

We start with the theoretical perspectives because there is a theory of sustainable livelihoods that we need to address. A theory is explanations of a phenomenon. According to Bachrach (1989), we discuss theories in our research to understand the concepts and propositions that present a logical, systematic, and coherent explanation of the phenomenon interest within some assumptions and boundary conditions. Here we discuss the theory of sustainable livelihoods to explain why sustainable livelihoods are the way it is and the contrasting mindsets behind it.

3.3.1. Sustainable Livelihoods and Adaptation to Climate Change

In order to understand the concepts of assets, adaptation, and sustainable livelihoods, we must first understand the origins of sustainable livelihoods. The concepts of assets, vulnerability, livelihood strategies, livelihood outcomes and adaptation originated from the theory of sustainable livelihoods. A framework to highlight the position of these concepts in sustainable livelihoods was developed in the 1990s by the Institute of Development Studies in Sussex University (Hans-Georg Bohle, 2007). It was also redeveloped and redesigned by Chambers and Conway (1991), Chambers (1995), Moser (1998), Bebbington (1999), Ashley and Carney (1999), Dorward et al. (2001), and Farrington, Ramasut and Walker (2002). Policymakers and practitioners use the framework as an analytical tool in assessing the current assets, shocks, trends, and stresses that affected the rural population's daily activities in acquiring a sustainable livelihood. Using this framework helped practitioners understand the changing combination modes of livelihoods in a dynamic and historical context. The theory of sustainable livelihoods has been interpreted differently depending on the context, but there are standard descriptions and definitions from which scholars derive their interpretations when doing scientific research. The study adopts the livelihood definition by Scoones (1998:5), who defines it as a 'means of securing the necessities in life.' Once the individual has acquired the necessities, the livelihood in theoretical terms is considered sustainable. Chambers and Conway (1991) see sustainability as a 'sense of continuity' whereby a system can sustain itself in the future. It implies that the livelihood system is adaptive and resilient to economic and environmental pressures.

In simple terms, the forefathers of sustainable livelihoods claim that we can only assess how an individual is performing in securing the necessities of life by analysing the SLAF framework to their scenario.

Therefore, we use the framework to assess the current assets and stresses that affect Zaka farmers' livelihoods in securing their necessities for this investigation. We use the framework to interpret their ability to cope with climate extremes. From the frames of reference, we are aware that climate change here is the shock creating poverty incidences in sustainable livelihoods. Eradicating climate change impacts and poverty is still a difficult task to achieve. The Institute of Development Studies developed the framework that would serve as the base for governments and non-government institutions to create development projects – as a strategic intervention- that would aid in improving the poor people's quality of life (Farrington, Ramasut and Walker, 2002; Morse and McNamara, 2013). The projects are created based on the time and resources available.

It is the responsibility of governments to provide infrastructures such as roads, drainage pipelines, hospitals, and markets to improve rural livelihoods. They organise for borehole water, land, crop seeds, education, training materials, and financial loans to be delivered. The governments also work in partnership with foreign-based multinational companies and fund some development projects in rural areas and work with the local expertise to ensure efficiency (Ashley and Carney, 1999). The national government capitalises on the building and staffing of medical clinics and school centres (Carney, 1999). Depending on what form of approach governments take to build adaptive capacity, they implement initiatives that support the primary goal of economic development and poverty alleviation (Bennet, 2010; Morse and McNamara, 2013). In the case of Zimbabwe, the government developed the ZNCP policy, the Climate Proofed Presidential Inputs programme (Pfumvudza) that encompasses the Emergency Preparedness Plan 2021 (The Herald, 2021) to create opportunities for the poor, both male and female, to make them productive contributors to the economic progress of that country while adapting to climate change. The plans are spearheaded by the Civil Protection Unit (CPU). They work in partnership with foreign-based agencies such as CARITAS International, Swiss Development Cooperation, and United Nations to develop rural areas.

In improving adaptation, the focus is on the current components present in the sustainable livelihood analytical framework (Davies et al., 2013). According to Farrington, Ramasut and Walker (2002), the SLAF framework has the following:

I. Five Capital Assets
II. Institutions
III. Capabilities
IV. Strategies
V. Livelihood Outcomes

Sustainable livelihood practitioners focus on these concepts. Some focus on one concept, and some focus on all the concepts depending on the relationships they are investigating. Let us discuss the assets concepts as it is part of the primary investigation of this study.

I. Five Capital Assets

Chambers and Conway (1991) and Scoones (1998:5) suggests that for an individual or communities to have decent well-being, assets need to be present. Assets comprise of :

1. Financial Capital
2. Social Capital
3. Human Capital
4. Natural Capital
5. Physical Capital

Assets are simply resources that individuals use to the best of their ability to make their livelihoods sustainable.

> *Geiser et al. (2011:317) refined it as: 'the minimum standard of living which a society should set for the poorest groups of its people' [including] meeting the minimum requirements for personal consumption of food, shelter, and clothing; and access to essential services such as safe drinking water, sanitation, health, education and transport; and the satisfaction of needs of a more qualitative nature: a healthy, humane and satisfying*

environment, and popular participation in the making of decisions that affect the lives and livelihood of the people and individual freedoms.'

If all these resources are in place and are sufficient in quantity and quality, a livelihood at an individual or group level would have the capability to withstand the shocks and stresses that would make them vulnerable. A livelihood is adaptive when the communities have access to all the resources. Resources range from water, food, shelter, education, credit loans, health care, equipment, cash, and land. Having a sustainable livelihood is not just about merely having the means to survive the environmental pressures but having constant access to resources and having the ability to transform the resources and create activities that foster resilience and long-term productivity (Scoones, 1998). To simply put it, the lack of access to water for irrigating land, lack of schools and health facilities, lack of agrochemicals, and lack of participatory process in the decision making are aggravating factors that hinder peoples' abilities to secure a livelihood (Geiser et al., 2011). According to Ribot and Peluso (2003:153), access is the 'ability to derive benefits from resources.' Thus, a positive application of resources would give communities the chance to earn a decent living and enhance their future returns.

Communities have access to resources or poverty and vulnerability reducing factors. Chamber and Conway (1991), Ellis (2000), and Hans-Georg Bohle (2007) draw special attention to these resources and suggest that these resources gain their meaning and value over time through the main social and institutional, and organizational channels in the environment. Firstly, to implement adaptation strategies, the causes of vulnerability need to be identified in the framework below (Figure 3.1), and the causes are the current trends and shocks. Secondly, practitioners focus on fixed assets that can tackle those vulnerabilities. Other authors like Bebbington (1999), Adger and Winkels (2006), and Hans-Georg (2007:12) suggest that assets like natural, financial, and social capital are of critical importance as they serve as the foundation for building a livelihood. A livelihood cannot commence without having natural, social, human, physical, and financial resources because the authors believe that vulnerabilities are complex and multidimensional. We cannot resolve vulnerabilities with one asset. It requires various combinations.

Several rural livelihoods are practicing different livelihood strategies that foster diverse levels of livelihood security. Their ability to engage in income-generating activities is dependent on the quantity and quality of the assets they have available and the different asset combinations that the rural people can capitalise on (Carney, 1998; Dorward et al., 2001; Longley and Maxwell, 2003). Having different asset combinations fosters livelihood security. Livelihood security means the 'secure ownership of access to assets portfolios and income-generating activities' (Hans-George Bohle, 2007: 18). It means having asset reserves to counterbalance risks, ease shocks and meet contingencies (Hans-Georg Bohle, 2007). Different types of activities in a livelihood system require different combinations of assets. Without the combinations, it is difficult to foster new intervention strategies. When asset portfolios are varied, it enhances the other facets of the livelihood system -the capabilities, strategies, and outcomes, without undermining the resource base for future generations (Schafer, 2002).

Access to assets and the lack of them are the crucial center of vulnerability because they are vital to fostering actions and consequences that either produce risk or resilience (Brockleysby and Fischer, 2003; Prowse, 2008). For instance, a household may gain adaptive capacity in many ways through ownership of land, livestock, water resources, farmers markets, transport, water infrastructure, trees, rights to grazing or gathering through stable employment with adequate remuneration or through varied repertoire activities (Jones et al., 2010). If uncertainty and instability arise with assets, it could foster long-term discontinuity with livelihood outcomes and compromise livelihood security.

Social scientists have a consensus (Prowse and Scott, 2008; Serrat, 2017) that capability, assets, access, and sustainability are the standard base. The four concepts are closely linked. All four have a standard and descriptive side with both an end and a means. All these concepts are viewed and understood as a platform for development thinking. According to Montreux and Barnett (2017), the First-Generation theory method revolves around adaptive capacity concerning the five capital assets reflected in Figure 3.1. Its roots came from the sustainable livelihood assessments in the 1980s and 1990s and Sen's (1987) capabilities theory. The theory explains that the 'capacity to adapt is a function of assets, entitlements, capabilities and social opportunities' (Prowse and Scott, 2008; Mortreux and Barnett, 2017:2).

The theory uses the five capitals as the center for measuring adaptive capacity :

I. Access to natural capital means having the ability to use the earth's natural resources and services.
II. Physical capital means having access to the necessary infrastructural support and technological solutions to minimise the impacts.
III. Financial capital means having the money to pay for the adaptation measures.
IV. Social capital provides the social and network bonds that assist in adaptation.
V. Human capital is the physical and mental resources to adapt.

In the asset literature, there are some imbalances that can induce vulnerability and it stems from access conditions, quality, the number of resources, or 'aggressive elements' that erode resource effectiveness.

However, we understand the beauty of having asset portfolios and the significance of having different variations of them. Assets are the critical foundation that determines the way of living amid interlocking stressors. We wanted to examine the different asset variations Zaka farmers use to adapt to climate change for this investigation. Do the farmers possess all five capitals? Studies in the literature have shown that there the increase in climate induced hazards is on the rise and thus we need more forward thinking on asset adaptation that can provide help for climate vulnerable communities like Zaka district. Moreover, what asset combination is critical for Zaka district in mitigating the droughts? We need to develop innovative asset adaptation frameworks that are backed up by financial and political investments before it is too late.

Even though a considerable amount of literature is on resources as the core of adaptation, it is difficult to ignore other variables concerning sustainable livelihoods central to adaptive capacity. Sustainable livelihood practitioners argue that we cannot neglect the other concepts -institutions, capabilities, strategies, and outcomes- because they are concepts that function with assets. They play a critical part in the security status of the livelihood system as a whole.

II. Institutions

The notion is that the policy, institutional, and level of vulnerability influence community resources. Policies and institutions are essential human-made external factors that create various livelihood outcomes open to small-scale farmers. They play a role in their resource accessibility. They appear in five different forms (Farrington et al., 2002; FAO 2016):

1. Informal organisations- labour groups, savings groups.
2. Socio-cultural institutions- religious groups.
3. Political institutions- political parties.
4. Formal membership organisations-cooperatives and registered groups.
5. Economic Institutions –private companies, banks, or the tax system.

Institutions are either non-governmental or governmental organisations. They support communities in developing their adaptive capacity and determining resource governance rules, market practices, land tenure, and customs. Their boundaries influence the formation and development of communities. Institutional boundaries consist of enabling and disabling policies. Enabling policy makes it easier for communities to access the resources they require to improve their livelihoods. A disabling policy may marginalise the poor, making it difficult for them to acquire access to resources. Although, both forms of policies ensure effective governance and sustainability of resources.

Institutions stem from the theory of institutionalism, which appeared in the late nineteenth and early twentieth centuries (Veblen, 1934). Institutionalism aims to establish a stable environment of social agreements, norms, contracts, and motives of behaviour settled in the country (Veblen, 1934). It was a transformation theory in economic development by A. Berle and G. Means (Berle and Means, 1967). The overall idea of institutions was to have a physical body that increased the state's role in the economy to satisfy the interests of different social classes. Institutions are present to satisfy the interests of rural farmers and other resource stakeholders in agriculture. Institutions are the foundation governing the nature of community-resource interactions or, as Putsentilo et al. (2020) put it, 'dictate socio-ecological systems long-term functioning.' In other studies, institutions are the 'community lawyers' (Putsentilo et al., 2020). They are considered highly skilled specialists with superior bargaining power in mediating resources with other governmental bodies, large multinational corporations, international governmental and non-governmental economic and financial organisations that influence global, national transformations. They aim to reduce uncertainty by establishing stable relations between individuals, which creates a more favourable economic environment (Putsentilo et al., 2020).

Now that we understand institutions in agricultural development, we must understand their role in Zaka farmers' livelihoods. It is not safe to assume that rural communities in Masvingo are operating with common-pool resources on their own without government interference. The study was interested in finding what governmental institutions are managing the Zaka rural farmers, and we wanted to assess their level of influence on resource accessibility. In several livelihood studies, the programs and processes facilitated by institutions contain conditions that systematically refrains farmers from accessing resources. The conditions contain rules of conduct, legal and formal rules (Hodgson, 2003). We wanted to find out what access conditions could either negatively or positively influence Zaka farmers' adaptation. The effectiveness of farmers' livelihood strategies depends on the institution's influence, and thus we wanted to examine if their resource accessibility is subject to institutionalism.

III. Livelihood Capabilities in Sustainable Livelihoods

The study adopted the capabilities definition suggested by Sen (1987) (as cited in Hans-Georg Bohle, 2007), who described it 'as the ability of the poor to perform basic activities.' He describes capabilities as a facet that 'shapes the quality of life.' It is viewed in terms of 'individual's most valued activities and the ability to choose and perform those activities' Sen (1987) (as cited in Hans- Georg Bohle, 2007:11). Having the ability to perform daily activities that foster efficiency reduces the level of income discontinuity. Farmers' capabilities is dependent on the degree of risks to which they are exposed (Ludi and Bird, 2007). Fewer assets equal low contingency plans to counter a shock (Ludi and Bird, 2007). Having a solid asset base is a strong determinant to improving farmers capabilities. Vulnerability in rural areas is composed of rural risks -any event that could make the household income or crop output fall below minimum disaster level (Ludi and Bird, 2007; Cannon, Twigg and Rowell, 2008). Analysing vulnerability in rural livelihoods is not about examining the risks and stresses but assessing the resilience in recovering from the effects of a changing environment (Ludi and Bird, 2007; Cannon, Twigg and Rowell 2008; Mortreux and Barnett, 2017). For rural households to adapt to the changing environment, they use their asset portfolios, which provide the capabilities to mobilise their productivity in the face of hardship.

IV. Livelihood Strategies

A livelihood strategy is a candid concept. Livelihood strategies are methods used by rural households to generate income (Sati, Wei and Xue-Qian, 2014). The primary purpose is to

ensure domestic and social stability (Koczberski, Curry and Gibson, 2001). Some livelihood strategies are combined to capture a variety of income-generating opportunities. Farmers apply livelihood strategies to diversify their sources of income, and their tactics depend on resource endowments and policy and institutional constraints (Sati, Wei and Xue-Qian, 2014). Agricultural intensification is a primary technique for ensuring livelihood security among rural farmers. Poor people's strategies are dependent on the resources available and the different combinations (Ludi and Bird, 2007). The resources available and different combinations increase their capability to perform the necessary tasks that will help them survive the internal and external pressures.

V. Livelihood outcomes

Livelihood outcomes is another straightforward concept. The outcomes are what farmers achieve through their livelihood strategies and resources. These include food security, income security, assert accumulation, high social status, improved health, and well-being (Chambers and Conway, 1991). Unsuccessful outcomes include income insecurity, high vulnerability to interlocking stressors, diminished assets, chronic poverty, and hunger. For this research, we wanted to find out what type of outcomes Zaka farmers experience. The type of outcomes they live with demonstrates their level of vulnerability or adaptive capacity against climate change.

Now that we understand the value of assets, capabilities, livelihood outcomes, and institutions in sustainable livelihoods, let us look at the sustainable livelihoods analytical framework in Figure 3.1 below that illustrates and outlines the concepts, positions, and interactions.

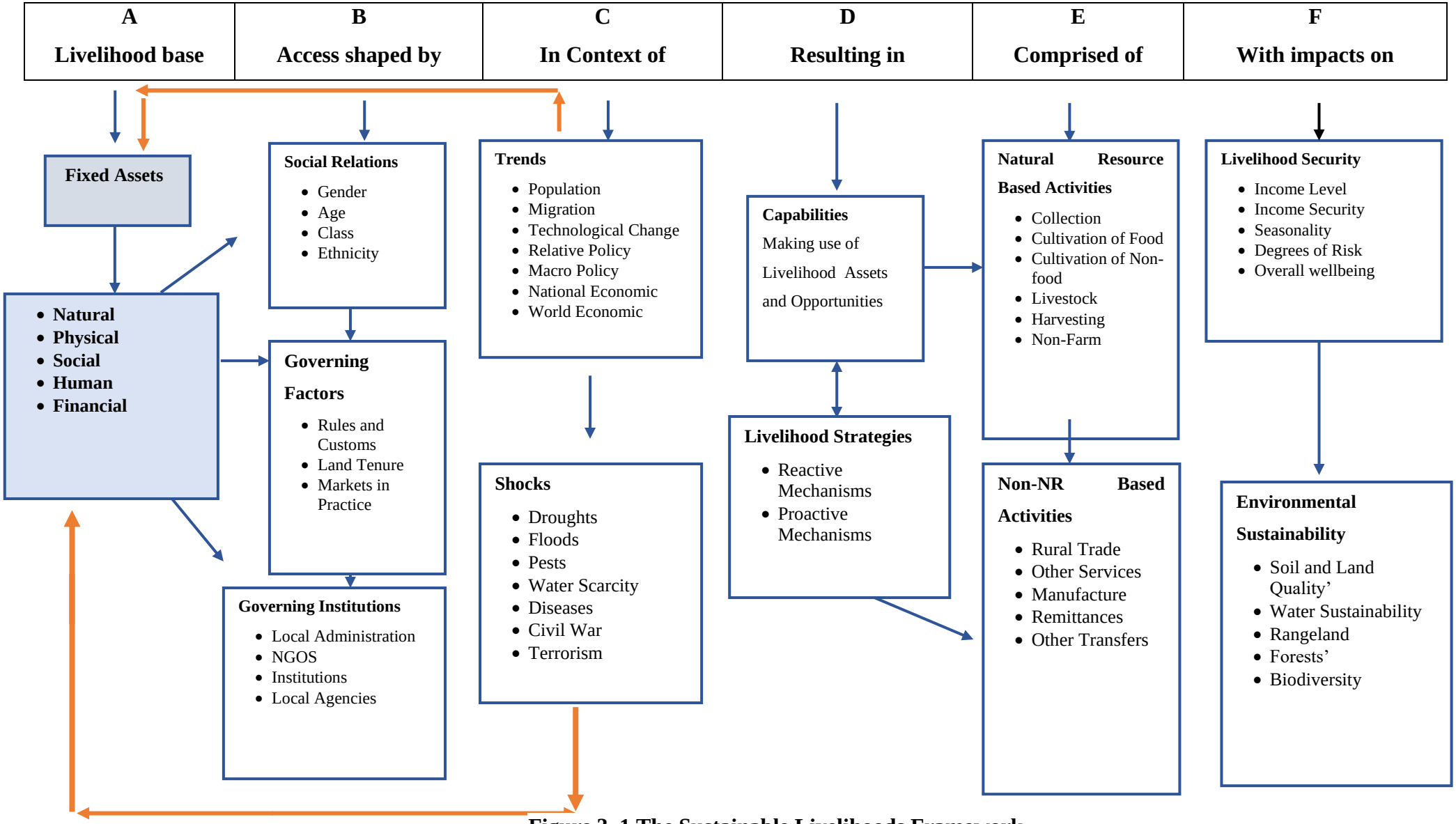


Figure 3. 1 The Sustainable Livelihoods Framework

Source: Adapted from Ellis (2000), Dorward et al. (2001), Morse and McNamara (2013)

The framework above (Figure 3.1) in a schematic form:

I. Box A shows assets as the resources that people have and this constitutes their livelihood base.
II. Box B illustrates how the people's access to their resources is shaped by social relations, governing factors, and governing institutions.
III. Box C in the framework shows how people use their assets in the context of environmental trends and shocks.
IV. Box D in the framework shows that people defend their livelihoods using assets. The assets provide the people with capabilities to perform strategies that are either proactive or reactive.
V. Box E shows that the people's strategies could either come in the form of natural resource-based activities or non-natural-based activities resulting from the people's application of assets in the face of trends, shocks or governing factors highlighted in box C and box B.
VI. Box F illustrates the status of the people's livelihood security or livelihood outcomes. The strategies that people devise from their assets has either a positive or negative impact on their livelihood security and on environmental sustainability.

3.3.2. Weaknesses of the Sustainable Livelihood Analytical Framework

Serrat (2017:25) has a different view about using assets to build adaptive capacity and argues that it is a weak measure in practicality. Serrat (2017:25) contends that practitioners assume resources appear in a generalized and incremented fashion. He explains that sufficient resources appear based on their availability, quantity and quality, and access in that defined period of circumstances. Other authors (Smit and Wandel, 2006; Newton and Franklin, 2011) have not pointed out the flaws of using assets but have pointed out the shortcomings of using the SLAF framework. Newton and Franklin (2011) stated that the framework does not pay attention to the inequalities of power, and it underplays the depth and severity of vulnerability contexts such as macroeconomic trends and conflict.

Another defect is that the framework does not fully define the existing relationships between the shocks and livelihood experience, the type of assets households use, and the effects shocks could have on livelihood capabilities and strategies and outcomes for the long term (Newton and Franklin, 2011). It is because relationships change over time, looking at the

nature of interactions. The framework only provides the possible relationship that exists for that current time. Moreover, using the framework does not outline the inevitable vulnerabilities households could experience and the potential availability of assets in the next five years. It just provides governments, practitioners, and institutions with the probability of what types of vulnerability a household may encounter. The framework does not indicate whether a household will undergo those vulnerabilities in the future.

Katherine Vincent's (2007) views on adaptive capacity align with Serrat's (2007) views regarding the flaws in communities using assets to withstand hazards. She argues that the disadvantage of using asset portfolios to build adaptation is that they provide 'generic' adaptive capacity. Resources can be diminished over time, especially if there are no actions in maintaining their quality and quantity (Serrat, 2017). However, Katherine Vincent (2007) argues that poor people are active actors and will continue to find ways of lessening the risks within their livelihoods. Their first protocol is to use and manage the current resources at their disposal (Ludi and Bird, 2007; Mortreux and Barnett, 2017; Sujakhu et al., 2018). Although, practitioners forget that resources need to adapt to the internal and external pressures and be backed up by financial investment. If the assets cannot cope with the pressures, individuals will incur livelihood challenges applying them across diverse scales and future risks (Sujakhu et al., 2018).

Adaptation is not a generic task. Adaptation is actions in response to risks (Vincent, 2007; Montreux and Barnett, 2017). The limitation to generic adaptive capacity is that capacity does not always translate to action in sustainable livelihoods. The SLAF framework is a theoretical assumption that needs constant testing (Vincent, 2007). Jones, Ludi, and Levine (2010) explain that developing countries must focus on the asset base, institutions, entitlements, knowledge, technical information and innovation, flexible forward decision making, and governance to promote adaptation. The suggestion is that the 'characteristics' of adaptive capacity may be present in different societies in many diverse forms (Engle, 2011; Vincent, 2007), but the 'characteristics' do not directly translate into adaptive capacity in practice. As Katherine Vincent (2007) highlighted previously, the interconnection between assets and adaptive capacity is convoluted. An asset base depends on the extent to which components within the system are interchangeable in disruption or degradation of one facet (Jones, Ludi, and Levine, 2010).

Livelihood case studies in India, Ethiopia, China, and South Africa demonstrate that adaptation practices arise from a far more degreed and affinitive action (Huq and Reid, 2007; Lisa and Schipper, 2007). Practitioners and institutions evaluate their adaptive capacity projects and find that resources are essential. Although, it is not the only facet that plays a part in minimising household vulnerability. The literature suggests that it requires a deeper level of assessment on the causes of vulnerability, a broader form of cooperation between the community and governing acting bodies in providing transparency and accountability, and creative thinking in solving capacity challenges (Eakin and Luers, 2006).

Despite the weaknesses outlined, the SLAF framework has helped develop intervention strategies in climate change, poverty, and livelihood debate. The components in the framework are not easy to practice and understand in reality. The conclusion is that every practitioner comes with their views on the relationship between sustainable livelihoods and adaptation. We can only agree with their mindsets if we use the SLAF framework to analyse Zaka farmers' livelihoods and evaluate the positives and drawbacks.

3.4. Using assets to develop strategies: small-scale farmers measures of adaptation.

3.4.1. Communities application of the five capitals in defending their livelihoods against climate change.

Based on the sustainable livelihoods theory, we are already aware of the value assets provide to adaptation, and we have established that they are imperative for small-scale farmers. The question here is, how are the assets applied from a global perspective? This section addresses this question. Resources are the foundation in the formation of rural livelihoods (Ellis, 2000). A single asset can generate multiple benefits (Thennakoon, 2010; Li et al., 2020). Here we begin by describing each asset’s characteristics in detail.

A. Human Capital

Human capital is the knowledge, habits, behaviour, and character traits of an individual that contribute to the economic benefits of the community (Ellis, 2000; Farrington et al., 2002). Individuals use the knowledge they have acquired from training, school, creativity,

experiences, exposure, and talent to develop strategies. Training and education provide them insights, including problem-solving techniques, writing, and reading, essential to improving their coping capacity (Mphande, 2016; Pasara, Mutambirwa, Diko, 2020). Individuals with these skills can transform other skills that yield other talents and creativity useful for their livelihoods. The skills an individual gains are passed down from one generation to another. Thus, a skilled family has potentially a good chance of coping with emergencies than a family without (Mphande, 2016; Li et al., 2020).

Regardless, two factors need to be considered for human capital to be practical. Firstly, individuals need to be in a good healthy state. Illness is a common risk amongst rural households. It is a risk that affects families in many ways. For instance, if the breadwinner is ill, it could directly affect their flows of income. Secondly, individuals need the willingness to learn the skills and apply them in the environment. Failure in application prevents them from making any creativity (Thennakoon, 2020). In Zimbabwe, human capital is low in rural areas due to a lack of proper education and training facilities (Phiri et al., 2020), and we wanted to see if human capital is low with the case of Zaka farmers. Do the farmers even possess human capital? It would be imperative to know what human capital characteristics the farmers have in building adaptive capacity against drought and water scarcity.

B. Physical Capital

Physical capital is an asset that assists in turning raw materials into finished products. Some resources process the outputs that communities need. Examples of physical resources include infrastructure, farming equipment, and chemicals. The resources boost production and yield income for households. However, its effectiveness is dependent on human and natural resources. For example, in irrigation, a family must know how to use the equipment. They must have an adequate water supply to produce the outputs required. Natural and human capital must be present for people to use the services of physical capital. In Zimbabwe, it is known for small-scale farmers in the region to have low physical capital due to limited financing, limited transport services, and old infrastructure (Chagutah, 2010). For instance, farmers lack fertilisers because there are limited transport services that provide them the inputs because they reside in remote areas. Therefore, it would be intriguing to see if this notion applies to farmers in the Zaka district in Masvingo. It is interesting to know how they would be coping with limited physical resources if it does apply to them.

C. Social Capital

Social capital is the relationships, institutions, and norms that shape the communities' interactions (Turner, 2007; Mphande, 2016). Cooperation can be horizontal between individuals. It raises productivity by facilitating coordination and communication on community problems. Alliances within the community are needed to give a sense of identity and purpose. The sharing of information is of great assistance to the rural community (Adger and Winkels, 2002), principally when negotiating natural and financial resources. In Zimbabwe, indigenous knowledge is dynamic in rural communities (Brazier, 2017). The majority of the small-scale farmers rely on community knowledge from chiefs, local councils, neighbours, traditional leaders, and families to improve their household stability and crop production. Being affiliated with a social institution has provided a platform whereby individuals can engage in problem-solving and decision-making (Bebbington, 1999). Especially regarding access to natural resources, family emergencies, the outbreak of diseases, and climate change issues.

D. Natural Capital

Natural capital applies to the biophysical elements such as water, seeds, air, land, animals, and minerals. Several social scientists argue that natural capital is the main foundation for increasing adaptive capacity for small-scale farmers (Ellis, 2000). The majority of strategies are developed based on the transformation of natural capital. For instance, several subsistence farmers are dependent on rivers, forests, grasslands, livestock and wetlands and their livelihoods are resilient to climate change effects because of the ecosystem's buffer availability and accessibility. For instance, continuous water supply for subsistence farmers means their crops are less sensitive to decreased precipitation and high temperatures. Zimbabwe is known for its biological diversity (Brazier, 2017). Approximately 80% of the residents live in biologically diverse areas and rely massively on the rivers, wetlands, trees, grasslands, and dams for subsistence agriculture (Brazier, 2017).

E. Financial Capital

Financial capital is the use of financial services (Mphande, 2016). Oxfam (2015:7) refers to it as micro-finance, 'a channel that increases farmers' access to financial services, markets, and trade.' Three objectives of sustainable development are to provide income security, food security, and job security. All three are essential to curbing poverty. The availability of financial resources is dependent on the application of other resources, and its availability can provide access to resources. For instance, poor people can use their money to apply for better education, acquire better health and nutrition. Poor people having funds means they can access networks they require to survive the shock and put themselves in an organized manner (Thennakoon, 2010). Besides, it means that poor people can access their natural resources such as land and secure ownership. It also means that poor people can buy equipment and upgrade their infrastructure to provide for themselves and make their income. Providing farmers with financial capital improves their access to trade systems and market opportunities (OXFAM, 2015). Although financial services are necessary, they should be sustainable in the long term (Oxfam, 2015). The financial systems in place should enhance their resilience against climate change and the damaging effects of the financial trade systems (Oxfam, 2015). Financial capital is about providing sustainable financial assistance to people with low incomes. Having an assorted supply of financial services is essential in building adaptive capacity.

Each capital has its advantages and drawbacks. Although it is essential to discern how poor communities use each of their resources to defend their livelihoods against climate change. There is a misconception regarding the application of assets for Zimbabwean communities that suffer from recurrent droughts. It improves our understanding of climate change adaptation (Kiem and Austin, 2003). Even though there is extensive literature on climate change adaptation, the limits of adaptation and the role of resources in fostering effective livelihood strategies remain unexplored (Esteve et al., 2018). *Livelihood strategies* are actions that evolve within the community's core activities (Thennakoon, 2010; Bailey et al., 2019). In the context of Zaka farmers, it would be in their farming activities. It is also dependent on the objectives and priorities of their households (Bailey et al., 2019). There are two types of livelihood strategies, proactive and reactive. The proactive strategy center on actions or decisions that eliminates problems before they have a chance to appear. A reactive strategy is when the individual responds to the events after they have happened (Bremser and Liach, 2015).

Livelihood strategies are formed based on the stresses and risks within rural livelihoods. *Stress* is a 'continuous or slow increasing pressure commonly within the range of normal variability' (Turner et al., 2003; Adger, 2006; Marschke and Berkes, 2006:8074). A *risk* is a 'state in which losses are possible' (Ludi and Bird, 2007). Su, Saikia, and Hay (2018) refer to it as the probability that stress will turn into a disaster. A *shock* is 'an extensive spike in pressure beyond the normal range in variability, which the system operates tend to be ongoing in case a resource declines and trend/ seasonality issues' (Turner et al., 2003). The start of the shock can be acute and dramatic (Cannon et al., 2008). Shocks and stresses can fade, and life can get back to normal. However, such 'stability thinking' does not make us comprehend how households respond and continually adjust to change, and this is why more scientific research is required. We needed to comprehend Zaka's household coping capacity and assess if their adaptive measures are proactive for the near future. It is also significant that we investigate Zimbabwe's national plan in ensuring their coping capacity.

Whether the capitals will pull the rural communities out of absolute poverty and whether these explicit attributes and adaptation responses play a role in making assets more effective in managing climate risks is still an idea that demands continuous investigation.

3.4.2. Barriers to adaptive capacity for small-scale farmers

I. Lack of Assets and Attributes

Lack of assets weakens livelihood strategies for individuals (Ribot, 2014; Rahman and Hickey, 2020). This process is known to worsen their poverty.

> *As Phillip and Rayhan (2004:5) express it, 'Vulnerability is closely linked to asset ownership. The more resources the community has the less vulnerable they are and the greater the erosion of communities resources, the greater their insecurities.'*

For instance, a family that is not financially secure with access to services such as credit and loans may not survive a shock. In some cases, they collapse or diversify to survive, but at the cost of taking an obscure risk-averse production strategy. For instance, several studies

conducted by Aryeetey (2004) and Li et al. (2020) have shown that rural labourers within Southern Africa, Northern Africa, and Asia apply livelihood strategies that produce lower crop yields that bring low financial returns. This form of action perpetuates a cycle of poverty and impedes economic growth as the financial pressures push farmers to a sub-optimal route (Aryeetey, 2004; Abraham, 2020).

On the other side, households with low financial capacity but have high human resources such as education and human skills have survived vulnerable conditions by being pulled by new possibilities (Tran et al., 2018). These new possibilities included rural-urban migration, whereby rural labourers acquire employment opportunities to sustain their livelihoods based on their skills and education, and for some, they seek information that improves their knowledge of climate change and land productivity.

The Vietnam farmers used human resources to create their strategies. The farmers learned and trained themselves on soil moisture content, studying climate change patterns, and practicing conservation agriculture to minimise annual crop failure (Tran et al., 2018). It raised their adaptive capacity against climate change. Therefore, there is a definite correspondence between asset attributes and adaptive capacity. There is an aspect where communities may not access all their resources and rely on maintaining and manipulating their qualities.

There are push and pull factors of the environment that encourage asset choices. The asset choices enable regular productivity to acquire daily income and consumption across periods adjacent to high rates of income shocks (Hill, 1963). Assets incite consumption by adding to the overall productivity. This aspect produces payments in periods where income is scarce. Polly Hill (1963) suggests that rural communities in developing countries genuinely tend to break out of the organized modes of production through migration to expand their asset portfolio. The protection or value of assets is subject to various social practices and norms that allow ‘rural capitalists’ to hold the bulk of resources.

The main concern is that rural farmers are often neglected or left out because they have limited bargaining power to seek the crucial resources necessary for their survival. The sad reality is that many rural families survive on small-scale farming. Farmers need resources for ‘hungry periods,’ particularly during periods before harvest. Periods of scarcity are frequent,

often caused by resource overexploitation, shortages of critical resources, particularly water supply and livestock, and low ownership of resources. Many families in Southern Africa lack sufficient resources to meet their minimal household and nutritional needs (Ngcamu and Chari, 2020). Droughts destroy many rural families throughout the world. They suffer from protracted and severe crises at the hands of hazards because of insufficient assets. This development has prohibited their coping capacity from utilizing their resources and reacting to urgencies.

V. Challenging resource access conditions for small-scale farmers

Poor people in Africa live in disadvantaged communities (Mofya-Mukuka, Sambo, and Kuhlgatz, 2017). The bulk of the population does not have the commanding rights to access the opportunities and entitlements to grant them an alternative livelihood (Aslop, 2005). There are three reasons why some do not have commanding rights (Aslop, 2005). It is because of traditional barriers, no solid ownership of assets, and a lack of capacity to transform and expand resources.

In Africa, particularly in Ethiopia, the appearance and development of the formal and informal laws, regulations, norms, and customs command that particular groups have access to resources and whether people can use the assets to obtain their desired outcomes (Aslop, 2005). For instance, in the literature, studies in Ethiopia have shown that people still apply customary laws to their economic and social ties (Aslop, 2005). It is the most obvious and perhaps the most damaging in how accustomed conflict resolution mechanisms and civil rights are interspersed. In theory, integration empowers citizens to preserve their ethnic and religious identities (Holmes and Jones, 2009). Although in practice, it has augmented damaging beliefs and customs towards vulnerable groups, particularly women and children (Holmes and Jones, 2009; Ndulo, 2011; Namubiru-Mwaura, 2014). Specific vulnerable groups such as women, the disabled, and the elderly do not have access to property, land, and water rights to lessen their vulnerability to poverty and climatic shocks (Maluleke, 2012). Due to refuted access, women have no housing, little or no education, no sustainable services of basic infrastructure, financial security to deal with climatic shocks, and socio-economic pressures. Additionally, they face difficulty acquiring goods and services (Ndulo, 2011; Namubiru-Mwaura, 2014).

Similar case studies exist in other African countries such as Mali, Nigeria, Tanzania, Zimbabwe, and South Africa, where traditional barriers strengthen vulnerability for specific groups, particularly with land tenure systems (Mutangadura, 2004). The main feature is the co-existence of various types of equities. The state is the overall trustee and owner of all the national boundaries and has complete jurisdiction over its allocation (Aslop, 2005; Willy, 2011). In local traditions, it is often a composite of customary and statutory rights. It is popular in a rural environment setting. The local chiefs, village councils, and municipalities commission the traditional rights over natural resources. They formalize land titling and registration (Bah et al., 2003). Formal and informal market activities occur under both systems, particularly in peri-urban areas where they overlay (Willy, 2011). Following the customary tenure, non-landowners can acquire land through various secondary rights classifications, varying from sharecropping, to tenancy, to borrowing land (Aslop, 2005). Although, these types of arrangements exclude low-income farmers and migrants from land allocation. While there is a discounting of low-communal farmers and migrants, they face the pressure of land becoming scarcer and more costly (Bah et al., 2003).

Rural farmers' access to land and water is subject to several pressures. Even in areas under the customary law, formal purchases rather than allocation are more common, and in many cases, the buyers tend to be urban residents who practice commercial farming (Nnoko-Mewanu and Walsh, 2018). In Southern Tanzania, Mali, and Nigeria, middle-and higher-income farmers displaced under-capitalised farmers. It exposed the under-capitalised farmers to conditions of vulnerability (Nnoko-Mewanu and Walsh, 2018). Restricted access to financial and natural capital such as credit, credit recovery problems, water supply, and mismanagement of parastatal institutions in Mali and Nigeria enhanced small-scale farmers vulnerability to climate change and poverty, to the extent that they were either pushed to migrate or move out of farming and become waged labourers (Smalley, 2013; Carte et al., 2019).

Resource access conditions are different for each country. Some conditions may apply to Zimbabwean rural communities, and some may not. We must investigate the resource stipulations for Zaka rural farmers. Investigating this narrative will help us identify weak spots that government can focus on when strategizing their adaptation. They have colossal power and influence on institutions and traditional customs. The government can readjust the laws to favour the rural farmers to attain food and livelihood security goals.

Do the conditions of resource ownership, institutional laws, customs, and regulations apply to the Zaka farmers as well? If they do, do they hinder or support Zaka farmers' adaptive capacity? These are the questions that the study wanted to address because it was a good starting point for analysing adaptation.

3.5. Gaps in the Knowledge

Climate change is indeed a problem in livelihoods. Many countries across the globe are dealing with it differently within their context. It has shown that the starting point to dealing with climate change in livelihoods is by working with the sustainable livelihoods analytical framework (SLAF), focusing on the concepts- assets, institutions, shocks, capabilities, strategies, and outcomes. Bear in mind that these concepts are in sync with one another. It is a domino effect whereby if one facet is affected- all are affected. Studying the SLAF framework has become developing countries' main agenda in improving adaptive capacity for rural populations.

However, in practice, of course, there have been many setbacks to achieving sustainability. The increased impacts of climate change and its severity are still challenging to eradicate. Research shows that even resilient livelihoods are still susceptible to the harsh effects. Despite this, the governing actors and stakeholders always come together to re-invent or re-strategise their adaptive capacity measures. In Zimbabwe, climate change is a national concern. Climate change curbs Zimbabwe's food security improvement, GDP, employment, water security, and livelihood stability. All these factors support rural growth for Zimbabwe. The government created policies that focus on achieving sustainable development outcomes amidst climate change, and the one we focused on is the ZNCP policy. There are small-scale farmer case studies that have shown progress with adaptive capacity. Although, their progress is short-lived due to technical and financial productivity barriers. Therefore, it is quintessential to investigate the farmers' perspectives' impediments. We wanted to understand the hurdles affecting productivity. The farmers' can provide their interpretation of adaptation by explaining the current resources adapted to cope with its effects.

In research, there have been various quantitative studies explaining the household vulnerability index, food, and water insecurity index, the rate of susceptibility with households, but very little qualitative research on understanding adaptive capacity through

the lives of the people who experience climate change daily. It is also imperative to find out what other barriers do small-scale farmers face in being adaptive. What obstacles are there, other than the ones in presented in the literature?

3.6. Conclusion

In the chapter, there is a substantial amount of literature on climate change adaptation and sustainable livelihoods. Several factors come to play, from the impacts of climate change to the assets to the institutions that govern small-scale farmers to their livelihood strategies and their livelihood outcomes. It is also seen from the proceeding discussions that several livelihood issues remain unresolved. Firstly, with the community and their resource application. Secondly, factors governing their resource application. Thirdly, identifying the risks and stresses embedded in the communities' livelihoods. Fourthly the community's resilience status and the policies that support development.

The matters remain unresolved because each community is different in how they manage their livelihoods. Practitioners have different ways of interpreting their contexts, and they devise solutions that are either successful or not. There is no direct answer to eradicating climate change in rural livelihoods. The environment that influences the communities is constantly changing. Climate change, adaptation, and sustainable livelihoods are ongoing topic that does not end in scientific research. Every country approaches the phenomena differently, and the beauty is that there is always something new and exciting that evolves from all elements about that phenomenon.

CHAPTER FOUR

METHODOLOGICAL ISSUES AND CONSIDERATIONS

'Equipped with his five senses, man explores
the universe around him and calls the
adventure Science'. –
Edwin Powell Hubble
(1889-1953)

4.1. Introduction

Here we present the methodological issues and considerations chapter. Chapter four tells the readers the decisions and actions the study took to answer the research questions. The purpose is to explain why specific decisions and actions were taken and describe how we accomplished them. This chapter was essential in the thesis because it justified the researcher's position on the subject. It explained the researcher's beliefs, background, and experiences in investigating the climate change-livelihood-adaptation phenomenon. The researcher used this chapter to explain why and how she did it. This specific area of the thesis will help the readers understand the researcher's actions and findings presented in chapter five.

At this stage of the thesis, the aim is to help the readers understand:

I. How the study concluded.
II. Why the study decided on the approach.
III. Why the researcher used specific tools to obtain the information.

The study first discussed the research positionality. The study wanted to understand the cluster of beliefs that dictate how social scientists have investigated this phenomenon and how they conducted research and interpreted it. This chapter provided the researcher's stance describing the interpretivism that influenced the study. There is a review of the epistemological, ontological, metatheoretical, methodological, and axiological positions adopted, and the implications of choosing those specific paradigms and explaining how applying the conceptual model of assumptions related to the qualitative approaches.

Secondly, there is a description of the research design. It begins by defining the Zaka district in Masvingo province as the research site. Examining the environment is essential as it gives a picture of the area's physical climate, socio-economic situation, and the participants' livelihood backgrounds. Thirdly, the chapter described the study population and procedures. There is a discussion on the population parameters and the sampling procedures. Fourthly, we presented the data collection tools. The methodology was purely qualitative. Key informant interviews, interviews with farmers, focus group discussions, and participant observations are scientific tools that the researcher used, and why she chose these tools is deliberated in this chapter. The chapter also offered a characterisation of the research analysis and methodological reflections.

4.2. Research Positionality

The philosophical approach that acquainted this study is interpretivism. Interpretivism states that people are essentially different from objects (Du Plooy-Cilliers, 2014:27; Kivunja and Kuyini, 2018). Interpretivism teaches us that 'humans cannot be investigated the same way as natural objects in natural sciences because humans evolve all the time and the circumstances in which they find themselves invariably influences them' (Du Plooy-Cilliers, 2014:27). In simple terms, we cannot study human beings in laboratories because they do not live in laboratories. The environment shapes the way people live.

Interpretivism has three philosophical traditions. These are hermeneutics, phenomenology, and symbolic interactionists. Hermeneutics tradition deals with the theory and method of simplifying human action (Bryman, 2012:28; Muganga, 2016). Phenomenology traditions report how individuals make sense of the world around them. It explains that human action is passionate and meaningful and applies meaning to their own and other people's actions (Tuohy et al., 2013; Du Plooy-Cilliers, 2014). Symbolic tradition implies seeing reality as high symbolic and constructed. Human activity has little intrinsic meaning, but humans can analyse another human's interpretation because they share purpose through a language (Oliver, 2011; Du Plooy-Cilliers, 2014).

These meanings permit us to interpret signs or actions that ascribe meaning to them. The study adopted the phenomenology tradition to interpret and understand how small-scale farmers defend themselves against the climate change phenomenon and then explore the

actions they engage in and understand why they do it from their point of view. Taking the interpretivism stance provided the study an in-depth understanding of the livelihood-adaptation scenario in the Zaka district. The researcher spent time with the small-scale farmers to investigate what it is like to live the life of a Zaka farmer. The researcher explored what was meaningful and relevant to them. The idea was to see their world through their eyes.

Positivists see scientific knowledge as the only legitimate form of knowledge and are completely against common sense as a form of education (Du Plooy-Cilliers, 2014; Ryan, 2018). Taking an interpretive stance challenges this view and contends that common sense is an element that guides humans in their daily living (Du Plooy-Cilliers, 2014; Pham, 2018). It is the epistemological position of interpretivism. The researcher wanted to understand small-scale farmers' behaviour, and to achieve that, she had to learn what they viewed as common sense in their world. What does it mean to be a Zaka farmer in an area exposed to climate change every day? What are the areas they see in their daily lives? And how do they cope and still meet their daily household needs? These are the inquiries the researcher had in the study. Using this line of questioning was an essential source of information in understanding the people. Taking the epistemological stance implied that the facts are fluid and embedded within a meaningful system. Therefore, for this research, what was truthful and genuine was dependent heavily on the context and the small-scale farmers' interpretation of the information. The adopted methodology was sensitive to the specific context and was not generalized beyond the study's context.

From an ontological standpoint, we do not believe in objective, but everyone endures the external reality differently (Du Plooy-Cilliers, 2014). The small-scale farmers' adoption of their resources follows a social construction, and this was on the meanings they assigned to their actions and interactions with other farmers. What is Zaka farmer's view of climate change? Did every farmer in the Zaka district have a problem with climate change? Or was it just a small group of them? Did the farmers all have access to assets, and did they all use their assets the same way? If they all experienced climate change together, did it help them cope better with the risks they faced? Moreover, did that improve their overall livelihood situation?

Addressing these questions provided insight as to what created the farmers' social construction. A social world is what people observe it to be (Du Plooy-Cilliers, 2014;

Zukauskas, Vveinhardt and Andriukaitiene, 2018). It is fluid and delicate, and it changes as human perspectives change. Depending on the events, experiences, and cultures, people may or may not encounter reality the same way. From this perspective, the researcher paid particular attention to the farmers' meanings of climate change and how they described it using their own experiences and interactions. Following this approach made the study appreciate the uniqueness of each farmer's case.

Researchers are often disheartened when they present their research findings (Du Plooy-Cilliers, 2014). Their work is evaluated unfairly by people who swing to the song of positivism rather than interpretivism (Du Plooy-Cilliers, 2014). Positivists like to use propositions, tests, and parallels to describe their data. Here, we present a richly comprehensive description of the case and use quotes from the participants to back it up. We aim to reveal the meanings and values of the people we study (Muganga, 2016). We wanted to make other positivist researchers understand the small-scale farmers-climate change phenomenon. The writing style may be informal, subjective, and rich in quotes to give the intended audience a feel of another person's social reality. The study made use of the narratives provided by a group of small-scale farmers in the Zaka district living in a rural setting, being exposed to climate change every day. For positivists, replication is imperative in defining a successful research study (Ryan,2018). We do not see it necessary with interpretivism that others agree with the researcher's claims (Bryman, 2012; Du Plooy-Cilliers, 2014:30). Despite this, other researchers should be willing to concede that the researcher's conclusions are plausible (Tuohy et al., 2013). They are probable by evaluating their credibility, transferability, dependability, and confirmability (Koonin, 2014). The researcher used detailed descriptions to explain the experiences and lived realities of the small-scale farmers.

From a methodological stance, the study is purely qualitative. The research concentrates more on words rather than numbers (Du Plooy-Cilliers, 2014). The study aimed to investigate the reality subjectively and used methods that included focus group discussions and interviews sensitive to the context. The aim was not to produce value-free research. The aim was to empathize with the small-scale farmers, share their social values, and even consider the researcher’s point of view and feelings to study others. In qualitative research, the researcher became the primary tool, and the small-scale farmers teach the researcher about their lives as Zaka farmers.

From an axiological position, understanding the unique, multifaceted entities of the study is essential. The main objectives were to openly discuss the principles that shaped the research, including the researcher's description of the study and those of the participants.

4.3. Research Design

The research design is the 'framework that ties up all the components in a research project collectively' (Akhtar, 2016:68). It is a mapped-out plan of how the researcher conducted the investigation. The research design describes the investigation, defines the boundaries, and provides direction. A research design presents the appropriate structure for the study (Jacob, 2014; Khan, 2014). The framework concludes how the study achieved the relevant information for the investigation. Although, it is a process that involves varying degrees of interrelated decisions (Rahman, 2017).

The study employed a qualitative research design. We used this design because quantifiable measurements were not fitting in this context for researching lived experiences and investigating the experiential meanings of the Zaka small-scale farmers community. By applying Neuman's (2011:424) theory, the study attempted to capture all the details of the Zaka small-scale farmer social setting in a detailed description and communicate the intimate feelings and the lives of the farmers in it. The study was only interested in exploring the farmers' experiences of climate change in their livelihoods, and by doing this, we could see the areas from their viewpoint. Using the design yielded the opportunity to understand what, how, and why. The benefit of using the qualitative research design is that it presented a worldwide experience that includes all the personal and subjective peculiarities characteristic of individual experiences and meanings associated with the climate change phenomenon (Strydom and Bezuidenhout, 2014). Qualitative research is not like quantitative research, as the design does not aim to convert the subject's perceptions into numerical form, and we do not separate or quarantine any part of the interaction from the whole (Keyton, 2011). The study did aim to keep in mind that when selecting the data methods, the overall aim was to explore, understand and describe and not to explain, measure, quantify, predict, and

hypothesize as quantitative researchers do. The choice of data collection methods used in the study determined the findings presented in chapter five.

The researcher wanted to explore the participants' in their natural elements, and thus she applied action research. The study considers that the participants' behaviour is what we perceive has meaning and represents deeper feelings and beliefs (Du Plooy-Cilliers, 2014). The study preferred to use the term participants instead of respondents. The research was conducted in the Zaka district, observing the participants in their farming setting. The participants described their climate change beliefs within their specific circumstances.

The study used a methodological format to investigate the research questions of the study. It is a format through which researchers conduct their investigation (Sileyew, 2019). It has two purposes, to address data collection and data analysis (Goundar, 2012). Before presenting the research sites' description, study population and procedures, data collection tools, and data analysis, we must remind ourselves of the research problem and the research questions. It is because the methodology was selected based on investigating the problem and answering the research questions.

Let us kindly remind ourselves of the research problem. The problem is that the sequence of climate change-induced weather events has increasingly made it difficult for rural households to engage in meaningful agricultural productivity. It is because agricultural activities in Zaka District are highly dependent on rainfed agriculture in the face of increased climatic conditions, increased crop failure, increased livestock death of which the development has exposed several rural households in Zaka District to high levels of extreme poverty, food insecurity, and low nutrition (Zimbabwe Humanitarian Appeal Revision, 2020:7). The development is affecting their capacity to generate incomes for the acquisition of particular services. The situation is making rural households of Zaka District susceptible to high-level poverty incidences.

The researcher selected a methodology that investigated the research problem and answered the research questions. The main research question of the study is :

I. How do water scarcity and drought episodes affect the livelihood outcomes for small-scale farmers in Zaka District in Masvingo province?

The subsequent questions of the study are:

I. What livelihood assets are accessible for small-scale farmers in adapting and sustaining their livelihood outcomes against water scarcity and drought?
II. What other constraints do small-scale farmers face in adapting to water scarcity and drought?
III. What institutional systems, structures, and processes are in place in which the adaptive capacity and resilience of the small-scale farmers in Zaka District can be pursued?
IV. What are the implications of the findings of this study in the broader context, particularly in Southern Africa?

We need to address the research questions to understand how small-scale farmers who are vulnerable to extreme weather conditions in increased water scarcity and frequent drought episodes adapt to these challenges by deploying different asset portfolios to obtain livelihoods. For investigation purposes, we explained the research approach and instruments appropriate for investigating the research questions.

The methodology begins by describing the different research instruments used to investigate the research questions. It explained why the researcher used focus groups, key informants interviews, interviews with farmers, participant observations and why she used qualitative content analysis to code the basic information. The research analysis is essential because it explained the results in chapter five and how the chapter concluded.

A methodology is also vital because it discusses the researcher's obstacles during the study (Strydom and Bezuidenhout, 2014). Here we present the researcher’s interest in this phenomenon's beliefs, biases, and personal background. This section explains the processes that were taken to manage the problems faced during the field research.

Thus, as we have established the purpose of having a methodology for the study, these sections shall describe the following:

I. Section 4.3.1 described the research sites. This section discussed the location of Masvingo and Zaka district, along with its climate and socio-economic characteristics.
II. Section 4.3.2 conferred the study population procedures along with the sampling methods.
III. Section 4.3.3 described the data collection tools that the researcher used to collect the data. First, it discussed the purpose of primary data: the interviews, participant observations, focus group discussions, and the advantages and disadvantages of using each instrument. Secondly, it described the secondary data and further discusses the advantages and weaknesses of using the method.
IV. Section 4.3.4 explained the data analysis. The section presented how we used qualitative content analysis to transcribe the data.
V. Section 4.3.5 presented the methodological reflections. The segment addressed the limitations and obstacles of the study.

4.3.1. Description of Research Sites

Here we begin by reviewing Zaka District in Masvingo Province. However, first, we start by describing the Masvingo environment narrowing it down to Zaka district, the leading study site. Understanding the research sites is essential as it gives a picture of the area's physical climate, socio-economic situation, and the participants' livelihood backgrounds.

4.3.1.1. Masvingo Province

Masvingo province and the Zaka district are essential areas that the researcher focused on because of their high exposure to climate change. The settings are well-known for having high household vulnerability. We must specify the climate characteristics and the socio-economic activities that occur there. It provides background to the participants' beliefs of climate change and their daily livelihood routines in chapter five. We must understand Masvingo's socio-economic and climate profile. It is where the Zaka district is. Describing Masvingo province provides a simplistic understanding of Zaka's socio-economic and climatic profile as well.

I. Masvingo: Location

Masvingo is a province of Zimbabwe located on the drier south-eastern lowveld side (Figure 4.1). The Rural District Council runs seven administrative districts in Masvingo. The seven are Gutu, Bikita, Chiredzi, Mwenezi, Chivi, Zaka, and Masvingo. Masvingo district contains the provincial capital Masvingo City (Figure 4.4). Masvingo borders with Matabeleland south province to the southwest, Midlands province to the northwest, Manicaland Province to the northeast, and Mozambique to the southeast. The province also has an international boundary with South Africa. It has an area of 56,566km² equal to 14.48% of the total area of Zimbabwe.

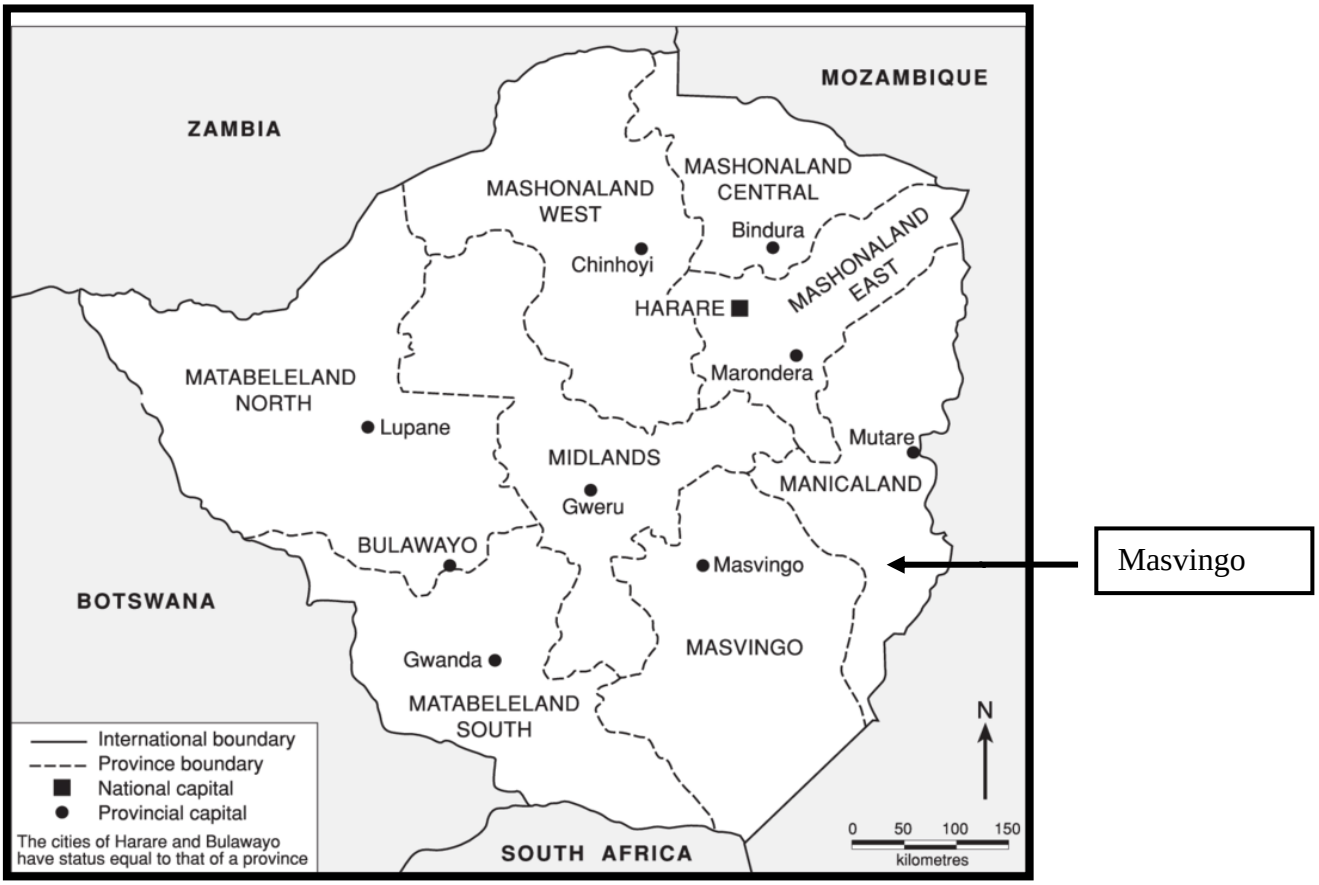


Figure 4. 1Masvingo : south-eastern Zimbabwe

Source: Munyati et al. (2008).

II. Masvingo: Climate and Topography

The province is semi-arid, rainfall is nominal, highly variable/erratic, and uncertain making it susceptible to droughts. The majority of Masvingo province falls in agro-ecological zone V

(see Figure 4.2 and Table 4.1), the vast farming region, with rainfall of <450mm. Masvingo district also falls in agro-ecological zone IV, a semi-extensive farming region with rainfall between 450mm and 650mm. A small quarter of the province falls in agro-ecological zone III, a semi-intensive farming region, with rainfall between 650mm and 850mm. Temperature ranges from (low) 22°C to 32°C (highest) (Brazier, 2017). Here we present a colourful altered version of the agro-ecological zones, explicitly focusing on the three regions that Masvingo province falls in.

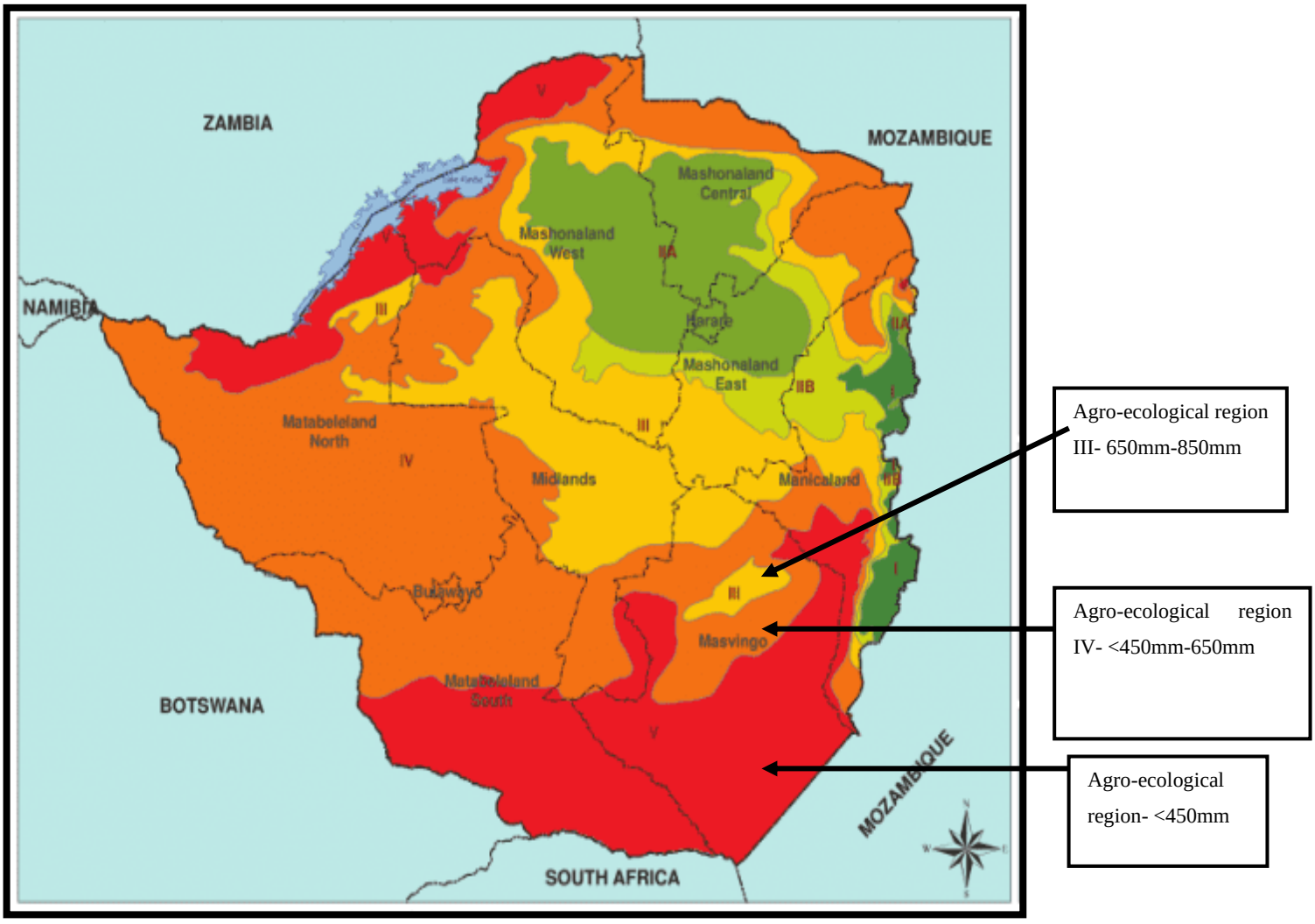


Figure 4. 2 The Agro-ecological zones for Masvingo Province

Source : Altered version of the agro-ecological zones from Kirubel (2018).

Table 4. 1 Agro-ecological zone characteristic

Agro-ecological Zones	Area Covered	Physiographic Region	Agricultural Production	Rainfall Variation
III	72900km²/19%	Kalahari Sandeveldt Sanyati Sengwa Basin , South Eastern Middleveldt	Semi Intensive Farming	500-750mm
IV	147800km²/38%	Northern Eastern Middleveldt and South Eastern Middleveldt	Semi Extensive Farming	450-650mm
V	104400km²/27%	Zambezi Valley South Eastern Low veldt Sanyati Sengwa Basin	Extensive Farming	<450mm

Source: Chidzoki et al. (2017).

Masvingo province is ordinarily dry, although it does hold some of the most agriculturally fertile soils, inland water bodies, and river systems and these include Save, Runde, Mwenezi, Mutirikwi, and Limpopo River systems and these dominate the drainage system in the province (Mudzengi et al., 2008). It is the third-largest province in the area of Zimbabwe after Matabeleland North and Mashonaland West. The province roughly has a population of 1,4 million (Zimstat, 2012:4). The Shona subgroup (Karanga) form the majority, with minorities of Shangani and Ndebele in the southwest. The bulk of Masvingo's economy is solely on rainfed and irrigated agriculture.

III. Masvingo: Socio-economic characteristics

This information is from the Zimbabwe National Statistics Agency (Zimstat) 2012 and 2019 reports.

The population in Masvingo is young, with 45% below the age of fifteen years and with 7% above the age of sixty-five years (Zimstat, 2019:11). Almost 26% percent of the population

has never married, and it is due to the large proportion of young people within the population. Masvingo's population is mainly rural, with 10% in the urban areas (Zimstat, 2019). The highest proportions of the employed are engaged in agricultural-related occupations, followed by the services which only constituted 7%. Masvingo is a populous province, and it does relatively have a big poverty gap of 20.7% of the population living in poverty.

A. Types of Rural Farmers in Masvingo.

We need to establish the different types of rural farmers in the Zaka district. This section is essential for the readers to understand. It is because the researcher worked with participants that were rural farmers. Understanding the types of rural farmers in Masvingo presents a picture of the participants' livelihoods and why they were appropriate for the study. It describes the participants' backgrounds, beliefs, and biases with climate change and their resources.

There are three types of rural farmers in the Zaka district. The first type of rural farmer is the irrigation farmer. According to Chambers (2006), the irrigation farmers would be what we call the rural elite of the Zaka district. Irrigation farmers in Zaka are the progressive farmers, as they have access to water supply from the dams supplied by Zimbabwe National Water Authority (ZINWA) to feed their crops. The farmers have land plots that range from 0.5ha to 1.5ha, and this is because their production supports food security and poverty alleviation government initiatives (Maiyaki, 2010). The second type of rural farmer in the Zaka district is the dryland farmers, also known as rainfed farmers. Dryland farmers have land plots that roughly range from 0.7ha to 2ha. They have relatively large land plots. Government initiatives also drive their production. Although, the success of their production is utterly dependent on rainfall. The third type of rural farmer in Zaka is a communal farmer. The farmers have land plots that range from 0.5ha to 2ha (Zimstat, 2019). Their production is reliant on the market. This type of farmer decides which type of seed or animal production is bringing him or her profit. There are the farmers that either decides to trade their products or use them to sustain their families. The farmers sell their produce to the market at the price they choose (Mutami, 2015).The communal farmer's produce is also reliant on rainfall. Irrigation farmers have smaller land plots compared to dryland and communal farmers. It is because they have a direct source of water supply from the Siya Dam. Therefore, they are always guaranteed production, compared to the dryland and communal farmer. Dryland and

communal farmers have bigger land plots to increase the survival chances with production. See Table 4.2.

Table 4. 2 Rural Farmers Characteristics in Masvingo

Types of Rural Farmers in Zaka	Plot Sizes	Production Speciality	Market	Resources	Climate Change
Irrigation Farmers	0.5ha to 2ha	I. Seed Production driven by government initiatives	I. Ready Market provided by government (Grain Seed Marketing Board) II. The farmers pay for their own agricultural inputs. III. There are times were government provides inputs as well. IV. Earn a regular income	I. Access to water supply from the dams. II. Pay for water tariffs. III. Depend on cattle for draught power. IV. Irrigation Infrastructure	I. Least affected by climate change II. Only affected if the dam levels are too low for irrigation
Dryland Farmers	0.7ha to 2ha	I. Seed production driven by government initiatives	I. Ready Market Provided by Government (Grain Seed Marketing Board) II. Pay for their own agricultural inputs. III. There are times were government provides inputs as well. IV. Earn a regular income	I. Dependent on rainfall II. Depend on cattle for draught power. III. Do not pay for water tariffs.	I. Heavily affected by climate change

Communal Farmers	1.5ha to 2ha	I. Production is driven by the market. II. Livestock Rearing III. Seed Production	I. Go and sell to the market. II. They set their own market prices. III. Pay for their own inputs. IV. Only earn an income if they make a sale. V. Government does not cater to their needs.	I. Dependent on rainfall II. Depend on cattle for draught power. III. Pay for water tariffs	I. Heavily affected by climate change

Source: Maiyaki (2010)**,** Mutami (2015) and Zimstat (2019).

We can already see from the data presented in Table 4.2 that there are distinctions between the farmers. Firstly, dryland farmers and communal farmers are practically the same types of rural farmers. The only differences are that dryland farmers already have a ready market to sell their produce. The dryland farmers specialise in seed production that is government-driven, and they receive a seasonal income. Whereas communal farmers, their produce is dependent on the market. They can specialize in any farming that yields them a profit but relies on what they sell on that day.

On top of that, the communal farmers do not earn a regular income. However, all types of rural farmers are greatly affected by climate change both pay for their inputs and rely on intensive labour. Now that we have an overall rounded climate and socio-economic perception of Masvingo, the following section proceeds to discuss the leading site of the study- Zaka District.

4.3.1.2. Zaka District

Zaka district is the study site. The district is southeast of Masvingo and located 130km away from Masvingo town and 70km from the Chiredzi district (Manzvera, 2015). Zaka district is borderline with Gutu district, Bikita district, Chiredzi district, and Masvingo district (Figure 4.3). Zaka's area is approximately 3,126km² with a density of 58.00/km² and has an estimated population of around 185,107 to 205000 people (Zimbabwe Research Department, 2011; Zimstat, 2012).

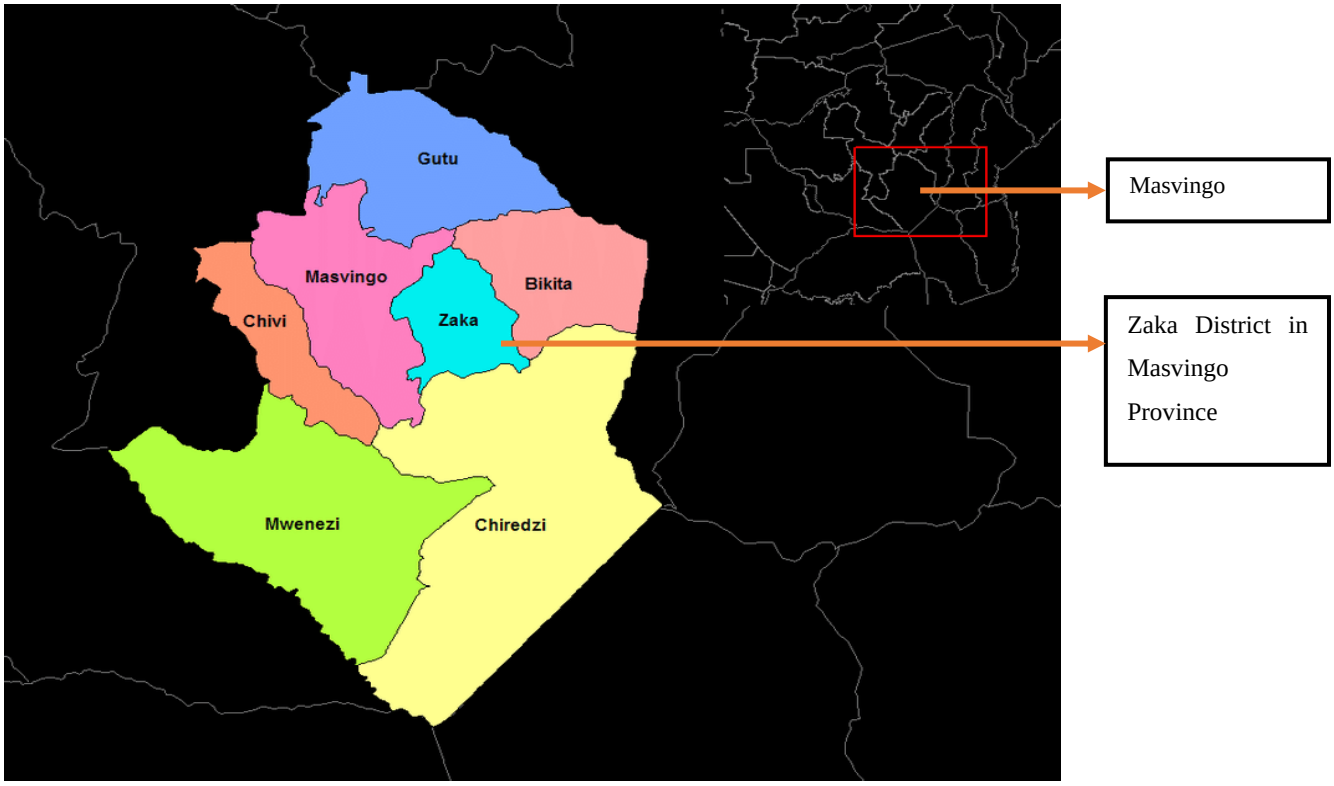


Figure 4. 3 Location of Zaka district in Masvingo Province.

Source: Organisation for Social Science Research in Eastern and Southern Africa (OSSRESA) (2018).

I. Zaka District: Physical Environmental Setting

Zaka District is a mountainous area with steep slopes and sandy, loamy soils. It is responsive to seasonal drought episodes. Eighty-one percent of the district is estimated to belong to agro-ecological regions IV and V, with a mean annual rainfall ranging between 450mm-650mm/yr.

II. Zaka District: Administration

Zaka district has 34 wards in total. Some of the wards are Ndanga, Jichidza Mission, Jichidza Rural, Gumbo, Chipinda, Fuve Panganai, Bvukururu, Nhema (Zimbabwe Research Department, 2011). The NGOs operating within the district are The European Union (EU),

working in poverty alleviation, health, and education. HEIFA works in the Zaka district for cattle restocking, and The International Labour Organisation operates in all socio-economic matters of the district. Several other NGOs such as Caritas, ENSURE, CARE, FARNPAN, and Consortium are also known for working within the district.

There are only two business centres in the whole electorate: Ndanga and Bvukururu. Even though some places have electricity, they are poorly serviced and require essential services such as banks, health centres, and police camps. With regards to local government, eight districts in the electorate are communal and one resettlement. The chief councils and farmers associations represent the wards. Zaka district is densely populated, with forty-eight villages with one thousand households (Guta et al., 2017).

III. Zaka District: Socio-economic livelihoods

This segment offers standard background information regarding the livelihood setup of the rural communities in the Zaka District.

Zaka district mainly consists of subsistence agriculture. The Zaka district population varies from subsistence and smallholder farmers, teachers, people in administrations, machine operators, mining, manufacturing, and engineers. Due to the land reform program, 99% of the farmers are communal smallholder farmers, 18.7% are resettled farmers, and 0.1 are large-scale farmers (Zimstat, 2019). The government gave rural farmers land as an inducement to curbing poverty and increasing food security. Thus, the rural labourers use their land to grow cash crops, including maize, beans, sorghum, and rapoko.

Due to high unemployment and high inflation, rural people rely on small-scale farming for food and livelihood security. Almost every household has a small vegetable garden. Some of the rural family homes are involved in the public and private divisions. Some of the members are teachers, policemen, community health workers, and field officers. The rural farmers consist of individuals that come from female-headed families, grandparent-headed homes, male-headed households, single mother and father-headed families.

Some of the members belong to smallholder schemes and commercial farming. The majority of the people are self-employed, involved in subsistence activities that include:

I. Running tuckshops.
II. Selling of surplus vegetables by the main roads.
III. Providing labour to other farmers in working in the fields.
IV. Providing hair services.
V. Selling airtime.
VI. Selling livestock at the auctions.

All the wards in the Zaka district are underdeveloped, with an insufficient provision of primary services. High unemployment, shortage of commodities, high inflation, climatic shocks, low housing standards, and low education characterise Zaka districts' rural environment. Their rural dwellings consist of cement, brick, or mud, followed by small vegetable gardens and livestock. Education and farming are significant preferences within the communities, as the older generation inspires the younger generation to pursue both divisions to achieve better livelihood outcomes . The wards are isolated from the main center and far from business services. Transport and health services are difficult to access. HIV/AIDS is still a threat to these rural communities. It is costly for households to look after their household members infected with HIV/AIDS. The disease is known to critically strain the families' finances, erasing the small positive changes.

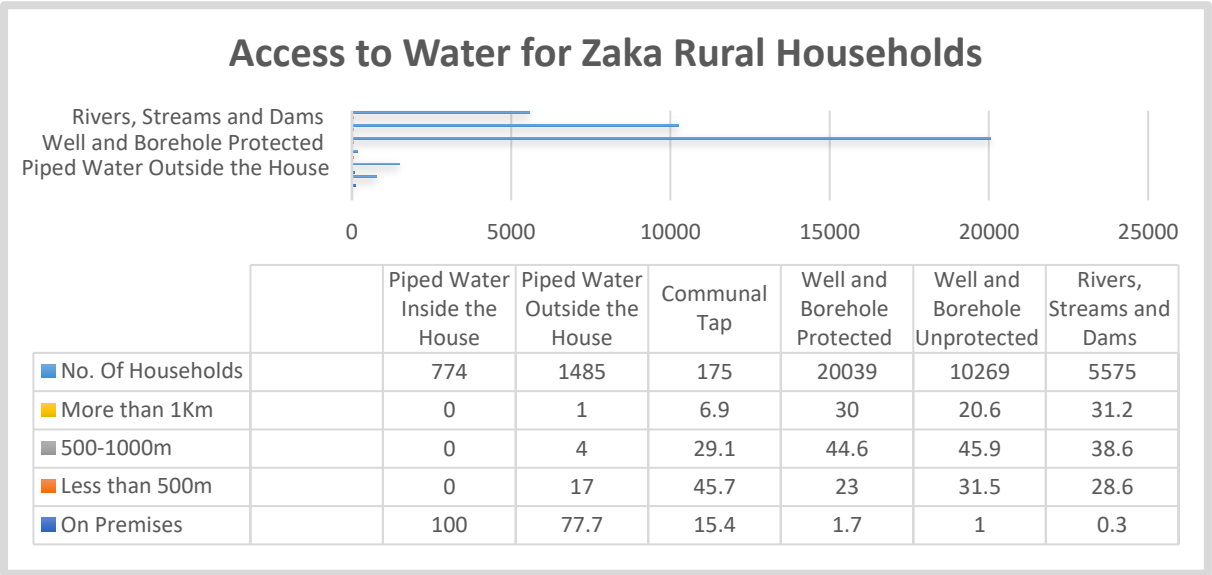
To gain a better understanding of the communities' livelihoods setup, we describe the livelihood setup with regards to :

I. Where the communities source their water for cooking and drinking.
II. Where the communities source their energy for cooking.
III. The levels of education within the communities.
IV. The housing conditions.
V. Access to health facilities.

This part of the section is essential as it provides a picture of the participants living conditions. The information is from Zimbabwe National Statistical Agency (Zimstat) (2012) demographic records and the Zimbabwe Research Department (2011).

A. Access to Water

Access to water in Zaka District for rural households is entirely satisfactory. The majority of the rural communities obtain their water within their premises through piped water inside their rural dwellings (Figure 4.4). In practice, almost 6% of Zaka district have their main water supply within the premises. Other rural communities use communal taps, protected and unprotected wells, boreholes, rivers, streams, and dams. 40% of the rural labourers travel a distance between 500m-1000m to acquire water. According to Zimbabwe Research Department (2011:6), there are approximately 115 deep wells and 130 boreholes within the district.



		Piped Water Inside the House	Piped Water Outside the House	Communal Tap	Well and Borehole Protected	Well and Borehole Unprotected	Rivers, Streams and Dams
No. Of Households		774	1485	175	20039	10269	5575
More than 1Km		0	1	6.9	30	20.6	31.2
500-1000m		0	4	29.1	44.6	45.9	38.6
Less than 500m		0	17	45.7	23	31.5	28.6
On Premises		100	77.7	15.4	1.7	1	0.3

Figure 4. 4 Access to water for drinking and cooking for Zaka District Rural Households

Source: Adapted from Zimbabwe National Statistics Agency, (Zimstat) (2012) and Zimbabwe Research Department, (2011).

B. Main Source of Energy Used for Cooking in Zaka Rural Households

The preponderance of rural households in the Zaka District use wood as their source of energy fuel. Due to the high inflation, gas, cooking oil, paraffin, and electricity have become expensive commodities for the Zaka rural communities. Therefore, the communities rely on trees as a form of natural sustenance.

C. Levels of Education

Households in Zaka District have access to primary and secondary education. There are 25 primary schools, with around 14860 students consisting of 51% males and 49% females. Zaka has an average of 400 teachers within the schools, with a teacher-student ratio of 1:38. This statistic is below the national average of 1:43. Each ward has a standard of 4 schools, and the least have a standard of 2 schools. Zaka District has 12 secondary schools that offer education up to the ordinary level. There is one boarding school. Three are missionary-owned, and the local council owns the rest. Primary and secondary schooling centres are present, although it is subject to the household's level of finances to pay for education.

D. Housing Conditions

Rural communities in the Zaka district live in conventional dwelling units characterized as a typical rural family settlement in which the homes consist of poles, cement, mud, or bricks with thatched roofs. The people live in cluster units, and their access to streets is through paths, steps, or pavements that other dwelling units do not share. The majority of the dwellings have household gardens. Zaka District has a standard household size of 6 persons per household. Some households differ by having a standard size of 8 persons per house depending on the size of their extended families. Based on the data provided by Zimstat (2012), there is a comparatively large proportion of male-headed homes compared to the female-headed homes for Zaka District.

There are approximately 40294 households within the district. The households' proportion mainly uses Blair toilets (31.1%) and pit latrines (4.9%). Though 55.9% of the rural family homes do not use any toilet facility at all, and that 1.3% of the households use communal toilets.

E. Health Facilities

Zaka District has five health facilities comprised of one hospital and five rural health centres. The main hospital, Saint Anthony, is owned by the Roman Catholic Church. The Rural District controls the rest, including Jerera, Chinyaba, Siyawere, and Fuve Panganai. The Zimbabwe Electricity Supply Authority (ZESA) connects all the health facilities, and the authority power grid has fire protection and fencing.

We can see that the rural people rely on essential services and infrastructure to support their well-being. Although, the services provided are inferior and do not reflect the properties of adaptation. The participants living conditions reflect more of a survival-environment picture, whereby the people depend on the necessities to keep their lives afloat amid climate change, chronic poverty, and hunger.

4.3.2. Study Population and Procedures

Zaka district has 34 wards(Zimbabwe Research Department, 2011). The researcher wanted to know which wards out of the 34 were small-scale farmers as they were the study population. Finding the small-scale farmer population within 34 wards was arduous due to outdated population records and controlled access to remote settings. Thus, the researcher opted for key informants to locate the small-scale farmers in the Zaka district. The key informants are academics, field experts, and government officers specializing in rural agricultural farming in Masvingo province. We must, more importantly, note that in Zimbabwean rural settings, there are non-governmental and governmental organizations that operate in the area performing developmental projects that serve the purpose of alleviating poverty and food insecurity. Thus, the researcher needed to speak with specialists established in the Zaka district, who had access authority and daily operations with rural communities.

The researcher came across Zimbabwe Super Seeds (ZSS) governmental organisation. This organisation was purposely chosen for this research because it helped the study in narrowing down the wards that practiced subsistence agriculture. The organisation was well invested in the climate change phenomenon in the Zaka district and was willing to provide knowledge about what they knew about it. For this project, the researcher spoke with the managing director, operation program officers, and field officers to identify the different wards. The key informants provided this information.

We found that Zimbabwe Super Seeds was already an established governmental organisation that managed ten wards specialised in seeds small-scale farming for ten years. Zimbabwe Super Seeds is an essential organisation for this study because it runs smallholder schemes in Masvingo province, including the Zaka district. Understanding how they operate was vital to the study because it provided context to how the small-scale farmers in the Zaka district

acquired their farming assets. It also provided information on how the small-scale farmers dealt with drought and physical water scarcity with assistance from the organisation.

Zimbabwe Super Seeds was a community based organisation (CBO) organisation that transmuted to a private company specialising in providing drought-resistant seeds and market access to small-scale farmers of Masvingo province (Ndlovu, 2020). They intended to provide small-scale farmers with the best hybrid seed varieties that cope with climate change and still produce high-quality yields (Echanove, 2017). The crop varieties will profit marginalised and greenbelt farmers who demand perfection in productivity (Echanove, 2017). The organisation collaborates with the Swiss Development and Cooperation (SDC), supported by FANRPAN (Food, Agriculture, and Natural Resource Policy Analysis Network). The organisation established seed projects that would help rural farmers that undergo high levels of chronic poverty and drought with the possibility to grow seeds and earn an income from their seed production. People from different wards were recruited into the project because they had land, whether large or small.

The objective of the program is to link the smallholder farmers to seed companies. There were already projects that were executed by SADC Seed Security Network (SSSN) between 2006 and 2008 in other SADC nations, and Zimbabwe Super Seeds followed through (Kureya, n.d). The program was established to advance food security and reduce the poverty levels of rural families in the SADC region by giving them seeds and direct access to markets (Kureya, n.d). The projects are currently running in Malawi, Swaziland, Zambia, and Zimbabwe.

The Zimbabwean projects started in 2010 and the company was later registered in 2012 by the Seed Services Unit of the Department of Research (Ndlovu, 2020). The first project was in Zaka District, and then it expanded to three other districts from Masvingo to Bikita and Gutu. Additionally, the organisation has smallholder projects in Manicaland as well. The Swiss Development and Cooperation and FARNPAN assist Zimbabwe Super Seeds in providing drought-resistant seeds, including beans, maize, rice, cowpeas, sugar beans, sorghum, and groundnuts. The organisation has recruited over 3000 farmers in 4 different districts. Each farmer has a contract with Zimbabwe Super Seeds, and they are annually evaluated based on crop performance (see appendix 3). Figure 4.5 displays the management structure and relationship with Zaka District farmers.

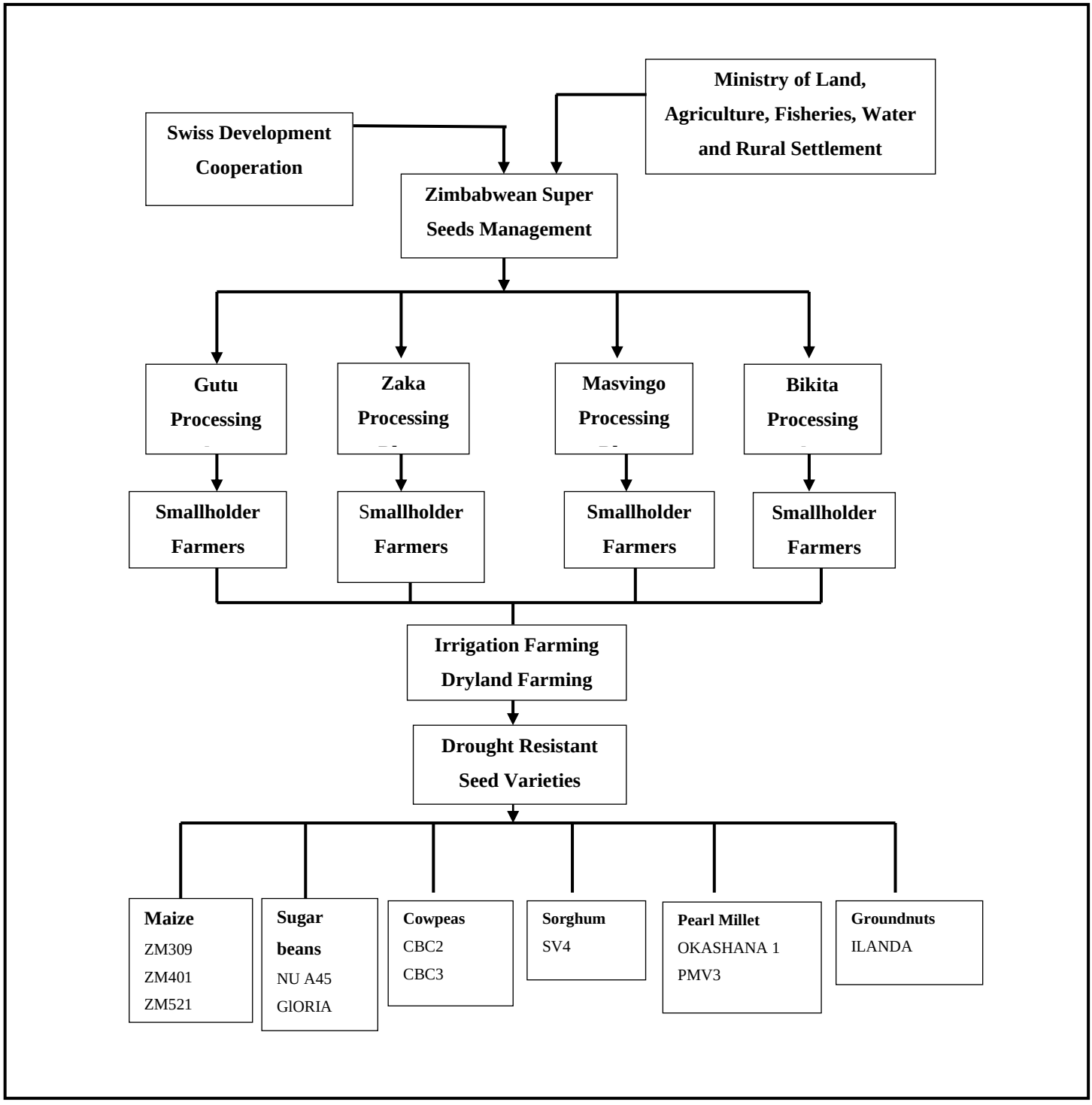


Figure 4. 5 Zimbabwe Super Seeds Structure

Source: Field Based Data Survey Notes (2020).

We found that Zimbabwe Super Seeds (ZSS) manages ten wards out of the 34 wards in the Zaka district. The wards are clustered together based on two crucial factors:

1. The wards consist of rural farmers that either specialise in dryland or irrigated agriculture.
2. Each ward consists of rural farmers the specialise in different seed production.

All the ten wards practiced seed subsistence farming, and they range from dryland agriculture to irrigated agriculture. The ten wards range from 1-6, 15,16, 22, and 23. Six wards specialised in dryland farming, and four wards specialised in irrigation (see Table 4.3).

Table 4. 3 Zaka wards that specialise in small-scale farming.

Wards in Zaka District	Type of Agriculture
1	Dryland
2	Dryland
3	Dryland
4	Dryland
5	Dryland
6	Dryland
22	Irrigation
23	Irrigation
15	Irrigation
16	Irrigation

Source: Field Based Survey Data (2019).

The seeds project range from maize (ZM309, ZM401, ZM521), sugar beans (NUA45, Gloria, Sweet Violet), Cowpeas (CBC2, CBC3), Sorghum (SV4), pearl millet (Okashana 1, PMV3), and groundnuts (ILanda). Wards 1-3 and 15 specialise in maize production. Wards 4-6 practice groundnuts production, and wards 22-23 and 16 specialize in sugar beans production. For this investigation, we were interested in the farmers that engaged in maize production. We purposely selected wards 1-3 and 15 for investigation because maize is Zimbabwe's traditional food crop, and it has been a central root of food and nutrition for many rural communities, providing food security for the local people (Shava et al., 2009). Maize is the

community's source of resilience to food insecurity and chronic hunger in Southern Africa (Ekpa et al., 2018). It made sense to examine the maize farmers and understand the challenges they faced. Doing this would shed light on the status of Zimbabwe's food security. Remember, alleviating poverty and increasing food security are Zimbabwe's core objectives in rural development planning, and therefore examining the maize farmers would provide information for Zimbabwean policymakers and development practitioners that could be feasible to improve their initiatives.

The researcher wanted access to all types of rural farmers to form a study sample of 60 participants. She specifically wanted access to the dryland and irrigation farmers for comparison purposes. Due to the COVID-19 lockdown restrictions, getting a hold of the communal rural farmers was difficult. The COVID-19 lockdown restrictions were beyond the study's control, and the researcher presented this limitation in detail in the methodological reflections. Sometimes, we cannot study all the population members that interest us (Pierce, 2008). We can never make every possible observation of them (Babbie, 2010; Pascoe, 2014), and in some cases, researchers view this as a positive interference as it leaves room for other scientific researchers to investigate. However, we can select a sample from two places in every case, from raw data or existing data (Babbie, 2010).

The aim was to ensure that every element meets the theoretical definitions laid down and has a chance of being selected. The study had accessed four wards based on subject availability, wards explicitly 1-3 and 15. Wards 1-3 consist of dryland farmers, and ward 15 consisted of irrigation farmers. All four wards specialised in maize seed production. See Table 4.4.

Table 4. 4 Ward 1,2,3, and 15 Rural Farming Characteristics.

Wards	**No. of Farmers**	**Types of Farmers**	**Production Speciality**
1	67	Dryland	Maize
2	48	Dryland	Maize
3	28	Dryland	Maize
15	36	Irrigation	Maize

Source: Field Based Survey Data (2019)

We can see in Table 4.4. that the numbers of farmers in each ward are not uniform. Therefore, the researcher purposely decided to apply the 30% margin of error to gain a representative sample of the farmers from each ward. We applied this scientific equation below:

$$\textbf{Representative Sample} = \pm 30\% \textit{ of Total No. of Farmers in Each Ward}$$

Table 4. 5 Representative samples for Wards 1-3 and 15

Wards	No. of Farmers	Margin of Error	Representative Sample
1	67	$\pm$30%	20
2	48	$\pm$30%	14
3	28	$\pm$30%	8
15	36	$\pm$30%	10

Source: Field Based Survey Data (2019)

With the data provided in Table 4.5, the study used stratified sampling to ensure that the final sample represents the population in situations where the population has multiple characteristics that are proportionately uneven. In Table 4.5, the population splits into subunits based on the 30% margin of error. The representative samples share the same characteristics within the same population. The characteristics are that they are Zaka rural farmers under the ZSS scheme, engaged in maize production.

Though, there are two strata sets in this population. One is all dryland farmers, and the second is the irrigation farmers. The proportion will be 14:10; for every 14 dryland farmers in the population, there are ten irrigation farmers. Dryland and irrigation farmers' experiences may differ, and as such, we wanted to ensure that both strata sets were factored proportionately. Our sample needed to have the same ratio as the population to be considered representative. As the two strata sets are based on the different types of farming, we drew a larger sample from the irrigation farmers than from the dryland farmers.

The researcher used the farmers' contact list to make the selection. She placed the contacts in a hat and used an interval of 10. For wards 1-3, ten people were randomly selected from the representative sample to make up 30 dryland farmers. From ward 15, the researcher added

twenty more people to the representative sample to make up 30 irrigation farmers, and this made the study population of 60 Zaka rural farmers (see Table 4.6).

Table 4. 6 Study Population with Simple Random and Stratified Sampling

Wards	**No. of Farmers**	**Types of Farmers**	**±30 Representative Sample**	**Final Sample**
1	67	Dryland	20	10
2	48	Dryland	14	10
3	28	Dryland	8	10
15	36	Irrigation	10	30
Total				**60**

Source: Field Based Survey Data (2019)

There are some sample elements that we needed to consider, and these are presented in Table 4.7 below.

Table 4. 7 Sample Factors

Sample Included :	Sample Excluded:
I. Male and female farmers starting from the age of 25 and above. II. Farmers that practice subsistence agriculture for market and income purposes III. Resided in a ward that was managed by Zimbabwe Super Seeds scheme IV. Reside in drought and water scarcity prone areas. V. Specialised in maize production.	I. Children who are farmers II. Communal Farmers III. Farmers that are not part of the Zimbabwe Super Seeds scheme IV. Farmers that practiced livestock rearing V. Farmers from other wards under the Zimbabwe Super Seeds scheme wards, 4,5,6,22,23,16.

Source: Field Based Survey Notes (2019)

In qualitative research, scientists choose a sample based on informational redundancy (Vasileiou et al., 2018). If the sample did not elicit any new information, the researcher

would terminate the sampling. The researcher followed the logic of informational comprehensiveness that suggests that if the sample provided vast information, the smaller the sample size needed and vice versa (Malterud, 2001).

There is no straightforward answer in qualitative research about 'how many' is sufficient for a sample (Malterud, 2001; Boddy, 2016). The sample size may stem from epistemological, methodological, and practical issues in the research (Dworkin, 2012; Vasileiou et al., 2018). Sandelowski (2004) claims that with large samples, we can obtain a strong and newly textured conclusion of the paradox understudy but meagre enough not to avert the deep case-orientated analysis of qualitative data. Vasileiou et al. (2018) claim that the more data collected from each person, the fewer participants. The structure of the questions in qualitative interviewing influences the richness of the data, and from the experience of most qualitative researchers in social science, there is very little information generated after interviewing more than 20 people (Ritchie and Lewis, 2003). Ritchie and Lewis (2003) advises qualitative researchers to conduct no more than 50 interviews so that researchers can manage the complexity of the analytical tasks at hand.
The researcher admits that a more comprehensive sample would have provided the study with valuable data. However, the researcher selected participants from wards 1-3 and 15 because they yielded a balanced picture of the situation the study wanted to investigate. The benefit of using stratified and systematic sampling is that it enabled the researcher to acquire the sample that possessed the population characteristics.

Wards 1-3 and 15 are special wards to the researcher and exploring them generated valuable enrichment to the study. Here is a brief description of the names and locations of the wards.

I. Ward 1, known as Chipinda, is located 200km from Masvingo town.
II. Ward 2, known as Bvukururu, is located 87km from Masvingo town.
III. Ward 3, known as Ndanga, is located 60km from Masvingo town.
IV. Ward 15, known as Fuve Panganai, is located 110km away from Masvingo town (see Figure 4.6).

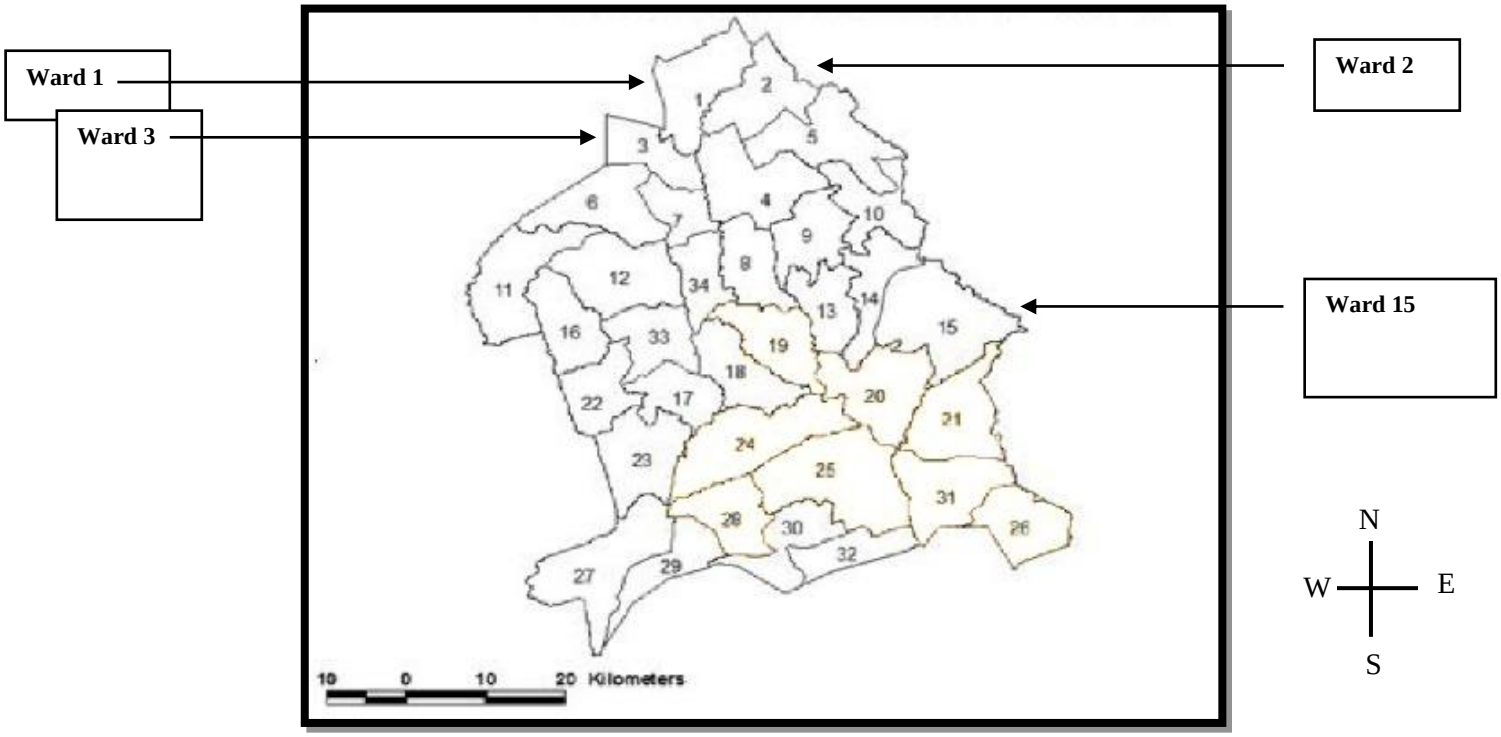


Figure 4. 6 Wards 1,2,3 and 15 in Zaka District

Source: Altered map of Zaka district and the wards from Munyati et al. (2013).

All the rural farmers in wards 1-3 and 15 possess land to practice subsistence agriculture for market and income generation. The Zimbabwean government allocated them land as part of the Fast-Track Land Reform Program and Food Security program in 2008. The purpose is to practice subsistence agriculture, using either big or small land to produce seeds for market purposes. The initiatives would serve the purpose of increasing food security within the region while enhancing the living conditions of the farmers because they would earn a seasonal income. The farmers in wards 1-3 and 15 live in areas where chronic poverty and food insecurity levels are high, and they reside in areas that are sensitive to drought and water scarcity.

Even though the study was confined to four wards, the four wards represent 12% of the Zaka district. The wards reside in agro-ecological zones between III, IV, and V, where annual

rainfall ranges between 450-650mm, respectively (Guta et al., 2017). All wards are highly responsive to physical water scarcity and droughts due to low annual rainfall and high temperatures ranging from 26°C to 32°C. The wards consist of 40% arable land, and the remaining 60% is hilly and rugged (Risiro et al., 2013).

The study chose wards 1-3 because they specialised in rainfed agriculture. For the rainfed farmers, the researcher wanted to (1)explore what the farmers' daily livelihoods entailed and (2) investigate how they managed maize production in periods where rainfall was scarce.

The study chose ward 15 for comparison purposes. The researcher wanted to (1) explore the irrigation farmers' daily livelihoods and (2) investigate if climate change was a problem for them.

Seed production is an essential variable for dryland and irrigation farmers because any changes can alter their seasonal income. The researcher wanted to explore the experiences the farmers have had in managing seed production and income. It is a cause-and-effect relationship. Both variables affect one another. In the same line of inquiry, the researcher wanted to investigate their livelihood resources. The only way to achieve that was to find out what resources they used to defend their seed production and income from negatively changing.

4.3.3. Data Collection Tools

Here we presented the data collection tools that the study used to collect the information. Gathering information demanded an active inquiry. The research was purely qualitative, and thus the researcher selected focus groups, interviews, visuals, and observations to collect data from the participants.

4.3.3.1. Focus Groups

Focus groups were one of the first primary tools the researcher used to collect information from the participants. Focus groups are a qualitative method that researchers use to collect data through group interactions (Babbie, 2010; Strydom and Bezuidenhout, 2014). The group comprises several carefully selected people who address the given topic. It is a very productive tool in gathering primary data. The focus group sessions consisted of 30 farmers,

16 males, and 14 females in total. The focus groups had young female and male farmers and elderly farmers. Four focus group sessions took place, and each session had about 7-8 people.

It was important for the participants to feel comfortable with the researcher where the meeting took place (Strydom and Bezuidenhout 2014). If the members did not feel at ease, then they would not volunteer information. The researcher created small groups to make participants feel comfortable sharing their feelings and opinions. It was more intimate that way. Each session was conducted for 60-90mins, with this being led by the nature and complexity of the discussions. The researcher gave the intended participants a prior notification of 14 days to plan their schedules and include this session in their engagements.

The intended participants were farmers engaged in rainfed farming. They mainly engaged in maize production activities that took up most of their substantial time. The meetings took place in areas that were convenient for the participants. The venues were school classrooms and open-air settings. Nyumba et al. (2017) insist that the venue should have enough seating that enables participants with a clear view of each other and the researcher. In some moments of the discussion, the researcher made quiet observations paying attention to the participants' body language. Babbie (2010) and Strydom and Bezuidenhout (2014) call it 'studying social behaviour without affecting it.' Paying attention to their behaviour was vital because we could pick up any signs of unspoken issues or negative feelings. It is easy to ignore body language (Mishra, 2016) when paying attention to just the information provided by the participants. Thus, the researcher looked for gesticulations that suggested levels of hesitancy, shyness, and exhaustion. The researcher used soft interferences to address them.

The researcher understood that the participants had taken out time out of daily their schedules to meet with me, and thus it was her priority to make the environment they were in feel safe and secure. The researcher sought to create a warm atmosphere by personally greeting them and showing gratitude for availing themselves. Making the participants feel safe and secure would encourage them to express their feelings and opinions without fear of being deceived, judged, or mocked (Strydom and Bezuidenhout, 2014).

During the introduction phase, the researcher began with an ice breaker about herself, which allowed the participants to laugh and feel relaxed about themselves before the discussions started. Each participant gave a short introduction about themselves, including their family,

age, education, and occupation. This information was essential, and it provided the researcher a better understanding of the participants concerning the study objectives. The researcher looked out for participants that may have felt nervous during the introductions and used the approach of reminding the participants of how thankful the researcher was to have them in this meeting and that whatever information they provided, she was beholden.

The researcher made sure that she explained the housekeeping rules, specifying how long each session would take, the research interests, and what was expected from each participant. The researcher described and repeated the study interests in situations where it was necessary. The researcher remained open-minded and did not pose leading questions that would influence their answers. The purpose was to gather as much knowledge as possible from the participants within the time frame. At first, it was a challenge because the participants were completely involved with the discussions, but the interview guide ensured vital questions were addressed.

Using the focus group technique allowed the researcher to question the participants simultaneously and systematically. The focus groups were general and conversational, and the researcher was grateful for the high attendance and co-operation. The benefits of applying this technique are that it provided flexibility and was low in cost. The technique fostered high face validity. Using focus groups helped the researcher capture the real-life data experiences about climate change, resources, and daily livelihood challenges. She managed to capture the emotions and feelings on issues that were greatly important to them. Using the technique helped gain insight on the topic from the participants' perspective, allowing the researcher to collect different viewpoints. The participants would build and add to each other's statements, which encouraged discussions and debates. Lastly, it helped direct the construction of interview questions. Th researcher came up with additional predetermined questions for in-depth interviews that she wanted to pose to the participants in ward 15.

The study applied a common interview approach and later on followed a conversational path. Specific themes were covered with predetermined questions, and the participants were free to express how they felt. In some cases, the researcher allowed the participants to go afield because they presented additional fortuitous information. Most of the time, the discussions required probing. Probing the participants was a very adaptable approach, as it allowed the researcher to adjust the nature and focus of the interview when deemed necessary.

I. Focus Group Interview Questions

The researcher came up with questions for the focus group discussions to examine the impacts of climate-induced hazards on small-scale farmers' livelihood outcomes in the Zaka district and explore what type of resources they had. The design of the questions was open-ended, with extra room for probing if required. The design had three sections. The first part addressed the perceptions and realities of water scarcity and drought. The researcher was interested in firstly; exploring whether the farmers understood climate change and its forms. The researcher drew up questions that brought up the challenges and how those challenges affect their families and livelihoods in the long term. The second section addressed the local institution and their assistance in helping small-scale farmers cope with drought and water scarcity. The researcher wanted to know what form of capacity assistance was provided by the local institution. The third section deals with capacity development. The researcher wanted to determine the farmers' perceptions about the solutions they had to the challenges to better their livelihoods (see appendix 4A).



Figure 4. 7 Focus group Introductions with farmers from ward 3.

Source: Photos captured by Thandiwe Mpala (2020).

4.3.3.2.Interviews with Farmers

The researcher adopted telephonic interviews. It is a tool that interviewers use to ask their participants one-on-one qualitative questions (Block et al., 2012). The technique provided a collection of detailed personal data that provides a high degree of response quality and the

opportunity for probing deeply into issues that required more clarification in the focus group meetings (Block et al., 2012:3).

The researcher conducted thirty telephonic interviews. The participants were irrigation farmers. The interviews had two groups. One group of eighteen male farmers and the second group of twelve female farmers. The benefit of telephonic interviews was that the researcher could reach participants electronically during the COVID-19 lockdown. During the COVID-19 lockdown, all the residents of Zimbabwe had to stay in their homes until the government deemed it was safe to resort back to daily activities. Thus, the researcher used telephonic interviews to continue with the research. Using the technique was more cost-effective than face-to-face interviews. It saved the researcher's transport, venue, and personnel costs. The researcher posed the question asking if participants were comfortable having the interview over the phone, and to the researcher's surprise, the participants were highly comfortable speaking on the phone within the comfort of their homes. The participants felt safe and willingly provided vast information that the researcher was interested in without feeling judged or ridiculed as they would feel in the presence of their colleagues. Using this technique yielded low refusal rates from participants. It was time-effective. The researcher could quickly gather information from participants as compared to focus groups.

The researcher began by arranging interview dates with the participants. The researcher started by giving a friendly introduction to who she was and where she came from. She explained how she acquired their contact details from the institution and explained her research interests and the purpose of the session. The researcher ensured that the participants felt relaxed by showing them gratitude for taking the time out of their daily activities and explained how valuable their opinions were. Some participants on the day of the interviews were busy with household and family duties that arose, and thus, the participants made a kind request to be called back after they had completed their tasks. The interviews lasted between 20-30minutes.

The study adopted standardized, open-ended interviews, asking the same set of questions to all the participants. The nature of the interview was natural and conversational. In essence, the researcher was just the listener in the conversations. The researcher listened to the participants speak freely about the issues and asked for additional clarity on matters brought up. The researcher asked open-ended questions, which were questions that did not lead the

participant to answer in a certain way. Participants provided varied opinions and responses that were not influenced or predetermined by the researcher. The researcher avoided double-barrelled questions as applying that approach would only confuse the participants and foster them into answering only certain parts of the question (Strydom and Bezuidenhout, 2014). Adopting the technique took less time as compared to doing face-to-face interviews. It required little personnel needs in setting it up.

I. Interview Guide Questions

The interview guide had four sections. The first section began with farming in the Zaka district. The researcher wanted to find out about the participant's farming background. Therefore, she composed questions about their farming routines, the period they began farming for Zimbabwe Super Seeds, the benefits of joining the program, their household demographics, and the types of resources they used for their household and farming. The second section dealt with their perceptions and realities of drought and water scarcity in their area. The researcher wanted to investigate the farmers' interpretation of drought and water scarcity and how it affected their farming routines. The third section addressed the assets and methods of adaptation. The researcher wanted to explore the resources they had access to and investigate how they used their current resources to adapt to the impacts of drought and water scarcity. The researcher wanted to explore what combinations of the resources they used to deal with climate impacts and if they incurred any additional challenges in using their resources. The last section dealt with the seed farmers' association. The researcher wanted to know if a collective body represented the farmers, and if there was, how did the collective body assist the farmers with their daily farming challenges (see appendix 4C).

4.3.3.3 Interviews with key informants

The researcher used telephonic interviews to collect specialized data from key informants. Informants are experts on the subject matter (Ryan et al., 2009; Babbie, 2010). It included informants who held professional capacity or authority. The researcher used telephonic interviews because it was productive. The tool had a more sensitive approach than face-to-face interviews. Ryan et al. (2009) state that self-consciousness and perceived status differences arise with face-to-face interviews, but there were none in this context. Using this technique provided the informants the opportunity to express their opinions freely. Each interview session was between 30-40minutes. Five key informants were interviewed. The informants ranged from Zimbabwe Super Seeds management to government officers and

agricultural experts. The researcher built a rapport with them, and it helped obtain crucial information from them.

The technique helped collect specialised information, making it easier for data analysis. It also allowed the researcher to compare the notes and opinions of the participants from the other sessions. The researcher conducted the interview using a semi standardised interview approach. It then followed a conversational path. It fostered unanticipated responses and allowed new issues to emerge that the researcher explored. The researcher adopted active listening, allowing the interviewee to be the mentor, and letting the researcher become the learner. It was pertinent to allow the informant to speak consecutively and at their own pace. The interview flowed more freely. The researcher did not offer any opinions on the answers or questions except to probe for simplification or amplification.

I. Interview Guide Questions for Key Informants

The researcher designed the questions using semi standardised and one on one interviews. The first section of the interview guide began with addressing organisational information. The researcher wanted to know about the organisation and understand how old the organisation was since the establishment.

The second section dealt with the basic understandings of systems in place with seed farming projects in the Zaka district. The researcher wanted to know how the projects came about and inquire about the institutional structure and policies they followed regarding agriculture and climate change in the Zaka district.

The third section of the guide addressed the knowledge and action taken to combat climate change and adaptation. The researcher wanted to know what support mechanisms the organization provided to improve the farmers' livelihood conditions. The researcher was interested in the institution's successes and failures. Using this guide helped the researcher acquire valuable detailed information for analysis (see appendix 4B).

II. Voice Recorder

The researcher used an audio recorder in the form of a digital phone to record the information. Using an audio recorder allowed her to concentrate on the interview rather than

adopting notetaking (Tessier, 2012). Notetaking is a valuable procedure in recording data (Carell, 2007) although, the drawback is that it can lead to a disorganized interview, where essential information can be forgotten or neglected (Tessier, 2012). The researcher used an audio recorder to locate information that she might have missed during the sessions. It helped the researcher recapture information that was useful for analysis.

III. Photos/Visuals

The researcher used visual methods to capture data. Pictures were taken during data collection and collected from the informants through emails. Visuals are an effective way of 'discovering additional layers and meanings behind the information, adding validity and depth, and creating knowledge' (Glaw et al., 2018:1). The researcher used visuals to capture the details of the information addressed in the sessions. It was more productive as compared to using verbal and written methods. The technique effectively illustrated the participant's ideas and opinions on the subject at hand. Glaw et al. (2018) state that using visual methods is a new novel approach to qualitative research, and it adds value to other existing methods by bringing in another dimension. The researcher used visuals to illustrate the matters brought up by the participants. Visual methods add trustworthiness to the findings in the study (Glaw et al., 2018). The technique provided new insights into the existing verbal and written data captured from the focus groups and interview sessions.

As we come to the end of section 4.3.3.1, which discussed the primary data collection tools, we move on to section 4.3.3.4, which describes the secondary data collection tools that the researcher used for the study.

4.3.3.4 Secondary Data

The researcher used secondary data to validate the findings from the primary data. According to Martins and Antonio Ribeiro Serra (2018:2), ‘secondary data is every data set not obtained by the researcher or the analysis of data gathered by someone else.’ The data may include information previously gathered and taken to develop new questions, for which the data collected was not initially intended (Vartanian, 2010). Secondary data for this study included transparent and trustworthy information from government and international projects. The data was put into files and reused to clarify the data acquired from the interviews and focus groups.

The data files varied from:

I. Published sources on climate change policies.
II. Published sources of small-scale farmer case studies.
III. Previous crop production records.
IV. Other previous photos and visuals collected by researchers.
V. Past studies of smallholder schemes by other researchers.

The researcher obtained secondary data from the University of Witwatersrand library, and it was inclusive of published journals, books, and articles regarding climate change and livelihoods from other case studies. The researcher was careful in selecting data, checking the credibility of the sources, and examining whether the information addressed the subject that the researcher was investigating. Any source that did not address the subject was dismissed and not used in the data analysis. It was done at a durable pace. The benefit of using secondary data was that it enabled the researcher to access ready-to-use available data. One of the objections was that the information gathered was accessible but not designed to answer the research objectives.

4.3.4. Data Analysis

Researchers often mistake that qualitative analysis is more candid than quantitative analysis. Quantitative analysis is associated with statistical analysis. Quantitative researchers miscalculate the amount of work and time required to perform a deep and close reading of statements and deliver a detailed account of the findings. Simply with qualitative analysis and interpretation, data is converted into findings. Data analysis is the 'process of bringing order, construction, and meaning to the body of data' (De Vos, Strydom, Fouche, and Delport 2011:397). The researcher implemented the translation by completely being invested in the data. The researcher spent time identifying and analysing the evidence, looking for eye-opening patterns of meaning emerging from the raw data. It was a long and challenging process.

The researcher deciphered data from telephonic interviews and focus groups. The researcher listened to all the recordings and wrote down all the information. After intense listening and transcribing, the researcher made sense of the data. Afterward, the researcher used qualitative

content analysis to analyse the data. Qualitative content analysis is defined ‘as a method used to explore and identify clear and covert themes and patterns enclosed in a particular text’ (Bezuidenhout and Cronje, 2014:234). According to Zhang and Wildemouth (2009:319), ‘qualitative content analysis creates special themes that display the spectrum of meanings of the phenomenon rather than the statistical importance of the appearance of the particular events or concepts.’ The model comes from an inductive or deductive procedure. The inductive method analyses the results from the precise to the general means (Bezuidenhout and Cronje, 2014: 234). This analysis suggests using the raw data in the researcher’s analysis to generate themes without a predefined conceptual framework. The deductive procedure analyses the results from the general to the specific. This type of analysis suggests using a predefined conceptual framework acquired from existing theories to identify specific codes within the data, classified into several themes (Bezuidenhout and Cronje, 2014: 234). They are codes that are developed before deciphering the data (Berg, 2001). The study selected the deductive approach. With the deductive approach, the study used a conceptual framework, in this context, the Sustainable Livelihoods Analytical Framework (SLAF) in chapter 3 from the sustainable livelihoods theory. The researcher used the framework to identify specific codes within the text and then categorised them as themes. These themes were then linked to the literature and to the theoretical framework that the researcher described in chapter three. The researcher established the codes before examining the data. (see Table 4.8).

Babbie (2010) states that sometimes, researchers like to work with variables and attributes when analysing qualitative data. The researcher looks for variables in the theoretical framework and assigns the attributes that follow the variables. In analysing the information, the researcher looked for indicators that represent that particular variable's attributes. Babbie (2010: 14) states that variables are 'logical sets of attributes.' An attribute is a 'characteristic or quality of that variable' (Babbie, 2010:14). Indicators are signs or patterns that represent the attribute (Babbie, 2010:14).

Table 4. 8 Coding Scheme and its links to the SLAF framework

Themes / Variables	Attributes/ Codes	Potential Indicators / Signs
Assets	I. Human II. Natural III. Physical IV. Financial V. Social	I. Land II. Water III. Rainfall IV. Seeds V. Education VI. Training VII. Associations VIII. Income
Trends and Shocks	I. Drought II. Pests Proliferation III. Harsh socio-economic climate IV. Diseases V. Water scarcity	I. High temperatures II. Shortages of water supply III. Crime IV. Price volatility V. Crop failure
Livelihood Strategies	I. Natural Based Activities II. Non-natural based activities	I. Diversification of resources II. Farming
Livelihood Outcomes	I. Income Security II. Well-being III. Low levels of risk IV. Improved livelihood Status	I. Low cases of hunger in households II. Improved capability to pay for basic household amenities.

Source: Field Based Data Notes (2020)

The researcher used Table 4.8 to make sense of the information collected from focus groups and in-depth interviews. The researcher would code responses using letters (C) and (P) to distinguish which responses represented a code and a sign and link them to the themes. Using excel, the researcher would group the responses from the participants and informants into tables. The responses were grouped under the questions provided in the interview guides. The researcher proceeded to use this process until the analysis was complete. The responses were evaluated and categorised as either essential, important, insignificant, or unrelated. The researcher used some quantitative aspects which included graphs and tables to present the results more accurately.

4.3.5. Methodological Reflections

Methodological limitations are common in social science research because of the nature of the people we study. We explore social science in open systems where we cannot ignore causation and impact. Limitations are highly likely to appear in action research, especially in a third-world setup where social structures are composite. These challenges arise from the intricacy of contexts in which the social irregularity exists. The complexity of contexts may include political, social, developmental, environmental, and health-related between the researcher and the investigated. The limitations vary from pandemics, language barriers, politics, transportation, lack of resources, or individuals with the essential erudition required for the research. The researcher used this section to provide an account of the limitations she encountered during the study. The researcher elaborated further on the matters that were mentioned in other divisions of the chapter.

In the first phases of data collection, the researcher liaised with the local organisation that managed the projects in the sites. In some cases, some officials provided recommendations to the researcher to consult members of the community. The members of the community were pertinent to the study. The local administrators of the wards, the chairman, secretary, field officers, and the district administrator were people that the researcher had to inform to carry out the research. The nature and intentions of the study were of importance to them. The researcher could not conduct the study until the crucial members of the community were aware of the research's interests.

During the focus group discussions, the women were vocal in their opinions. They expressed how they felt about the subject and even provided solutions that they saw fit to solve the community problems. Their responses were valuable in enriching the study. Although, the researcher noticed few women who did not wholly participate in the discussions because of the male members of the association who sat among them. It brings forth the disadvantages of having focus groups with male and female people sitting together. The researcher felt that some of the answers the female participants provided were not a true reflection of what they wanted to say. If the researcher took the half-truth, then the results would not represent the entire picture.

In Zimbabwe, in the rural villages, elements of the patriarchal system are still present. It is a traditional system that is greatly respected. In some cases, during the group discussions,

women will show respect to the village men by putting aside their opinions and allowing the male to speak for them. It may refrain them from speaking bluntly to avoid offending the male members. For accuracy and representation, the researcher phoned the female participants directly to verify the information. Separate telephone interviews were arranged with the participants and called on the days they were free. In doing so, the participants felt safe and more comfortable speaking about the subject on the phone without feeling self-conscious around their male colleagues.

During the transcribing and data analysis stage, the researcher picked up unanswered questions during the interviews. To ensure that the data was precise and reliable, the researcher contacted the participants again to clarify. It provided the researcher the platform to correct the interpretations and challenge what was perceived wrong or misinterpreted. Afterward, the data was consistently re-read and re-analysed. The researcher studied the information until it provided the intended depth of insight.

The researcher applied an audit trail in the fieldwork process. She was responsible for providing a complete set of notes on decisions made during the fieldwork process, contemplative thoughts, sampling, fieldwork materials selected, the presentation of the findings, and knowledge about data construction. An internal auditor examined the transparency in the methods applied. The internal auditor in this context was the principal supervisor. The supervisor examined the analytical procedures, the raw data and evaluated if the techniques were practiced accordingly.

In social science, planning the field research and carrying out field research are two separate intricacies. Planning is a continuous process that requires decisions and choices about alternative ways of using available resources to achieve particular goals (Wright, 1998).

Several factors apply when planning research (Babbie, 2010; Kumar, 2011; Leedy and Omrod, 2013). The factors are:

1. Time Management
2. Abilities of the researcher.
3. Budget and resources.

Although planning influences how research is carried out, performing the tasks is different because the environment invariably changes; on some occasions, the changes are beyond the researcher's control. It is why most researchers alter their planning to suit unexpected changes in the environment (Babbie, 2010).

The researcher could not fully exhaust the fieldwork to its full potential due to the COVID-19 global pandemic limitations, economic constrictions of the country, and transport constraints. The researcher had planned a field trip to meet with the irrigation and communal farmers in March 2020. However, the researcher cancelled the trips because of the COVID-19 national lockdown. The researcher was worried about her safety and health. There was police enforcement on the main roads preventing people from visiting sites. The researcher was not allowed to travel. The principal supervisor and the University advised her to take precautionary measures when conducting field research.

The government temporarily banned traveling from March 2020 to October 2020. As a result, the researcher could not travel to the areas where the communal farmers resided. The country was undergoing the COVID-19 global pandemic but experiencing severe fuel shortages (ENCA, 2020) at the same time. These external circumstances put mobility constraints on the resources the researcher had. Regardless, the researcher adapted to the external circumstances and used other means to gain a hold of the farmers using cell phones.

It is important to note that when the researcher proposed this research in 2018, she had not anticipated the implications of COVID-19. It was not an area of study in that period. During the data collection phase in 2020, it became apparent that COVID-19 is a significant aspect of farmers' livelihoods. Babbie (2010) states that qualitative research is not predetermined in social science because we study human beings that continuously change to adapt to the environment. Humans are not objects. We cannot set pre-existing conditions to explore the phenomenon they face. Instead, we work to explore the current conditions they face. Nonetheless, the researcher was appreciative of the time she spent with the participants in February 2020. She was indeed grateful for all the transcripts, observations, visuals, and audio recordings that she acquired within that time frame.

There were some instances where capturing data proved to be a challenge. In some rural farm environments in Zimbabwe, individuals cannot access the people directly without permission from the local district administrator. Seeking approval from the authorities was time-consuming. In Zimbabwe, some areas are not stranger friendly for political reasons. If the researcher's intentions about the study are not transparent to the local authorities, they could easily mistake her for a journalist or reporter. Hence, the researcher had to seek permission from the Ministry of Lands, Agriculture, Water, Climate and Rural Settlement (see appendix 2) and show the letter from the Ministry and ethics letter from the University of Witwatersrand (see appendix 1) to the local district administrator. The researcher was also thankful for Zimbabwe Super Seeds' assistance in gaining approval from the local district administrator. In February 2020, the researcher was given one month to visit the rural sites.

Gaining trust from the participants was a challenge. The researcher mentioned that several rural environments are not entirely stranger-friendly. However, the one thing that helped the researcher was speaking to the locals in their native language. It was the ice breaker in the group introductions. It eased up the awkwardness. The researcher explained to them in their native language that she is a Zimbabwean, that grew up in Harare. She explained the purpose of the focus group meetings and the purpose of the research as well. The researcher also made it very clear that there were no monetary gains involved.

Some of the participants attended the meetings assuming that the researcher was a sponsor and would have their problems resolved that day. Several times during the sessions, the participants asked how the researcher would help them with their challenges after conducting the study. The researcher had to kindly remind and explain to them the purpose of the research. With a bit more clarity on the subject, the participants engaged in the discussions, and they were friendly and cheerful throughout. Afterward, the researcher wanted to show the participants how grateful she was for their attendance and cooperation, and she did it by providing them with refreshments as a thank you gesture.

4.4. Conclusion

In conclusion, the methodological considerations appear to be unique. The research design was carefully thought out and presented in a detailed manner. The field research was an awe-inspiring experience. Despite the reflections and problems addressed, it is vital to note that the study cannot represent anything other than the interpretations made from the researcher's academic and female perspective. The main objective was to listen and learn from the farmers and professionals involved in agriculture and climate change. Paying attention and listening to their opinions and stories about their everyday realities in food production and climate change made me aware of their real-world complexities.

CHAPTER FIVE

EMPERICAL EVIDENCE

'*Scientists generally agree that no theory is 100 percent correct. Thus, the real test of knowledge is not truth but utility*'.

Yuval Noah Harari

(1976).

5.1. Introduction

This chapter presented the research findings. This chapter intends to display the data and tell the readers what it means (Weaver-Hightower, 2014). It is essentially the main body of the thesis. We presented the data only to approve or reject the main ideas underpinning this study. Here you find several pieces of information in the chapter answering the research questions with brief discussions.

For organising purposes, the chapter presented the findings on:

I. Water scarcity and drought episodes impacts on small-scale farmers livelihood outcomes.
II. The livelihood assets accessible for small-scale farmers in adapting and sustaining livelihood outcomes against water scarcity and drought.
III. The constraints that small-scale farmers face in adapting to water scarcity and drought.
IV. The systems, processes, and structures in place that increase adaptive capacity and resilience for small-scale farmers.

Displaying the results helps us understand the research ideas from within as we separate them into pieces and see the research problem from different contexts.

5.2. Water scarcity and drought episodes impacts on small-scale farmers livelihood outcomes.

5.2.1. Participants perceptions of climate change

The first question of this study was to find out how water scarcity and drought episodes affect the livelihood outcomes for small-scale farmers in Zaka District in Masvingo province. In this section, we are examined how climate change influences Zaka farmers' livelihoods. How does climate change affect the areas that make up their well-being?- is what we investigated, but to examine the ways, Hitayezu, Wale, and Ortmann (2017) argued that we must first establish the small-scale farmers' perceptions of climate change. It is not part of the research questions, but we used the farmers' perceptions approach to seek the answers about climate change in Zaka and their livelihood difficulties.

The study considered the farmers' perceptions of climate change because:

1. The farmers pointed out the specific forms of climate change that affected them.
2. Their perceptions directed us to the troublesome areas in their farming routines, and the farmers described to us how the difficult areas affected their households (Hitayezu, Wale, and Ortmann, 2017).

Focusing on the participants' perceptions of climate change helped the study see the crucial areas in their farming routines and showed us the underlying risks they faced in their fields and households. We started by looking at the specific climate change forms that the farmers talked about the most. In the focus groups and interviews (2020), the researcher asked these specific questions. What do you know about climate change? How does it affect you as a farmer? What are the areas you worry about when dealing with climate change?

The participants identified aspects of climate change in four ways:

I. Late start of the rainy seasons
II. Erratic rains
III. Pest outbreaks
IV. Very hot days

These are the themes that the participants expressed when speaking about the climate change in the Zaka area. Figure 5.1 shows the level of responses from rainfed and irrigation participants on climate themes.

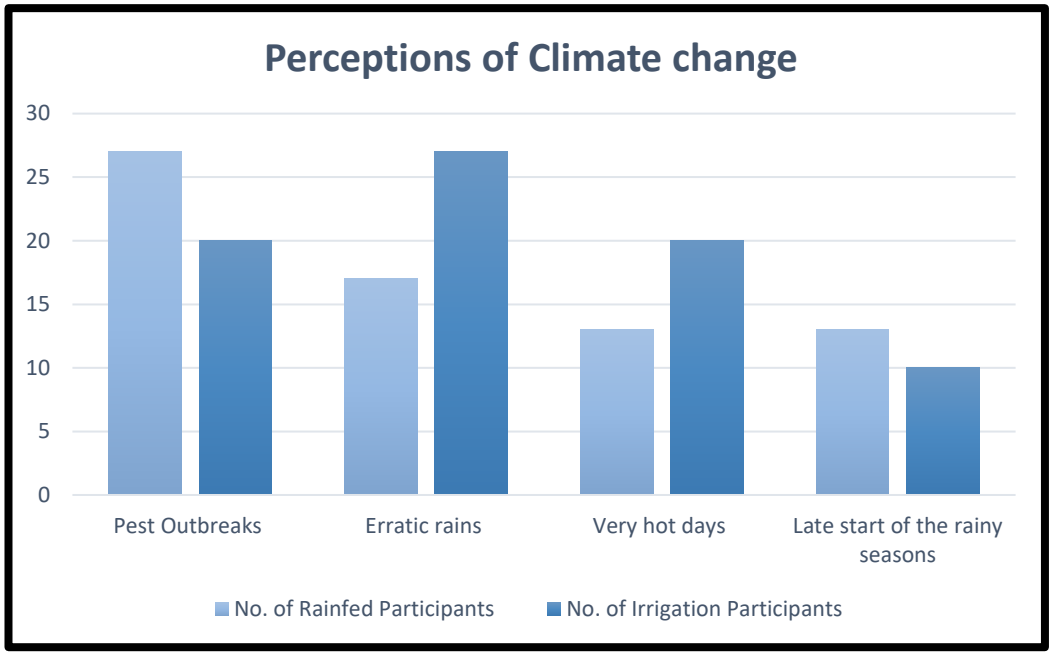


Figure 5. 1 Climatic themes identified by rainfed and irrigation participants.

Source: Field Based Survey Data (2020).

Figure 5.1 shows us that pest outbreaks and erratic rains were the most common themes, followed by hot days and the late start of the rainy seasons. These themes appeared a lot in their quotes. The participants viewed these themes as disturbances to their crop productivity. The quotes below are examples of the participants' experiences with climate change and crop productivity. Exploring the relationship between climate change and crop productivity is essential to our investigation. The literature states that finding out how the different forms of climate change affect small-scale farmers' production points us to understanding the indirect effects climate change has on their livelihood outcomes (Mugabe et al., 2013; Davis and Hirji, 2014). The bulk of rural livelihoods in Southern Africa are linked to crop production success (Brazier, 2017). If we did not examine the farmers' perceptions of climate change, then we would not see the troublesome areas in their livelihoods. Below are some examples displaying the farmers' experiences with erratic rains, hot conditions, and crop failure.

I. Erratic rains and Late start of rainy seasons

Out of the 60 participants, relatively 90% from irrigation and 57% from rainfed spoke of erratic rains. Others also talked about the late start of the rainy seasons (33% irrigation and 44% rainfed). The responses suggest that the farmers find rainfall in Zaka troublesome because they lack the climate information and technical means to monitor the rains for their planting seasons (Calow et al., 2002). In this study, rainfall was indeed a problem for the participants because they could not time it. Failure to time the rains meant that they were subject to years of poor planning, water scarcity, and crop failure. The rainfed farmers were more vocal about this predicament than the irrigation farmers. Nonetheless, both groups brought up the issue of erratic rains.

One rainfed farmer said she experienced two years of erratic rains in the Zaka district and suffered from crop failure forthwith. She understood erratic rains and described seasons when rainfall was abundant or less. She further revealed that she struggled to plan her planting seasons to catch the rains and encountered challenges producing a good quality crop batch.

> *Participant 15 said (Focus Groups, 2020), 'It is challenging to plan the seasons when you are unsure how much rain you will receive. There are times when there is lots of rain, and then there are times when the rains are little. I have also experienced sometimes where there is no rain at all. All the other seasons in 2017 and 2018, the rainfall has been bringing water. The problem with rain is that my crops either get more or less. But in 2015 and 2016, rainfall was very erratic, and my crops did not do as well as I had anticipated.'* ***Participant 15.***

The block quotation matches Sanga, Moshi, and Hella's (2013) claim that erratic rains are a popular theme that farmers use to express their farming challenges, and when they experience unpredictable rains, they encounter difficulties planning their crop seasons. The farmers live in areas with low access to climate information technology and rely on their personal experiences to plan their seasons. Experiences alone are ineffective in countering the erratic rains. With the limited technical capacity to plan ahead of climate change and unreliable rains, the farmers face the risks of crop failure and diseases (Kutywayo et al., 2013). With Sanga, Moshi, and Hella's (2013) and Kutywayo et al.'s (2013) ideas, it makes sense why

participant 15 had seasons of crop failure. Participant 15 did not have the adequate tools and means that would aid in monitoring rains.

One irrigation farmer said that though he was receiving water supply from ZINWA, he was grateful for the rains because they lessened the drought effects on his crops. He understood that the rainfall patterns were different for each season. Although he mentioned that he was not entirely worried about the rainfall patterns, having it helped ensure that he had good crop production.

> *Participant 28 said (Interviews, 2020), 'When there is lots of rain, it is helpful for the crops. Water is essential for crops to grow. Sometimes the water from ZINWA may not be enough to water my crops. It will be hot on some days, and crops dry up very quickly when there is no water. So, when the rains are present, it helps a lot. I may not suffer as severely as the farmers that depend on it, but when the rains are there, I am happy because I know that I will be able to harvest.'*
> ***Participant 28***

Participant 28's comment shows that rainfall is pretty essential for irrigation farmers. Despite its unreliability. Recha, Okilo and Nindo (2017) state that the misconception in the literature is that several practitioners assume that irrigation farmers are not dependent on rainfall for productivity because they rely on surface and ground surface water systems. It is true, yet it does not mean that the farmers do not welcome rains. It is another water supply alternative and for Zaka irrigation farmers, having vast amounts of it contributes to their productivity. Therefore, based on participant 28's quote, it is safe to say that when there is a lack of rainfall, their crops are also affected by it.

II. Hot Days

The results in Figure 5.1 suggest that almost 13% of the rainfed participants and 20% of the irrigated participants depicted climate change in the form of hot days. It is another general theme that farmers are very conscious of, and the climate change literature extensively speaks of this theme. Hot days are periods of high temperatures. It is known to cause heat stress in humans and crops. From the participants' perspectives, it is a disturbance that generated low

crop productivity for Zaka farmers. Hot days are harmful to crops, specifically if the crop is at the flowering stage (Directorate Agricultural Information Services, 2003). If this stage is disturbed, it could potentially result in no seeding at all.

Participant 18 complained about working in the fields during the hot days. He explained how he could see the crops change colour because of their sensitivity to high temperatures.

> *Participant 18 said (Interviews, 2020), 'There are days where it is just too hot to work in the fields. I can see the heat affecting the crops because they change colour, from green to yellow or brown, and the leaves wither. When I walk on the ground, it will be hot.'* ***Participant 18***

Participant 9 expressed a similar experience. She explained that some of her crops did not make it to the harvesting stage because they dried up.

> *Participant 9 said (Focus Group Discussions, 2020), 'The weather changes. There are days where it pours a lot, and then they are days where it is humid and dry. I will look at the crops and find that they did not grow all the way. They just stayed at one stage because they were too dry to grow any further.'* ***Participant 9***

The block quotations above show that the farmers are conscious of the hot conditions because of their crops' sensitivity to high temperatures. According to the FAO's (2014) report, many rural farmers in Southern Africa and Asia face crop failure and pest outbreaks because of high regional temperatures. According to Schleussner et al. (2016), temperatures in Southern Africa can reach up to 40°C, and this development is a stressor to rural farmers' crop productivity.

Hot conditions create even more dire situations for farmers' crops, predominantly when they reside in water-stressed areas. These types of climatic conditions could potentially create complications in the farmers' ability to maximise production. Any obstacle to their production could create complexities in their ability to provide for themselves.

Pest outbreaks (90% rainfed farmers and 67% of irrigation farmers) and late start of the rainy seasons (43% rainfed farmers and 33% irrigation farmers) were other climate change indicators that affected farmers' crop productivity. Section 5.2.2. reports the perceptions presented in more detail. Now that we have used the climate change perceptions suggestion by Hitayezu, Wale, and Ortmann (2017), we have a considerable understanding of climate change in the Zaka district and fair perception of low crop productivity and crop failure. Climate change is unpredictable in the Zaka district, and it would be interesting to find out how these different climatic themes indirectly alter the livelihood outcomes for small-scale farmers.

The next step in this analysis was to see how the modifications to Zaka farmers' crop productivity affected their households.

5.2.2. Water scarcity and drought effects on Zaka farmer's Livelihood Outcomes.

The study selected qualitative measures to investigate how water scarcity and drought episodes affect the livelihood outcomes for small-scale farmers in Zaka. The researcher asked these specific questions to the participants. How did the lack of rainfall, hot conditions, pest outbreaks affect you as a farmer? Moreover, what did that mean for you and your household? The responses were deciphered and evaluated. In the interviews and focus groups, the opinions differed from one participant to another. They varied through the type of agriculture they specialised in and household obligations and expenses. The effects of water scarcity and drought were a problem for both participants that specialised in rainfed and irrigated agriculture.

The results revealed three ways drought and water scarcity affected the livelihood outcomes for small-scale farmers and these were:

I. Income Instability
II. Job Insecurity
III. Increased farming and household expenses.

The level of responses pertaining to income instability, job insecurity and increased farming and household expenses from irrigation and rainfed participants are displayed in Figure 5.2.

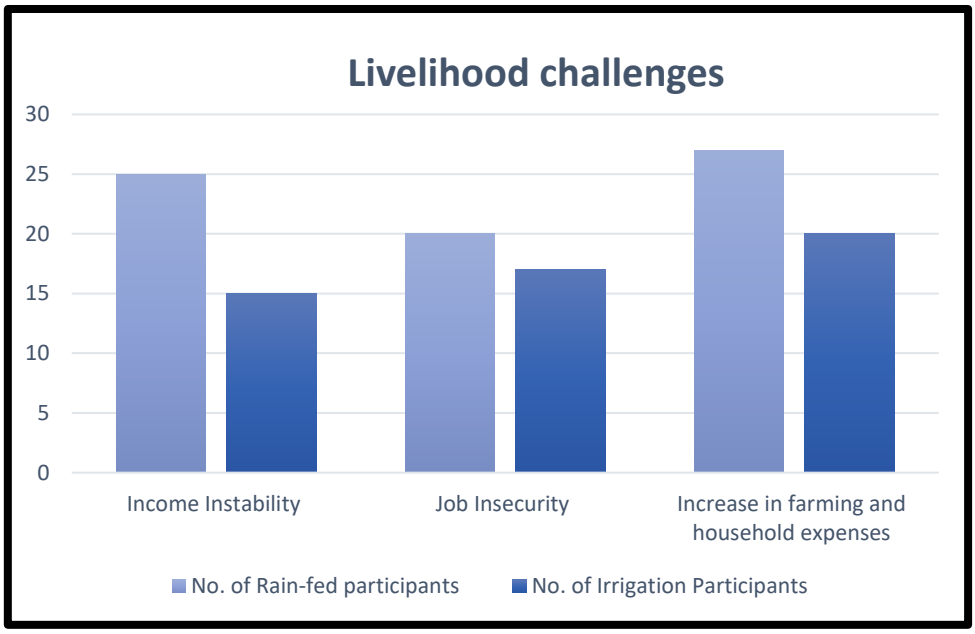


Figure 5. 2 Livelihood challenges participants faced in their households.

Source: Field Based Survey Data (2020)

From the bar graph above in Figure 5.2 the data suggests that out of the 60 participants:

I. Relatively, 85% of the rainfed participants and 50% of the irrigated participants faced income instability.
II. Almost, 67% of the rainfed participants and 57% of the irrigation participants faced job insecurity.
III. Roughly, 90% of the rainfed participants and 67% of the rainfed participants were subject to farming and household expenses.

Figure 5.2 shows a low percentage response rate for irrigation farmers compared to the rainfed. Out of the 60 participants, 70% of participants who specialised in rainfed agriculture were more affected by the effects of climate change and feared the financial impacts they would face within households compared to the 30% of participants that specialised in irrigated agriculture (see Figure 5.3).

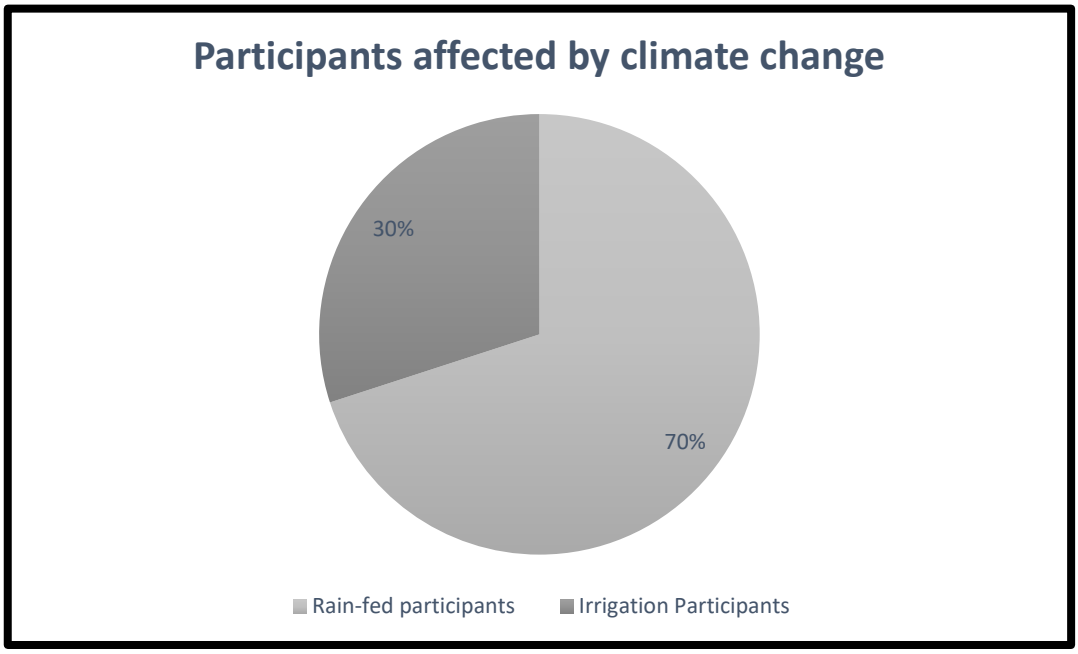


Figure 5. 3 Participants affected by climate change.

Source: Field Based Survey Data (2020)

The results in the pie chart are not surprising. In the literature, it is a known norm that irrigation farmers are less concerned with the effects of climate change because they do not worry about rainfall patterns (Tubiello, 2003; Kurukulasuriya et al., 2006; Vanschoenwinkel and Van Passel 2018), and this explains the low percentage rates when it comes to the effects, but some of the farmers are still affected by the developments. Rainfed farmers are greatly affected by rainfall changes, explaining the high percentage rates in Figures 5.2 and 5.3.

I. Income instability

Income instability is one-way water scarcity, and drought episodes affect the livelihood outcomes for small-scale farmers in the Zaka District. It is apparent from Figure 5.2 that almost 85% of the rainfed and 50% of the irrigation farmers were affected by it. It is a positive result as it authenticates the research problem presented in the frames of reference and theoretical issues and considerations chapters. The results unveiled that income instability affected Zaka farmers' well-being and influenced their adaptation methods. It is a theme of interest for the participants, and they described how it brought adverse implications to their living conditions.

Income instability is a negative outcome that affects crop productivity. Income instability in the climate change-vulnerability literature is a critical factor that several organisations and governments focus on because it generates dire consequences for small-scale farmers' households (Harvey et al., 2014). Any disturbances to farmers' money-making capabilities create unwanted situations that force farmers to engage in extreme trade-offs. There are cases of income instability in the small-scale farmer adaptation literature, and the authors all point that it stems from high levels of crop failure. It explains why crop productivity is a colossal priority for Zaka farmers. Low rainfall and low water availability meant that farmers would suffer from income instability.

For example, one rainfed participant explained that she had seasons where she did not make enough money from her production. Crop production is essential because it provides the bulk of her income. During the seasons of bad harvests, she grappled with paying for farm inputs, school fees, and food. These were necessary livelihood outcomes that had to be met.

> *Participant 16 said (Focus Group Discussions, 2020), 'Having no water means that the crops cannot grow. I cannot make a good sale on my production. I did not make a good sale in the last four seasons because I had terrible harvests and struggled to pay for inputs, food, and school fees needed for the farm and home. It is hard to find money to pay for things these days. This farming is the one thing that brings me most of the money, and if I do not do well in the fields, it will be a challenge to pay for things at home.'* ***Participant 16***

Participant 12 had a similar encounter with participant 16. His crops suffered from the outbreak of pests (see Figure 5.4). He had to discard the crops as they were not of the quality for production. In that season, he was banking on the profit to pay for his necessities, but he could not acquire the whole amount due to crop failure. He and his family had to survive on the little profit he made until the successive season.

> *Participant 12 said (Interviews, 2020), 'During the hot days, there are a lot of pests that attack the crops. There are several seasons where I have had bad harvests because of pests. There*

is this fall armyworm that spreads and eats the crop. I find them on the leaves and inside the maize cobs. The crops get so damaged that I would have to reject them, and that is not good for production, especially when I am trying to make money for my family. I would have counted on the money from that harvest to cater for things at home. One time, I had budgeted on the money to pay for school fees in advance and buy medicine for my family when they were sick at home. But I did not get the whole amount because of the losses. If the harvest does not pull through, there is nothing I can do but make do with the little I have and hope that the next harvest will be more fruitful.'
Participant 12



Figure 5. 4 Participant 12's fields attacked by Pests.

Source: Photos Captured by Zimbabwe Super Seeds Organisation (2020)

The block quotations above show that income instability is upsetting to farmer's households. It restricts their access to basic amenities necessary for their survival. Crop production provides a picture of the farmers' level of capability, and it directs us on whether they have the means to provide for themselves in the near future. The worry here is that Zaka dryland farmers have to predict every season and hope that rainfall will come in great amounts to

support their crop productivity. But the underlying problem here is that when rainfall fails, the farmers face limited access because they have no other income options other than crop production. We can see in the block quotations analysis, Zaka farmers' crop production has not always assured financial elasticity. The money from crop harvests is inept to meet the basic household demands.

Below are several additional responses of themes speaking of income instability from Zaka rainfed farmers.

Table 5. 1 Income Instability Themes

Participants	**Income instability themes**
19	*'There was a period where rainfall was scarce for a long time, and my harvests were terrible. I did not get enough payment for my harvests, and I struggled to pay for things at home. My daughter needed fees to be paid to go to the university, and I had lost one of my relatives, and I needed the money to help with the funeral costs. I had to borrow money from my other relatives to assist. The hot days were a tough time for me. But now the rainfall is slightly better, and I haven't had extreme bad harvests in a while.'*
5	*'Even if you plant the crops and the soil is hot, they simply cannot grow without water. Even if I add fertiliser and the soil is not in a good state, and there is no rainwater, the crops will remain stagnant. Maize is what is wanted in the market. If I cannot meet the market's needs, I cannot make money for my family to survive on, which I cannot work with. I need the money to support my family. Otherwise, I face trouble at home.'*
22	*'2015 was a complicated year for me. My crops did not do so well. I could not get the amount I wanted to buy the things I needed to sustain my family. It was just too little. The rains and the dry seasons make the situation harsh when making money from the fields.'*

Source: Field Based Survey Data (2020)

Table 5.1 showed that climate change indirectly affects small-scale farmers' livelihood outcomes by diminishing their chances to make income. Low income means they cannot fulfil their livelihood obligations. For Zaka farmers, their primary responsibility is to provide financial support to their families in every way possible. The literature argues that if farmers received high-income returns, their households would function as self-supporting units amidst the shocks and trends because they can support the well-being of their families (Prowse,2008). However, in this case, we see that rainfall can either decrease or enhance their household's susceptibility to poverty risks at any given period.

For instance, the rains can either positively or negatively affect crop production. Any changes in crop production will create alterations to income. Farmers' income could fluctuate at any given period, and these inconsistencies could increase their exposure to future vulnerabilities such as chronic poverty and hunger, which Chamber and Conway (1991) and Phillip and Rayhan (2004) mention in their papers. Therefore, income instability is an essential concept that should be strategically dealt with in sustainable livelihoods for small-scale farmers because it is a risk that induces vulnerability in livelihoods. The households that rely on rainfall in the Zaka district are sensitive to climate change, but that is because they depend on an aspect of climate change that is purely unpredictable.

Now the question here, did income instability apply to the irrigation farmers? The study posed the same questions to the irrigation participants, and the results revealed that water scarcity and drought episodes affected their livelihood outcomes the same way, even though they had a reliable source of water supply. Climate change created income instability for them although, it was not the only factor that played a role. Power shortages also fostered it.

For example, participant 4 explained that she struggled to make money from crop production because of drought and power shortages. She explained that she acquired a small batch, but the profits were not enough to pay for everything at home. Participant 4 had to use the little money she had to pay for her sister's medical cover and wished she had made more money to meet other livelihood outcomes.

> *Participant 4 said (Interviews, 2020), 'Drought is a problem here because the crops dry up quickly when there is no water. I have had moments where I did not get enough water from ZINWA because they could not pump the water from the dam because of no electricity. For more than five days, the situation was like that because the ZESA people were fixing the transformers. I did manage to irrigate after that. But approaching harvest time, not all my crops survived. Some of them dried up, and I still had to sell with the small batch that survived. I managed to get the payment, but it was not a lot to pay for everything at my place. I had to send the little money I had to my sister, who needed it for the clinic. If I had produced more seeds, I would have made some more money.*' ***Participant 4***

The quotation above shows that an irrigation participant like herself also worries about crop production and the money she makes from it. She was not happy with the power shortage situation that lasted five days because it restricted her ability to irrigate and maximise crop production. We can imagine her situation whereby she would prepare her fields and waits to receive water. Only to be notified that she has to wait another week to water her crops. Climate changes could happen within one week, and depending on those changes, they could either create insignificant or drastic effects on her crops. Although she is an irrigation farmer, we would assume that her direct access to the water supply would limit her from the risks of income instability, but we can see that the risk of income instability can stem from other factors other than climate. With this analysis, we can safely agree that income instability affects both rainfed and irrigation participants.

Although, from the data in Figure 5.3, comparatively, almost 30% of the participants that practice irrigation does not fear the risk of income instability. This figure shows that the farmers are not as greatly concerned about it as the 70% that practice rainfed agriculture. It is because, over the years, irrigation farmers have received sufficient water supply from ZINWA. The participants do not fear the dire risks affiliated with income instability than the rainfed participants because their personal experiences have shown that the ZINWA has been solid in providing sufficient water supply. Having a secure water supply minimises income

fluctuations, and therefore, they can explore their livelihood opportunities. From this 30% analysis, we can see that irrigation is indeed a coping strategy for the participants to combatting income inconsistencies.

For example, participant 32 explained that she does not worry about climate change and money problems because her fields are close to the canal pipelines. She invariably receives enough to irrigate her fields, and she gets good harvests. Despite the challenges ZINWA may have, it is not critical that she mentally worries about income instability.

> *Participant 32 said (Interviews, 2020), 'Water is not a problem for me because my fields are close to the canal pipelines. When ZINWA pumps water, I always get it, and it is enough for me to irrigate my fields. I have good harvests and a few bad harvests, but it is not harmful that it entirely affects my payment. The money I receive is enough, but it would be nice to make more. When the water is there, I get good harvests that allow me to get good money that I can use to buy food and clothes for my grandchildren and help my other relatives in other places. Ever since I became an irrigation farmer, my family and I have not suffered from hunger in a while. I am grateful for the water I receive.'* ***Participant 32***

The block quotation shows that participant 32 does not worry about the money challenges because she has direct access to water to irrigate her fields. Having direct access to water means that her chances of crop failure are low and that she will receive sufficient money to buy food and clothes for her grandchildren and help her relatives. The participant is indeed grateful for the water supply from ZINWA because it means she and her family does not face the risks of hunger and poverty. This finding is in agreement with Tubiello (2003), Kurukulasuriya et al. (2006), and Vanschoenwinkel and Van Passel (2018) studies. The irrigated participants do not face any dire income consequences if precipitation decreases or increases. The crop production and income records in Figures 5.5. and 5.6 back up this evidence.

The bar graph below (Figure 5.5) compares the groups between the rainfed and irrigation scheme's crop production for four years. It is important to note that calculations were drawn on all the rainfed and irrigation schemes specialised in maize production under the Zimbabwe Super Seeds scheme.

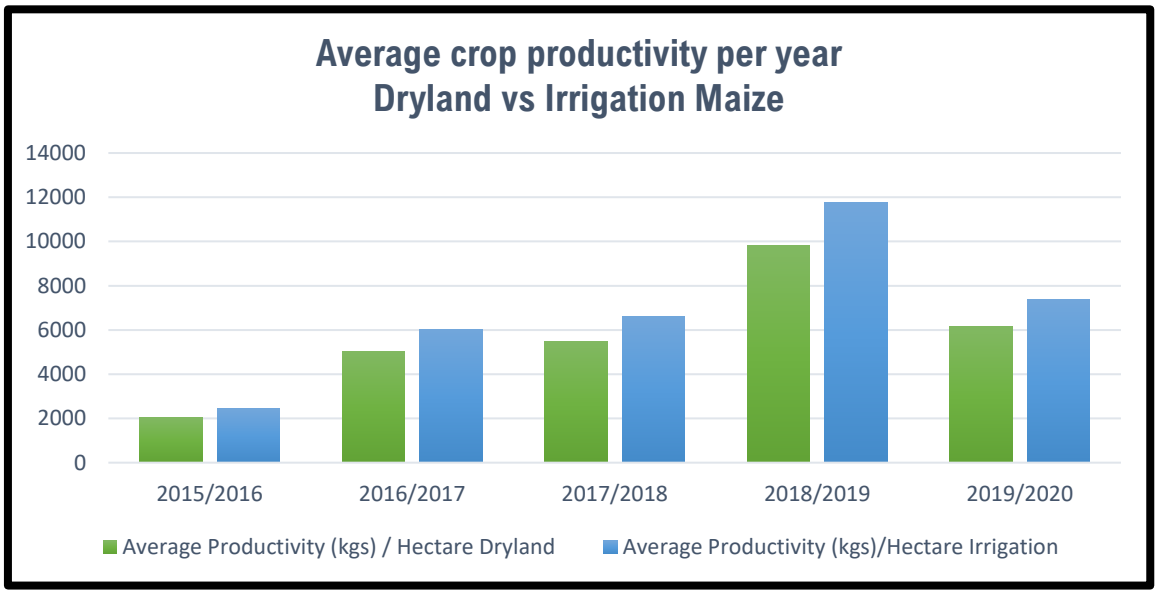


Figure 5. 5 Average crop productivity per scheme: Dryland vs Irrigation Maize Farmers.

Source: Data collected by Zimbabwe Super Seeds Organisation (2015-2020).

Figure 5.5. shows the average crop productivity produced from dryland and irrigation maize schemes over five years. There is a gradual increase in crop productivity from 2015-2020 for both schemes. Production was at its lowest in the 2015-2016 and 2019-2020 periods. The highest was in the 2018-2019 period. Although, we can see in the bar graph that the irrigation schemes relatively produced more than the rainfed schemes. For instance, in the 2016-2017 period, the irrigation scheme produced an average of 6038kgs/hectare of maize seeds than the dryland schemes that produced 5039kgs/hectare. We can see that the irrigation farmers generated more in the following years.

Table 5.2 presents suggestive information explaining the reasons for low and high production for dryland and irrigation schemes. Please understand that the information is suggestive, nor is it absolute or confined to just these factors.

Table 5. 2 Suggestive reasons for low and high production for dryland and irrigation schemes

Dryland		Irrigation	
Low Production	**High Production**	**Low Production**	**High Production**
I. Dependency on unreliable seasonal rainfall. Seasonal rainfall usually commences beginning of October. However, due to climate change, the rainy season delays and starts in January. II. They have no other alternative to water supply, other than rainfall. III. Long period of hot days increases pest manifestation which has resulted in several bad harvests. (see Figure 5.4 and Figure 5.1). IV. Farmers do not possess all the farming inputs i.e., pesticides and fertilisers due to price volatility (This is explained in section 5.4.1). V. Dependent on human labour and cattle draught power.	I. Improved fertiliser and pesticides varieties II. Better adapted crop genotypes – drought resistant seeds III. Farmers were trained on climate smart agriculture i.e., potholing and water channelling (see Figure 5.11) IV. Improved pest and disease management. V. Improved external labour.	I. Drought caused water shortages, due to low water availability in the dam. II. Power cuts reduced efficiency to irrigate on time. ZINWA could not pump water from the dam because of no electricity. III. Increase in pest proliferation due to the increase in hot days. IV. Lack of proper farming inputs V. Dependent on human and cattle labour VI. ZINWA closures due to delayed payments	I. Dependent on reliable and accessible water supply from the dam. Water supply is guaranteed by ZINWA. II. Better adapted crop genotypes – Drought Resistant Seeds (Figure 5.15) III. Farmers were trained on climate smart agriculture i.e., use of center pivots. IV. Farmers have access to irrigation infrastructure.

Source: Field Based Survey Data (2020).

Please kindly note that the crop production findings cannot be extrapolated to all the agricultural case studies. The information was interpreted and calculated with caution. However, the analysis suggests that the secondary data in Figure 5.5 does match the farmers' quotes. Although, it is not definitive as there are so many factors encompassing production, such as land hectarage, input quantity, and water supply. Here we are just trying to understand why the participants worry greatly about crop production because they fear income reduction. Figure 5.6 shows evidence of income reduction.

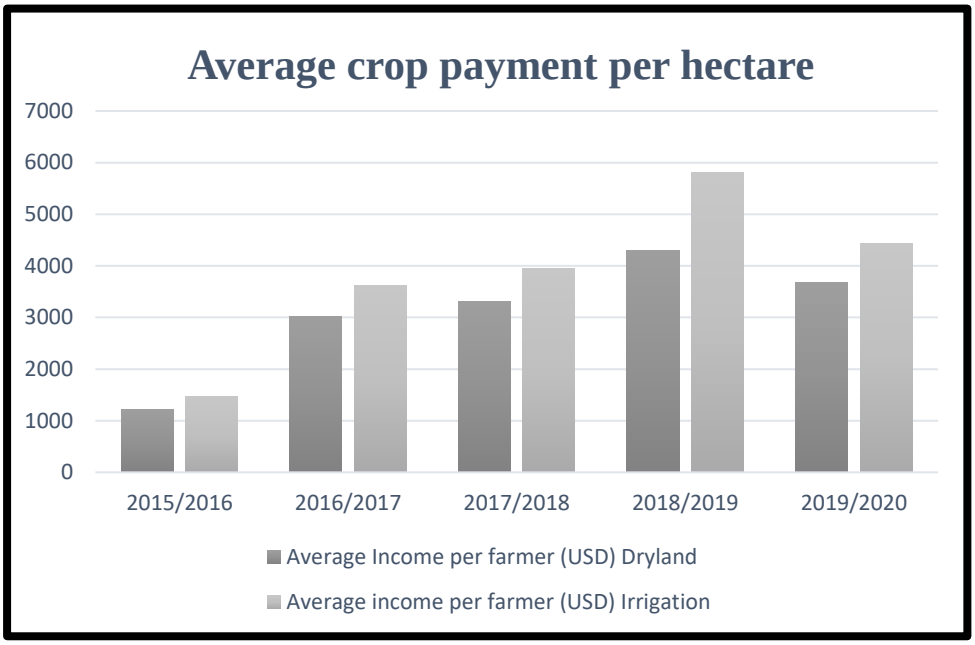


Figure 5. 6 Average Crop Payment Per hectare

Source: Data collected by Zimbabwe Super Seeds Organisation (2015-2020).

Figure 5.6 presents the average crop payment per hectare, and the farmers receive payment on an annual basis. The lowest was in the 2015-2016 period. For instance, the average farmer received US$1220 for the rainfed maize scheme and US$1462.8 for the irrigation scheme. The highest was in the 2018-2019 period with US$4300 for the rainfed schemes and US$5800 for the irrigation schemes. The results in Figure 5.5 and Figure 5.6 suggest three points:

I. There is a negative association between drought, water scarcity, and crop productivity.
II. There is a positive relationship between crop production and income.

III. Farmers did face a season of moderately low income as their lowest was in 2015-2016. We would term this statistic a period of scarcity or hunger periods, as Phillip and Rayhan (2004) would claim.

This finding agrees with the thematic considerations presented in the frames of reference. Farmers' livelihoods will always be affected by climate change because of production. We have seen here that any change to crop production results in a change in income. A change in income leads to a modification of farmers' livelihood portfolios. In this context, looking at the results objectively, the low-income levels represent poverty in its relative form, though it is subjective, as data on poverty measurements were not evaluated here. However, based on the responses and numerical data presented, it is suggested that income instability is a concept that puts the farmers in an impoverished state.

Income is essential in sustaining farmers' livelihood portfolios, and we wanted to understand the deeper meaning behind income and Zaka farmers' livelihoods. What value did income bring to the participants' livelihood portfolios? We received the answers to these questions using qualitative measures. Responses to why income is crucial for you were captured using an audio recorder during focus groups and interviews (2020). Figure 5.7 displays the different livelihood outcomes that small-scale farmers value and spend a lot of their income working to obtain.

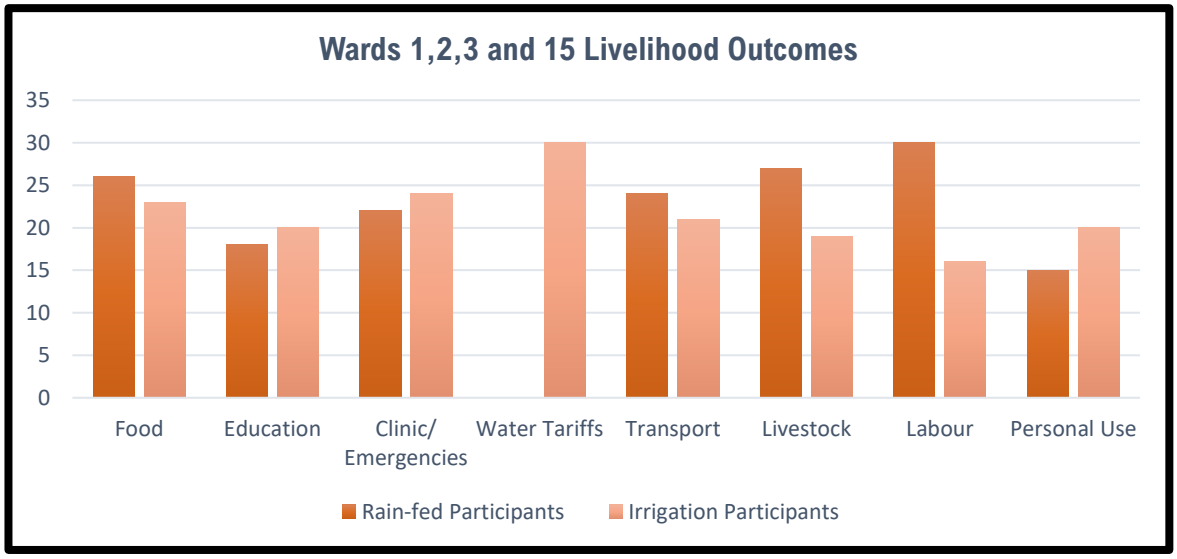


Figure 5. 7 Response rates regarding livelihood outcomes for Zaka Farmers

Source: Field Based Survey Data (2020).

Figure 5.7 shows that Zaka farmers spend their income on food, education, clinic and emergencies, water tariffs, transport, livestock, labour, and personal use. These are their livelihood outcomes. Mishra (2005), Harvey et al. (2014), Oxfam (2018) argue that income is more valuable than food production, and the study agrees with this point of view. Zaka farmers will spend long hours making sure their crops produce quality seeds of market standard because it encourages high-income returns. Money provides the farmers with capabilities that improve their chances of securing livelihood outcomes that better their living conditions. It provides them with access to these procurement services that enhance their chances of surviving chronic poverty and hunger. Income is Zaka farmers' form of livelihood security, and this notion of livelihood security is shown below in the following examples.

For example, participant 36, an irrigation farmer, disclosed that he uses the income to buy food. He described the market and income challenges he faced when he was unemployed. Making money on his own for his family was difficult. He struggled to meet his family's needs with the limited funds he had. Working for the scheme, he receives a yearly income that allows him to buy food for the household, making his home secure from the effects of hunger.

> *Participant 36 said (Interviews, 2020), 'I joined the scheme in 2011 to earn some money to buy food for my family. Before I joined, I struggled to find a market where I could sell the produce. I used to sell on the main roads nearby, but it was difficult. It is not always guaranteed that I would make money for that day. The money I used to get was very little, compared to what I am getting now. But I need the money to buy food so that my family and I can survive the whole year. Because I work for the scheme, I am guaranteed some money at the end of each season for my crop produce. I can use the money to buy food for my family, and we can last until the next payment.'* ***Participant 36***

The block quotation shows that food is an essential aspect of their livelihood outcomes, and ideally, it makes common sense. On average, roughly 84% of the farmers stated that it was an

important livelihood outcomes. As rural farmers, their first protocol is to ensure that their families are well-fed, predominantly when they reside in an area known for chronic poverty and hunger. Several households live on hand to mouth, and thus farmers will do their best to alleviate any signs of hunger in their families. Food is crucial for rural farmers. Having an income provides them the ability to secure food for their household for protracted periods. It is a natural and vital need without question.

The second example describes the importance of income in accessing health care. Two participants (participant 40 and participant 26) construed how income helped pay for emergencies and medicine. They use their money to support their relatives in the case of funerals or illness.

> *Participant 40 said (Interviews, 2020),' Like last week my sister was sick with tummy problems. Her husband did not have enough money to take her to the clinic, so I sent him some money using eco-cash to take her to the clinic. At least my payment had come in the week before my sister had the problem because I was at least able to help them.'* ***Participant 40***

> *Participant 26 said (Interviews, 2020),'My brother-in-law had lost his brother last year. When the situation happened, I used the money to assist them with funeral preparations. I was able to help them to buy food and other funeral expenses. It is in situations like this where I need money available so that I can help my family when going through tough times.'* ***Participant 26***

The quotes indicate that farmers spend most of their earnings on health expenditures, which is similar to Zhou, Guo and Liu's (2020) findings. Paying for health care, whether it be for themselves or their families, is a distinguished cause for small-scale farmers because they reside in unhealthy environments without decent shelter, clean water, and sufficient sanitation, making communities easily remain receptive to the risks of chronic diseases that affect their physical abilities to provide. Medical care is a significant aspect of small-scale farmers' livelihood outcomes, and they see value in spending their money to access it in any way or form.

Climate change strengthens the pressures that farmers already face in unhealthy environments. The farmers depend on successful crop productivity to ensure that they attain money to support their livelihood outcomes. The different livelihood outcomes stated in Figure 5.7 safeguard their families from severe vulnerabilities that could threaten their well-being level. Thus, income security for Zaka farmers is the gateway to fulfilling their needs and surviving the shocks. Remember, the main idea of this investigation was to find out the ways and means by which water scarcity and drought episodes affect the livelihood outcomes for small-scale farmers in the Zaka district. The results showed that income instability is how climate change negatively penetrates the livelihood outcomes for small-scale farmers. Climate change threatens farmers' crop productivity by minimizing their income, fostering negative changes to their livelihood outcomes. Income instability inhibits the farmers' capability to access livelihood outcomes critical for their survival. Enhancing income security should be our starting point in the climate change -adaptation debate because as long as farmers remain dependent on crop production, their livelihoods will always be susceptible to the effects of climate change.

II. Job insecurity and increased farming and household expenses.

Job insecurity and increased farming and household expenses are the other ways water scarcity and drought episodes affect the livelihood outcomes for Zaka farmers. The results displayed in Figure 5.2 show that about 67% of the rainfed participants and 57% of the irrigation participants faced job insecurity, and relatively 90% of the rainfed participants and 67% of the irrigated participants suffered from increased expenditures. Job insecurity is a result of low performance, and increased expenses are a result of income instability. These themes induced vulnerability for the Zaka farmers, particularly on the inner side.

We found that job security is crucial for Zaka farmers. The individuals were concerned about the status of their job security when they faced periods of low crop productivity. The study found that the farmers do not want to lose their appendage to government and private smallholder schemes because of the institution's proficiency in providing market access and natural and financial resources. Job security is a livelihood growth turbine for small-scale farmers in developing countries (Blockland, 2013; Manhas, 2020). Without job security, Zaka farmers cannot increase production scale, access resources, and improve their livelihood conditions. Climate change has created risks to Zaka farmers' job security by reducing their

capability to maximise productivity. The challenge is that the farmers still have to meet the production standards set by the organisation. High performance secures their access to resources (see appendix 3). Failure to meet the organisation's standard puts the farmer's jobs at risk of being unemployed. Employment with Zimbabwe Super Seeds comes with the benefits of having access to a direct market and resources that enable the farmers to withstand the pressures of poverty and hunger. These aspects are embedded in farmers' job security.

For example, one rainfed participant described how low crop productivity impacts his profits and job security. He revealed how he has to produce 3500kg/ha of seeds to receive his fair share of the profits (see appendix 3). He feels that if he fails to meet that standard, the organisation will let him go. He elucidates that he needs to maintain his performance as a farmer as this job brings food to the table for his family.

> *Participant 26 said (Focus Groups, 2020), 'Having no rainwater to produce my crops puts my job as a farmer at risk with the company. I signed a contract stating that I would produce 3500kg/ha as the minimum standard. If I fail to produce that amount, I could risk losing my job bringing food to the table at my home. The organisation understands that erratic rains are a serious issue, but I am still required to deliver as a farmer. If I keep having a series of bad harvests, they could let me go because of my performance. I have heard many stories of farmers being let go because they failed to deliver.'* ***Participant 26***

This quotation shows why climate change is a problem for Zaka small-scale farmers. The phenomenon can erode farmers of their job security just by reducing their crop production. The study understands why participant 26 is worried about it because he enjoys working for the Zimbabwe Super Seeds, and the main benefit is receiving an annual income and a ready access market. This income saves his family from hunger, but he has to meet the organization's performance standards to receive it. Unfortunately, the level of crop productivity determines his performance, and we are already aware that his crop productivity is at risk because of climate change. From his perspective, he has already seen the results of low performance from other farmers. Thus, he fears that he could lose his ability to provide

for his family because of climate change. A phenomenon that he cannot control. We see Adger and Winkel's (2002) concept of internal vulnerability, whereby the individuals are defenceless and lack the means to cope with the risks and yet still respond.

Participant 24 and participant 18 share comparable views with participant 26. Participant 24 explained that losing his job was not an option as he valued the benefits of working for Zimbabwe Super Seeds. Participant 18 talked about a farmer who lost his job to low crop productivity and feared the consequences. He was the primary breadwinner in his family.

> *Participant 24 said (Focus Groups, 2020), 'The last thing I want is to lose my job with Zimbabwe Super Seeds. The company has helped me a lot. They have given me good opportunities, and I make sure that I give my best as a farmer. Opportunities like this are hard to come by. I got a chance to produce for the company and a chance to feed and support my family. Others are feeding on less than RTGS3000 (US$30) a day. Things are expensive, so you do your best to hold on to the link that feeds you.'* ***Participant 24***

> *Participant 18 said (Interviews, 2020),'There was a farmer who was let go by the company because of poor performance. Some said that the person was lazy because he was just sitting with the land, and some are saying that he struggled to produce for more than three years. A lot of farmers worry about losing their jobs because of low performance. They worry about finding money to buy groceries and pay for fees, especially when jobs are hard to find in Zimbabwe.'* ***Participant 18***

The study believes this finding is essential. It outlines the fears that farmers face every day in their lives, and it is painful to be in a situation where we cannot control specific circumstances, yet we have to deliver our best with the limited means we have to ensure that our families' well-being is met. If the rains do not appear on time, what will I do to increase production? Moreover, If I did not produce enough to feed my families, how will my family

survive the long periods to come until the next season? These are the thoughts that farmers think of every day when dealing with climate change.

Another way water scarcity and drought episodes affect the livelihood outcomes for small-scale farmers is by decreasing their capabilities to pay for their household and farming expenditures. It is not surprising as it is an outcome of income instability. Income instability consequently enhances the farmers' expenditures. As money becomes insufficient, the more expenses the farmers have. The analysis shows that Zaka farmers have suffered the loss of invested inputs, particularly with fertiliser and pesticides, during the climatic crisis and thus have to use their previous or little earnings to repurchase the inputs. The participants consider them as expenditures because of the high price volatility.

Participant 17 described the periods where he lost the fertiliser and pesticides that he invested that season to climate change. Participant 17 explained that he is greatly dependent on those inputs for production as a farmer, but he fears that he might lose them to climate change because of the erratic rains. He further explained that the inputs were already a cost to him and that to repurchase them, he would have to use his backup savings to keep the crop production flowing.

> *Participant 17 said (Focus Groups, 2020), 'When rain doesn't come, I lose all the inputs that I have invested into the fields. I spent a lot of money in 2018 on inputs. Especially with fertiliser, it is expensive to buy in the shops. I would have bought and used 100kg of fertiliser, only for it to have gone to waste because there was no rain. Inputs have become expensive, but I have no choice but to put money aside for it. I could use that money to pay for other essential things. I have to buy them, especially if I want to produce crops that are of quality. Otherwise, I cannot get my money at the end of the year.'* ***Participant 17***

This quotation reveals that farmers will use their savings to attain their production even if they incur extra expenses with their livelihood outcomes. The participants are trying their best to maximise production despite the threats climate change poses.

Participant 6 explained that university fees were expensive. He explained that the university would increase their fee rate every year, and it was challenging to manage the new rates when money was insufficient.

> *Participant 6 said (Interviews, 2020), 'In 2017 I struggled to pay for my son's fees. They kept increasing the fees every year, and that year I had to borrow money from my friend because what I had was not enough.'* ***Participant 6***

The quotes above demonstrate that farmers face increased expenditures because of climate change. It is a domino effect (see Figure 5.8). Any impact on crop productivity produces a series of transitions that positively or negatively alter livelihood outcomes. In this context, the responses and results suggest climate change has created a series of negative transitions to Zaka farmers' livelihood outcomes. We cannot ignore the series of income instability, job insecurity, and increased expenditures that climate change has brought to Zaka farmers. The findings support Meinzen-Dick and Rosegrant's (2001) findings. Income inconsistency, unemployment, and increased expenses damage the overall well-being of farmers. Farmers' inability to meet their basic needs forces them into poverty, which they actively fight against every day. It is not like they can confront climate change directly and suppress it. It is a phenomenon that they have to adhere whether in its extreme or minimal form.

The main conclusion here is that climate change is a threat to farmers' livelihood outcomes, and it indirectly forces farmers with little means to cope with it into a circle of starvation, underdevelopment, hardships, bankruptcy, and impecuniousness. All these are extreme risks that some farmers may or already have faced in their livelihoods, but the important thing here is that they will actively fight their way through the challenges to ensure they can provide for their families.

At the beginning of section 5.2.2, we began presenting the results of question one. Question one was to find out the ways and means in which water scarcity and drought episodes affect livelihood outcomes for small-scale farmers. Based on the analysis, we found that income instability, job insecurity, and increased farming and household expenditures are the indirect ways climate change affects livelihood outcomes for Zaka farmers. Figure 5.8 provides a

diagram illustrating the linkages between water scarcity and drought episodes and farmers' livelihood outcomes.

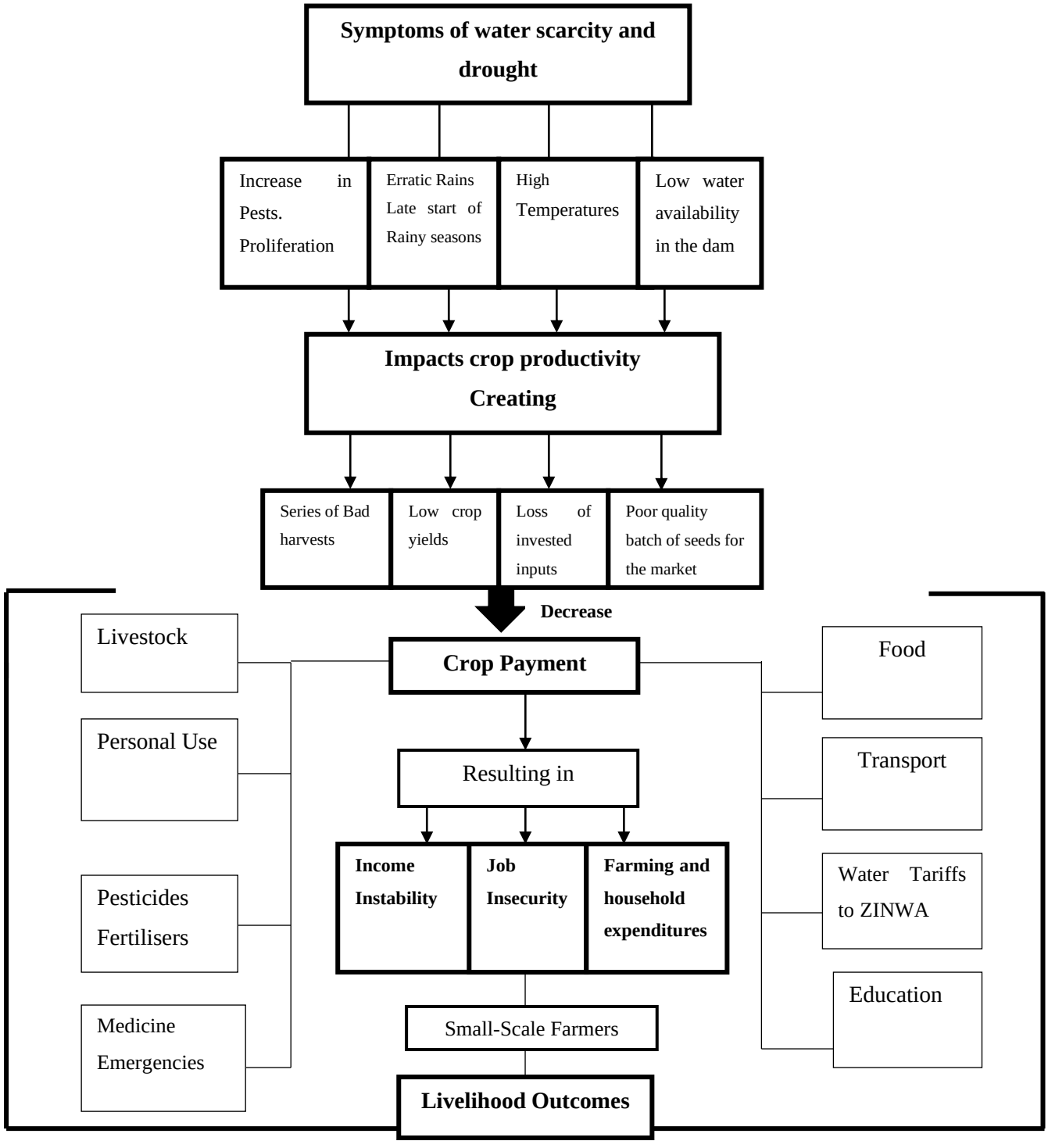


Figure 5. 8 Diagram illustrating how water scarcity and drought episodes affect livelihood outcomes .

Source: Field Work Survey Notes (2020)

This diagram illustrates the water scarcity and drought impacts on Zaka farmers' livelihood outcomes. The diagram presents the symptoms of water scarcity and drought which are represented as pest proliferation, erratic rains, late start of the rainy seasons, high temperatures, and low water availability. These symptoms negatively impact farmers' crop productivity creating a series of bad harvests, low crop yields, loss of invested farm inputs, and a poor quality batch of seeds. This particular dominoes effect negatively impacts farmers' crop payment. The crop payment presented in the diagram is the source that gives the farmers access to their livelihood outcomes. However, because farmers' crop payment is negatively affected, it has created income instability, job insecurity, and increased farming and household expenditures.

5.3. Livelihood assets accessible for small-scale farmers.

Section 5.3 presents the results of the second question of this study. The second question of the study was to address the resources small-scale farmers use to adapt to the effects of water scarcity and drought and explore whether their resources were accessible. What resources do you use to manage the problems you face with low crop productivity and households? How have the resources improved your situation with water issues and drought?-were questions posed to the participants. Several responses were varied and recorded amid conversations. Each participant explained how their resources improved their livelihood situations.

Remember, one of the main ideas underpinning this study is to explore the resource combination that farmers use to defend their livelihood outcomes. The theory of sustainable livelihoods dictates that assets are the resources that individuals use to the best of their ability to make their livelihoods sustainable (Scoones, 1998). If the participants have sufficient resources in both quality and quantity, they should withstand the effects of job insecurity, income instability, and increased expenditures highlighted in section 5.2.2. Farmers do not have their livelihoods to survive environmental pressures. They have resources that provide them the capability to create livelihood outcomes. How the farmers transform them either fosters proactive or reactive measures. As a researcher, I believe this is where we see whether their adaptation strategies are productive or inefficient. We wanted to know what specific resources Zaka farmers use and their resource combinations. Are their asset combinations effective in the eyes of the forefathers of asset portfolios- sustainable livelihoods?

5.3.1. Zaka Farmers Resources

In the analysis, we discovered that Zaka farmers have several resources. Figure 5.9 displays the different types of resources that both rainfed and irrigation participants use, based on their response rates.

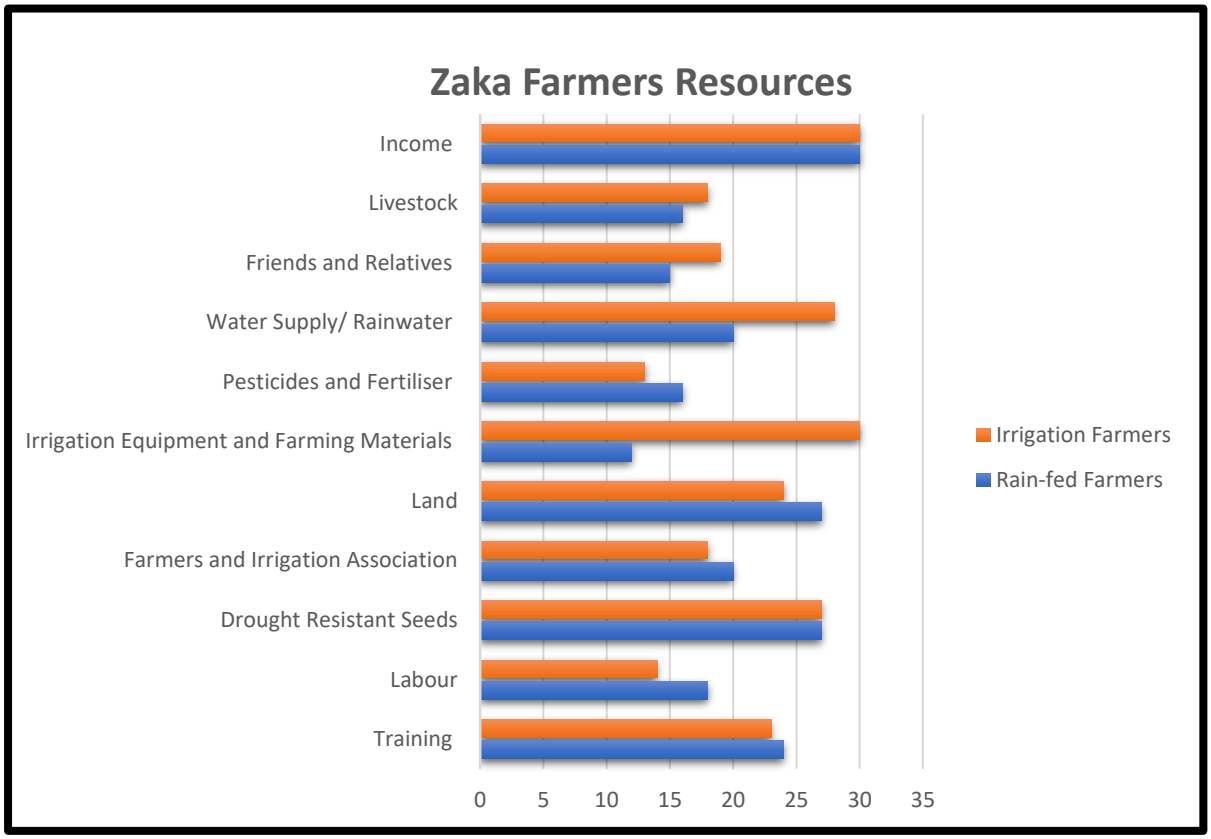


Figure 5. 9 Zaka Farmers Resources

Source: Field Based Survey Data (2020).

Figure 5.9 represents the assets accessible to that irrigation and dryland farmers. Orange represents irrigation farmers. Blue represents the rain-fed farmers. There could be other assets available which the researcher may not have picked up during data collection, but these are the assets that the participants mostly spoke about in the focus groups and interview discussions. Figure 5.9 shows that training, drought-resistant seeds, land, water, friends/relatives, income, and livestock were resources with the highest responses. Labour, social associations, pesticides and fertiliser, and farming accessories had the lowest answers.

Participants cited these resources in the interviews and focus groups (2020). Analysis shows that farmers had more natural capital than physical, financial, human, and social capital. There are two reasons why the participants referred to these resources. The first was on how the resources helped them manage their fields to get better crop yields, and the second was on the resources that helped them improve their living conditions. From this diagram, the study created separate diagrams for each capital. Each diagram shows the number of rain-fed and irrigation farmers that valued natural, social, human, financial, and physical capital.

I. Human, natural, and physical resource combination to improve crop production.

The analysis suggests that Zaka farmers used human, natural, and physical capital to improve crop yields. Using this particular combination of resources aided them in achieving consistent production rates during the drought periods and achieving adequate income returns. According to Ellis (2000), this combination of resources is effective for adaptation. The study agrees with Ellis (2000) because, in the analyses, we see the communities using their skill set to manipulate their resources, and the process fosters long-term learning and gratifying crop productivity. We see the value of learning in the participants' responses.

A. Human Capital : Training and Labour

We can see that almost 77% of the irrigation participants and 80% of the rainfed participants used training and 60% of the rainfed, and 47% of the irrigation farmers used labour to improve their crop production (see Figure 5.10).

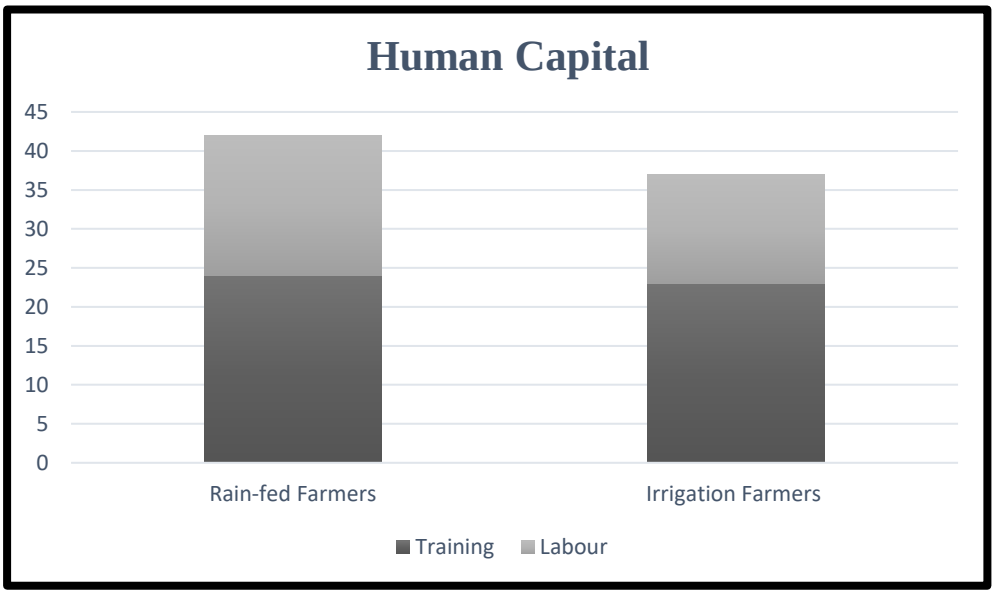


Figure 5. 10 Training and labour responses

Source: Field Based Survey Data (2020)

Figure 5.10 exhibits a confident result. There is a good association between human capital and crop productivity. Several Zaka farmers attained their crop yields through training and labour. The results from the focus groups and interviews (2020) showed that human capital inspired empowerment as the participants recognised the value of climate and crop knowledge. The resource provided them with farming skills that enhanced their preparedness and awareness in tackling water scarcity and drought extremes. The farmers felt that they handled the challenges positively with human resources.

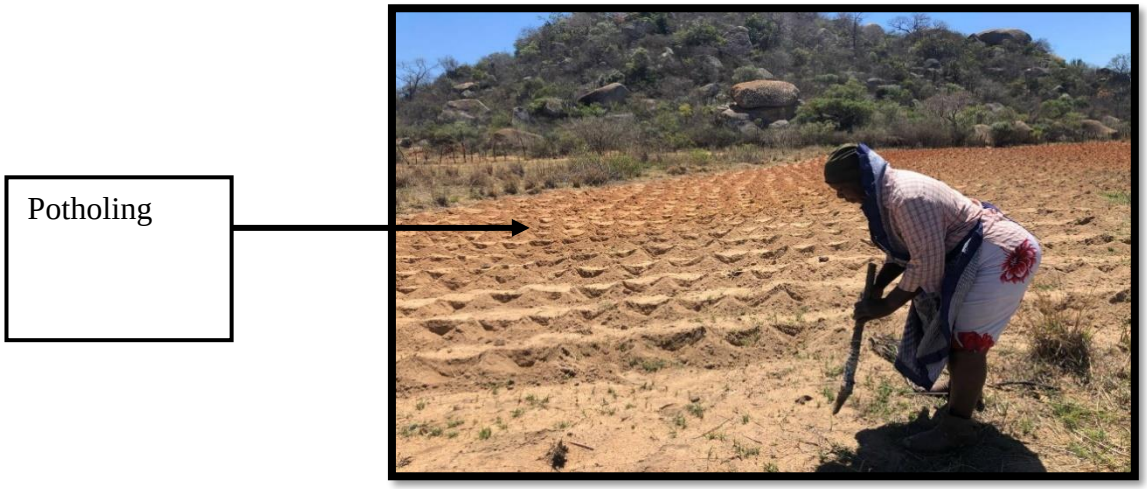
For instance, participants 48 and 27 spoke of the soil and water management techniques. Zaka farmers learned the technics and applied them in the fields. Applying the technics increased their crop production. Participant 48 spoke on the methods of potholing, and his maize yields progressed by 10%. The concept of potholing is illustrated in Ndlovu's (2020) visuals (see Figure 5.11). Participant 27 applied water channelling to increase her maize yields. This is exemplified in the visuals Zimbabwe Super Seeds captured (2020) (see Figure 5.11). Training fostered an increase in income returns for participant 48 and participant 27. See the responses:

Participant 48 said (Interviews, 2020) 'With potholing, I create holes 15X15cm and dig and plant the seeds. Each hole will contain water, and it is kept within reach for the crop. But before I add water, I add all the fertiliser and manure into that hole as well. When it rains, the holes fill up with water. I have been doing this potholing for more the five years, and it has helped me maximise seeds produce, especially during these dry conditions. I have been getting good batches of seeds because of these methods. Like I used to produce 6000kg/ ha, now I produce 6600kg/ha of seeds. That extra 600 makes a huge difference when trying to make money.' ***Participant 48***

Participant 27 said (Focus Groups, 2020), 'In the workshops, the company taught us how to use water efficiently to improve crop productivity by increasing infiltration and reducing evaporation. The field officer comes and shows us how to create ridges on the edges of our fields and in between. When water runs on a flat dry surface, it quickly dries up. We create ridges, and then the water is directed towards only the crops and reduces the rate at which the water would dry up. The technique works, and the crops come out well. I produce more than the minimum requirement. I always attend training; I learn something new that helps me do better as a farmer. I learn how to make more money with the seeds I have.' ***Participant 27***



Source : Photos captured by Zimbabwe Super Seeds (2020).



Source: Adopted from Ndlovu, (2020).

Figure 5. 11 Water Channelling and Potholing Techniques

The block quotations show that the participants appreciate the training and find it essential to improving their coping capacity against the drought effects. Participant 48 is confident in using the potholing technique because he knows his crops can survive the hot conditions. Participant 27 values the method of water channelling. Both participants will continue to use these methods to increase their crop yields during drought conditions.

We can see that Zaka farmers used training to defend their crop production, which had positive aspects to their livelihood outcomes . Remember, we found that there is a positive interdependence between crop production and income. Thus, any resource that yielded a

positive impact on crop production generated a positive effect on household income. We see the positive impacts through the farmers' responses. Table 5.3 displays other responses that show how the use of training helped farmers attain better crop yields. Several participants spoke of soil and water management and pest administration.

Table 5. 3 Training Themes.

Participants	**Training Themes**
28 learned about soil and water management	*'The training helped me perform better in my field. The organisation taught us in the workshops about crop and soil management. The people from the organisation and the trainers would train me in my field to teach me the proper way of actually doing cropping and how to maximise maize yields. They even showed me some demos on soil content and how to preserve moisture in the soil. It helped me get some good harvests because it meant that I would get a good sale at the market.'*
39 learned how to deal with pest outbreaks	*'I was struggling to deal with the fall armyworm pests in the fields. But after some training, I learned how to detect the pest early and how to apply pesticides to kill the pest without damaging the crop. Because when people say just spray mushonga (pesticide), I did not understand how it was done in the first place. But then these guys from the organisation showed me how to do it properly, and it helped seeing how they do it. Now I can manage the pest problem better and get a good batch of crops.'*

Source: Field Based Survey Data (2020).



Figure 5. 12 Zaka Farmers Training Session in Masvingo

Source: Photos captured by Zimbabwe Super Seeds (2020).

Other participants spoke of the use of labour to improve their crop yields. Its source came from family, friends, neighbours, cattle, and labourers within the community. Although, from the discussions, most participants engaged with cattle, neighbours, and labourers. Farmers used labour to manage tasks during the hot days with ease. Labour was a resource that was more beneficial to the elderly. For instance, participant 40 is a 58-year-old farmer who relies on hired labour to perform daily farming routines.

Participant 40 explained in the focus groups (2020) that he seeks hired labour to perform the weeding, clearing of crops, and cattle rearing for cultivation and harvesting purposes.

> *Participant 40 said (Focus Groups, 2020), 'I look for people who can help me in the fields. There are people in this area that are constantly looking for jobs. They come to me asking for jobs, and sometimes I go looking for them. They help me with weeding, putting the seeds in, rearing the cattle, and creating the rows. Using labour helps a lot because I can cover many tasks on the ground in one day. I just give the people different tasks that will cover the fields. I pay them with anything with*

food, seeds, money, and they come and help me in my fields. These days in Zimbabwe, it is tough to get by, so I help where I can, and they help me in return.' ***Participant 40***

The block quotation shows that labour gives participant 40 the ability to manage tasks with ease, especially during hot days. They could perform early planting on time and manage the hard work with harvest time using the workforce. Farmers had several tasks to perform, and they used hired labour to cover most of them. Table 5.4 shows similar labour responses from other farmers captured during the Interviews and Focus Groups (2020).

Table 5. 4 Labour Themes.

Participants	**Labour Themes**
44 uses labour to plant and harvest on time	*'I pay for extra labour because I cannot do the fields by myself. I need people so that I can plant and harvest on time. I also need people to help me with cleaning the plants before it is sent for collection. If I do it by myself, it will take a long time. In a way, I am happy with other people helping my fields because I get to help other people who need jobs in our community. I get to help people who are hungry and unemployed and help me with my fields.'*
32 uses labour to cover groundwork needed for farming	*'The family members help us in the fields. They are our labourers. But sometimes, it is tricky for our families to help because we still have young ones that go to school, some of us are old, and it is difficult to stay in the fields for long, especially on the days where it is too hot. So, we pay other people to come and help us in our fields, and it is a lot easier because I can cover a lot of the ground in one day.'*
53 uses hired labour because of family members are not always present	*'I manage the fields with my family. Sometimes, all the members are not always present. Some are at school, some are at other places, so when they are at home, they help me when they can. In those times, I also seek extra help from other people. I give them tasks to do on the fields, and then I supervise to make sure that it is being done correctly. That's what I have seen other farmers do as well.'*

Source: Field Based Survey Data (2020).

Table 5.4 indicates the importance of labour to Zaka farmers. Farmers can manage the drought conditions using labour. Labour gives them the physical support to carry out the necessary tasks required for production. We can see this notion with how Zaka farmers used cattle for draught power purposes.

For example, participant 45 described that he used cattle to complete his tillage tasks. It helped him transport seeds, acquire manure, perform land clearance, and obtain capital storage. Cattle assisted the participant in completing their tillage tasks when drought conditions were unbearable for his physical capacity.

> *Participant 45 said (Interviews, 2020), 'The young boys I hired put the ridger on the cattle for the fields, and they move forward to create the ridges. When I ran out of fertiliser, I used manure from the kraals for the crops and used the cattle to transport the seeds. Cattles are very useful because if I am to do the tasks by myself without the cattle, it will be a lot harder, and it will take too much time for me to finish the whole field. It is still not easy, but the using cattle make farming a bit easier to manage.'*
> ***Participant 45***

The responses show the positive link between human capital and adaptation. The knowledge, the workforce, and the livestock had a confident impact on the Zaka farmers' crop yields. Despite the gains human capital has yielded for Zaka rural farmers, the results presented in Figure 5.10 show that it is an inadequate resource as it only comes in two forms. For practical adaptation, farmers need substantial human resources to tackle the different pressures, and it is not satisfactory for Zaka farmers to only use two forms.

Regardless, human capital made it easier for Zaka farmers to manage their daily tasks in the face of climatic pressures. They became good problem-solvers and developed techniques that improved their coping capacity against job insecurity, income instability, and increased expenditures. The findings agree with Chmieliński et al. (2011) that human capital generates agricultural productivity for small-scale farmers. The resource is practical for the Zaka community adaptation because of the increased knowledge and management of their farming problems. Indeed, there is a positive correlation between human capital and economic

benefits. Other participants used natural and physical resources to defend their livelihoods, especially from income instability and job insecurity (see Figures 5.13 and 5.14).

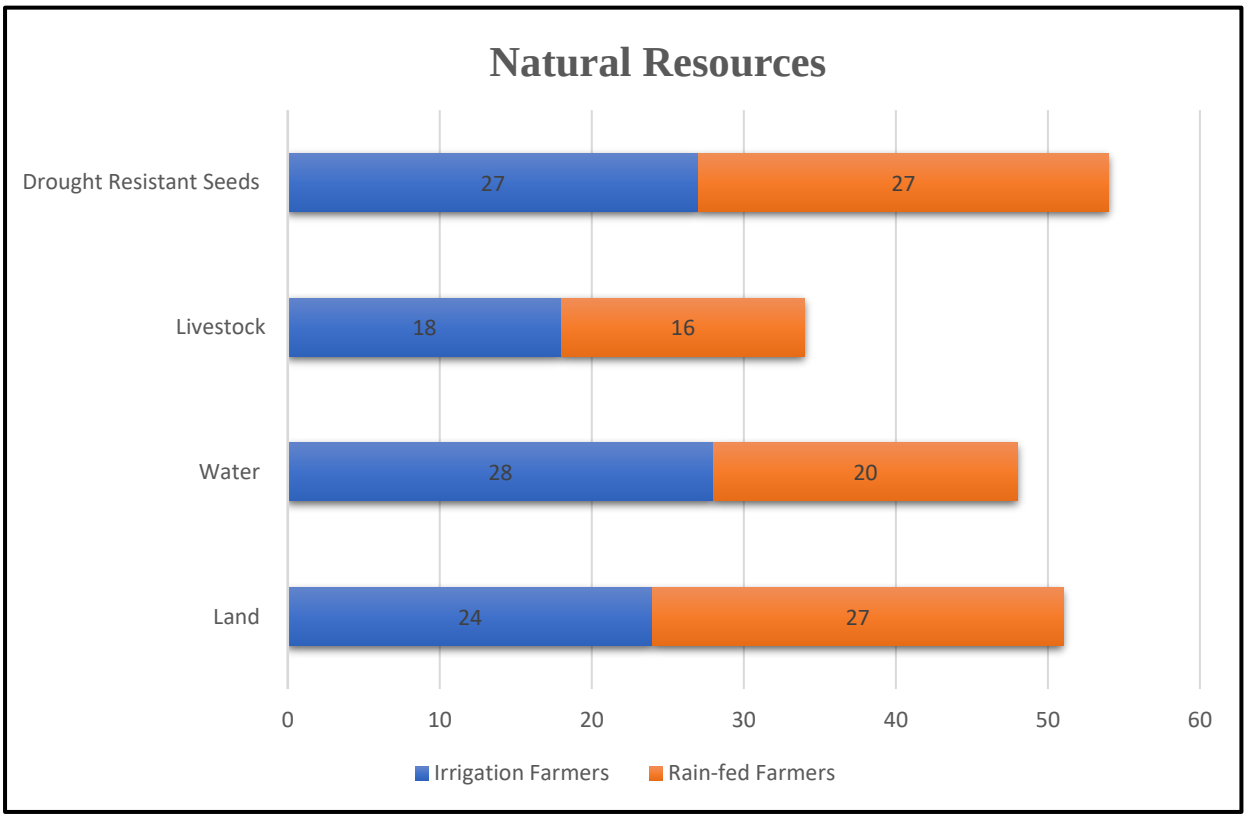


Figure 5. 13 Natural Resources for Zaka Farmers

Source: Field Based Survey Data (2020)

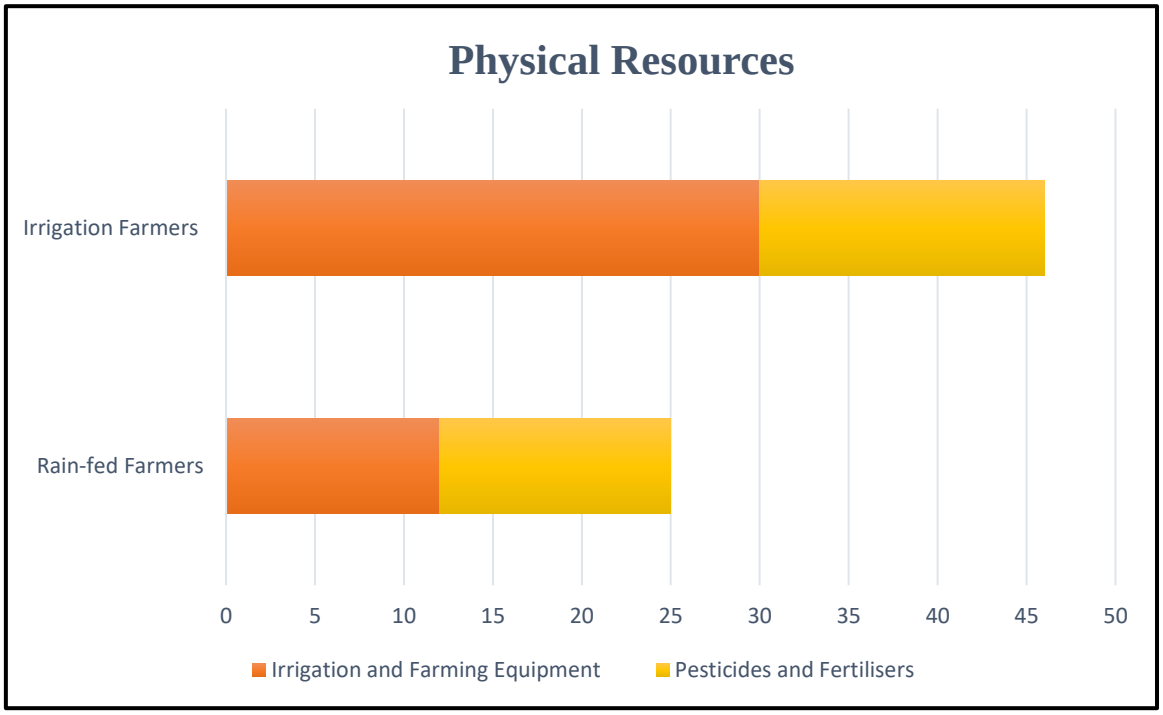


Figure 5. 14 Physical Resources for Zaka Farmers

Source: Field Based Survey Data (2020).

Figure 5. 13 confirms that Zaka farmers used more natural resources (land, water, livestock, and drought-resistant seeds) than human and physical resources. Figure 5.14 reveals that the farmers were only limited to two forms of physical capital, and these were only farming equipment and agrochemicals. Let us examine the results of natural capital.

B. Natural Capital : Water, Livestock, Drought Resistant Seeds and Land

The majority of Zaka farmers' coping capacity stemmed from the manipulation of their natural resources. Of course, human capital was essential. But natural capital in the case of Zaka farmers was the central piece to their adaptive capacity. The farmers used natural resources to limit their crops and households' sensitivity to climate-induced hazards, and they used it by exploiting all its services. Let us examine how they adopted each one. Relatively, 60% of the irrigation farmers and 54% of the rainfed farmers used livestock to defend their livelihoods. The farmers used livestock for manure when they could not afford fertiliser at the market rates. Some farmers used their cattle to obtain cash when income was insufficient.

The farmers used the money to solve any outstanding fees or inputs presented in section 5.2.2. For instance, participants 50, 38, and 26 explained how they used cattle to support their crop production and livelihood outcomes. Cattle had four purposes for the farmers. Cattle was another cash alternative, a form of manure, draught power, and food. See the quotes below

> *Participant 50 said (Focus Groups, 2020), 'I needed money to pay for my son's fees at the University, so I sold some of my cows to cover the difference. It helped, and I was lucky to have a buyer at the auction.'* ***Participant 50***

> *Participant 38 said (Interviews, 2020), 'When there was no food in the house, and I did not have the money to buy, we got meat from the livestock we had. It helps, especially when you are in a situation where you are completely broke. But I always make sure that when I get paid, I replace them, because you never know when you might need them again.'* ***Participant 38***

> *Participant 26 said (Focus Groups, 2020), 'I go and look for people to help me and for cattle as well. I do not have cattle of my own for ploughing. My mother and I manage the fields by ourselves. We used to have cattle three years ago, but they died from diseases. Buying cattle is also expensive. But we try our best to save so that we can buy at least 2. But for now, I have been hiring cattle from my fellow neighbours. I just rent two of their cattle and use them during the ploughing season. It is a cost I have to take to keep the fields ready.'* ***Participant 26***

From the block quotations above, we can see that livestock is a precious resource for farmers. Other farmers did speak of selling chickens, goats, and pigs as it was a cash alternative. However, to the majority of the participants, it did not provide the same long-term value as cattle did. The participants used livestock because it was readily available. It is considered shared pool storage, whereby they are held and mobilized during times of scarcity (Agrawal and Perrin, 2008).

It is the same principle as land. Nearly 80% of the irrigation farmers and 90% of the rainfed farmers praise land because it gives them ownership and the platform to create and produce food. It is a resource where they spend most of their time and energy trying to get good crops to earn their payment and provide for their families.

For instance, participant 52 explained how she acquired land from her late husband. She has been trying to keep her land productive to feed her family. She sees land as a source of income and a food source, and she feels that it is a priceless resource for surviving against poverty.

> *Participant 52 said (Interviews, 2020), 'Land is essential because if I do not have land, I cannot grow anything. The money cannot come by itself. I have land that I took from my late husband so that my family and extended family can survive. If I die, I know my family can continue to feed themselves with this resource. They can take over my job and continue working with the organisation and earn money.'* ***Participant 52***

Participant 46 shared a similar account with participant 52 on the subject of land and the value it yields.

> *Participant 46 said (Interviews, 2020), 'Land is significant to all of us. Without land, you cannot plan your life. Owning it is essential because no one else besides my family and I can use it. I do my best to make sure that it is used and kept well because other people are just sitting on it and not doing anything productive. It means that they do not see the value it brings. My wife and I will get to an age where we can no longer manage it independently, and I want my sons to come and manage it after me. No one else should manage it unless I decide to sell it.'* ***Participant 46***

The block quotations state that land is essential for Zaka farmers in managing climatic pressures. Participant 52 believes that, by owning it, her family can survive the future risks of

hunger and poverty. She views land as a way of making more money. Participant 46 believes that owning land provides his family with long-term security against hunger and poverty. Several farmers during the interviews and focus groups spoke of wanting more land. Out of 60 participants, 15 comments from farmers highlighted that some farmers were making more money from having bigger plots to plant more seeds and practice livestock rearing, and this assisted them to manage risks associated with climate change. Thus, farmers wanted more land to increase their survival chances. Participant 56 explained this notion.

> *Participant 56 said (Interviews, 2020), 'We each have roughly 1.5ha of land. It is minimal, and there are others with 2-3ha of land. It is unfair. They can make more money to survive. I hope that the government could assist some of us with this challenge by giving us more land. It is a local issue. As a community, we are growing seeds for Zimbabwe, and if we get extra land, we can help produce larger quantities of seeds.'* ***Participant 56***

In climate change studies, the land is a popular resource. It is a resource that several practitioners focus on when developing climate change policies. They focus on ownership, productivity, and accessibility because they are crucial for farmers' adaptation (Manzvera, 2015). The findings here demonstrate why land is significant to Zaka small-scale farmers. It is the main foundation of their livelihoods. Without land, farmers cannot practice agriculture and survive the external pressures.

Other participants valued drought-resistant seeds and water. On average, nearly 80% of the participants spoke of drought-resistant seeds and water to reduce income instability. There was no dispute about it. Several participants mentioned that the characteristics of the seeds were the reasons for them having high crop yields. See Table 5.5, displaying participants' responses on drought-resistant seeds.

Table 5. 5 Drought resistant seed responses

Participants	Drought Resistant Seeds Themes
22	*'The seeds are more advanced. The difference between normal maize seeds and these ones is that they can survive during the hot days. The normal ones may not survive for that long, but with these ones, they were designed to survive dry conditions for long periods and still produce good seeds.'*
12	*'These seeds carry a lot of good qualities that help me produce more in the fields. I have 1.5ha of land. They give me 50kg of seeds to go and plant. With this type of seed, I can make 100kg of seeds from that one bag. The more sees I produce, the more money I can make. These seeds do not take too long to grow and harvest.'*
16	*'The seeds the organisation gave me are pretty strong for the hot conditions. They belong to the company. It is an advanced kind of seed. This kind of maize seed is suitable for this area. That is how some of the farmers have been able to produce and maximise production. Because in this area, it is challenging to grow regular seeds where the rains are erratic. However, with these kinds of seeds, they can survive with very little water in the hot conditions.'*

Source: Field Based Survey Data (2020).

Based on the responses provided from Focus Groups and Interviews (2020), drought-resistant seeds provided a positive impact in minimising the risks of crop failure.

These are the maize characteristics below:

I. Early Maturing- Open Pollinated Variety
II. 110-120 days to mature at mid attitude and can take 190 days in hot lowlands of Zimbabwe.
III. It is a white semi-flint maize grained with high yield potential in drought prone areas.

IV. Good resistance to maize streak virus, grey leaf spot, cercosporazeae-maydis, PLS, and common rust(Puccinia sorghi)

V. Yield potential is 5 000kg/ha.

VI. Tolerant to drought and low- N stress. **(**See Figure 5.15).

Source: Zimbabwe Super Seeds (2020).



Figure 5. 15 Drought Resistant Seed : Maize

Source: Photos captured by Zimbabwe Super Seeds (2020).

Water is a critical resource for managing climate change and increasing seed productivity for Zaka farmers. Almost 93% of the irrigation farmers and 67% of the rainfed farmers said water supply was an efficient resource for crop production. It minimised the risks of pest outbreaks and withered crops.

For example, participant 5, a rainfed farmer, described how she uses water from the well to water her crops during drought conditions. She explained that she borrows her neighbour's 20L containers and uses her wheelbarrow to distribute the water on her fields.

> *Participant 5 said (Interviews, 2020), 'I go and get water from the well to water the fields. I have people that help me in the fields, so we go and fill up three of my 20L containers with water and take them with a wheel burrow to the fields. I do this when the rainy season delays. My crops will not survive if I do not water them. It is just a tiring process, but with the help from the people, I can manage, and I get it done.'* ***Participant 5***

The block quotation above shows that participant 5 appreciates the value of water regardless of how she acquires it. It is difficult for her to access water. However, she understands that it is an essential resource for crop production. The irrigation participants favour water because they can access water regularly from ZINWA and exploit its uses, in contrast with the rainfed participants who solely rely on the erratic rains to meet their crop production.

For example, participant 44, a rainfed farmer, explained that rainwater was essential for crop production but relying on it limited them from improving their crop yields. He was aware that the farmers in Fuve Panganai were doing well with their crop productivity because of irrigation, and he expounded that water was only valuable as a resource if it were accessible.

> *Participant 44 said (Interviews, 2020), 'Rainwater is an important resource for us. When it is there, good yields come out of it. But the problem is that we cannot access it the way irrigation farmers access theirs from the dam. Water is useful when there is plenty of it. If you have plenty of it, you can make good use of it. But now the problem is that we need more of it to handle the crops. But because it is unavailable most of the time, it is hard to use it in the fields. We can only hope that there are plenty of rains in the next season. If rainwater were to come at the times, we had planned to receive it; then we would not be complaining about drought.'* ***Participant 44***

From the participant's perspective, rainwater is a valuable resource in coping with climate change effects. The drawback to using this resource is its unreliability. Adaptation is limited if the water is not accessible in quantity and quality (Hirji et al., 2014). It is not surprising because water is the most talked-about resource in the asset portfolio adaptation literature, and the common consensus is that its source can either increase or decrease vulnerability in livelihoods (UNESCO, 2020). Despite this observation, Zaka farmers are exploring other alternatives to improve their access. They either seek other resources or use a different source of the same asset. It explains the block quotation presented by participant 5.

The results show that the farmers have more natural resources than human resources. Natural resources have vast purposes, which helped Zaka farmers develop more strategies to deal

with the climate pressures. Each natural resource provided the farmers with many different services effective for their adaptation. The land gave the farmers the platform to create and produce. Drought-resistant seeds and water increased their production chances during the dry seasons, and livestock provided them with access to financial capital that resolved some of their livelihood expenditures. From these findings, the study believes that natural capital was indeed the queen in the chess game for farmers surviving these internal and external pressures.

C. Physical Capital

Physical capital is another chess piece that farmers used to defend their crop production. Figure 5.14 illustrates that, on average, 70% of the participants valued production equipment, and 48% appreciated crop inputs, specifically pesticides, and fertiliser. John and Quance (1972) consider them production tools that play a vital role in adaptation. These resources boosted production and yielded income for Zaka farmers.

For instance, participant 33, who practiced irrigation, explained how the center pivot system increased the maize yields for farmers in his section. However, he also disclosed that some farmers were not keen on maintenance costs.

> *Participant 33 said (Interviews, 2020), 'I learnt about the center pivot system in training and how it distributes water to the fields. They fixed the one that was abandoned for a long time. We are using it at the scheme to water our fields. The only challenge is that some of the farmers are not so keen on it because we have to pay for maintenance costs. But the system works very well especially during the drought conditions, and I have been getting good yields from using that.'* ***Participant 33***

Participant 33 found the center pivot a helpful system in improving maize yields. The participant appreciated the center pivot system because the farmer used less water to improve production. Physical capital ranged from agrochemicals, wheel burrows, shovels, and cattle rears for the rain-fed farmers. They viewed them as mandatory tools for production purposes but not adequate to deal with climate challenges because these resources were in moderate

forms and worn out. Nonetheless, these types of resources did make some form of contribution.

For instance, participant 54, participant 6, and participant 37 spoke about the application of agrochemicals and how they relied on them for crop survival during hot conditions. They were religious about buying pesticides and fertilisers every season to ensure that the soils had nutrients and pesticides to prevent pest outbreaks. See their responses below.

> *Participant 54 said (Interviews, 2020), 'As a farmer, I need all the inputs for the crops to do well during the season. I need the water, the seeds, the cattle, the land, the fertiliser, and the chemicals. Especially fertiliser and chemicals are essential. I use fertiliser so that the crops get nutrients that make sure the crop survives nicely. I use pesticides to stop the spread of the pests attacking the crops. There are too many of them. I need to have at least the majority of the inputs to manage throughout the season. I have managed to recover some of the crops because of using fertiliser and pesticides.'* ***Participant 54***

> *Participant 6 said (Focus Groups, 2020), 'During the hot days, I worry a lot about the maize in my fields, because sometimes when I check, I find plenty and plenty of makhonye (caterpillars) inside the cobs. I am still struggling to manage the spread—the damage shows on the maize leaves and inside the cobs. I would have no choice but to abandon them. So, I was advised by the field officer to use pesticides so that I could save more of my maize. The chemicals do help, but they are expensive. Fifteen litres of pesticide are 1200 RTGS (12USD), and I would need three or four to manage the crops during the season. But using them helps me in making sure that my crops survive these pests.'* ***Participant 6***

> *Participant 37 said (Interviews, 2020), 'Some of the farmers crops do not survive because they did not put enough fertiliser.*

> *I remember my neighbour coming to ask for some of my fertiliser because she did not have enough for the season and in the shops, they are expensive. Some of her crops died and some survived, but it was not her best performance in the fields. I am required to produce 3500kg of seeds and for me to do that I must have the inputs. Otherwise, I will produce lower than the standard that is required. So, having the inputs really help especially when rain is scarce. With the inputs I am able to produce above the required standard during the drought conditions.'* ***Participant 37***

The block quotations suggest that the use of agrochemicals makes production feasible, despite its costs. The resource assists the farmers with the nutrient provision and limits water scarcity and pest proliferation challenges. Without these resources, Zaka farmers struggle to produce quality crops essential for selling at the market. What we see here is that physical capital is practical in turning raw materials into finished products. It is a concrete result. The resources process the outputs that communities need for their adaptation. However, the two impediments to the physical resources are that some individuals avoid them because of maintenance costs, as we have heard from participant 33, and it is a resource that is lacking for other communities that are in great need of it for adaptation purposes.

II. Financial capital and social capital in improving livelihood outcomes for Zaka farmers.

Social capital and financial capital were other resources that aided the participants in defending their livelihoods against job insecurity, income instability, and managing livelihood expenditures. Figure 5.16 and Figure 5.17 illustrate the different social and financial resources farmers used based on the responses provided from the interviews and focus groups (2020).

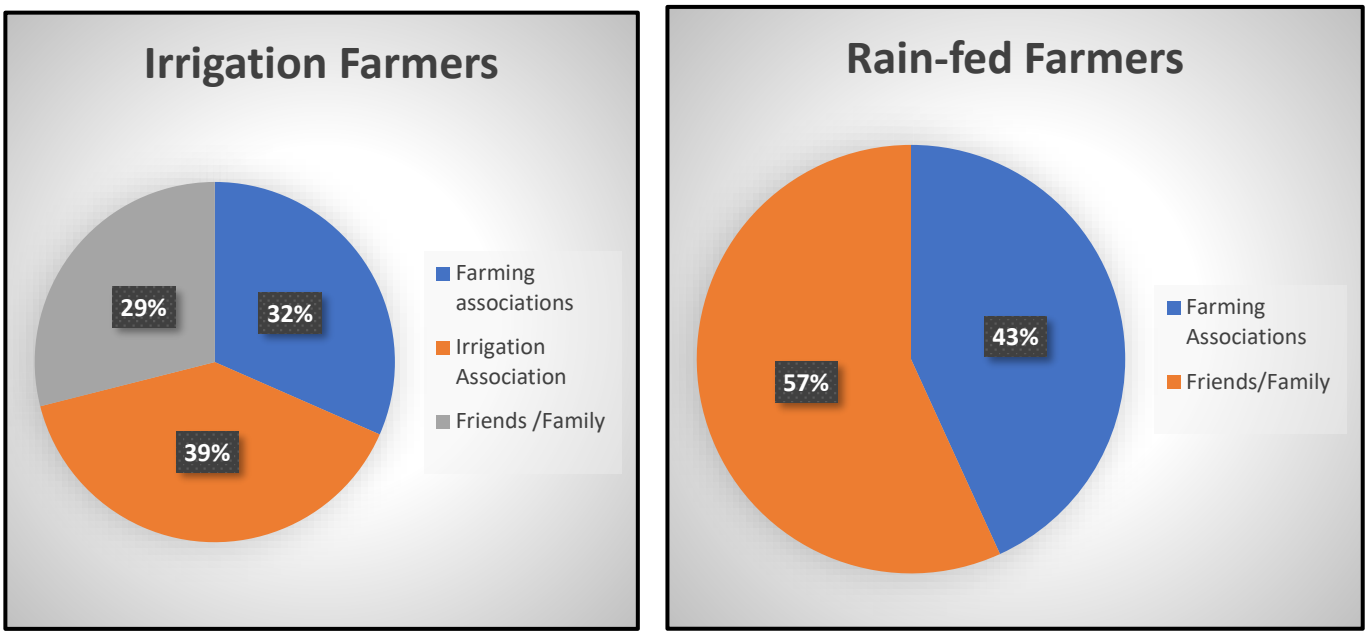


Figure 5. 16 Social Capital Resources for Zaka Farmers

Source : Field Based Survey Data (2020).

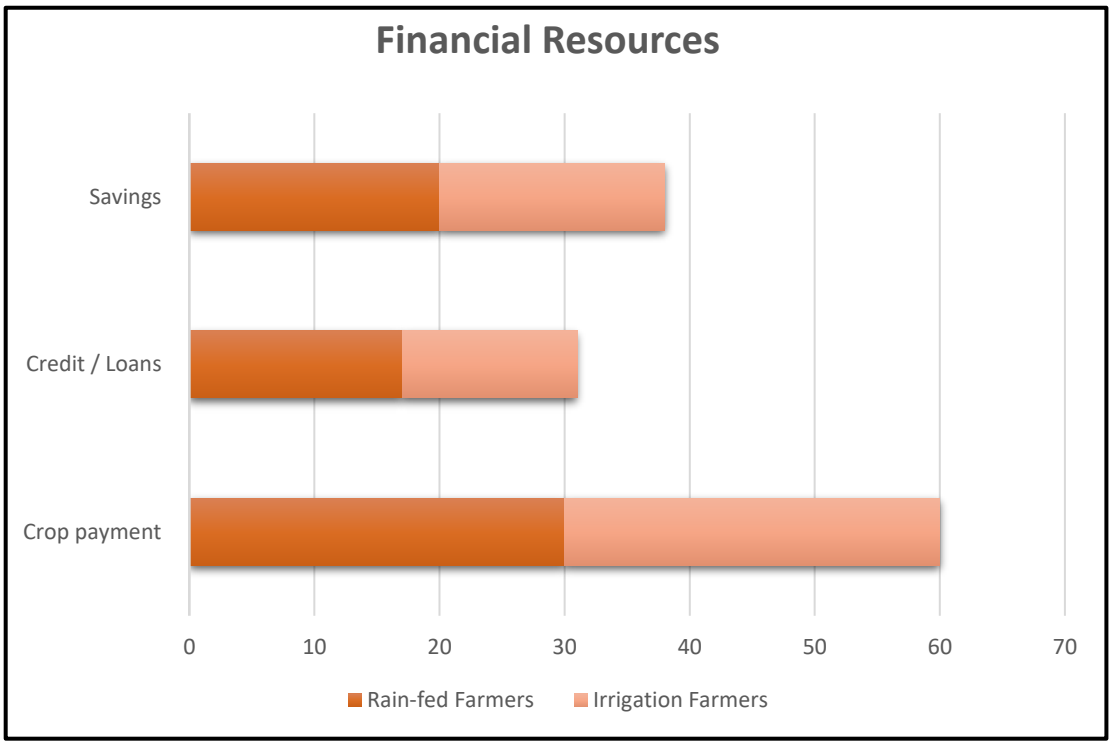


Figure 5. 17 Financial Resources for Zaka Farmers

Source: Field Based Survey Data (2020).

A. Social Capital : Farming Associations, Family and Relatives Relations.

The results showed that social capital provided a support system for farmers during times of hardship. The results in Figure 5.16 indicate that the farmers used social capital in different ways:

I. Social capital was a platform for farmers to voice their farming and household challenges, making them part of the problem-solving and decision-making process.
II. Social capital gave them a platform whereby the farmers could negotiate access to resources with other institutions. It fostered a collaborative action and resource network that increased their adaptation.
III. Social capital provided them with access to financial capital.

The participants used social capital to defend their livelihoods from income instability by engaging with their family and friends to assist them with funds during hard times. For instance, in Figure 5.16, almost 57% of the rainfed farmers and 29% of the irrigation farmers requested financial assistance from their friends and family. The farmers would specifically contact their children abroad or cousins or siblings who resided in the capital city to assist them with money. This strategy helped them manage their outstanding expenditures and survive severe bearings associated with food scarcity and income instability.

Take participant 29. Participant 29 explained that she contacts her son in Harare when she is short of money. She explained that she needs extra money to cater to her three grandchildren regarding food, clothes, and education. She only contacts him if her current earnings are insufficient, and she has no other financial option.

> *She said (Interviews, 2020), 'In situations where I am short of money, I call my son to help me. I have three grandchildren and I look after them on behalf of my son, who has to work travelling abroad from one country to another delivering goods. I ask him for money to help me pay for their fees, their clothes, and their food as well. But that is only when payment from the organisation is delayed, and I still need to pay for their things on time.'* ***Participant 29***

Participant 57 expressed a similar thought. He explained that when money or food is scarce in challenging situations, he has no choice but to contact his family for assistance. He believed that his family would always assist him because he also looks after them by caring for the essential things that support his family.

> *Participant 57 said (Interviews, 2020), 'When things are tough you have no one else to call other than your neighbours or family to help. It is a lot easier to call your family members because they will try to assist you where they can. Especially for a lot of us who are looking after their children or their livestock, whilst they are working in other places.'* ***Participant 57***

Both quotations show that 57 and 29 rely on their family and relatives to raise extra funds or goods needed for their livelihoods. The nature of their relationships with their family and relatives provided them with financial security. The study finds that the interactions and bonds make social capital very useful in achieving adaptation against climate change for Zaka farmers. Social capital as a resource does provide that element of cordial support which is crucial to withstanding risks of chronic poverty and hunger.

We also see the concept of collaborative action with the associations. Figure 5.16 shows that 43% of the rainfed farmers and 32% of the irrigation farmers disclosed that they relied on farming associations to handle complex farming and household challenges beyond their controlling capacity. Using the association provided Zaka farmers a sense of empowerment whereby they participated in the community forums and developed solutions as agricultural units.

For instance, participant 55, the vice secretary of the association, described how Zaka Farmers Association (ZFA) collectively resolves the problems that affect every farmer at the district level. He further explained the association's origins and how some issues were resolved, and some were not due to financial constraints.

> *Participant 55 said (Interviews, 2020), 'The association is what brought all the seed farmers. If you as a farmer have problems,*

the association handles all the problems at district levels. If it is not at ward level or district problem, we approach the officer to assist with the problem. Because he is the person who can help the household with the problem, but if it is a problem that is affecting all the farmers within the district, then we go and solve the problem using the association that manages it at the district level. We write down the problems so that we do not forget in the meeting. We have ten wards in Zaka District, but for our association, we only have seven positions. As for the Ndanga ward here, we always have two people representing at the district level than others like Chipinda and Bvukururu. It has been like that for four years. So, for those wards that do not have a representative, we ask the chairman of the ward to take a committee position. We ask for three chairpersons from the districts to make it 10 in total. That is how we form our association. We have elections every three years to ensure that people are also given a chance to be represented fairly. The meetings are held at the district with Zimbabwe Super Seeds, District Administrator, and Village Council representatives. That is where all our farmers' problems and our community issues are addressed as well. However, not all problems are solved in one day, some problems are too complicated, and when we fail to resolve them, we involve other organisations to assist us. Most of the time, the problems do not get resolved because of the issue of money. It is a big issue.' ***Participant 55***

Participant 30 shared a similar notion about using social associations to solve her livelihood challenges. She explained how farmers came together as a unit to solve pests, agrochemicals, and the provision of agricultural extension services.

Participant 30 said (Focus Groups, 2020), 'We meet every month as a unit to discuss issues of farming, like the issues of the pests, issues of labour and agricultural extension services, especially on the supply and price of fertiliser and pesticides,

and social problems like how to help our members who struggle financially and see how best to handle it and then we bring it forward at the district level. Like on the pesticides and fertilisers, we asked the company and local government if they could get the suppliers to reduce the price rates for us to buy at an affordable rate, and they managed. That is how we have been surviving.' ***Participant 30***

The quotations from participants 55 and 30 suggest that the association is a helpful resource for farmers in addressing their complex challenges. The farmers have family support and organisational support. The results agree with Bebbington's (1999) claim that 'the capacity of individuals to collectively come together to address challenges and devise solutions' increases adaptation for small-scale farmers. The resource gives them networks that bring them a sense of connectedness to authoritative institutions. This form of connectedness assisted in solving some of the challenges they had. However, there are two flaws with social capital. Firstly, based on the responses above, social capital is inefficient if the interactions do not benefit everyone, and secondly, it is a resource that cannot work independently without financial access.

B. Financial Capital

Figure 5.17 shows that farmers relied on savings, credits, and crop payments to defend their livelihood outcomes. Although, the bulk of it comes from crop payment. Remember, these financial resources provided several livelihood outcomes presented in Figure 5.7. Financial capital was indeed a vital chess piece in securing their livelihoods from the risks of poverty and hunger. In this context, it is the principal catalyst to improving their well-being. The responses show that the farmer's ability to use financial resources is based on social and natural capital. Farmers could access income through their social networks (organisations, neighbours, family, and relatives), crop production, and livestock.

Nonetheless, the financial resources aided the farmers in sustaining their livelihood outcomes. For example, 60% of the irrigation farmers and 67% of the rainfed farmers relied on savings to invest in medication, food, and social networks. Several farmers, particularly the elderly from the ages 59-69, used their savings to purchase blood pressure and pain killer tablets to deal with the psychological pressures from working in the fields during the hot

days. Drought leads to psychological conditions. It ranges from psychological, behavioural, physical, and emotional. According to Hayati, Yazdanpanah, and Karbalaee (2010), they are considered symptoms of farm stress. Participants used their money to buy painkillers to ease the pain from their legs, back, head, and hands.

For instance, participant 39, 60 years old, revealed that she uses her money to buy pain killers to help with headaches and back pain. She explained that she had these conditions for a while and used her previous earnings to acquire medication for the hot days, especially when she had too many time-consuming tasks to perform.

> *Participant 39 said (Focus Groups, 2020), 'I suffer from headaches and back pain from time to time. The pain is more intense on days when it is hot, especially when I have been working in the fields in the sun. My legs get numb from standing for too long and my hands get sore from slashing and cleaning the crops. I use the money I saved from last season to travel to the clinic and the nurse gives me pain killers and blood pressure tablets for the month. That is how I get by. I find it difficult to work in the fields sometimes, it is very tiring. I am not as strong as I used to be, but the tasks need to be done, otherwise there is no food on the table. With medication I can work for longer hours.'* ***Participant 39***

The quotation above highlights the stresses that farmers go through during dry conditions. These are long-term stress effects that have been traced back to Sodderman (1991). He found farmers in Iran fainting in the fields and were overwhelmed with anxiety, tiredness, agitation, and aggressiveness being the most common aspects. Participant 39 incurs substantial stress and pain working in the fields. However, she will continue to go through the psychological pressures of farming to ensure food is on the table. Thus, she resorts to savings to buy medicine to keep her physical capacity going.

The study sees the value income has in managing psychological conditions. The resource helps the farmers sustain their physical capacity during drought times. Farmers need money to complete their daily tasks, or they may succumb to the illnesses, forcing them to stay at

home. The lack of income would cause delays in their progress with production. Production is something that Zaka farmers cannot postpone because it creates further setbacks with their payments and reduces whatever breakthroughs they have made in limiting climate change effects. Table 5.6 displays income –medication-food responses.

Table 5. 6 Income: Medication and Food Responses.

Participants	Income: Medication and Food Responses.
32	**Food** *'Hunger used to be a serious problem in our household. It was difficult growing crops during the dry seasons when there were no rains, and it was more difficult to sell the crops at the price I wanted. Money for food was a problem. I did not have enough food to survive the year. But when I joined the scheme in 2012, it changed my life because now I started earning a regular money. I started using the money to buy livestock and to buy seeds so that I could plant more vegetable gardens. This helped my house. My grandchildren can eat, and I even help other people who are struggling. I don't worry about hunger as I used to.'*
47	**Medication and Emergencies** *'I use the money from the crops to buy medication and to sort out crises when they appear. Like last month, my grandchild had a severe cold. She had the flu, the sore throat, headache, and coughing, and luckily my friend was coming from Masvingo. I had asked her to buy a coughing mixture and painkillers for me. I had sent her eco-cash, and she brought the medicine the following day. I have learned that I cannot spend everything because if I ran out of money quickly, I would not manage problems that could appear at any time.'*

Source: Field Based Survey Data (2020)

The results indicate that nearly 57% rainfed and 46% of the irrigation farmers apply for credits and loans to cater to their farming necessities. It helps them manage their daily challenges and achieve their farming objectives on time. Zaka farmers used their financial services to keep their livelihoods sustained, and thus they continued to invest in their farming activities to acquire more income at the end of each season.

Take, for instance, participant 22. Participant 22 describes how he used credit to pay for fertiliser and pesticides to manage his fields. He explained that it is easier for him to apply for credit through Zimbabwe Super Seeds because it is difficult to get money from the banks to

buy the inputs at the current market prices. He explained that the inputs are expensive, and he preferred to take the credit service from Zimbabwe Super Seeds. Using the credit service enabled him to buy the inputs during drought times, and it ensures that he sustains productivity, even though he knows that it is a cost that the company will deduct from his next payment.

> *Participant 22 said (Interviews, 2020), 'I use the money to settle expenses. Sometimes I take out credit with the organisation in buying fertiliser and other inputs. Having this option is helpful because, at times, it is challenging to find fertiliser at the right price in the market, and I would not have the money available at that time to buy them. So, I ask for inputs from the company, and they supply me on credit and deduct the cost of my next payment, which is fine. At least I will be able to prepare my fields and still earn something for the next season. It is better than being stuck with no money to buy the inputs and yet having so many tasks that need to be done.'* ***Participant 22***

The quotation above shows how valuable credit is to participant 22. He finds the credit service a helpful way to purchase his physical resources. This financial resource enables him to complete his farming duties on time.

Other participants used their income to expand their food supply and social networks. For example, participant 38 described how she used her money to buy seeds to grow her vegetable gardens. She sells the vegetables to make money and feed her family.

Participant 9 used his money to invest in social bonds with his neighbours. He expressed the idea of helping his fellow neighbours in dire situations with drought. He is in tight bonds with his neighbours, and he sponsored their welfare to expand their level of support, connectedness, and trust in one another. The general opinion amongst the community was that they should help their fellow neighbours during the tough times to build a reciprocal relationship because they shared the same sentiment on life challenges. See participants 38 and 9's responses from the interviews and focus groups (2020).

> *Participant 38 (Focus Groups, 2020), 'I buy seeds to grow vegetables in my garden. I grow (muriwo) rape, tomatoes, onions, and cabbage. Some of the vegetables I sell to make extra money, and some I eat at home.'*
> ***Participant 38***

> *Participant 9 said (Interviews, 2020), 'In this community we help each other. Every one of us is struggling. We assist each other where we can. Like last week one of my neighbours ran out of fertilisers for her fields and he could not afford to buy some more, I gave her the remainder I had left. He is a very good friend of mine; we have lived next to each other for about 8 years. I know that he would do the same for me if I was in that situation.'* ***Participant 9***

The block quotations above suggest that income is a crucial resource for the farmers in defending their livelihood outcomes. The money provides them with options that prolong their livelihood endurance during drought and challenging conditions. Zaka farmers are strategic with their money because they understand how precious money is to their livelihoods and how difficult it is to get it. They develop other means to ensure their security by investing in gardens, investing in neighbours, and investing in their physical welfare. The downside with this resource is that Zaka farmers' means of obtaining money are inadequate. They are reliant on only three sources of income, of which neither have a complete guarantee. The analysis showed that despite the restricted funds, the farmers are intelligent and active individuals who will try to access every possible financial service they have to safeguard their livelihood outcomes.

Based on the data presented, training, money, labour, livestock, land, water, pesticides and fertilisers, family and relatives, drought-resistant seeds, irrigation infrastructure, farming materials, and associations are assets that the Zaka farmers use to adapt against water scarcity and drought. Applying the theoretical framework, we can see that the participants' natural capital is their colossal resource, followed by financial capital, social capital, human capital, and physical capital. The analysis showed that the resources are available for Zaka farmers but limited at the same time. Figure 5.18 illustrates a summary of Zaka farmers' assets.

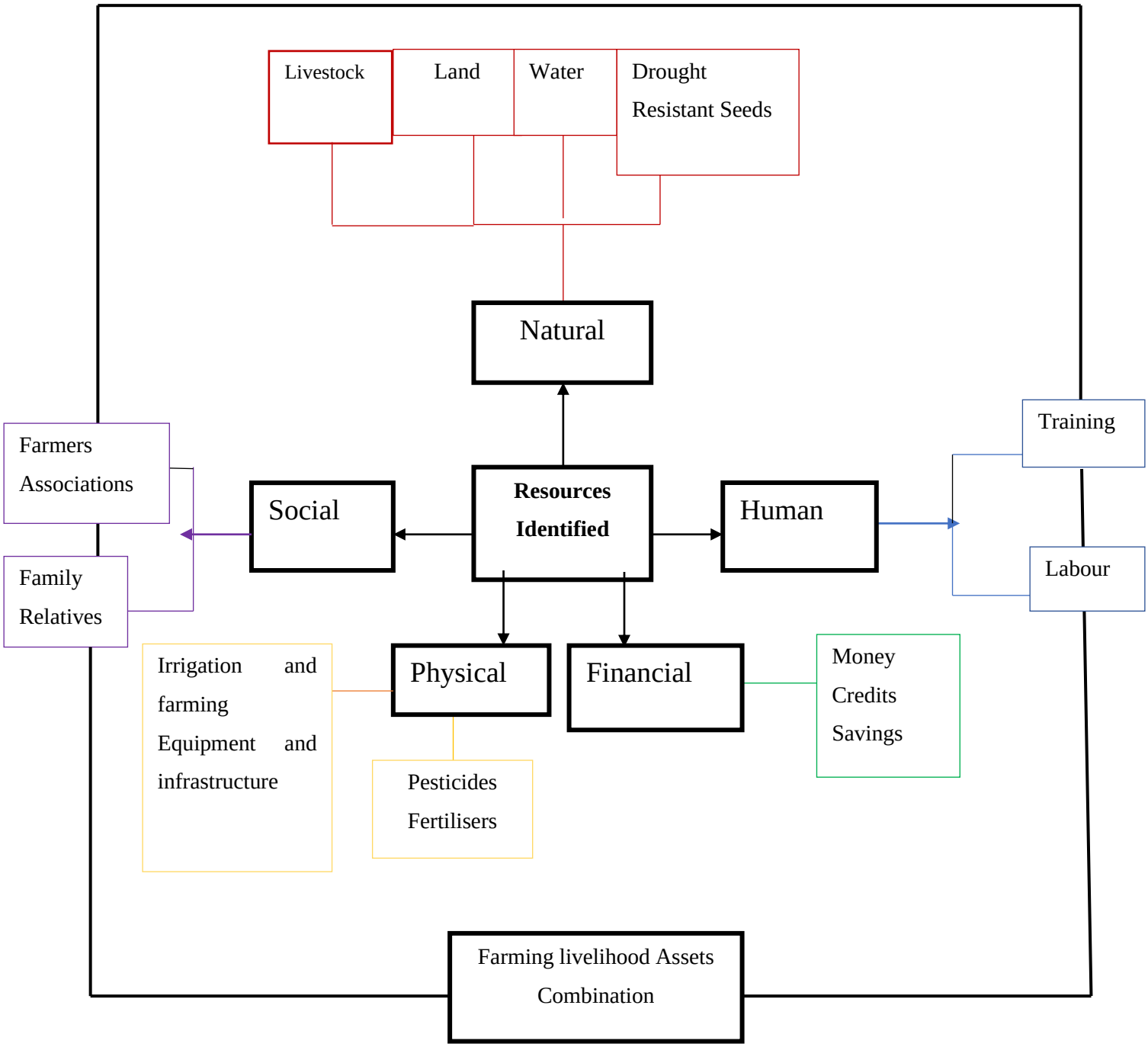


Figure 5. 18 Farming livelihood Asset Combination participants use to adapt to drought and water scarcity.

Source: Field Work Survey Notes (2020).

5.3.2. Accessibility of Assets for Zaka Rural Farmers

Now that we know of Zaka farmers' resources, it was imperative to investigate their access conditions. The question in the frames of reference specifies that we assess whether the resources were accessible for small-scale farmers in adapting and sustaining their livelihood outcomes against water scarcity and drought. This segment answers this question. It reveals how the Zaka participants acquired the resources. It specifies the terms and conditions of how they accumulated them. It discloses whether the farmers' level of accessibility hinders or promotes their adaptation.

Understanding how the participants obtained their resources gave insight into their livelihood status in measuring their adaptation to drought and water scarcity. The researcher asked these specific questions. Where do you get your resources from? How did you obtain them? The researcher analysed the responses from interviews and focus groups (2020). Remember, we are looking to see the farmers' capacity to procure benefits from the use of resources (Ribot and Peluso, 2003). This section reveals the requirements that determine the farmers' access.

The results from the interviews and focus groups revealed that Zaka farmers 'assets were accessible, but their accessibility was subject to four factors, and these are :

I. Institutional factors
II. Affordability
III. Land policies
IV. Limited crop diversification and financial infrastructure

These factors determine the Zaka community's level of access to the resources presented in section 5.3.1. The next section discusses the institutional factors.

I. Institutional Factors

Institutional mechanisms shape Zaka farmers' access to natural, physical, social, and human capital. Farmers can only obtain the resources if they follow the guidelines set by the institution that trains them. Out of the 60 participants, almost 70% revealed that they could access training, drought-resistant seeds, and irrigation infrastructure if they were an employee of Zimbabwe Super Seeds and could continue to obtain the resources if the farmers abided by

the rules set by the institution. We found that on average 90% of the rainfed participants and 64% of the irrigation participants stated that farmers' access to training is subject to their employment. For instance, participant 31 disclosed that she could attend the training sessions as an employee of Zimbabwe Super Seeds. She explained that she had to undergo training to join the scheme and continue as a mandatory requirement.

> *Participant 31 said (Focus Groups, 2020), 'To join the scheme, I had to first go through training for one month. After that, I continued and attended some of the workshops. Any farmer could come for training, but the problem is that some of the sessions are held in Masvingo, and it is far and expensive. The training would go as far as Harare. People were rotating to go for training. Sometimes the people from the organisation and the trainers would come to train me here at home to show me the proper way of how to plant and how to maximise maize production. They even showed me some demos on soil content and how to preserve moisture in the soils. Like there have been many people who come to demonstrate how these things are done.'* ***Participant 31.***

The quotation above shows that participant 31 received training from the organization by being an employee of the scheme. The organization provides training sessions for the farmers, and farmers would obtain them by attending the workshops and paying attention to the field demonstrations provided by field officers.

Another example is the relevance of drought-resistant seeds. Out of 60 participants, nearly 85% explained that they could procure seeds directly from Zimbabwe Super Seeds (ZSS). During the focus groups and interviews (2020), the participants were adamant about the laws associated with seeds accessibility from ZSS. They spoke of farmers laid off from the scheme due to failure to abide by the terms and conditions regarding seeds.

Participant 3 was given seeds by Zimbabwe Super Seeds. He explained that there were rules to using them. He disclosed that he was not allowed to sell the seeds or use them for his gain. He had to follow these rules to ensure his job security. See response below.

> *Participant 3 said (Focus Groups, 2020), 'This seed, ZM309, is strictly for planting and selling when it has been harvested. The seeds are the foundation of Zimbabwe Super Seeds. The company and the field officer told us these seeds carry many good qualities that should help us produce more in the fields. We cannot keep some for ourselves or sell them to other people or plant them in our gardens. It goes against the rules. It is strictly for business. If I go against these rules, I will lose my job. They would tell me that I violated the contract I signed.'*
> ***Participant 3***

According to the ZSS contract (see appendix 3), under conditions, no. 5, the organization provides the farmers with 50kg of stock seed, and the farmer shall produce the seed crop from the stock, and seed crop grown at the reform, at all-time shall remain the property of ZSS. If Zaka farmers were caught side marketing the seeds to another buyer that ZSS was unaware of, farmers would face trial in traditional and civil courts. On top of that, the organization would stop recruiting and providing support to the other farmers from the ward he or she resided.

The quotation above outlines the link between institutional factors and asset accessibility. There is a positive and negative result to the relationship. The positive side is that Zaka farmers have access to resources set by the institution that supports their coping capacity against climate-induced hazards. The negative aspect is that the institutions' rules systematically refrain farmers from using the resources to their full advantage.

Additionally, the notion applies to irrigation farmers that rely on the canal infrastructure for water supply. The results from the interviews (2020) reveal that:

1. The water infrastructure and equipment are accessible to irrigation farmers under the co-operative of ZSS and the Irrigation Board.
2. Irrigation farmers' access is limited if they are responsible for any damage or failure to pay the maintenance costs.

3. Every irrigation farmer has access to the equipment and infrastructure and can use the systems when it is time for irrigation.
4. The use of the systems is dependent on irrigation scheduling.
5. As long as infrastructure and the systems supporting irrigation are in place, farmers will have the capacity to defend their crops against water scarcity and drought.
6. Although, there were cases of ZINWA closing down the water supply due to delayed payments.
7. If the farmers abide by the irrigation scheduling, every farmer has an equal chance of accessing the water supply.

Source : Field Based Survey Data (2020).

ZSS institution boundaries control the formation and development of Zaka's resource access. The institution ensures there is effective governance of resources (Elobeid, 2008) and they authorise and limit the set choice of resources for the Zaka farmers. The rules and guidelines disclose how farmers receive resources.

The following section reveals the results on affordability and its relationship with asset accessibility for Zaka farmers.

II. Affordability.

The results revealed that farmers' access to livestock, water supply, labour and fertilizer, and pesticides were subject to affordability. It is an intriguing observation. Affordability is a unique finding in this study, and this is because it is affiliated with the housing and macro-economic disciplines, whereby institutions estimate the ability of households to acquire decent accommodation by instalment of a reasonable price (Hulchanski, 2007). But in this study, access to physical, natural, and human capital is based on Zaka farmers' financial abilities. The individuals must have a reasonable amount of money to access benefits from the resources.

The findings from the focus groups and interviews (2020) indicate that out of sixty participants:

I. Around 60% of the irrigation participants could use water supply if they paid their monthly water tariffs to ZINWA. Failure to pay this requirement resulted in denied access.
II. On average, 80% of the participants (rainfed and irrigation) stated that their ability to use pesticides and fertiliser was subject to market and price affordability.
III. Almost 50% of the participants (rainfed and irrigation) explained that labour was available depending on whether the participants could afford the labourers and how many were available to work.
IV. Nearly 40% stated that access to livestock was subject to a rate of buying and selling at the market.

The results confirm that affordability and access are linked. Affordability could either go positive or negative depending on the level of income. The higher the income, the higher the access and vice versa. However, in this context, the relationship is viewed negatively. We already know from section 5.2.2 that Zaka farmers' income is unstable. If the farmers cannot afford the resources, they cannot improve their adaptation. The resources are available but at a cost.

For example, participant 7's access to agro-chemicals is linked to affordability. She described the difficulty with price volatility and disclosed that she travels to other places to find cheaper chemicals.

> *Participant 7 said (Focus Groups, 2020), 'Getting pesticides and fertiliser is a challenge nowadays because of the economic situation in Zimbabwe. I go to the market, and there are people with different rates and prices. Today I find that one bag of 50kg potassium nitrate is 1000RTGS (US$10), and then after two days, it will be now 1500 RTGS (US$15). My friend told me the other day that other people were selling fertilisers at 2000 RTGS (US$20). It is not easy to decide which price to buy, mostly when money is also a challenge. So, I travel to other areas where it might be cheaper, but that is also expensive, but at the same time, I need the inputs.'* ***Participant 7***

Participant 7's access to physical capital is affected by affordability. Agrochemicals are available for the participant, but they are not within her affordability range to obtain them. Thus, she travels to other places to find a market within her price range. Her response also confirms that affordability is based on opportunity. It means that access to resources has to be acquired at the right time, at the right circumstance, at the right price, with the right people, and at the right place. It is the principle of affordability, and despite being unable to access it at an expensive cost, the participant can still acquire the asset at its lowest standard. Though, it becomes critical when the participant's affordability falls below the poverty standard.

The link between affordability and asset accessibility is seen with labour, livestock, and water supply. Labour was available depending on whether Zaka farmers could afford the laborers. To some participants, labour is a more economical alternative, and to others, it was an expense.

Other participants spoke about buying and selling their livestock to make more profit. They would start to buy auctioning livestock that made the most minimum contribution (such as chickens, sheep, and goats) and purchase livestock (such as cattle) that provided more value in the long term.

Water supply was subject to affordability for irrigation farmers. It came across as a collective issue. If one of the farmers could not afford it, it prevented other farmers who could afford it from accessing it.

For instance, participant 46 explained the issue of water accessibility. He revealed that the farmers were hesitant to pay for water tariffs, as it was considered costly, and this development had restrained other farmers who could afford it from accessing water supply from ZINWA.

> *Participant 46 said (Interviews, 2020), 'Some people are hesitant to pay for water because of socio-economic circumstances. It is a cost that they think about. However, the thing is, ZINWA does not supply water to one farmer in this section, it supplies water to everyone who uses irrigation, and the company only supplies water when everyone has paid. It*

becomes a challenge when we find that some have paid and those refuse. So, the committee tries to ensure that all irrigation farmers cooperate and pay for water and alert farmers on the days ZINWA supplies water or if ZINWA has problems on the days we are supposed to be irrigating.' ***Participant 46***

Participant 46's block quotation proves that affordability is a fundamental factor that requires consideration when analysing resource accessibility for small-scale farmers. It is a constituent that farmers think about when developing their strategies against climate change. Below are several examples of responses on affordability with labour and agro-chemicals presented in Table 5.7.

Table 5. 7 Themes of Affordability

Participants	**Resources**	**Themes of Affordability**
12	**Labour**	*'I hire people for the jobs, only if I have money or food to pay them.'*
9	**Labour**	*'Looking for people is slightly cheaper than buying a tractor. Although it would be nice to have a tractor, I cannot buy it on my own. That one would be a collective thing that all of us would pay for. But hiring people is easier because they are available, and all if I have to do, is meet them halfway with their wants.'*
14	**Agrochemicals**	*'It is a lot easier to get inputs from the organisation. They can supply it to me deduct it from the crop payment. I cannot buy these inputs with the rates they are charging. It is hard to find them at a fair price in the market. Most of the time I am given by the organisation, it is hard to locate them at the right price. it would be beneficial if the company could give the inputs all the time.'*
28	**Agrochemicals**	*'As soon as I get my money, I check for the prices of fertilisers, pesticides that same day, because I know the prices will not be the same the next day. I can only*

		purchase the inputs when the money comes in. I buy for the season and prepare for the following year as well. I have to constantly be aware of the prices in the market, because if I wait, I will have bigger problems trying to buy them because of the price rates.'

Source: Field Based Survey Data (2020).

Two factors Table 5.7 discloses are income and price. Price is important because it outlines the amount required to access the asset, and money is essential as it proves the farmers' ability to pay for the resources. Based on the farmers' responses, we can safely agree that there is a relationship between affordability and resource accessibility for small-scale farmers. It can either foster positive or negative upshots, depending on the farmers' income and price, as stipulated in Table 5.7.

III. Land Policies

This theme only applies to the subject of land accessibility for Zaka farmers. Responses from farmers and informants suggest that specific processes ensure laws, regulations, operational preparatory measures, practices, and societal norms to accessibility. They are necessary for Zaka farmers' livelihoods. The procedures provide incentives that stimulate the community to make better decisions on their access. The discussions in this section contain different varied responses about land acquisition. The information came from the farmers, government officials, and the management. This is how it follows:

1. In the Zaka district, out of the sixty participants, almost 70% stated that their access to land is subject to the Rural District Coordinating Committee Chair. The majority of residents in communal areas and resettlement areas acquire their plots from the local government authorities. Legislation that foreshadows the constitution retains primary rule over-allocating communal land to the Rural District Council.
2. The Rural District Council has the power to allocate land, particularly concerning development projects. Traditional leadership retains refusal power through a compound of legislative grants, historical and customary functions, and proximity to rural communities.

3. Traditional leaders work in concurrence to the day-to-day use of rural land, and they cannot be overlooked in the allocation and sustainable administration of land in the communal and resettlement areas.
4. Regarding the subject of gender, both males and females can apply for land from RDC.
5. Each farmer owns a piece of land allocated to them either through traditional authority or RDC because the land is productive.
6. Any rural person can apply for land. Although, once in possession, the owner is liable to paying tax to RDC. Failure to pay tax results inland is repossession.
7. The field officers are the people who recommended to the organisation the farmers who are doing well in their fields but lack agricultural extension support. Thus, the organisation recruits rural farmers who are already in possession of the land.
8. Out of the sixty participants, around 80% confirmed that the farmers were paying their taxes to RDC from the crop payment they were earning and that to make more money, they sought permission from RDC to acquire more land.

Source: Field Based Survey Data (2020).

These results demonstrate the correlation between asset accessibility and policies. Farmers have to seek authorization from governmental officials and apply the practices to acquire more land. In simple terms, the land is available, but it comes with procedures that Zaka farmers have to follow to collect it. For example, the vice secretary of the farmers' association revealed the formalities that the farmers have to go through to acquire more land. The farmers require more land to improve their agricultural productivity, but they can only access it if they pay their taxes and if the RDCC permits them.

> *Participant 55 said (Focus Group Discussions, 2020), 'Some of us got our land through our traditional chiefs, but some got theirs through the Rural District Council for big plots. We pay our taxes to them. We asked for more hectarage to expand on crop productivity and give us the chance to grow other crops other than maize. The more different crops we grow, the more money we can make as farmers. If the local government provides us with more land, it will mean more money for us in the long term. Having more means, we*

> *can produce more seeds and increase production. However, it also means putting more effort into managing it as well. It is a national issue. We are waiting for a response from the local government to see if they approved our request to give us more land.'* **Participant 55**

The block quotations show that land policies influence small-scale farmers' adaptation. It is a significant factor in how a Zaka farmer acquires land. Land is a critical resource for rural farmers. They believe that the more land they have, the more money they can make for their families. The participants believe that they can produce more seeds for Zimbabwe. Farmers can access land, although the size is dependent on the land functionality and authority of the RDCC. To access land, a Zaka farmer would have to examine the RDCC and see if they fit within their land allocation policies.

IV. Limited crop diversification and financial Infrastructure

In the analysis presented in section 5.2.2, we already know that access to income for Zaka farmers is subject to crop production, but it is also subject to limited diversification and limited financial infrastructure. It is a negative result. There are several other factors that affect the participants' access to financial services:

1. Limited crop diversification. Out of 60 participants, nearly 35% reported that they did not have other prominent income alternatives other than maize production. The irrigation and dryland participants only specialised in seed production. Specialising in other crops or livestock farming would increase their chances of earning more money.

For example, participant 48 and participant 32 explained that they wanted more income by growing other cash crops. Growing other cash crops would increase their chances of surviving the income inconsistencies. See the responses below:

> *Participant 48 said (Interviews, 2020), 'We asked the organisation if we could grow other crops this side other than maize. At the market they sell the crops at different rates, we could earn more money if we were growing different crops like*

maize, sorghum, and beans. It would increase our chances of survival.' ***Participant 48***

Participant 32 said (Interviews, 2020), 'There are a lot of farmers here like me that specialise in breeding livestock because that is another way of making money. If ZSS could find us a market for livestock, like they do for seeds, then we could make more money for us and for the organisation.' ***Participant 32***

The responses above show that the farmers are keen on increasing their access to financial capital to reduce their household's susceptibility to climate change and chronic poverty. There is a strong tie between income accessibility and diversification. Zaka farmers' access is limited because they do not have many sources of income. The one source of crop production that yields them the most money is subject to climate change.

2. Out of 60 participants, 28 responses indicated that limited financial services constrain the farmers' access to financial capital in their areas. Several participants complained about the state of the banking systems in the Masvingo district and explained that they have to travel to Masvingo to acquire their payment because there are no financial services present in the Zaka district. Secondly, accessing the money was dependent on whether the banks in Masvingo had physical cash present. The participants revealed that they could not access their salaries if the banks did not have the physical cash to give them, and this shows how the status of financial systems plays a role in the farmers' access to income. Farmers' income is linked to the economy, and limited physical cash increases their susceptibility to poverty and inequality.
3. Income is subject to the state of their current resources. Out of the sixty participants, relatively 20% explained a few cases stating that they could make money if their other resources were in good condition. For example, they could make extra money from the livestock they kept. However, they could not sell them if they were sick.

For instance, participant 2 described how his access to income depended on his livestock status. He explained that if he is livestock were in good shape, he could profit from the auction.

> *Participant 2 said (Focus Groups, 2020), 'I sell my cows at the auction. There are these big guys that come to buy cows at the auction. I take some of mine there to get extra money. They look at the size, the health of the cow and the type. Before I take them to the auction, I check for any diseases. These buyers do not buy cows that looks sick or skinny. They want fat healthy ones. On a good day I can sell one between 50000- 60000 RTGS (US$500-600) and it is enough to pay for fees and food for another two months.'* ***Participant 2***

From this response, we can see that participant 2's access to livestock increased his access to income. However, he is one of the very few who have access to livestock, and thus he has a better chance of making money to adapt to the pressures of poverty.

Based on the responses provided by the participants, assets play a critical role in shaping the farmers' productivity in adapting to climate change. Each asset comes with its barriers, and some are more critical than others. We can see that there are factors that either promote or prohibit Zaka farmers from deriving benefits from their resources. Table 5.8 summarises the resource access conditions and challenges for small-scale farmers in the Zaka district.

Table 5. 8 Summary of Resource Access Conditions and Challenges for Zaka small-scale farmers.

Resources	**Accessibility Conditions**
Training	I. Training was a prerequisite to being a Zimbabwe Super Seed farmer. II. Training is a resource that is only accessible to farmers who work with the organisation.

Drought Resistant Seeds	I. Seeds are provided by the organisation only. II. Farmers that have a contract with the organisation have access to the seeds. III. Access is denied for farmers that violate the terms and conditions of the contract
Social Institutions	I. Accessibility is dependent on the subjects degree of the problem addressed.
Land	I. Land is accessible to every Zimbabwe rural farmer, both male and female. II. Land is allocated by the Rural District Co-ordinating Committee Chair (RDCCC). III. The farmers that work for ZSS own the land they have been allocated.
Water	I. Water supply for irrigation farmers is subject to affordability. II. Rainwater accessibility is subject to climate change.
Livestock	I. Livestock's accessibility is subject to affordability.
Pesticides and Fertilisers	I. Accessibility is subject to market price and affordability
Income	I. Income accessibility is subject to the status of crop production. II. Income access is limited because they have low diversification. III. Income is subject to the state of financial services in the area. IV. Income is subject to the state of their current resources.
Family and relatives	I. Subject to the degree of the relationship with the member of family.
Infrastructure and equipment	I. Accessibility of irrigation equipment and infrastructure is only for the irrigation farmers in the ZSS scheme. II. Accessibility of physical equipment is dependent on maintenance

	costs.
Labour	I. Affordability of the labourers and on the number of people who were willing to work for them in the fields.

Source : Field Based Survey Notes (2020).

5.4. Constraints in adapting to water scarcity and drought.

In this section, the study presents the findings to the third question of the research study. The third question of this research was to investigate the constraints that small-scale farmers face in building adaptive capacity. We look at the impediments that get in the way of farmers' adaptation to climate change. The study wanted to investigate the barriers that are undermining farmers' livelihood strategies. The study answered the research question using qualitative measures. This aspect of the study formed part of the interviews and focus groups (2020). We needed to investigate the constraints that small-scale farmers faced. The study wanted to identify additional opposing developments that would affect farmers' ability to make money and procure different services. We wanted to see if these adverse developments made their households more susceptible to high-level poverty indices. Is climate change the only phenomena that are making farmers' livelihoods sensitive to poverty and chronic hunger? This section addressed that. The literature claims that small-scale farmers' constraints are linked to access conditions and the lack of assets. The study wanted to understand if that was the case here with Zaka farmers.

Remember, Zaka farmers live in an environment that is invariably changing. It is not safe for us to assume that climate change is the only phenomenon affecting their well-being. Finding out farmers' challenges will give us insights into the interlocking stressors that play a role in their households. How do these additional stressors change the dynamics of their adaptation? Do they stem from climate change? Or is climate change just an extra stressor that is adding vulnerability to the existing conditions they face? These are the questions that this section is disclosed.

After a thorough analysis, there were two constraints identified:

I. Zimbabwe’s socio-economic climate (2019-2020).
II. The COVID-19 lockdown global pandemic (2020-2021)

According to Scoones (1998), the socio-economic climate (2019-2020) in Zimbabwe's context is classified as a negative economic trend, and COVID-19 is a sudden shock, as it is a hazard that appeared unexpectedly. The results show that Zaka farmers had to defend their livelihoods and capitalise on their assets in the face of these non-climate-related occurrences.

The following section begins by discussing the socio-economic climate that hindered Zaka farmers from building adaptive capacity.

5.4.1. Zimbabwe socio-economic climate (2019-2020)

The researcher posed questions kindly asking the participants to list some of the challenges they faced other than climate change in their livelihoods. The responses were varied. The participants communicated the answers based on the conditions surrounding their rural lifestyle.

The four themes that the participants disclosed in the discussions and interviews (2020) were:

I. Cash shortages
II. Slow revenue collection
III. Farm crime
IV. Price volatility

The level of responses pertaining to cash shortages, slow revenue collection, theft crime and price volatility from irrigation and rainfed participants are displayed in Figure 5.19.

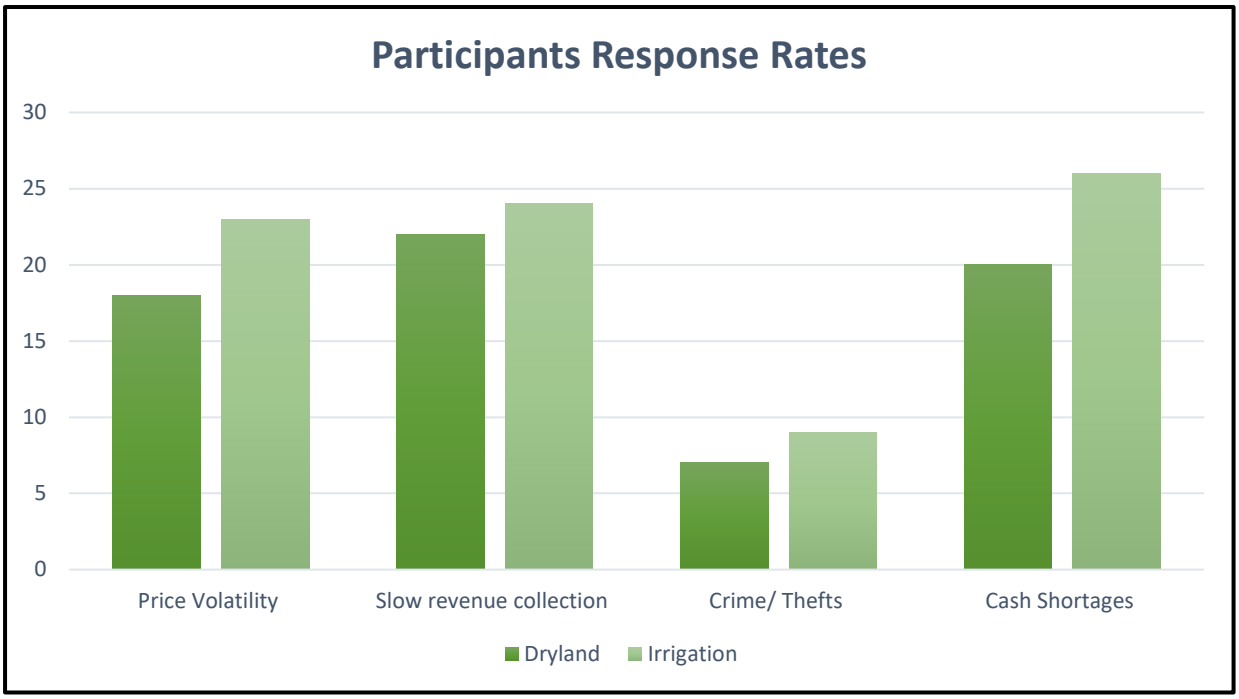


Figure 5. 19 Zaka farmers response rates on socio-economic themes.

Source: Field Based Survey Data (2020).

Figure 5.19 reveals that out of sixty participants:

I. Almost 73% of the rainfed participants and 80% of the irrigation participants experienced slow revenue collection.
II. Approximately 67% of the rainfed and 87% of the irrigation participants had encountered cash shortages.
III. Around 60% of the rainfed and 77% of the irrigation participants faced price volatility.
IV. Nearly 23% of the rainfed and 30% of the irrigation participants faced farm crime.

Remember, Zimbabwe is a unique country, and these themes stem from its hyperinflation presented in chapter two. We must briefly remind ourselves of Zimbabwe's socio-economic climate (2019-2020) as it helps the reader understand the socio-economic conditions farmers faced because it provides clarity on the themes displayed in Figure 5.19.

On the 20th of February 2019, The Reserve Bank of Zimbabwe introduced the Zimbabwe RTGS (Real Time Gross Settlement). The RTGS consists of bond notes and bond coins (The Zimbabwean Independent Newspaper, 2019). The government published that the 'new currency's rate against other international currencies would be floated on the Interbank Foreign Exchange Market and introduced that day' (Zimbabwe Ministry of Finance and Economic Development, 2020). The unstable Interbank Foreign Exchange Market led to the daily rise in goods prices, slow transaction of funds between banks, and physical cash deficits. This development had touched all the sectors in the economy, specifically agriculture.

Several participants expressed that they had difficulties getting money. The participants would refer to the word 'mari' in their native tongue, speaking sincerely on the challenges. Now that we are aware of the economic conditions let us begin with the first result.

I. Slow revenue collection

The bar graphs in Figure 5.19 indicate that relatively 73% of the dryland participants and 80% of the irrigation participants encountered slow revenue collection from the company. The participants communicated that the organisation was slow in depositing the payment for crop production. The consensus amongst the participants was that being paid on time was imperative. Receiving payment on time meant that they could pay for household necessities on time. Although, due to the slow revenue collection, they had to endure long waiting periods.

For example, participant 30 was affected by slow revenue collection. She explained that the organisation was slow in depositing her payment. There were some days she endured long waiting periods to receive her money. She had to keep checking with the organisation to confirm if the payments were processed.

> *Participant 30 said (Interviews, 2020), 'Mari is a challenge. It is a problem in my household. After I sent the crop production to the company, the company will not have the money ready for me by that time. I have to wait for the company to sell the seeds. I could wait for a long time, or I could wait for a short time. I*

> *would keep calling the company to ask if the money was processed, and they would tell me that they would be having issues with the bank. The company calls me when my payment is ready, and I travel to the bank in Masvingo and collect it, but at times I get there, and the money is not reflecting.'* ***Participant 30.***

The block quotation above depicts that slow revenue collection affected the participant's ability to acquire income. There is a privative result between slow revenue collection and adaptation. Farmers' adaptation capacity is low because the slow revenue collection delays them from accessing the funds required to defend their livelihood outcomes. The long waiting periods increase their susceptibility to poverty indices because their income options are insufficient, as we are already aware in section 5.3.1. and 5.3.2. There are other responses similar to participant 30 that speak of slow revenue collection. See Table 5.9.

Table 5. 9 Slow Revenue Collection Themes.

Participants	**Slow Revenue Collection Themes**
28	*'I don't get paid on time these days. The organisation would say that they put my money in the account. I travel to the bank and find that the money has not been deposited. I have to decide if I will go back home and come back after one week or spend the day in Masvingo and try the bank the following day. It is expensive to travel. Masvingo is far.'*
16	*'Waiting for money is a problem. I wait for the company to pay, or I borrow money elsewhere. But the process takes time. With this situation here, it is difficult to make money and get it on time, and climate change is just making it very difficult for me to progress. Making losses in production means I have to fight for small amounts of payment which could devalue the next day.'*
25	*'Receiving money from the seeds production is a problem. It takes a bit of time for the money to get deposited into the bank in Masvingo. However, there is nothing much I can do about that. It is the way things are here. The other farmers in the community and I all go through this. It is just the economic*

	conditions here that make receiving the money process difficult.'

Source: Field Based Survey Data (2020).

Table 5.9 discloses that waiting for money is a challenge to farmers' adaptation. Farmers are dependent on income to defend their livelihood outcomes, and it is unsettling when they cannot access their funds on time because it puts them a step behind in their livelihood strategies. Farmers design their livelihood strategies based on opportunities and consistency. Acquiring money from the organisation on time is a process that was consistent for them before the 2019-2020 period. Due to socioeconomic climate, their adaptation is affected because their ability to perform functions necessary for their household and fields is decelerated. This theme fosters a line of risks that the farmers are trying to prevent with the funds they need.

II. Cash Shortages

Approximately 67% of the dryland participants and 87% of the irrigation participants complained about the challenge of cash deficits. Farmers could not receive their income in cash due to a lack of physical funds within financial institutions. It meant that farmers could not access all their income, as the banks reduced the daily limit withdrawal per person, of which for the participants, the daily limit was inadequate to meet most of their livelihood needs.

For instance, participant 42 expressed the troubles she faced in getting money from the bank. She explained that they were physically and mentally tiring. She struggled to acquire cash at the banks to buy food and pay the labourers at work. She explained that she cannot carry out livelihood tasks without money and could not leave the banks without something.

> *Participant 42 said (Interviews, 2020), 'I need the money to buy food for our families at home and pay the labourers working in my fields. There are people I pay who do not have bank accounts and live on a cash-to-cash basis. I have to find the cash to pay them. I also need money for my consumption. It is hard to manage all these things when there is no ready cash available in the banks. With this situation here, it is challenging*

to get 400RTGS in one transaction, and at times, I have to do two transactions over two days, and in most cases, the cash is not available altogether, bringing in more delays. I did not leave the banks until I had enough to buy some of the things I needed.' ***Participant 42***

The block quotation above depicts cash shortages as a constraint to farmers' adaptation. The participant is unable to acquire the funds she needs to defend her livelihood outcomes. The physical cash shortages threaten her ability to manage her livelihood outcomes. Cash shortages jeopardize farmer's adaptation by eroding their capabilities to perform the necessary functions for their livelihood security. Their income strengthens their capabilities, and without income, their households remain exposed to poverty and hunger. Table 5.10 displays other responses that speak of cash shortages.

Table 5. 10 Cash Shortages Themes

Participants	**Cash Shortages themes**
12	*'Finding physical cash is a problem. The situation is that there is no money at the banks to apply for a loan or to even withdraw.'*
39	*'There is no money in the banks and at times the banks only give out specific amounts at a time. If I go to the bank, I can only withdraw 300RTGS a day. I have to come back the next day to withdraw the same amount until I have taken all my money out. I will not be able to pay or buy the things I need on that day. With the situation here, the price of things changes every week.'*
44	*'Money is scarce here. I went to the bank to withdraw money and they told me that I could only take out 300RTGs for the day. I spent the night there and waited to withdraw another 300RTGS at the bank. The situation here is not normal.'*

Source: Field Based Survey Data (2020).

Table 5.10 shows that cash shortages are a problematic barrier to farmer's adaptation. What makes cash shortages an arduous barrier is that it is a phenomenon that is beyond the farmers' and management's coping capacity.

Participant C from management described it as an abnormal situation and linked it to the country's hyperinflation. He explained that the farmers' inability to cope with it stems from a lack of proper financial services and infrastructure. He even described the situation of the slow revenue collection that is also adding the farmers' vulnerability and stated that the situation is not the farmers' fault as they just part of the collateral of the circumstances. He stated that the phenomena affected the entire nation.

> *Participant C said (Interviews, 2020), 'Cash shortages is a national problem everywhere, in Masvingo, Harare and Bulawayo and it requires collaboration from all stakeholders. The banks are trying to move towards encouraging the farmers to use plastic money, but some farmers are not accepting of it. They require some amounts that are not bankable to pay their labourers and that requires physical cash. The financial system is not as good here. Financial infrastructure is absent and its only located in Masvingo. Availability of finances is not easy. Most of the time the financial systems require people to have some of collateral and that is not easy to come by. The farmers struggle with the availability of finances, but the situation is not their fault. Pricing of the seed produce is an issue, because with this economy, the rates are always changing, and the prices are always increasing. We have to strategize and plan the prices using the current rates. This situation affects everybody working in the economy. It does not spare anyone that works in Zimbabwe.'* ***Participant C***

Cash Shortages are a very rare constraint in the livelihoods debates. It is not a universal phenomenon in farmers' livelihoods. It dates back to the German hyperinflation during World

War I in 1923 (Fischer, 2010). However, Zimbabwe's economic trend is not new, as it has always been in Zimbabwe since the Fast-Track Land Reform Program in 2008 (Mkodzongi and Lawrence, 2019). This negative economic trend regained its momentum after the multicurrency era in 2015 and only gained its confirmation in 2016.

Nevertheless, we do see the problems it brings to farmers. Zaka farmers spend a vast amount of time waiting in the banks, only to leave without any withdrawals due to no external funds from the banks or withdraw a quarter of their income for the day. The participants do not have the means to acquire loans because of the tight financial structure of the system. Banks from 2019-2021 became reluctant to lending money to small-scale farmers (Pindula News, 2021). The farmers remain restrained in pursuing their livelihood strategies. The situation forced them to make tough decisions that could constitute risks and losses to their livelihood security. The study finds this result very fascinating and unique in the barrier-livelihood debates. This kind of result is unparalleled in other case studies and applies only to Zimbabwean rural farmers.

III. Price Volatility

In Figure 5.19, nearly 60% of the rainfed and 77% of the irrigation farmers reported price volatility as a constraint to their adaptation. Price volatility was a theme that the participants spoke substantially about in the focus groups and interviews. Zaka farmers could pay for goods using bond notes and electronic currency, but the money has no value outside the country. It was not easy to import goods as the economic sectors had to use the scarce USD to buy the goods. Obtaining the USD meant catching the currency at a high premium in the domestic market (South hall, 2018:391).

For instance, participant 20 described how price volatility was a barrier to her adaptation. She explained that price volatility reduced the funds she had available for her survival. She was greatly concerned about it because it implied having little money to pay for education, water tariffs, and food. The money she had was not sufficient to meet the current market prices.

> *Participant 20 said (Focus Groups, 2020), 'The problem with the situation here is that I have to pay for school fees, water for irrigation, and buy food on time before things go up. And a lot of these shops do not take eco-cash or swipe as payment. They*

want USD cash. Cooking oil and mealie meal is expensive. One two-litre bottle is 400 RTGS (US$4), and one loaf of bread is 70RTGS (70cents). I go back to the shops the following week, and the prices are not the same. But despite the problems here, I am grateful that it is something. Getting some money from the bank is better than getting nothing at all.'
Participant 20

Participant 41 shared a similar account to participant 20's experience. She explained that that she wanted to buy sugar at the price she had budgeted for but found the next day that the prices had changed.

Participant 41 said (Interviews, 2020), 'I went to go and buy sugar. I wanted to buy two 2kg packets of sugar, and it was going for 250 RTGS each. I went back the following day, and they were now 380 RTGS. I wished I had bought it the other day, but what could I do? I had no choice but to buy them. Otherwise, there is no sugar at home. My money will finish very quickly with these prices.' ***Participant 41***

The block quotations above depict that price volatility is a situation that prevents farmers from accessing their livelihood outcomes. Remember, when we analyse barriers in adaptation, we look at obstacles, situations, or processes that prevent people from access and cause obstruction. Price volatility prevents farmers from acquiring the necessities they need to secure their well-being and consumes their current income swiftly. Zaka farmers had to adhere to high price volatility in short and medium transitions when they are engaged in long-term perennial crops that usually require high capital. Price risks strongly affect farmers' income growth (FAO, 2011; Ngare and Simtowe, 2014). The participants have minimal capacity to take advantage of extreme price unpredictability. Most farmers have a little cushion to manage low prices over time.

IV. Farm Crime

Further analysis showed that moderately 23% of the rainfed and 30% of the irrigation participants reported farm crime as another barrier to their adaptation. Though, it was a theme that had the lowest response. Farm crime lowers their livelihood defences against poverty and hunger. It is a phenomenon that erodes farmers of their resources critical to their survival.

Participant 53 gave an account of the challenges she had in dealing with the theft of seeds. She had explained that she had experienced theft in 2016 and sought help from her neighbours (who were part of the scheme) to keep an eye out for her fields. She felt that the crimes were associated with loiterers who were not part of the scheme and perceived that the theft lessened when more people joined the scheme. However, the issue of looting picked up again when the economic situation in 2019 got worse.

> *Participant 53 said (Interviews, 2020), 'People used to steal seeds and crops from me. There were a lot of people who were against this seeds project. They failed to join the project and started stealing crops from the fields to go and sell on the main roads. I had found maize cobs missing of the crops. I would ask my neighbours to help me watch my fields when I am away. I had to explain the situation to the field officer, because I am not allowed to sell seeds to anyone. The company understood. After some time, the stealing stopped when more and more people joined the scheme and saw the money benefits that the farmers were getting […]. But then people started stealing again in 2019 during the economic situation. My friend had two bags of grain stolen from her house and she was very unhappy.'*
>
> ***Participant 53***

The theft had eroded participant 53 of her crops that contribute to her crop production. She had to seek out help from her neighbours to prevent her resources from being taken away. Theft causes low crop production for farmers. With the stealing of crops, the farmers have very little to contribute to the production and thus earn minimal returns. Farm crime in rural areas is gradually becoming a big problem in Zimbabwe, especially with isolated locations becoming ideal targets (Uromobo, 2018). Farm crime is an imperative area of organized criminality and a big concern for rural communities (Bunei, Rono and Chessa, 2013; Grote,

2016). It is because it erases the hard work put into achieving these obligations, consequently putting their households in a state of vulnerability to job insecurity and income instability.

Although farms are isolated, farm property is easily accessible from main roads, and they contain several public commodities and goods that are easy to steal (Barclay et al., 2001). Furthermore, farm neighbours can still be far enough away from each other that they may overlook intruders and thieves in their proximity.

The results show a negative correspondence between the socio-economic climate and farmers' adaptation. The socio-economic climate is another phenomenon that increased Zaka farmers' sensitivity to the risks of chronic poverty and hunger. Climate change in this context is a phenomenon that made their current livelihood environment worse. Erratic rains, high temperatures, pest proliferation, prolonged droughts are direct causes of low crop yields. It is transparent that Zaka farmers are already struggling with water scarcity and drought episodes with little access to adaptive mechanisms, unpredictable markets, price volatility, cash shortages, slow revenue collection, with very little social protection. Farmers' livelihoods are always at risk.

The next section discloses the results with COVID-19 Lockdown restrictions as another obstacle to their adaptation.

5.4.2. COVID-19 Lockdown 2020

During the interviews (2020), the participants brought up the issue of the COVID-19 lockdown, and the researcher asked them if they could further elaborate on the challenges they experienced. The researcher obtained a range of responses. The results revealed that COVID-19 is another barrier to their adaptation. It has caused disorganisation in their supply chains and increased the farmers' hardships in defending their livelihood outcomes. The majority of the participants were worried about COVID-19 from a health perspective and a business perspective. The participants were concerned about the business perspective compared to the health perspective. Some of the participants saw it as a significant complication, whereas some did not. The responses from the conversations in the interviews suggest that there were two themes associated with COVID-19 that served as obstacles and these were:

I. Mobility Restrictions

II. Risk of Exposure

The level of responses pertaining to mobility restrictions and risks of exposure, from the participants are displayed in Figure 5.20.

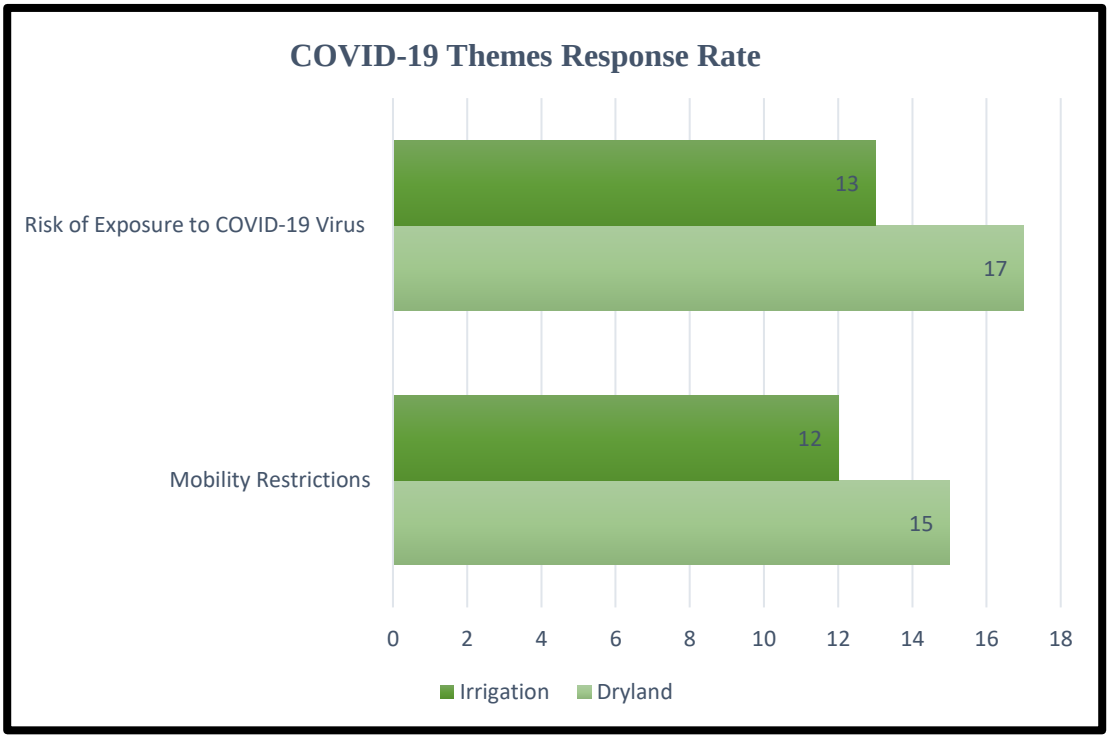


Figure 5. 20 COVID-19 Response Rates

Source: Field Based Survey Data (2020).

The results in Figure 5.20 disclose that out of the sixty participants:

I. Around, 50% of the rainfed and 40% of the irrigation farmers faced mobility restrictions.

II. Nearly, 57% of rainfed and 43% of the irrigation farmers faced risks of exposure.

I. Mobility Restrictions

Zaka farmers had to stay at home to contain the spread of the virus, but they had no choice but to go into their fields to keep the crops growing. The government had acknowledged them as essential services. Therefore, they do what they can to contribute to production at their best, and in this case, it is to support Zimbabwe in its negative stages. Several participants explained that their movement was limited. It is already expensive for them to travel, but now they had more difficulties acquiring crop inputs and basic amenities for the household because of the government restrictions on their movement.

For instance, participant 45 described how mobility restrictions prevented him from buying inputs necessary for his crops. He explained that restrictions had placed the police on the main roads in search of exemption letters from the government. The letters permit them to work. Without the letter, people would be arrested for working during the lockdown.

> *Participant 45 said (Interviews, 2020), 'It is difficult to go to the shops or to the place where they sell inputs, because there are police everywhere on the roads. They are restricting commuter omnibuses from picking up people. If you bump into them, they ask for exemption letters and if you do not have exemption letters, they arrest you, because I am not allowed to be travelling to places during lockdown.'* ***Participant 45***

The quotation shows how mobility restrictions prevented farmers from progressing in their farming livelihoods. Restrictions limited the farmers from following their livelihood strategies. Part of their livelihood strategies is to purchase crop inputs to defend their production to have income returns. However, restrictions prevented them from implementing those strategies as they could not travel to the market, and this created extra hardships for them in performing those actions, putting setbacks in their livelihood progress. Table 5.11 presents more responses that speak of mobility restrictions.

Table 5. 11 Mobility Restriction Themes

Participants	Mobility Restriction Themes
19	*'Getting exemption letters is a process. I have to go to the District Administrator and apply to get the letter. I need the letter to go to the bank, to go to the shops, to go to the market, because the police are on the main roads, stopping people, asking to see the permission letters.'*
28	*'COVID -19 has made things hard for me. I had to go and see the chief and go with him to go and get the letter from the District Administrator, and it took some time to get it. There are long queues there. It is hard to travel on the roads because of the police. I have to go to the shops to buy rice, soap, and cooking oil for the house. The schools have closed, the children are at home. Getting things is a lot harder now.'*

Source: Field Based Survey Data (2020).

The COVID-19 lockdown limited the participants' capabilities to continue with their daily tasks. Restrictions in movement yielded disruptions, and they had to adhere to the restrictions in situations where their livelihoods were already at a disadvantage.

II. Risk of Exposure

The results in Figure 5.20 suggest that 57% of the rainfed and 43% of the irrigation participants feared COVID-19 exposure. They feared performing their daily tasks. Farmers are at significant risk of exposure to COVID-19, particularly for the older age group 59 and above. Responses from the interviews (2020) suggest that the participants were worried about getting sick because it meant that they would be unable to work in the fields and earn less money to support their families. They had also feared the severe implications of COVID-19. The participants heard about the rise in death cases and the shortage of oxygen ventilators in hospitals from the local radio, community, and relatives.

For instance, participant 55 described how he feared succumbing to COVID-19. He explained how he feared falling ill because it meant less food on the table for his family and medical expenses. He wanted to stay healthy and fit at all times and abstain from any areas or

circumstances that would increase his exposure. He explained that the measures he took were necessary because he is the breadwinner for his family.

> *Participant 55 said (interviews, 2020), 'I cannot afford to get sick. If I get sick, I cannot work in the fields and that means less money for me. I am already low on money as it is. Right now, I need more money to stock up things for the house because of this lockdown. People are now trying to stock up for the month because we do not know how long this lockdown will keep going. I need to buy medication, masks and soaps to reduce the risks of exposure at home.'* ***Participant 55***

The block quotation above depicts that the participant could not afford to fall ill. Remember, the farmers reside in areas with little to no health facilities and being exposed to the virus puts the farmer in jeopardy and his/her family. Participant 4 described the difficult situation that happened to her colleague's father with COVID-19. She explained that her friend could not work and had to stay in isolation to contain the virus from spreading. Participant 4 stated that she could not risk falling ill because there were very few clinics that could assist her, and she still had the responsibility of looking after her family.

> *Participant 4 said (Interviews, 2020), 'My friend lost her father to COVID-19, and she told me on the phone how they had to bury him the next day, and the government only allowed thirty people at the funeral. She had to stay in isolation. People were scared of visiting her because of exposure. COVID-19 is scary because there are not that many clinics on this side. If there were many of them, then I would not worry so much about it. But I am in a situation where I still have to produce, look after my family, and avoid getting sick.'* ***Participant 4***

COVID-19 has put farmers and their families at risk of poverty, illness, and hunger. It is harrowing that they not only had to face the socio-economic conditions but COVID-19 conditions as well. These non-climate-related factors are increasing their exposure to vulnerabilities that the farmers are trying to prevent. What is even more troublesome is that

the farmers are already limited on their livelihood strategies. As their livelihood strategies weaken, the more vulnerable and ineffective they become in the face of these existing conditions. They are already battling with climate change as it is, and now, they have to modify their strategies to counter these different conditions. The participants are worried about falling sick because they want to maintain their daily tasks that ensure security for their families. They want to continue producing and earning money. Earning less money because of COVID-19 means more hardships on buying inputs, cultivating land, and paying off their expenses. Even though the participants have to protect themselves from COVID-19, it is a cost to their livelihoods. These costs include lower crop outputs, lower income, fewer farming activities, and food and health security issues.

5.5. Institutional systems, structures, and processes for Zaka farmers.

5.5.1. Systems governing small-scale farmers.

Identifying the institutional systems, structures, and processes is an essential aspect of the study. The study wanted to find out the systems in place that support Zaka farmers' adaptation. Systems and structures are designed and interconnected with a purpose and assessed in their functioning.

We wanted to investigate the procedures the ZSS organization implemented to support Zaka farmers' adaptation. This detail was an area of discussion with the key informants from ZSS management. The ZSS informants that assist the rainfed and irrigation schemes explained that the current systems and structures aid Zaka farmers' adaptation to climate change. Although, the study discovered that there are gaps in the systems and structures vital to the farmers' adaptation process. The gaps are challenging to address because of limited financial backing. However, it was imperative to explore the systems and structures and how they came about. The management provided this information. During the interviews, the informants explained that they took some initiatives of the ZNCP policy document and used it to implement some of the current systems and structures. The results from the Interviews (2020) showed that these are the current systems in place:

I. Providing drought-resistant seeds to the farmers. Studying the seeds and teaching the farmers how to grow and harvest them.

II. Providing education and training on climate-smart agriculture and water use efficiency to the farmers. Equipping farmers with farming tools that would aid in achieving high productivity.
III. Providing market support that will enable farmers with a yearly payment. It would support the initiative of poverty alleviation and promotion of food security for the region.
IV. Studying the various diseases and pest outbreaks and researching alternatives that would aid the farmers during the dry conditions in combatting pest outbreaks.
V. Provide technical and financial support to the farmers.

Source: Field Based Survey Data (2020).

The initiatives listed above are the current systems that facilitate the adaptation process for small-scale farmers in the Zaka district. They are initiatives designed to strengthen the farmers' capacity against the impacts of climate change. This is a positive result. The questions regarding institutions' objectives for adaptation were asked. Participant D, a managing director with ten years of experience working for ZSS and small-scale farmers in the Zaka district, communicated that the organisation's objective is to alleviate poverty and increase food security in the province. The interviewee explained that the organisation made this contribution by implementing these initiatives listed above.

> *Participant D said (Interviews, 2020), 'For the past ten years, I think with our contribution, with the seeds we are offering and the training that we are providing with the technologies that help reduce crop losses, we have made a significant contribution to improving the adaptive capacity of agriculturally based livelihoods. I think we have made a valuable contribution. More so, the value of the seeds that are drought tolerant, which we have promoted from the Masvingo community scale to Zimbabwe scale at large, has dramatically fostered an increase in food security. We have managed to produce 500metric tonnes of seeds every year, and these are from crops that have grown properly and cannot give the*

country less than 50000 metric tonnes of food [….]. We go into distribution networks, which then actually any customer from anywhere in Zimbabwe can come and purchase. Selling of crop production is through the market, but we do stock consignment take. The farmers produce, collect, process, package, and then distribute to the market. It is our vast contribution. We are putting all these seeds harvested by the farmers in the market, and people are buying. The scheme has grown well and is supporting many people in Masvingo and other areas, and the farmers are earning payments for the products they make, which they use to improve their livelihoods. I think that is a positive impact that the Zimbabwe Super Seeds organisation has made in the community.'

Participant D

The study believes that the current systems and management's statement are a profound and confident result on livelihood adaptation. Zimbabwe Super Seeds has done well to recruit rural farmers and provide them with possibilities for a better future. We are already aware of the company's contribution because of the farmers' statements. The farmers' have experienced the benefits of working with ZSS, and this is why they actively maintain their agreement with the company by focusing on improving crop production, knowing fully well the income they will receive.

Despite the positive contributions, the participants from the organisation are aware of the challenges farmers experience in achieving productivity, and therefore, they designed different processes that would increase their coping capacity against climate change impacts. These processes are:

I. Provide more physical equipment, by acquiring tractors, and setting up more sustainable irrigation schemes for dryland farmers.
II. To link the farmers to stable financial institutions that could support them in acquiring loans for specific issues to help with their crop production.
III. Provide more training sessions with adequate resources and necessary skills.
IV. Diversify the farmers specialisation from seed production to livestock production.

Source: Field Based Survey Data (2020).

Participant D, from management, explained these processes. He explained that the organisation wanted to diversify the farmers into livestock production and link them to financial institutions to increase farmers' income and their coping capacity against the current pressures. He stated that the institution works with other governmental institutions that have better financial and bargaining power to make the farmers' livelihoods better and still achieve their regional objectives.

> *Participant D said (Interviews, 2020), 'As an institution, we plan on expanding the scheme. We have adopted the drought-resistant seeds, and now we plan to move towards livestock. At the market level, people ask for livestock production, and we do not have anything yet, and for us, that means it is a lost market that we have not used to our opportunity. For a government scheme most, agricultural programs are designed to hire tractors specifically for irrigation schemes, and we have set aside objectives that cater to that demand in our scheme. The other demand is to link the farmers to financial systems to acquire credit or loan services to address specific issues they may encounter with crop production. As part of the management of Zimbabwe Super Seeds, we have devised more workshops and meetings with the Ministry of Lands, Agriculture, Water, Climate and Rural Settlement and Ministry of Environment, Water and Climate, responsible for climate change and development in the agricultural sector in Zimbabwe. All of these measures that are in place, we follow under their governance. Using that platform, we can contribute and discuss what is required and what can be achieved.'*
>
> ***Participant D.***

The statement above shows that the systems and processes do present suitable adaptation measures for Zaka farmers. The organisation formulated the systems to ensure that farmers'

farming routines are safeguarded from disruptions, and they designed systems based on the environmental and social pressures farmers face. It is essential to understand that these are not the current systems in place, but proposed systems which are designed to increase farmers' adaptation.

5.5.2. Structures for Adaptive Capacity

As we know the challenges farmers face in adapting to climate change, the study sought to investigate the management's perspective on the policy structures that needed more attention to strengthening farmers' resilience to climate change impacts. The ZNCP policy is one of the frameworks Zimbabwe Super Seeds adopted in designing farming adaptation structures for Zaka farmers. However, during the interviews, the management explained that there were gaps in the framework that needed reform, and in their view, they believed that improving these structures would enhance farmer's adaptation to climate change. In the interviews, the researcher asked the informants to list structural areas that were of importance, and these were:

I. Low Resource Capacity
II. Climate Smart Agriculture
III. Subsistence Agriculture to Commercial Agriculture

Source: Field Based Survey Notes (2020).

In the context of the ZNCP policy, it would fall under section 2.2.4 VII that is to strengthen capacity on agricultural support services that meet development challenges arising from increased climate change and variability (Ministry of Environment, Water and Climate, 2017). Participant D, the scheme's project manager, mentioned the need to improve farmers' access to financial, physical, and natural capital. He expounded that barriers to resource capacity need to be identified and then met with agricultural support systems moving forward.

I. Low Resource Capacity

ZSS management stated that farmers lacked adequate resources that were essential to their adaptation. From their perspective, the farmers lacked substantial financial, physical, and natural capital.

In the asset literature, the lack of financial capital is a general problem in Southern Africa (FAO, 2019). Ideally, farmers acquire money through savings and borrowing and using the combination of both. However, the general observation is that the per capita incomes for farmers are low. Based on the responses provided in sections 5.2.2 and 5.3.1, the farmers' earnings are insufficient to cover their family needs, leaving them very little to save. The source of funding for credit and loans comes from banks. Although, the socio-economic climate leaves the farmers with limited to no financial options. Zaka farmers need loans to meet their farm fixed obligations and variable costs. The obligations include irrigation machinery and tractors, and variable costs include chemicals, top dressing, fertiliser, pesticides, and labour. Such operating expenses require loans from financial institutions that are limited and unavailable in Masvingo.

Participant D commented on developing financial infrastructure in the Zaka district and increasing lending capital to support the farmers coping capacity.

> *Participant D said (Interviews, 2020), 'Capital is necessary to increase efficiency in their fields and to cover basic needs as well. The farmers have many expenses that they need to cover aside from their family expenses. In times like this, where climate change is inevitable, having additional funds would assist them greatly in dealing with risks they have. The farmers depend on the current revenue they have to support themselves, and unfortunately, they are already financially strained because of the price shocks. The rate of expenses is increasing, and they now in a situation where they have to selectively choose their farming expenses over their family expenses to maintain their livelihoods. Improving the financial side can help them apply*

for loans and help them save. So that in times like this, they have a backup and still balance out the risks.' ***Participant D***

The block quotation above depicts that limited financial infrastructure and lack of lending capital limits the Zaka farmers coping capacity as they are a few banks that could provide fast and intermediate loans for agricultural development. The circumstances increase the small-scale farmers' dependency on the general earnings to solve their farming obligations. With the climate the farmers are in, with a few banks available, cash shortages, and COVID-19 restrictions, it has made it extremely stressful for them to obtain their seasonal income on time. The participant from management emphasised that developing the farmers' financial services will prepare them well for the future impacts that are yet to come.

Water, land infrastructure, and farming equipment are essential components in influencing farmers' livelihood strategies. Investment in both forms increases Zaka farmers' capacity to produce goods that can produce other goods. By doing this, it raises their level of income. The farmers have weak mobile assets which include, tractors, harvesters, plows, and combines. The only mobile asset they have is human labour and cattle (highlighted in section 5.3.1), which they are purely reliant on for production. Secondly, they have limited immobile assets that include land and infrastructure. The land is a necessary resource to the farmers in them surviving the climatic impacts. By providing them more access to land, it encourages them to invest in other livelihood capitals. The more invested farmers, the more dedicated they are in increasing production at a faster rate.

Participant B, a field officer from management, stated that farmers calculate risks based on the resources they have at their disposal. The farmers have to find ways of dealing with the risk and protect themselves from future uncertainties. However, with limited physical and natural capital, they struggle to cope with the complex challenges at hand and make informed decisions that constitute more risks in the long term.

Participant B said (Interviews, 2020), 'Farmers are struggling with climate change because they do not have the resources that they can use to tackle the challenges they have. At the moment, they are surviving and trying to make ends meet. They need the money to survive and continue while facing these harsh

conditions. They do not know if the money decisions they invest in will affect them negatively or positively in the long run. However, for policy purposes, more investment needs to be directed towards improving land access, water access, and other agricultural extension services. More plots need to be divided and shared and build infrastructure to create additional water sources. We have issues with being unable to reuse equipment at the farm level. Some of the equipment they are using is old and damaged, and it can only push so much. Land size is a challenge. Many farmers complain that they cannot grow as much as they want because they have small plots to begin with. It is not easy to get all the resources they want, and it is a big challenge looking at the circumstances we are in. The scheme would do well if we shifted towards irrigation completely and transit from subsistence to commercial agriculture. However, the farmers need plots that are suitable for commercial viability. So, all the stakeholders involved need to co-operate and draw funds to acquiring all the attributes of the scheme requires.' ***Participant B***

The quotation above depicts that increasing the adaptive capacity of smallholder farmers is significant to reversing the rising food insecurity and low crop production in Zimbabwe. Investments in physical, financial, and natural capital offer great potential to build sustainable agricultural systems. With this approach, it will maintain the natural resource base and provide income stability for small-scale farmers. Supporting the development of capitals will foster capacity expansion and reduce vulnerability to climate change, COVID-19, and poverty for small-scale farmers. Based on the management responses, this structure of the ZNCP policy (section 2.2.4. No. X) needs more support from the government.

II. Climate Smart Agriculture

During the interviews (2020) with management, climate-smart agriculture was another initiative they wanted to improve. Participant A, another field officer for wards 1-3,

communicated that the farmers need to learn more about climate-smart agriculture to cope with the future uncertainties climate change would bring.

> *Participant A said (Interviews, 2020), 'Particular areas in the project have to be taught appropriately. As more and more farmers are trained and get used to the farming technologies, they will improve. Over the last few years, crop productivity increased because the farmers started adopting better land and water management practices[..].Our focus is on the choice and variety of seeds that can survive with less amount of rainfall. So, we incorporate technologies and teach farmers how to conserve moisture and improve soil fertility. We teach farmers how to do potholing, shifting agriculture, and conservation agriculture. We also consider improving irrigation, shifting from hose to sprinklers and drip so that we can counter the effects of droughts. […].The thing is the farmers need to be educated on the technologies to understand the positive benefits of the technologies we are adopting. Once they are educated on that, farmers are keener to try. It is the same with irrigation. If the infrastructure is upgraded, farmers will be more invested in using the systems to their best ability. The only challenge is the additional cost they may have to pay for maintenance. However, when they see the results in productivity, it will be easier for them to accept.'* **Participant A**

Zimbabwe is in favour of climate-smart agriculture. Climate-smart agriculture (CSA) has had a success rate in improving crop yields (Brazier, 2017: 110). It is part of the ZNCP policy initiatives (section 2.2.4 No.VI). The practice of CSA in Zimbabwe has expanded adaptation by; encouraging diversity in household income for farmers, formulating risk insurance and risk administration strategies, and promoted adaptive management for food production systems. It can be agreed that climate-smart agriculture has played a good role in the case of the Zimbabwe Super Seeds in improving the farmers' seed productivity. The responses from management indicate that they want to increase climate-smart agriculture training for the farmers because of the steady improvements they have seen in the farmers' fields.

III. Subsistence to Commercial Agriculture

The nature of farming for the dryland and irrigation participants still lies under subsistence agriculture. Firstly, there are conditions to their access (as we have seen in section 5.3.2). Secondly, the farmers specialise in one cash crop that reduces the rate of efficiency and diversification. If Zaka farmers joined the full commercialisation by growing more than one cash crop, this would minimise their exposure to climate risks, income instability, and price shocks. Diversifying crops becomes a form of risk management in stabilising their income. During the interviews, participants from management highlighted that shifting from subsistence to commercial agriculture was critical in building adaptation against climate change.

Participant D said (Interviews, 2020) that the farmers will need land plots suited for commercial production to combat climate change. Therefore, the government should expand farmers' land allocation.

> *Participant D said (Interviews, 2020) 'In moving forward, the handholding size plot should shift from subsistence agriculture to commercial agriculture. It includes the designing of irrigation schemes that should consider plot size commercial viability. I feel that smallholders can be more efficient and produce more significant amounts to maximum output if they have a decent plot size that can cater to at least three or more crops that are drought resistant, with better quality of inputs. The more land they have, the more crops they have, the more money they can make.[…]. So, it is just a matter of taking it on a commercial scale as well.'* ***Participant D***

Participant D's perspective shows that shifting to commercial agriculture is a building block in fostering adaptation for Zaka small-scale farmers. It plays an integral part in upscaling farmers' production. Creating a more specialised and integrated system with production by adopting efficient irrigation technologies, diversifying improved seed and crop varieties, and getting farmers to participate more in the market space improve adaptive capacity.

The systems and structures in place are practical and based on the responses provided by the farmers in section 5.3; the systems assist farmers in coping with climate and socio-economic pressures. However, they are still flaws in their implementation, and this is because the systems lack financial support and adequate governmental support that facilitates long-term stability. The fact that the risks of climate change in the future are unknown, it is pretty clear that farmers in the scheme will need to make far-reaching adaptations in their farming systems to accommodate the lack of rainfall, outbreak of pests, low water availability, and yet still alter cropping seasons and plant new crops with new varieties and incorporate new farming practices in the process. Changing the Zaka farmers' mindset of climate change and land use in Masvingo is imperative because their approach to handling it determines the future of Zimbabwe's livelihood and food security.

5.6. Conclusion

The results match the arguments presented in the frames of reference and literature review. However, there are some interesting observations. The chapter provided detailed results from the data acquired during the interviews and focus groups. The main objective was to investigate how climate-induced hazards impacted the livelihoods of rural farmers in Zimbabwe and how they are adapting to the impacts by taking the small-scale farmers of Zaka Seed Farming District as a case study. The results are as follows: (1) The perceptions of climate change pointed us to the different weather conditions that affected communities farming routines. (2) From that approach, we saw the effects of erratic rains, high temperatures, pest outbreaks on Zaka crop production, and the negative transition it had on households acquiring basic amenities. Certain areas of the daily routines were affected, and this compromised their security. (3) Farmers knew about the type of resources, and we discovered how each resource was favourable to their livelihoods. They adopted the human, natural and physical combination to improve crop productivity and used social and financial to manage their livelihood outcomes. (4) We also found out about their resource access conditions. The resources are subject to institutional and affordability factors, land policies, and limited diversification and financial infrastructure. (5) The study investigated the barriers to the communities' adaptation and found that the effects of the socio-economic climate 2019-2020 and COVID-19 were additional obstacles. We discovered how cash shortages, slow revenue collection, price volatility, farm crime, mobility restrictions, and risk of

exposure weakened the farmers' asset portfolios. (6) Lastly, the systems and structures in place guided by the ZNCP policy favour adaptation for small-scale farmers. Although, improvement is required in certain areas, as indicated by the organization.

CHAPTER SIX

ANALYSIS AND DISCUSSION

'*The good thing about science is that it's true whether or not you believe in it'. —*

Neil deGrasse Tyson (1958).

6.1.Introduction

The discussion chapter is about delving into the meaning, importance, and relevance of the results. The aim was to present the interpretations and describe the findings concerning the research problem investigated. We are here to explain the insights that emerged from the results. What do the results mean, and why do they matter? What cannot the results tell us, and how do the findings relate to the literature review and the research questions? What is the argument regarding these results? The study presented the answers to the questions in this chapter.

The study explored the connection between climate-induced hazards and the livelihoods of rural farmers in the Zaka district. We concentrated on identifying assets or their combination that played a cardinal role in building adaptive capacity and resilience of rural communities in Zaka. This chapter presents the discussion of the results found during the research. The first (1) section burrows into the impacts of climate-induced hazards on small-scale farmers' household livelihood outcomes. The second (2) section focuses on the ways and means through which small-scale farmers adapt and build their resilience against water scarcity and climate change extremes. Section three (3) considers the different asset combinations that played a role in building adaptive capacity against climate change and water scarcity. Lastly, the fourth (4) section discusses the institutional and policy framework through which adaptive capacity and resilience of poor rural people can be promoted with interpretation measures for small-scale rural farmers.

6.2. Impacts of climate-induced hazards on small-scale farmers' household livelihoods portfolio.

Before we discuss the results, let us kindly remind ourselves of the research problem. We are doing this to see if the results relate to the research problem we were investigating. In the frames of reference, the problem is that the combination of climate change-induced weather events has increasingly made it difficult for rural households to engage in meaningful agricultural productivity. It is because agricultural activities in Zaka District are highly dependent on rainfed agriculture, and in the face of increased changes in climatic conditions, increased crop failure, and raised livestock death. The development exposes many rural households in Zaka District to high levels of extreme poverty, food insecurity, and low nutrition (Zimbabwe Humanitarian Appeal Revision, 2020:7). The development is affecting their ability to generate incomes for the procurement of different services. The services include agricultural extension services, education, and health. The situation is making rural households of Zaka District receptive to high-level poverty incidences.

The results presented in chapter five coincide with the research problem. The analysis showed that the combination of high temperatures, erratic rains, and pest outbreaks had frequently made it difficult for Zaka rural households to engage in meaningful agricultural production. Irrigation and rainfed farmers faced increased climatic conditions and increased crop failure. The development had created income instability, job insecurity, and expanded household and farming expenditures, exposing farmers' households to high levels of poverty and food insecurity. This relationship had indeed altered their ability to generate income to access the acquisition of different services. The results showed that Zaka farmers manipulated their resources to ensure that they could still acquire income to obtain services that included food, transport, personal use, medicals, emergencies, agrochemicals, water payments, and livestock. We found that the socio-economic climate (2019-2020) and the COVID-19 restrictions were additional impediments to the farmers' adaptation. The blocks made it challenging for irrigated and rainfed farmers to engage in meaningful production. Such barriers induced vulnerability by undermining their livelihood strategies and eroding their current resources. These developments made rural households in Zaka sensitive to high-level poverty incidences. The results did meet the problem's expectations.

6.2.1. Perceptions of Climate Change

The first purpose of the study was to examine the impacts of climate change on small-scale farmers. The study achieved this by discovering Zaka farmers' perceptions of climate change. Adaptation to climate change requires us to understand their perceptions because they are the first to see that climate change has shifted, and they develop the strategies to alleviate the risks they face (Gbetibouo, 2009). Zaka farmers have a very close relationship with climate, and thus to develop adaptation strategies for them would be ineffective without understanding their perceptions. By focusing on Zaka farmers' perceptions, the study found out about the high temperatures, erratic rains, pest outbreaks, and delayed seasonal rainfall. The results were quintessential to this research because we recognized the troublesome areas in their farming routines and households. The study discovered crop failure and how that affected Zaka farmers' ability to generate incomes. It was a negative development that affected their ability to access necessities that were crucial to their survival.

The study observed that Zaka farmers first anticipated the impacts of climate change and developed their adaptation strategies to mitigate the vulnerability. This type of information is significant for policymakers when it comes to enhancing vulnerable households in the face of shocks (Alam Monirul, Alam, and Mushtaq, 2017). The study agrees with Arbuckle et al. (2013) and Niles and Mueller (2016) in that more studies on farmers' perceptions of climate change are required. Farmers' perceptions provide us with a long-term panorama of the risks they face under the changing climate because they know the direct impacts they experience on their livelihoods. Perception is a compelling factor in the adaptation process (Maddison, 2007; Alam Monirul, Alam, and Mushtaq 2017). Although, the study is aware that misleading observations can cause inappropriate alterations (Taylor et al., 1988). However, Zaka farmers who identified the potential aftereffects from climate change are most likely to back up policies and programs that aim to address their concerns (Gordon et al., 2013).

6.2.2. Climate change impacts on livelihood portfolios.

Zaka farmers' perceptions of climate change showed us how high temperatures, erratic rains, delayed seasonal rainfall, and pest outbreaks compelled them to high crop failure. The high levels of crop failure subjected them to income instability, job insecurity, and increased expenditures. These were identified as the impacts of climate change on small-scale farmers' livelihood outcomes. Now we ask ourselves, what does this mean in the context of climate-

induced hazards and livelihood portfolios debate in Southern Africa? Furthermore, why do these findings matter?- the answers to these questions are presented in the next section.

I. Income instability on livelihood portfolios

The current study found that rainfed farmers and irrigation farmers encountered income instability (see Figure 5.2). This finding agrees with the thematic considerations and with Mushongah and Scoones (2012), Shiferaw et al. (2014), and Gamudani (2016) claims presented in the theoretical perspectives chapter. Income instability is a comprehensive impact that induces vulnerability for rural subsistence farmers. The result creates severe risks to their livelihood outcomes. The perils include incapacity to pay for basic amenities, failure to find money, helplessness to support family, and exposure to poverty incidences. Income instability means that farmers do not have sufficient funds to secure a decent living for protracted periods. The high response in Figure 5.3 from rainfed farmers suggests how worrisome income instability is for them. The bulk of their income depends on the success of agricultural production, but the generation of their income depends on unreliable rainfall.

Zaka rainfed farmers are the most vulnerable people, and the study agrees with the arguments presented in the adaptation literature (Dasgupta and Badola, 2020; Kantamaneni et al., 2020). Rainfed farmers are the most helpless in the face of climate change (Harvey et al., 2014; Sathyan et al., 2018; Malhi, Kaur, and Kaushik, 2021). Dependency on climate-sensitive activities produces bleak forecasts for crop yields, low production, food insecurity, job insecurity, income instability, and chronic poverty. Zaka farmers have a restricted capacity to adapt to the aggravated vulnerability situation (Rosa et al., 2020). In Zimbabwe, large populations of rainfed smallholders reside in convoluted, distinct risk-prone areas contributing to their susceptibility (Brazier, 2017). With this finding, if no constructive adaptation measures are improved, many rainfed smallholders will continue to experience immediate hardships and hunger due to climate change. Farmers have a low coping capacity to make relevant decisions about what to plant, cultivate, and time inputs. The study agrees with Sathyan et al. (2018) that climate change perceptivity evaluations in rainfed farming systems are essential in adaptation planning and decision making to curb the severe impacts of climate change on the most vulnerable people. It is evident in the findings that climate change increases rainfed farmers' susceptivity to the poverty sphere, and thus, we need to

rethink the entry points that improve their adaptation measures and develop robust strategies that ensure resilience.

The study did find that some Zaka irrigation farmers had a low response rate to the fear of climate change in Figure 5.3. It is because they do not suffer from reduced interannual production. Convenient water supply from ZINWA secured their livelihoods from intertwined vulnerabilities. We find that irrigation is a coping mechanism against climate change for farmers in ward 15. Zaka irrigation farmers can explore their livelihood opportunities without suffering from water stress. The conclusions of the current investigation are consistent with those of Kurukulasuriya et al. (2006), Varela-Ortega et al. (2016), and Vanschoenwinkel and Van Passel (2018) findings. Practicing irrigation has a mitigating effect. It reduces dependency on the uncertainty of rainfall patterns (Vanschoenwinkel and Van Passel 2018; Xing et al., 2020) and lowers income instability. Irrigation boosts crop productivity twice to four times (Mhembwe et al., 2019; Bahta, 2020). Therefore, more irrigation schemes in Zimbabwe should be encouraged.

We can see the boost in Zaka farmers' crop production figures presented in Figure 5.5. The study discovered that the irrigation farmers had slightly higher production rates, and it clarified why the irrigation farmers were not mentally concerned about the precipitation changes. This observation match Calow, Howarth, and Wang, (2009), Passel, Massetti, and Mendelsohn (2017) and Frischen et al., (2020) findings.

Although, the study still found that some of the irrigation farmers still feared climate change (see Figure 5.2). Drought played a role in curbing their water availability in Siya Dam, which harmed their crop productivity and incomes. We can see that both schemes are concerned about crop productivity because it is a central source of their payment. There is an unfavourable exchange between climate change and crop production, and the relationship is evident in Figure 5.5 and Figure 5.6. A negative effect on crop production meant that the Zaka farmers would have little to no access to the opportunities illustrated in Figure 5.7.

This notion is evident in the participants' responses. Here we are simply highlighting the sequence of events that follows as a result of climate change. See Table 6.1.

Table 6. 1 Sequence of climate change Impacts on Livelihood outcomes

Analysis	**Supporting Evidence : Block Quotations**	**Sequence of Impact**
The participants made references to the impacts of climate change	I. Erratic rains II. Pest proliferation III. High temperatures IV. Delay of rainy seasons.	Climate Change Induced Hazards
The participants spoke of how these forms created low crop production, talking of the different forms of crop failure,	I. 'Maize leaves eaten and find worms inside the maize cobs'. II. 'Harvests were bad; crops dried up quickly, and the soil is hot'. III. 'Without water they simply failed to grow'.	Crop Failure/ Low crop production
The participants explained the complications they incurred of having low pay due to bad harvests. They found it hard to use their money to pay for amenities-	I. 'I struggled to pay for inputs, for food, for school fees that were needed for the farm and home'. II. 'I did not get the full amount because of the losses I made with the crop production'. III. 'I did not get enough payment for my harvests, and I struggled to pay for things at home'.	Income Instability Failure to pay for basic amenities critical for livelihoods. Low livelihood outcomes

Source: Field Based Survey Data (2020).

The statements showed that climate-induced hazards do have an indirect impact on farmers' livelihood portfolios.

Crop production impacts the income of small-scale farmers (Chauke et al., (2014). It fits with the case of the Zaka farmers. If we look at Figures 5.5 and 5.6 in section 5.2.2, there is a positive association between crop production and income. The information presented suggested that any reflection of low productivity is a potential reflection of low income. A

probable observation of low income is a presumed rumination of poverty. Of course, we cannot conclude and say it is a definitive finding and a reality that applies to all farmers in agricultural case studies across the globe, and as we recall Philip and Rayhan's (2004) claim, poverty is idiosyncratic. It is an analysis of a five-year production, and that is not plentiful.

Remember the study adopted the interpretive approach to explore Zaka farmers livelihood experiences with climate change using qualitative measures and gain an in-depth understanding of what is it like to be in their shoes and thus, Figures 5.5 and 5.6 and the farmers' responses suggest the underlying that problems that typical rural farmers in Zaka district go through every day. We are not saying that this is precise. The study is saying that there is some sense of truth in the picture. Figures 5.5 and 5.6 correspond with the farmers' feedback, and it explains why they are anxious about income instability because they are afraid of succumbing to poverty. There is truth in their responses. It is what we identified as the 'hungry period.' The reduction in income levels is evident in Figure 5.6.

The study did see that crop productivity picked up in 2017, and it was the same for income. Therefore, the relationship between climate change and livelihood outcomes is axiomatic. Zaka farmers' livelihoods will always be influenced by climate change if they continue to remain reliant on crop production unless they change the root of their income. Low-income levels are the fundamental causes as to why farmers remain stuck in poverty and fail to invest in their farms (Bhusal, Subedi, and Khanal 2018). Minimizing income instability implies a meaningful transformation for them, and it is a segment in the sustainable livelihoods debate that needs critical attention. Income stability assures that farmers can invest in their productive capacity and have the ability to thrive. If the farmers cannot invest in their productive capacity, how do we expect them to survive future climate changes and manage the nation's food security in the long term?

The results outline that income stability should be of governmental precedence. Farmers are the primary food security managers of the country (Fan and Rue, 2020). Their livelihoods are responsive to increased climate changes, yet the farmers still actively try their best to achieve meaningful agricultural production. Farmers are the tools to developing the nation's food security, and thus addressing their living income status should be central to the government climate adaptation policy. Fan and Rue (2020) argue that we must monitor farmers' income to prevent them from adopting unhealthy livelihoods. Unhealthy livelihoods encompass high

expenses, increased debts, extreme trade-offs, decreased mental and health levels (Merriot, 2016). There is evidence of suicide in India and livelihood collapse in Africa (Misra and Hiremath, 2015; Merriot, 2016) due to income instability, and it would be in our best interest to prevent this situation from escalating. For Zaka farmers, income is of great importance. We can see in chapter five that farmers rely heavily on their income to pursue their livelihood opportunities. It is evident in Figure 5.7. Exploring their freedoms is what keeps the Zaka farmers going through the hardships that climate change poses. Therefore, we cannot ignore income stability in climate change adaptation research. If countries aim to achieve sustainable development goals, they should prioritize income stability. It is a significant unit that improves the farmers' living standards in an environment where chronic poverty and hunger are high.

II. Job Insecurity on Livelihood portfolios.

Another important finding was that both rainfed and irrigation farmers spoke of job insecurity in Figure 5.2. Farmers were concerned about losing their access to income from secure working arrangements with Zimbabwe Super Seeds. It is an outcome of the relationship between climate-induced hazards and livelihood portfolios. Job security provided Zaka farmers with a decent quality of life. Employment with Zimbabwe Super Seeds enabled them to invest in better livelihood choices for themselves and their families, especially food, education, and health. Chapter five's findings suggest that climate change exacerbated the risk of job insecurity for Zaka farmers through crop production. As we have highlighted before, maize is Zimbabwe's main staple crop and has substantially several rural farmers engaged in its production through job contracts with non-governmental and governmental organizations (Oslen, 2008).

Maize production is responsive to rainfall and temperature changes (Olsen, 2008), and with Zimbabwe being a developing country, many of the regions in Masvingo province are at risk of unemployment because of poor production performance. Increased changes in climate will reduce small-scale farmers' capability to maximise production. Crop production is a potential representation of their performance in farming. Any indicator of low crop production jeopardizes their performance and influences their employment status in the organization. The results suggest that several rural farmers may face job losses with poor living conditions and low-income levels. The government should make job security a priority in sustainable development (FAO, 2015).

Remember, governmental organizations aim to increase food security and employment within the region, and they can only provide income instability to farmers that deliver on performance. They are aware of the climate-induced hazards on crop productivity and thus enhance the systems and structures to improve the farmers' coping capacity. However, they are also financially restrained. The organization cannot keep underperforming farmers because it refrains them from achieving their objectives. The study finds this situation very intricate. The authority needs to think thoroughly about how best to handle convoluted scenarios.

Job security is relatively a new finding is as it becomes the fifth additional concept to the four primary impacts of climate change presented in the theoretical perspectives chapter. Although, it matches FAO's (2012) and Gassner et al.'s (2019) report on rural employment in Africa. FAO (2012) states that climate change is forcing farmers out of farming jobs because they cannot maximise production with the current climate effects. It has made farmers search for other greener pastures. They succumb to internal vulnerability whereby they face damaging production losses with no means to cope. We can see in the results that climate change is compelling Zaka farmers to accept low productivity with vulnerable employment to ZSS.

Testimonies in section 5.2.2 suggest that several Zaka farmers have already experienced unemployment because of climate change. A situation that they cannot control. This conclusion is important because it tells us the importance of job security in livelihood adaptation. Job security is the most sustainable and dignified means of food procurement, social inclusion, and long-term food security for Zaka farmers. The government needs to focus on securing rural employment for small-scale farmers because it is an attractive factor that apprehends the status of communities living standards when dealing with climate change.

III. Increased expenditures on Livelihood portfolios.

The results showed that both rainfed and irrigated farmers in Figure 5.2 reported farming and household expenses. It is a high response and a great concern to the farmers. A bad year in crop production placed Zaka farmers in debt.

The low capacity of farmers to deal with the changing patterns in climate has placed Zaka livelihoods in a circle of poverty that encompasses high levels of debts. Zaka farmers have limited sources of finances to solve their expenditures. They only have credit, savings, and crop payments, which are not guaranteed. This inadequacy limits their adaptation. Chingosho, Dare, and Wallbeek (2020: 2) also came across increased expenditures in their studies and found that nearly 57% of the tobacco farmers in Manicaland province, in Zimbabwe, faced tobacco debt, and they were victims of climate change and martyrs of the agricultural sector rather than beneficiaries. The farmers faced debt because the institutions and local government could not provide stable financial systems to improve their income (Chingosho, Dare, and Wallbeek, 2020). Climate change indirectly pushed Zaka farmers into debt due to increased crop failure and high farm maintenance. Farmers have to control large plots with family and independent laborers to sustain productivity. Chingosho, Dare, and Wallbeek (2020) recommended that government intercedes and improves the conditions of small-scale farmers, either through the sector or through crop diversification, to upgrade their income levels. Increasing their income stability will curb the levels of expenditure. The study acknowledges Chingosho, Dare, and Wallbeek's (2020) report as the findings are relevant to Zaka rural farmers in Masvingo province.

Yang and Choi (2007)and Abraham and Fonta (2018) argue that increased expenses result from increased climate change. It forces farmers into a poverty track that they cannot avoid. Zaka farmers pay for inputs, labour, water tariffs, farming equipment out of their pockets to defend their crop production, and it is invariably out of reach for many of them. The story here is that Zaka farmers will develop numerous financial strategies to counter this circumstance, but they require years of solid income for their tactics to be effective. Without a substantial income, spending levels will rise to accommodate the demands. What could this mean in the context of adaptation? It means governments need to re-strategize the policies and measures when integrating financial development and climate change. Sustainable livelihoods aim to design systems that increase individuals coping capacity against external shocks by providing structures and assets that improve their well-being despite experiencing vulnerability (Moser, 1999; Prowse, 2008). The findings described here demonstrate that the conditions of job insecurity, income instability, and increased expenses are still variables that continue to weaken Zaka farmers' defences, forcing farmers to work with a paralyzed livelihood. Figure 6.1 illustrates Zaka farmers' livelihood conditions.

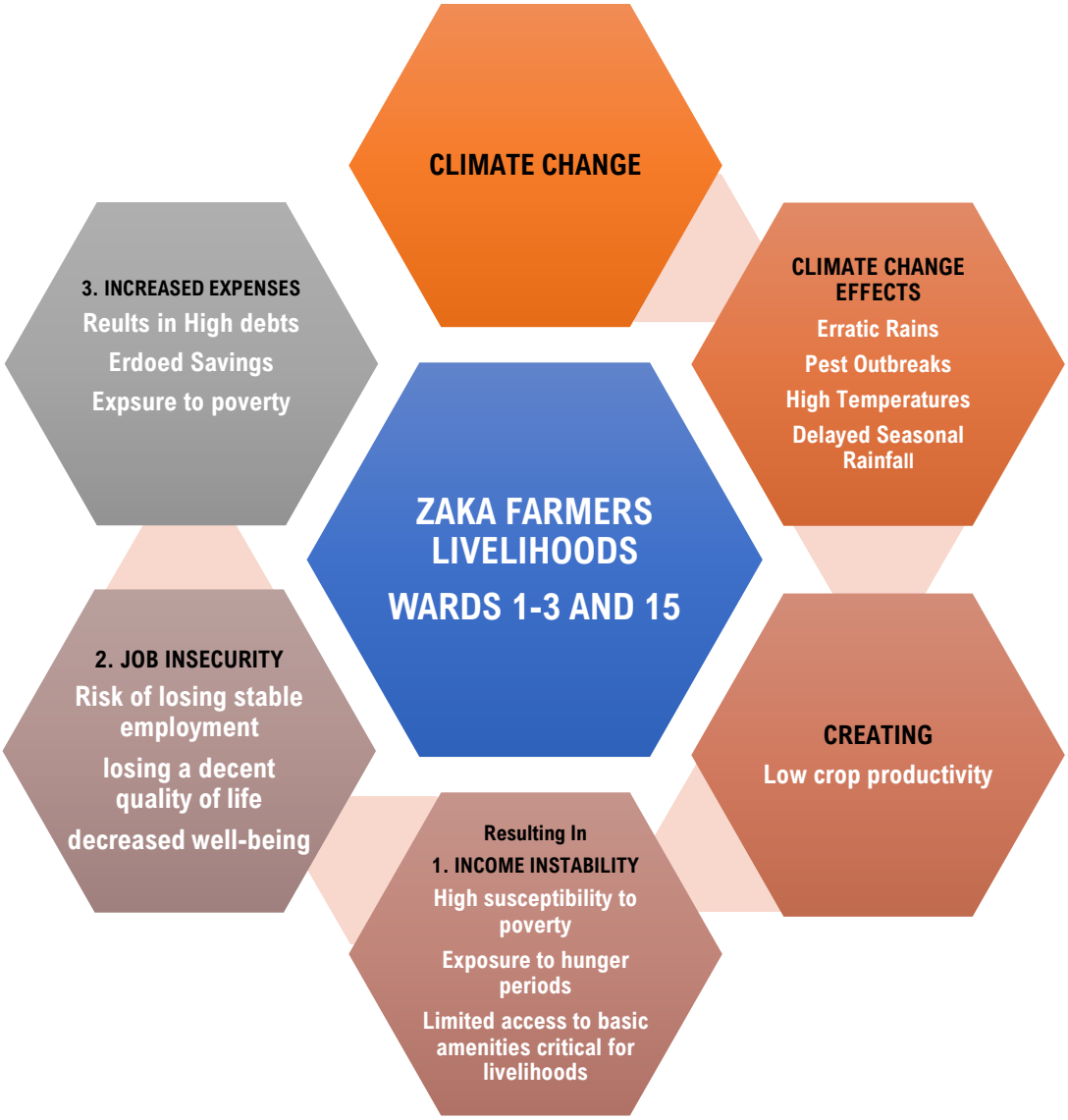


Figure 6. 1 Conditions created by climate change on Zaka farmers livelihoods.

Source: Field Based Survey Notes (2020)

6.3. Adapting and building resilience against water scarcity and climate extremes.

Identifying the asset combination that farmers used to defend their livelihoods from climate change was an area of investigation for the study. The results revealed that Zaka farmers selected the human, natural and physical asset combination to improve crop production and adopted the financial and social capital combination for their livelihood outcomes. The participants use the resources to make 'better adjustments' in their farming livelihoods to the evolving climate. There are various ways and means that farmers adjust to climatic variations, and we have seen this in Dulal et al. (2010), Akinagbe and Irohibe (2014), Antwi-Agyei et al. (2018), Arunanondchai, Fei, and McCarl (2018), and Jamshidi et al. (2019)'s findings. Zaka farmers are active players in climate situations. The farmers cannot sit at home during times of crisis.

Instead, they actively look for means to guard their livelihoods. The farmers create strategies to improve crop production and tactics for their households. The finding matches what is in the climate change adaptation literature. Farmers' go-to approach is to use their current resources to curb their existing vulnerabilities, whether farming or household assets (Morse and McNamara, 2013).

6.3.1. Asset combinations for Adaptive Capacity

The study wanted to identify the assets and their combination that played a cardinal role in building adaptive capacity and resilience of rural farming communities in Zaka to secure sustainable livelihoods in the face of increased environmental change. It was the main aim of the study. Firstly, the results found that resources are available for Zaka rural farmers for both males and females, but accessibility comes with a set of conditions that promoted and hindered their adaptation. Secondly, based on the data presented in Figure 5.9, the study found that natural capital (livestock, water, land, and drought-resistant seeds) was Zaka farmers' colossal resource. They also relied on human capital (training and labour), financial capital (crop payment, savings, and credit), physical capital (agrochemicals, machinery, infrastructure, and farming equipment), and social capital (farmers' associations, family, friends, and relatives). All capitals were imperative as one capital could not function without the other. To lessen the risks of income instability, job insecurity, and increased expenses, Zaka farmers used the five-asset combination to manage their current vulnerabilities.

Human, natural, and physical asset combinations were adopted to improve income. Securing income increases farmers' level of adaptation against climate change and poverty-induced factors. It all boils down to how we resolve the situation with income instability. It is critical to note that expanding income does not directly equate to an increase in earnings because it requires an amalgamation of resources that support components that foster the expansion. In the context of Zaka farmers, we discovered that the segment that yields income is crop productivity. Thus, Zaka farmers actively applied the human, natural and physical asset combination to improve crop productivity.

Human capital was a vital resource for improving crop productivity. Labour and training provided Zaka farmers with the proficiency and abilities necessary for minimizing the risks associated with crop productivity. For example, in the study, the participants in rainfed and irrigated agriculture used training and labour to reduce crop failure.

The participants specifically used potholing and water channelling techniques to reduce the risks of crop failure. Hired labour increased their labour input per hectare without raising external non-labour inputs. Hired labour allowed the farmers to perform their daily tasks during climatic stress. The training empowered the farmers with climate knowledge, and by learning the skills of potholing and water channelling, they achieved better results with crop production over time. It is evident in section 5.3.1. The study agrees with Bazylevych et al.'s (2019) opinion. Training and labour are fundamental factors of human capital in promoting productivity. We can see in the results that training and labour provided Zaka farmers with organizational skills, crop knowledge, and climate management that they continue to adopt in their farming routines. It is a confident outcome.

Zaka farmers adopted labour to increase their physical and mental capacities. The selection of hired labour guaranteed reaching their farming objectives. Zaka farmers complete their productivity objectives by delegating the tasks to the laborers. It allowed them to perform critical tasks, increasing production capacity. It is a positive result as it contributed to their crop production. This finding demonstrated the price of human capital in improving adaptation. We have seen the value of human capital in Paavola (2008), Cassidy and Barnes (2012), and Voronin et al. (2020) report. According to Cassidy and Barnes (2012), training and climate knowledge boosted farmers' crop productivity and their access to natural and financial capital. Such a confident result improved their adaptive capacity by 30% (Cassidy

and Barnes, 2012). We see a comparable positive value of human capital on Zaka farmers' adaptation. Zaka farmers used training and labour to attain high productivity, which guaranteed more seeds for the next season and income returns, and we see the steady progress of crop production in Figure 5.5.

The study recommends that non-governmental and governmental institutions create training programs that promote positive livelihood changes and educational sessions on climate change, adaptation, and food security developments. It encourages small-scale farmers to welcome climate and farming education and apply other knowledge sources in agriculture. It increases the continuance of human capital (Huffman and Orazem, 2005; Bazylevych et al., 2019). There is an actual transaction between human capital and adaptation. The application of training and labour potentially suggests the increased production in Figure 5.5. These findings agree with Bailey et al. (2019) argument that human resources are significant for adaptation against climate change, and they heavily impact coping capacity on a large scale. Although, human capital cannot operate without the presence of natural capital.

Natural capital is required to make these modifications take place. The study believes it is the main foundation that brings all the other assets together, and their formulation increases farmers' adaptive capacity.

Each resource magnifies the effectiveness of another resource. Natural capital is the queen chess piece that improved Zaka farmers' adaptation. It is the resource with more attributes (life, ownership, utility, productivity, holding costs, complementarity, and security), and thus it could provide numerous services that strengthen farmers' access and performance of other resources. Natural capital is just as necessary as financial income. Bailey et al. (2019) believe that natural capital is imperative for small-scale farmers and that any reduction in quality and quantity limits their adaptation options.

The study found that Zaka farmers had four forms of natural capital. They capitalized on drought-resistant seeds, land, water, and livestock to increase crop productivity. Each resource had several attributes that provided the farmers with many uses. Firstly, drought-resistant seeds can absorb shocks and maintain crop growth during the dry season. As a resource, it increased Zaka farmers' production in the face of water scarcity and drought effects. The study agrees with Esther Ngumbi's (2020) argument that the drought-tolerant

crops and their characteristics have saved rural farmers from years of bad harvests because we can see from Zaka farmers' testimonies presented in section 5.3.1 how they place such a high value on drought-resistant seeds.

The seeds are famous amongst small-scale farmers. Several studies have shown that low-income farmers have engaged in many different varieties to attain high profits (Mao et al., 2020). The process has promoted long-term livelihood protection from climatic and poverty pressures for small-scale farmers. Although there is evidence of some crops losing their drought protection qualities, and thus, farmers are encouraged to acquire new seeds (Ngumbi, 2020).

Land builds adaptive capacity, and it is true with Zaka farmers. Rainfed and irrigation farmers used the land to expand their coping capacity. Such findings highlight the significance of land for rural farmers in Zimbabwe. It is a resource that gave the farmers the platform to create and produce. Zaka farmers spend most of their time with land, outside their household activities, in maximising seed output. Several studies conducted by FAO (2011), Pawlak and Kolodziejczak (2020), Woodhill, Hasnain, and Griffith (2020) have stated that land is a vital resource for small-scale farmers when building adaptive capacity. It is a resource other than water that small-scale farmers strive to have in large quantities. Land lessens vulnerability by double farmers' seed and livestock production. Land for Zaka farmers is the ground to their economic success, source of their food security against hunger, the root of fresh and healthy produce, and offers services that benefit their rural landscape. However, its level of minimization comes in small phases. It is because the majority of subsistence farmers have smaller land plots. In the Zimbabwean agricultural literature, commercial farmers have larger land plots (FAO, 2015; Scoones and Murimbarimba, 2020).

Small-scale farmers grapple with climate change because they have smaller land plots to support their daily needs (Woodhill, Hasnain, and Griffith, 2020). Zaka farmers use the land to perform tasks, cultivating, weeding, harvesting, and livestock rearing. All these tasks are in response to market and risk demands. The land is the groundwork for production. Woodhill, Hasnain, and Griffith (2020) argue that farmers with limited land size below 2ha produce less but face a market that demands products that require 5ha of land. Zaka farmers need more land to improve their income and market chances. From the findings, the land from the government encouraged farmers to produce more, increasing their profit margin. The land

provides capital and resources that fuel farmers' livelihood growth. Although, the connection is not automatic. It varies according to the land's potential, government policies surrounding its procurement and quality.

Water is another crucial resource for farmers' adaptation. It serves multiple purposes in seed production (Mekonnnen, 2020). Both irrigation and rainfed farmers in the Zaka district used water to reduce the levels of crop failure. Having water meant that farmers were assured high income for protracted periods. Remember, this particular asset combination serves its purpose of improving income levels through crop yield expansion, and just like the land, it is also evident that there is a high demand for water and its services, especially from rainfed farmers. Zaka farmers use water for applying fertilizer, which provides nutrition to the soil and magnifies the production of better crops (Filipovic, 2020). Water is relevant for cooling down crops during the hot seasons (Filipovic, 2020). Water prevents crops from wilting and withering and prevents pest attacks during the hot seasons (D'Odorico, 2020). All these services reduce bad harvests. Water is a crucial ingredient that ensures that Zaka farmers reach their income stability. It explains why there was such a high response regarding its value from irrigation participants than the rainfed participants. Irrigation farmers praise their access to a water supply from the Siya dam because of its convenience and security. Zaka irrigation farmers can access all the services. Unlike the rainfed participants, they cannot celebrate rainwater because of its unreliability, but it still serves its purpose when it is available.

Livestock is the utility player in the procurement of services. It can serve versatile purposes competently in assisting farmers against income instability. The study saw that livestock rendered manure for the participants when they could not afford fertilizer at market rates. As a natural resource, it granted the farmers access to financial capital. Farmers were able to convert their livestock into cash to solve their expenditures. It is also a resource that gave farmers' families food when food was expensive and scarce. Livestock rendered draught power for the farmers to manage their fields with ease. All these purposes are in their block quotations presented in section 5.3.1.

Livestock plays a crucial role for Zaka farmers through domestic consumption, monetary income, animal draught power and fertilizer, and transportation, supporting farmers' economic status. According to Fan and Rue (2020), support to the community's financial

status automatically boosts their resilience against internal and external risks, and Le dang et al. (2019) argues that policymakers be decisive in their initiatives when expanding on natural capital. Natural capital is fundamental to farmers' adaptation, and thus we should magnify their services to improve livelihoods while applying compelling sustainability and government measures that ensure that future generations benefit.

The amount of services shows how preeminent natural capital is to farmers' adaptation. Natural capital supports Zaka rural farmers by providing water, land, livestock, and drought-resistant seeds that are regularly obtainable and do not require comprehensive knowledge or training to exploit them (Osbahr et al., 2010; Belay et al. 2017). With these results, the study coincides with Dorward et al. (2001), Alam (2015), FAO (2015), and Le dang et al.(2019) discussion in that natural capital is the primary foundation of adaptation for small-scale farmers. Each service that each resource administers tackles the problem small-scale farmers face with climate change. The more natural resources they have, the better their adaptation (Whitten et al., 2017).

Farmers used physical resources to improve production. These units played a role in promoting their adaptation. Participants used different physical resources from fertilizer, pesticides, ox-drawn plows, shovels, and wheel burrows to support crop production. Fertilizer and pesticide management ensure that the soils contain nutrients and prevent pests during the dry season. This type of measure improved their crop yields over time. Water infrastructure provided irrigation farmers with direct access to water supply from ZINWA regularly. The water infrastructure guaranteed that they remained productive during the drought periods.

However, the drawback is that their physical resources are not on a large scale. The farmers are still at a risk of non-productiveness, which places their livelihoods at risk at any given period. Small-scale farmers having insufficient physical capital is a frequent finding in the developing countries-climate change literature.

Goodwin (2003), Dulal et al. (2010), Arunanondchai, Fei, and McCarl (2018) found that subsistence farmers have little to no physical capital due to:

I. limited financial backing from institutions.
II. Institutions have difficulty in accessing highly remote areas.

This idea is valid in the context of Zaka farmers. Price volatility and financial constraints from ZSS institutions make it difficult for Zaka farmers to capitalize on physical capital. Dulal et al. (2010) argue that climate change is unpredictable in situations where its effects increase annually. Farmers need to expand their physical resources to create adaptive strategies that safeguard their productivity from interruptions and delays to improve their resilience against climate change. Physical capital is the 'building' that ensures processes are met and sustained in production, and we can see that the infrastructure and equipment provide technical support that makes Zaka farmers productive at all times.

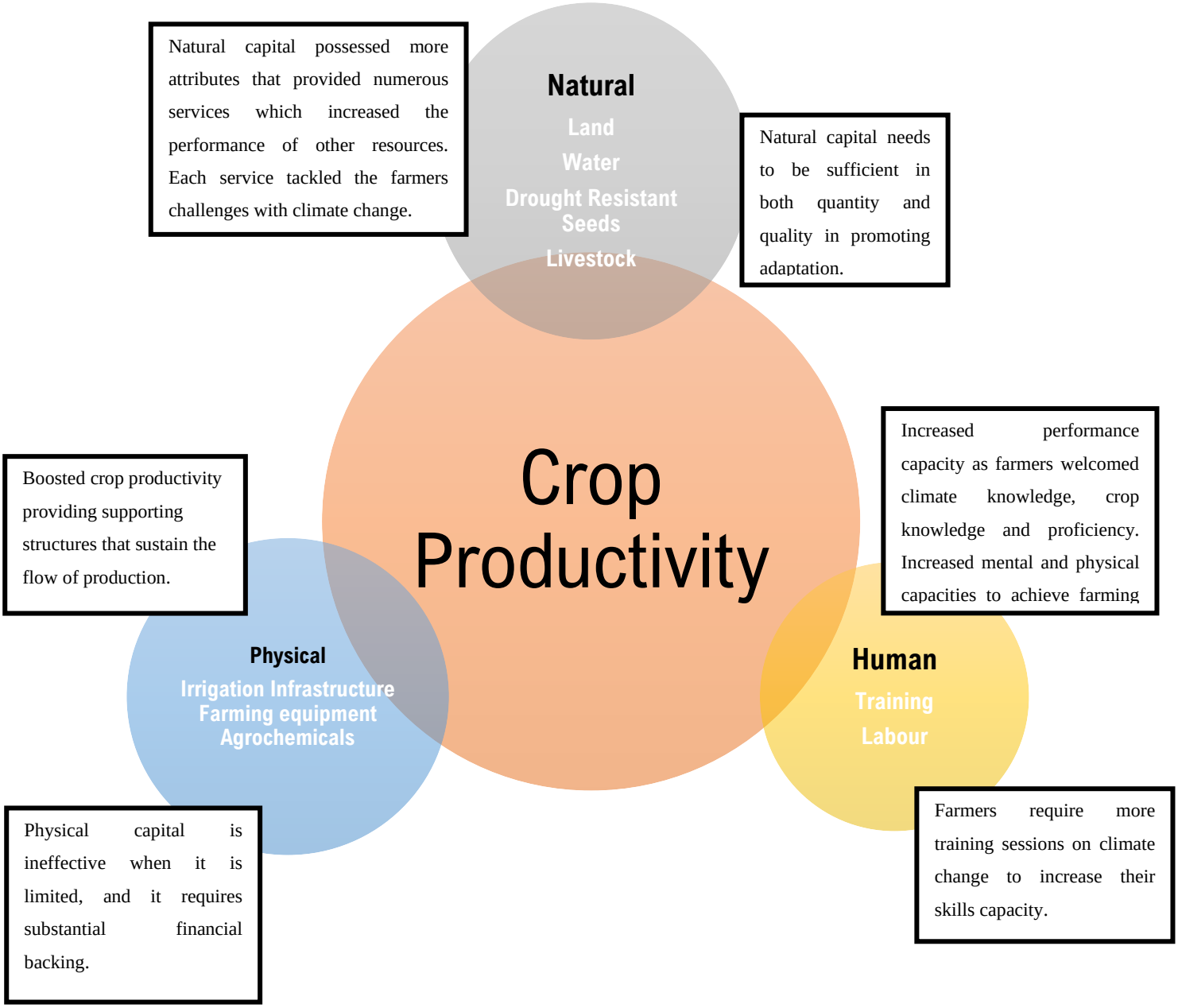


Figure 6. 2 Human, Natural, Physical Asset Combination

Source: Fieldwork Survey Notes (2020)

A. Social and Financial capital asset combination

Farmers used social capital as a support system during times of stress. Both rainfed and irrigation farmers relied on social associations.

It operated in two diverse ways:

I. It gave the participants a sense of recognition.
II. The resource gave them a platform to voice their concerns, acting as a collective unit in devising solutions.

Social capital promoted adaptation for Zaka farmers through collective action and resource networks (Bebbington, 1999). For instance, Zaka farmers used social capital to resolve pest proliferation, the price issue with fertilisers and pesticides, and address the challenges of the socio-economic climate 2019-2020. Coming together as farmers to discuss at the district level is a process that ensures corporate support and increased capability to resolve matters as a united front leaving no farmer behind. Individuals who discuss concerns cooperatively promote their coping capacity (Udmale et al., 2014). It fosters encouragement and participation in a platform where solutions are inter-exchanged with social contacts and institutions. Other institutional networks (Zimbabwe Super Seeds and local government) required participation, and decision-making was present. It assured that institutions were aware of communities' challenges. The corporates paid attention to the things that mattered to the farmers. The process prevented Zaka households that suffered from climate change from being left out of the decision-making process. For instance, the Zaka Farmers Association held a meeting with the farmers to discuss the price volatility of pesticides and fertilizer and the socio-economic climate. Members of the association went further to address the matters with the representatives of the ZSS organization and other institutional networks. As a collective unit, they discussed some concerns, though they could not resolve them due to financial barriers. Nonetheless, social capital served a positive purpose to their coping capacity by finding solutions that tackled their challenges together.

As a resource, it gave the participants access to financial capital. Both irrigation and rainfed farmers used social capital to acquire extra funds to defend their livelihoods from income instability. Farmers contacted their family and friends to buy food, pay for education and buy inputs when money was insufficient. Just having that measure of family support yields a positive effect on adaptation. It is safe to say that these results agree with Bebbington's

(1999) and Aldrich's (2017) findings. Farmers use their connectedness and relationships with institutions and family networks to defend their livelihood outcomes with the colossal financial capacity. Farmers use this negotiating power to obtain solutions that promote their coping tactics (Bebbington, 1999, Aldrich 2017).

Financial capital provided a variety of livelihood outcomes for Zaka rural farmers. Figure 5.17 displays three income groups that Zaka farmers used to defend their livelihood outcomes. These were crop payments, savings, and credit. Crop payment was the highest, and it was the most used resource. Zaka farmers spoke in detail about the different livelihood outcomes they attained and how they managed to alleviate their risks and stresses using the three income groups. Income is necessary for food, payment of fees, and emergencies. This study is in line with the previous work done by Maponya and Mpandeli (2013), Ayanlade et al. (2017), and Kom et al. (2020). It is true with Zaka farmers in the study sites. The individuals use the income to preserve their economic status or improve their well-being.

For example, the study found that rainfed and irrigation farmers used their savings for medication, food, and social networks. It prevented disruptions in the production process. These three variables represent their livelihood outcomes presented in Figure 5.17.

Farmers from wards 1-3 and 15 relied on crop payment to solve their farming and livelihood challenges. The farmers treasured it because it was the leading source of their income, compared to savings and credits. Zaka farmers used their savings and credit to ensure they received annual crop payments at the end of their harvests by seeking credit from ZSS for inputs or investing in medication. Financial resources are significant for farmers' adaptation.

Although, the findings from the study site suggest that the farmers' resources are inadequate. Ayandale et al. (2017) and Wulandari et al. (2017) speak of savings, loans, income, credit, private money lenders, microfinance institutions, credit cooperatives, and in Figure 5.17; there are only three that apply to Zaka farmers. The argument is that small-scale farmers remain in poverty cycles because they have limited financial options due to residing in areas where financial services are absent. Low financial capital is a fundamental problem known to disrupt rural farm households' production, crop productivity, and income (Thomson, 2020; Langyintuo, 2020). Zaka farmers' access to financial capital is low because the banks are far from their residences, and they depend on three forms of payment which is incompetent to

sustain their livelihood outcomes. The farmers do not have adequate financial resources to transfer their income into current agricultural investments. Thus, their opportunities are constrained. Although, the study sees that their financial capital has pulled together other forms of capital assets, specifically land and agrochemicals, necessary for an effective livelihood strategy. Zaka farmers save their income to invest in inputs, medication, social networks to increase annual crop output. The findings demonstrate why income is essential to Zaka farmers' adaptation against climate change.

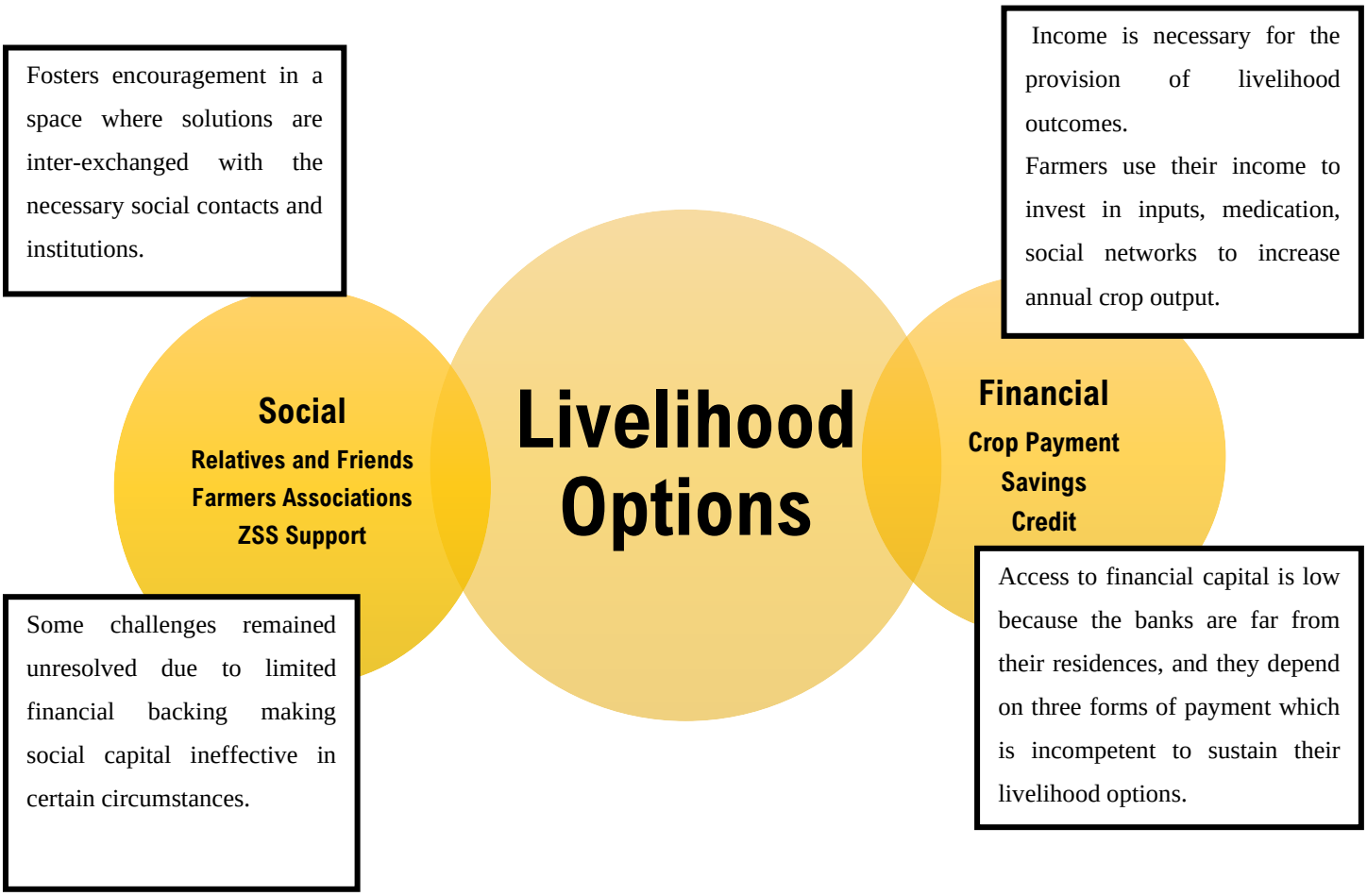


Figure 6. 3 Social and Financial Asset Combination

Source: Fieldwork Survey Notes (2020)

In conclusion, the asset combinations that Zaka farmers use to defend their crop production and livelihood outcomes yielded a positive result to their adaptation because farmers can

cope daily with the climatic pressures. The farmers can manage the pressures of income instability, job insecurity, and increased expenses using their current resources. The farmers can function as self-supporting units to some degree. However, their adaptation is constrained. Some assets are limited in their attributes. Specifically financial, human, and physical capital. Thus, farmers are likely to remain vulnerable to the existing stresses. The findings presented agree with the theoretical perspectives in that we need to design more resilient systems that foster better disaster risk management and promotion of household adaptation systems.

6.3.2. Resource Accessibility for Zaka Farmers

The second objective of the study was to investigate livelihood assets accessible to small-scale farmers. This section discusses the accessibility aspect. The study investigated if Zaka farmers' assets were accessible, and we found that they were available, but it came with a set of requirements that governed how they acquired them. The study discusses the resource settings and their arguments and explains why they are significant to asset adaptation. Access to productive assets is a dominant issue in the climate change adaptation discourse (Ogato et al., 2009; Elum et al., 2017). Despite the imperative roles Zaka farmers play in Zimbabwe's food security and agriculture, they have insufficient bargaining power over a range of productive assets, including water, land, financial resources, climate information, and crop inputs. Regardless, Zaka farmers are empowered. They are conscious of their situations. Farmers collectively organize themselves to receive public services and agricultural resources.

I. Institutional Factors

Zaka farmers' access to resources is subject to institutional factors. The results indicated that the farmers could access natural, human, and physical capital through formal attachment to Zimbabwe Super Seeds. They could continue to use the resources provided they followed the guidelines set by the institution. Institutions are the foundation for the long-term functioning of socio-ecological systems against climate change (Putsenteilo et al., 2020). Their boundaries influence the structure of communities. Zimbabwe Super Seeds set the Zaka farmers' development and organization. Institutions' rules and regulations shape the way farmers' activities and interact with resources. The rules affect how farmers exchange assets, and the arrangements are made clear in their contracts.

The rules and regulations make sense because institutions guarantee effective governance of resources (Elobeid, 2008). Douglas North (2003) argues that institutions reduce uncertainty and risks to the community by providing a structure to their everyday life by stating the human and resource interaction guidelines. With Zaka farmers, the individuals attached to institutions can access resources not open to every rural farmer in Masvingo. Farmers from wards 1-3 and 15 joined governmental schemes to obtain resources to produce high household consumption that improved their livelihoods. In essence, the assets are available to Zaka farmers because of ZSS support. We can see from the study site that farmers who are part of the Zimbabwe Super Seeds scheme can access drought-resistant seeds, training, and the irrigation farmers can access physical infrastructure and water supply from ZINWA. The different resources support their livelihood development. It is a decisive result. Zaka farmers' assets are available because they have institutional support, and they can continue to manipulate their resources for a protracted period provided they stay formally attached.

II. Affordability

Affordability is not an open concept. It is investigated using quantitative research methods. Though for this study, it is a concept that appeared for Zaka farmers' resource accessibility. They are codes in the participants' statements that depict themes of affordability. For example, physical, natural, and human capital are available to Zaka farmers only if they can afford them. This association could either go negative or positive depending on the farmers' income levels and opportunities. Stone (2006: 21) states that 'affordability is not just a characteristic of housing but rather a correlation between income and prices.' It also applies to resources and services.

Firstly, the study found that the irrigation participants could use water supply if they paid their monthly water tariffs to ZINWA. Failure to pay this requirement resulted in denied access. Secondly, both rainfed and irrigation participants stated that their ability to use pesticides and fertilizer was subject to market and price affordability. Thirdly, both irrigation and rainfed participants explained that labour was convenient depending on whether they could afford the laborers. Lastly, the participants stated that access to livestock was subject to the rate of buying and selling at the market. For Zaka farmers, a resource is unaffordable if it costs more than their potential budget. Such a relationship is restrictive. The concept of

affordability is securing an asset at a price that does not impose an exorbitant burden on farmers' income.

We see that Zaka farmers operationalise affordability by analysing their income, evaluating the asset price in question, and query the possible temporary hardship. As indicated in chapter 5, price and money are indeed crucial aspects when it comes to Zaka farmers' resource accessibility. The problem with affordability is that the rural farmers are low-income earners and lack access to financial services to safeguard their access. If the resources are too costly, the farmers cannot purchase them or take out their savings or loans. The findings suggested that it is significant to compare and examine the affordability of assets across developing countries and monitor its impact on adaptation, seeking improvement. The study believes that affordability is indeed an outstanding result in the access-asset- adaptation field, as it is a subject that is not universal.

The outcomes are similar to FAO's (2015) report on affordability studies on education, health care, water, transportation, and housing of rural people in developing countries. The report stated that individuals hesitantly spend a large sum of their budget to solve the risks and still pursue livelihood outcomes, but such actions have yielded catastrophic consequences. Farmers reluctantly accept the financial burdens as long as they acquire the resources. It is a negative side of affordability. Zaka farmers will face poverty incidences because of financial difficulties. We must continue to dig deeper into the relationship between resource accessibility and affordability to identify entry points in the financial system to improve their income levels. The government must make critical resources affordable for Zaka farmers. Also, improve their access to credits and loans to increase their affordability capacity. It might minimise the risks of debt and overspending to some degree, but more importantly, it will give the farmers opportunities to invest and save for their livelihood outcomes.

III. Rural Policies

Results presented in section 5.3.2 indicate that rural policies influenced the way Zaka farmers use and acquire land. The land is accessible to the farmers, granted they followed the rural-governmental policies. Policies provide incentives that stimulate communities or individuals to make better decisions about their resources. The policies are managed by a collective committee. The study found that Zaka farmers' access to land is subject to the arrangements with the Rural District Coordinating Committee Chair. Zaka farmers do not have complete

authority in terms of land productivity, and thus they cannot transform or manipulate the resource to their advantage without the permission of RDCC. The farmers requested more to maximise seed output to obtain a higher income. However, the request is subject to a formal assessment from RDCC. The RDCC policy decides if the farmers can pay the required tax for owning more land and maintain its functionality.

From this analysis, we can indeed see the relationship between land policy and farmers' accessibility. In rural areas, land allocation is reviewed in terms of ownership, use rights, and the shaping of land use. It is a fundamental natural asset in rural livelihood security (FAO, 2016). Farmers build their livelihoods from land. To obtain the resource, they must conform to Zimbabwe's land registration systems that authorize their property rights and control land use in agricultural development. In other studies, ownership and land rights were obstacles in implementing climate change adaptation policies (Smith et al., 2010). They were obstacles because of the increased conflict regarding land access and equality (Smith et al., 2010).

However, the findings pointed out that land policies support farmers' access because the government aims to increase food security and eradicate poverty within the regions, despite the formal assessment from RDCC. A farmer could apply for more land from the RDCC, and the approval of the application could take a long waiting period, and whether this delay is an obstacle to their adaptation remains in question. From what we can observe, the farmer would have to make do with the current land size to meet the current market demands while waiting for the decision of the RDCC and facing the effects of climate change in the same breath.

The circumstances surrounding farmers' productivity and land accessibility do require some attention. Farmers build their adaptive capacity to climate change by securing ownership of land. Having control allows them to manipulate the land to their preference, they can expand on their livestock and seed production, and this form of diversification can alleviate the levels of income instability. Zaka farmers are aware that having more land increases their capability to expand production and make more profits.

Let us put it this way. If we had a resource that could expand our profit margins or livelihood outcomes , but our ability to access more of that resource is subdued by mandatory policies, our capacity to progress shortly is restrained. Therefore, we would have to follow the procedures the policy stipulates and continue to follow up, hoping that we will acquire the

resource much sooner to prevent our progress from being delayed. This situation applies to people who apply for bank loans, property, resources, and funding. The necessary institutions with authority assess the individuals based on their tax payments and credit. Individuals cannot easily acquire the resource without applying the procedures. It is how Zaka farmers evaluate the situation on the subject of land. This finding is similar to reports published by Turral, Burke, and Faures (2011). Accessibility is guaranteed through land policies, and the policies could either influence farmers coping capacity or limit it.

IV. Limited Diversification and Infrastructure

Zaka farmers' access to resources is subject to diversification and infrastructure. It mainly applies to their financial assets. The results in section 5.3.1 showed that farmers have low financial capital, and it is because they have limited forms of diversification of farming activities and reside in areas where there are little to no financial services.

Responses from the focus groups and interviews (2020) suggested that financial assets are not conveniently available for Zaka farmers because of low diversification. Their feedback explained why farmers are striving to increase it. Zaka farmers could make more money if they capitalised on other Zimbabwean cash crops. These findings are similar to Delgado and Siamwalla's (1997) theory. Delgado and Siamwalla (1997) argued that increasing farmers' revenue is subject to diversification. They say it is a positive correlation in itself. The lower the diversification, the lower the income returns and vice-versa (Achiba, 2018; Tacoli, 2003).

We also see that different income alternatives determine the level of resource accessibility. Due to rules and regulations, little infrastructure, and low access to markets and resources, Zaka farmers' coping measures are insufficient (Delgado and Siamwalla, 1997). Small-scale farmers can only achieve adaptive capacity if they specialise in different farm activities or various resources. Specialisation and triangulation yield high-income levels because it means farmers have more than one alternative to acquiring their income.

Diversification of resources generates fewer risks, with more predicted gains in liquidity and seasonality (Tacoli, 2003). This measure allows farmers to adjust their outputs more accordingly. Diversification encourages resource accessibility, particularly with natural and human capital. The specialisation will allow Zaka farmers to access and practice different crop varieties. The process would equip them with skills and knowledge on how to farm

different variations. However, specialisation requires development backing from institutions for diversification to be fully effective. Development backing includes expanding infrastructure, more landholding capacity, and financial support from local and private institutions, which we find is limited for Zaka farmers. There are case studies of failed agriculture projects because of limited financial backing to increase farmers' diversification (Turner et al., 2006; Zonneveld, Turmel and Hellin, 2020; Bellon et al., 2020).

Results from focus groups and interviews (2020) suggest that resource accessibility, particularly with income, is subject to financial infrastructure. Limited banking infrastructure in rural districts forces Zaka farmers to travel long distances to Masvingo business center to acquire the financial instruments. It delays productivity. Limited infrastructure means that the farmers cannot access the financial mechanisms required to make savings, invest, purchase inputs, and take-out insurances to back up their farming investments. Ruete (2015:3) states that the development of financial infrastructure is necessary for rural areas. One of the main objectives of Sustainable Development in alleviating poverty is to 'expand access to economic and responsible financial products and services to poor and vulnerable populations.' With limited financial assistance, Zaka farmers' livelihoods remain responsive to financial risks because they cannot tackle the liabilities.

The study's second objective was to investigate whether assets were accessible for Zaka farmers in managing climatic pressures. The results showed that every resource provided multiple benefits that aided Zaka farmers' coping capacity, and each had its disadvantages and advantages. Investigating this aspect helped the study comprehend how rural communities in Masvingo use their resources to defend their livelihoods against climate change using their asset portfolios. Zaka farmers adopt assets based on reactive measures. They use the assets based on the current risks and events that have unfolded. The farmers engage in numerous livelihood approaches using their resources to lessen the vulnerabilities. We can see the diverse portfolio of assets and how their accessibility is subject to several fundamental factors, although we find that such diversity is necessary to have rural households cope with the unexpected shocks.

However, the results do not tell us how Zaka farmers would cope if they did not possess a range of these assets. Would they still survive against the current risks they face? We can see that they are still better off than some of the farmers mentioned in the literature because of

institutional support. Of course, this does not apply to every rural farmer in Zimbabwe. What about the communal rural farmers? The real question here is how are farmers without the same level of access as Zaka farmers managing the climatic pressures. This research needs to be investigated by other scholars.

6.4. Barriers to adaptive capacity for small-scale farmers.

Question three of the investigation was to identify the other barriers that small-scale farmers face in adapting to water scarcity and drought. As we recall, the literature states that the lack of assets (Schdmidt et al., 2006; Zurovec and Vedeld, 2019), increased climate change impacts (IPCC, 2019), inequality of resources (Wellborn, 2018), the outbreak of diseases (Ansell et al., 2016; Carte et al., 2019) are universal constraints to farmers adaptation. The study found that the impacts of socio-economic climate and COVID-19 were barriers that affected Zaka farmers' coping capacity. These are different barriers compared to the ones stated in the literature. It is because it is country-context specific. These barriers apply to rural farmers in Zimbabwe. Section 6.4.1 discusses the impacts of the socio-economic climate from 2019-2020.

6.4.1. Socio-economic Impacts (2019-2020)

The study found that the socio-economic climate was a barrier to Zaka farmers' achieving their adaptive capacity. It is a macroeconomic trend caused by changes in the external environment as a result of economic policies. The findings demonstrated that Zaka farmers faced cash shortages, farm thefts, slow revenue collection, and price volatility as outcomes of the harsh socio-economic climate trend of Zimbabwe 2019/2020 (See Figure 5.19). These impacts weakened their asset combinations which undermined their livelihood defences against climate change. These kinds of barriers happen in developing countries with weak economies (Oramasionwu et al., 2011; UN, 2020), and they deepen the underlying risks that Zaka farmers face with income instability, job insecurity, and increased expenses. In this context, the local government has a low approach to tackling them. The study showed that the socio-economic impacts weakened Zaka farmers' asset base, particularly financial capital, and physical capital. The effects stretched their social capacity safety nets to the limit.

For instance, both rainfed and irrigation farmers suffered from cash shortages. Zaka farmers could not acquire physical cash from their financial institutions to implement their livelihood

strategies because the banks reduced their daily limit withdrawals in 2020. In the beginning of 2019, financial institutions had to restrict physical withdrawals to stretch out the allocated funds (Gudhlanga, and Madongonda, 2019). This force created more hardships for farmers as it caused delays in their productivity and forced farmers to spend their savings, catering to the build-up expenses and psychological and physical stress. The findings witnessed in this study slightly mirror those of the previous studies reported by Calomiris, Hubbard, and Stock (1986), FAO (2011), Dekker and Kinsey (2011), Borawski et al. (2015), Maluleke et al.(2016), Lombard et al. (2017), Phuong et al. (2018) that have examined the effects of farm crime, price volatility, cash crisis in small-scale farmer's livelihoods. The findings implied that livelihoods will always be responsive to climate change because of weak economies and additional aggravating factors in the environment. The farmers have to deal with circumstances beyond their control measures.

Singh (2011) and Maluleke et al. (2016) found price fluctuations, farm crime, war, and terrorism in their reports and explained that these forces erode the farmers' coping mechanisms and force them to the point of livelihood and psychological collapse. In that case, the farmers adopt survival tactics that involve migration to safer environments (Stringer et al., 2020). Padhy and Raju (2019) highlighted that farmers face extreme circumstances whereby they lose their physical and mental capacity, income, resources, and employment to economic demands, forcing them to remain ensnared in poverty. Zaka farmers indicated that they had no means to cope with the effects of the socio-economic climate but used whatever means they could develop with the resources, using their mental and physical abilities and skills to manage the risks. Yes, the farmers used whatever resources they had to cope, but if this socio-economic climate continued for another three years, would they still be adaptive? It is the question that remains in this investigation.

6.4.2. COVID-19 Impacts

The impacts of COVID-19 weakened the Zaka farmer's livelihood strategies. It is not surprising that COVID-19 was an obstacle to their adaptation. It is globally known for causing an austere economic downturn for small-scale farmers (FAO, 2020; Poudel et al., 2020). Mobility restrictions and risk of exposure caused a stringent plunge to Zaka farmer's adaptation. These barriers caused income losses that fostered increased risks of food and livelihood insecurities for vulnerable groups, specifically for the women, the elderly, and people with disabilities. These types of impediments created hardships. The first one being

limited access to markets. The feedback from interviews (2020) indicated that mobility restrictions disrupted the farmers' daily farming and livelihood activities. Farmers could not purchase crop inputs from their input suppliers and access commodities without a letter from the Ministry of Lands, Agriculture, Fisheries, Water, and Rural Resettlement. Their statements indicated tones of frustration and convalescence. The finding correlates with FAO(2020) report. FAO (2020) claim that the COVID-19 pandemic had slowed down many livelihood operations for small-scale farmers, decreasing their ability to survive the internal and external pressures. For example, Zaka farmers were unable to purchase inputs from the market necessary for production. The input suppliers were unable to make it to the market because of lockdown measures in Masvingo. Therefore, a disruption in operations fostered a backlog in production and risks, and in the long term, it raised hunger in already poverty-stricken areas. It reinforced the risks of job insecurity and put pressure on their current cash flows. There was uncertainty on whose jobs are considered essential in society because of COVID-19.

COVID-19 pandemic lockdowns have affected ZSS as well, in that staff members were forced to work from their homes without adequate technological and human resources, yet they had to maintain business operations to pay the farmers their crop payments. The overall outcome is that the COVID-19 pandemic had slowed down the transactions resulting in delayed payments. COVID-19, climate change, and the socio-economic impacts meant that Zaka farmers would not cultivate as much as they used to. In 2020 there was fear of irrigation services closing because community leaders and institutions did not want to take risks (ZELA, 2020). The results showed that Zaka farmers adhered to the lockdown rules, with very little agricultural activity achieved. Zaka farmers had to minimise their hired labour to reduce the risk of exposure. As a result, it meant that the turnover activity was prolonged, increasing their production costs. The delayed production and lockdown restrictions already damaged the income of many farmers' families whose money had already been consumed by the 2019/2020 hyperinflation (Matiashe, 2021).

Small-scale farmers' livelihoods are not outside the impact of the COVID-19 pandemic and 2019/2020 socio-economic climate. The government needs to enforce measures to control the trends and forces to safeguard the farmers' livelihoods. Paudel et al. (2020) suggest that governments need to strategically apply measures that do not further restrict the food supply chain as food production is at the forefront with healthcare. The study agrees with Paudel et

al.'s (2020) argument that the rural population in Zimbabwe is dependent on agriculture for the generation of their income. The 2019-2020 hyperinflation has already weakened the financial base of rural households in Zimbabwe, and yet the COVID-19 pandemic extends substantial threats to their income, livelihood, and health securities. Zaka farmers require immense governmental support. They are (besides the medical practitioners) our unsung heroes in trying to maintain the food supply chain. The government should cater to the farmers' livelihood needs as they the managers of food security for the nation.

Even with the vaccine provided, there will be lifetime effects on the health and income capacity of the many meagre, food insecure, and vulnerable households (FAO, 2020:16). There could be new COVID variants that could cause more lockdowns, and it is essential that in adapting to the pandemic and household threatening trends, that we build resilient and sustainable livelihoods for farmers as this will ensure that food security is maintained and improved, preventing farmers from facing a harsher poverty cycle.

The study achieved its third objective by identifying the barriers that restricted small-scale farmers in building adaptive capacity against climate change and water scarcity. This study found that the impacts of socio-economic climate and COVID-19 were barriers that undermined Zaka farmers' coping capacity against climate change. These barriers were specific to Zimbabwean rural households. The findings agree with the arguments presented by Ansell et al., (2016), Ndulo, (2011), and Jones et al., (2010). External trends and shocks erode the financial base of small-scale farmers' households. For Zaka farmers, the obstacles accentuated their debt and expenses, it created severances in their livelihood activities, and on top of that, they had to draw from their current savings to manage their livelihood outcomes . The ability to pay for these additional costs contributed to the declining income. The implications of the socio-economic climate and COVID-19 presented thus far provide evidence that the lack of productive resources, job insecurity, income instability, increased expenses, climate change pressures are recognised as deep-seated driving forces for local impoverishment. The government needs to focus on how to curb these aggravating factors.

These results here can be the foundation of how we can increase the effectiveness of intervention strategies. It is because we are aware of the areas that affect them. As we devise strategies for Zimbabwean rural farmers, it would involve plenty of intangible processes, decision making, and governance with communities that foster innovation, experimentation,

opportunity exploitation, and the structure of institutions and entitlements. It requires looking at the risks separately, identifying the direct root cause, listing the possible solutions, evaluating the options, and creating an implementation plan.

6.5. Institutional and policy framework to enhance adaptive capacity.

The last objective of the investigation was to identify a policy framework through which adaptive capacity and resilience of poor rural people can be promoted with interpretation measures for small-scale rural farmers. To create the policy framework, we need to pay particular attention to the livelihood conditions that small-scale farmers face in Zimbabwe. The status of their well-being is reliant on agriculture. Improving farmers' livelihood conditions is vital because they are an essential group of people to improving food security for the nation. For Zimbabwe, tackling their livelihood conditions will yield positive results in reducing chronic poverty, unemployment, and food insecurity. It is important that we have a fair picture of the current situation. The recommendations drawn up for a policy in this chapter are defined and outlined based on the findings presented in chapter five. The research evidence presented in chapter five indicates the need for change. Following the SLAF framework provided in chapter two, a SLAF framework of Zaka farmers' livelihoods is displayed in Figure 6.4, showing the conditions they face.

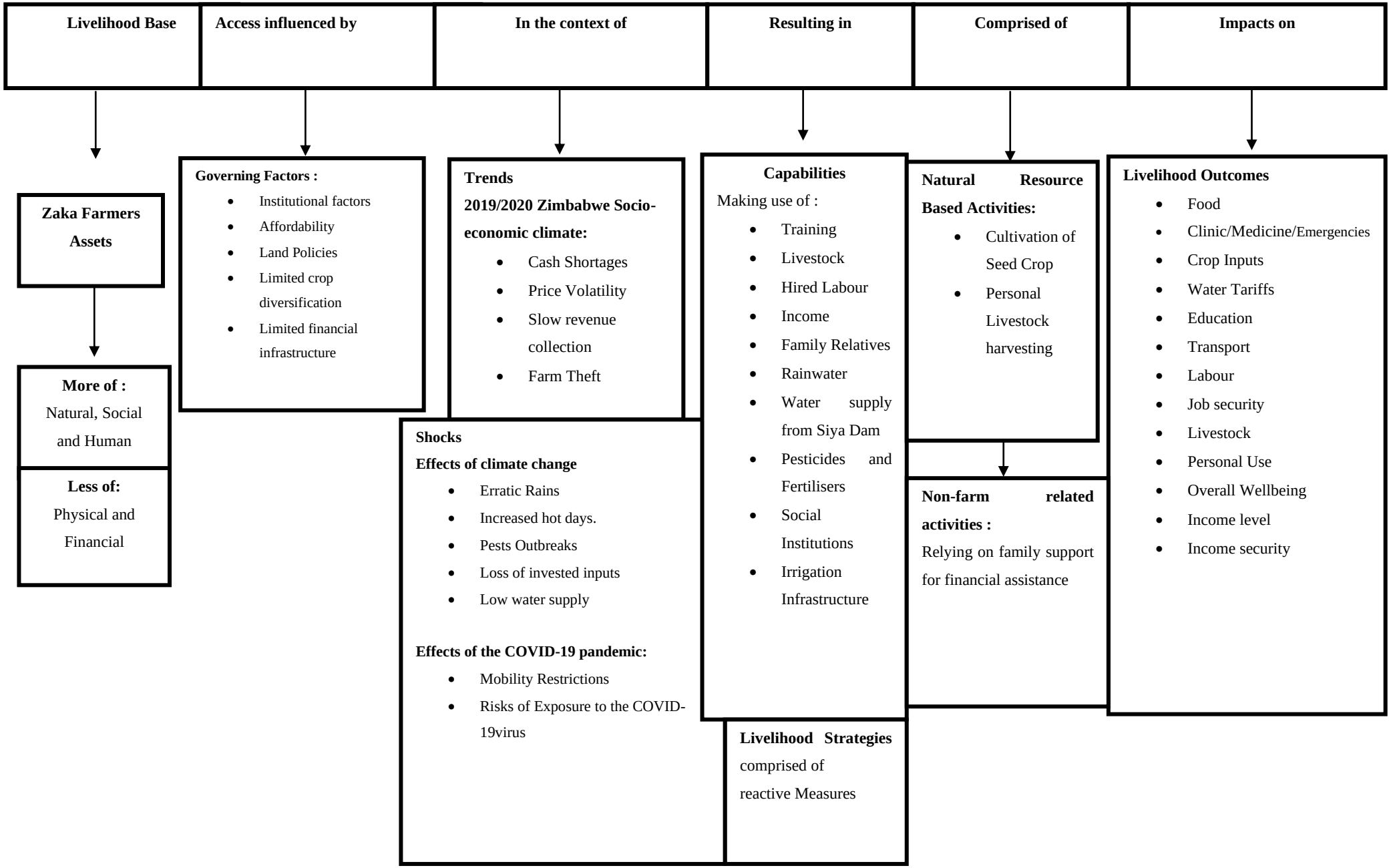


Figure 6. 4 Zaka Farmers Livelihoods Analytical Framework

Source: SLAF Adjusted from Ellis (2000), Dorward et al. (2001) and Morse and McNamara (2013): Field Work Survey Notes (2020).

There are several approaches policymakers of Zimbabwe have already taken in solving these conditions listed in Figure 6.3. The climate change issues are not new to Zimbabwe. Within the ZNCP policy, there are existing capacity measures that agricultural institutions follow, and we have seen the initiatives presented in section 2.3.1. Each capacity measure has its advantages and challenges. Thus, based on the research evidence provided, the actions can be fine-tuned and redesigned to tackle the current challenges from an institutional and community scale.

A considerable amount of the ZNCP's policy initiatives are centered around upgrading agriculture and improving small-scale farmers' livelihoods to climate change. However, there are no initiatives addressed in mitigating socio-economic and COVID-19 impacts for small-scale farmers. Chapter five revealed that farmers are suffering from the effects of the socio-economic climate and COVID-19 pandemic, yet the current ZNCP policy only addresses how governmental and non-governmental institutions, and the government should help farmers cope with climate change. Socio-economic impacts have been a challenge for Zimbabwe since 2008, yet there is no practical defined policy. The current initiatives in place are just reactive mechanisms in response to what we have seen on the ground and not proactive mechanisms that address any future severances.

The COVID-19 pandemic is an unexpected shock that nations worldwide were economically unprepared for, and it is not surprising because COVID-19 was unexpected for every country in the world. However, these results stresses the need for why it is mandatory that we have policies that address them. Due to the Zimbabwe's unpreparedness, the impacts of COVID-19 have created lifetime effects on poor small-scale farmers' livelihoods that will take a long time for them to recover. It is essential now that the Zimbabwean government formulate a policy that addresses the livelihood conditions and provide practical long-term solutions. The current picture is that farmers are applying reactive mechanisms to cope with the effects and such measures are not sustainable. There must be systems within their realm that facilitate their behaviour towards proactive measures should austere situations arise.

Furthermore, there are limited initiatives in the ZNCP policy addressing rural farmers' resource allocation. Most of the current initiatives were formed to address natural, human, and social capital. Even though aspects of it present in the smallholder schemes, farmers remain vulnerable because of low asset capacity. There should be initiatives that carefully

explain how each capital is discussed and distributed for small-scale farmers to improve adaptive capacity. Although no breakdown measures have stipulated how it is implemented at the sector and community level, the initiatives regarding assets and adaptation are just present in the policy.

6.5.1. Adaptive capacity against Climate change.

From the evidence, we can expect the erratic rains, pest outbreaks, delayed seasonal rainfall, and high temperatures will affect Zaka rural farmers' productivity. With these climatic impacts, the farmers will continue to face the risks of income instability, job insecurity, and increased expenses. The results are evident in Figures 5.1 and 5.2. Government must devise measures that address the different interlocking stressors. Finding ways to increase crop production should and always be the starting point to improving farmers' adaptation. It involves creating solutions that foster long-term positive results.

The results revealed that the Zaka farmers rely on indigenous knowledge, labour, crop, and soil information to cope with the climatic conditions. Farmers need climate information in grasping the climate change and farming business. Zaka farmers require training on weather forecasts, catchment data, soil management, and drought forecasts. The individuals have to find ways of handling the risks and guard themselves against future uncertainties, and they can achieve that through anticipation. Human capital for rural farmers encourages preparedness against climate change.

It is evident that both Zaka rainfed and irrigation farmers favoured CSA training, and the study observed positive results in their crop production. Farmers require preparation against hazards using climate information sharing, behaviour change, and training. Public funds should aid constructive small-scale farmer CSA programs to produce large-scale high yields. Although for the Zaka district, it is an area that needs to be prioritized by the Zimbabwean government. Research, educational and advisory capacities are slightly low. It suggests that future climate changes may be generally unfavourable for their production. We should encourage small-scale farmers to welcome CSA programs, but farmers can only embrace the program when technological infrastructure and institutional support are present. The provision of technological infrastructure can foster the farmers to adopt sustainable land, crop, and water management practices. The design of CSA programs in the Zaka district

should also include a segment of integrated pest management systems (IPMS), as this will train the farmers on how to deal with the pests outbreaks.

Denmark, the Netherlands, South Korea, and Japan have successful case studies of sustainable CSA small-scale farmer operations. The farmers in these countries have shown substantial production gains using high-value crops in their field trials (Corsi and Muminjanov, 2019). Governments took the initiative of expanding the irrigation culture amongst small-scale farmers and supplied technological and financial infrastructure (Corsi and Muminjanov, 2019). It included converting dryland areas to irrigation areas and improved water access by investing in proper water infrastructure, installing solar technology, and supplying irrigation equipment (Hartung and Pluschke, 2018). The governments from these countries funded climate educational programs to empower farmers on climate risk management, irrigation methods, controlled crop environment growing, and environmental sustainability (Anabaraonye et al., 2018).

In this context, the study would like to mention that Zimbabwe suffers from power shortages. It is evident in the irrigation farmers' transcripts. To minimise power shortages, it would be in Zimbabwe's best interests to adopt solar technology. Zimbabwe is the best candidate for adopting solar technology as an alternative power source for irrigation. Not only is it sustainably efficient, but it also minimises the water shortages associated with climate-induced hazards, and it ensures that agricultural productivity reaches its full potential (IRENA, 2016). Expanding Zaka farmers' access to human resources fosters sustainable technological innovations that enhance their productivity. Agricultural institutions and the government should encourage climate-agriculture education programs and participatory research to increase the farmers' coping capacity. Although, the measures should be in response to the farmers' challenges and needs addressed in the results presented in chapter five.

Public funding should go to tools and resources that increase skill procurements, informal knowledge, professionalism, and in-service training (Li et al., 2020). The government should build higher education infrastructure within the districts of the Zaka farmers' residences. It will increase certificate and diploma levels for Zaka farmers in agriculture. Participatory and scientific research should be migrated from the workshops to fields to translate knowledge into practice. Farmers are practical learners. It will increase the adoption rates of CSA as

participants will apply new methods and techniques suitable to their needs. Educated and skilled farmers are likely to solve the challenges and implement potential innovations which increase productivity. We have already seen its effectiveness in the literature and the empirical evidence (Mphande, 2016). Public subsidies can be directed to research and training. Institutions can acquire resources and materials to operate their workshops and field practices.

Natural capital is the main foundation of the participants' seed production. The participants face high market demands but deal with low and impaired land and water resources to meet them. More soil and water conservation programs are required to increase productivity. The government needs to incorporate Integrated Water Resource Management (IWRM) plans into its climate policies. It will ensure high food security, and all stakeholders' interests will be met, especially for rainfed farmers. IWRM will assist rainfed farmers in having a secure water supply, and the concept, if applied correctly, will guarantee its sustainability. IWRM will minimise the risks of low perennial crop production for Zaka rainfed farmers. Though, the government must reserve funds for this initiative. It involves a detailed process that requires extensive research on Masvingo's current water resources status, a level of transparency is recommended from water institutions when it comes to monitoring and abstraction of water (UN Water, 2013). Proper water conservation irrigation systems are mandatory to minimise high water usage but still attain high productivity.

Drought-resistant seed is a brilliant initiative, and it works well with Zaka rural farmers. More smallholder programs are needed in Masvingo province to encourage other rural communal farmers to practice agriculture with drought-tolerant crops. Increasing the level of these programs encourages Zaka farmers to adopt new cropping methods. Providing farmers with modern inputs fosters them to manage their fields effectively with less water. The government should fund small-scale farmer projects that yield different sources of income for small-scale farmers. Ways of improving income stability for small-scale farmers are partnering with other private sectors that play a significant role in Zimbabwe's GDP economy, like Delta Beverages Limited Company and Pro-Brands Foods. A beverage company that plays an imperative role in Zimbabwe's economy could be interested in maize production to produce beer beverages for the local population, particularly with the production of Chibuku and Maheu. A company like Delta Beverages could be a potential supplier and sponsor ZSS agricultural smallholder maize schemes and support the farmers by

providing additional technical and financial resources, minimizing the financial burdens of ZSS. With such developments, seed exports will increase and yield in foreign currency. Foreign currency will benefit the farmers, the business, and the nation. Overall, there would be increased food security and employment in Masvingo's rural areas. The scheme will expand to accommodate more farmers to meet the high market demands.

The government needs to increase small-scale farmer livestock production in drought-prone areas. It is already a measure that Zimbabwe Super Seeds plans to adopt, and it is a bright initiative for increasing income stability and food security for small-scale farmers. This measure can provide multiple channels for farmers to obtain their income and develop their specialization. Applying this measure can strengthen the participants' livelihood strategy against climate change because diversification can encourage small-scale farmers to use their land more intensively. It reduces the chance of land being idle, misused, or degraded.

The government, international donors, and other agricultural cooperatives should provide more social institutions that address farmers' wants and concerns, fostering more relationships. A platform that outlines the existing relationships, highlighting all policies, laws, traditions, and customs, needs to be structured to prevent conflict amongst stakeholders (Bebbington, 1999). Zaka farmers need social skills to improve their negotiating power. This notion will increase farmers' access to knowledge, extension services, and productive assets such as marketing information.

Public funds can go towards increasing fixed capital to ensure long-term value. The extension and expansion of irrigation schemes are critically essential. Investing in water sustainable irrigation techniques and equipment increases Zaka rural farmers' chances of maximising crop production. We must develop irrigation infrastructure for the rainfed schemes as they are most affected by climate change compared to irrigation farmers. Designing such measures and systems will reduce their dependence on rainfall and increase annual production. It could consequently yield higher income returns.

Results presented in chapter five suggest that the financial instruments available do not satisfy the Zaka farmers' needs. To increase the participants' access to financial capital, public or private funding in development should be directed towards developing banks in the farmers' residential areas and improving their use of financial technology in promoting

transactions (Oxfam, 2015). Mobile banking is an effective method of technology in facilitating payment transactions. Supplementary credit and payment registries should be improved and installed in farmers' residential areas (Thennakoon, 2010). It cuts down transport costs. Additional improvements can go towards improving credit access and providing financial education. It encourages Zaka farmers' to understand the terms and conditions of accessing credit and educates them on financial decision-making to avoid future debts that will impact their long-term livelihood security.

6.5.2. Adaptive capacity against the Socio-economic climate and COVID-19.

Socio-economic impacts played a counteractive role in farmers' livelihood outcomes. In the context of Zimbabwe, it is a negative macroeconomic trend that requires the same critical attention as climate change. The impacts of the socio-economic climate created substantial elements of uncertainty for Zaka small-scale farmers. Constructive economic instruments are necessary to lessen the risks. One way of mitigating the socio-economic conditions is through the implementation of fixed price controls for price fluctuations. It is a form of price stabilization, putting the prices either or above the minimum equilibrium (Pettinger, 2019). The benefits are that suppliers will stick to prices affordable for the farmers. The drawback of this action is that it could nourish a more moderate supply and potential commodity shortage (Pettinger, 2019). If an oversupply occurs, the government will have to buy a surplus to cater to the demand (Pettinger, 2019). Despite the drawback, the benefit is that it will lead to lower prices for Zaka farmers. It safeguards them from exploitation from monopoly and black markets. This initiative would ensure that farmers' income is less vulnerable and safely make informed decisions about their livelihood strategies.

Zaka farmers do not have adequate tools to handle the effects of the socio-economic climate. Regardless, assistance from the national government can reduce the associated risks. If cash shortages do arise again shortly, the government should increase the withdrawal limits for small-scale farmers. Increasing Zaka farmers' withdrawal limits provides the farmers with a chance to plan and invest ahead. The farmers can budget and make logically informed decisions regarding their households and farms. It lessens the risks associated with the price shocks because they would have the ready income to fall back. Zaka farmers can purchase their agrochemicals, basic amenities, and other inputs, worry less fear about price and

shortages. The current Zimbabwean financial institutions and the national government should make farmers their first business priority, especially farmers that work for government agricultural schemes. The Zimbabwean farmers are the managers of food security, and they contribute to the country's exports.

The impacts of COVID-19 are responsible for thinning Zaka rural farmers' livelihood defences against climate change, chronic poverty, and hunger. Its presence strengthened the farmers' existing vulnerabilities. The Zimbabwean government had already taken short-term measures to reduce the impacts of COVID-19 by executing thirty-day lockdowns. The government had classified agriculture as an essential service sector in sustaining food security for the whole nation (ZELA, 2020). The Ministry of Lands, Agriculture, Water, Fisheries, and Rural Resettlement published guidelines in April 2020 for the resilient food supply chain system during and after the lockdown (ZELA, 2020). It was to ensure that the lockdown caused no food supply shocks. The government had also acknowledged the need to install mitigatory rules and strict hygiene requirements throughout the food supply chain markets. This initiative affected the farmers in their movement for purchasing inputs and distributing seeds while adhering to the social distancing and hygiene requirements in light of the COVID-19 pandemic. It is a good measure for addressing the spread of COVID-19. However, ZELA (2020) argues that it created a floor of monopolies in input production, marketing, and food distribution. The monopolies charged their prices because of being the only distributors, making farmers deal with incalculable charges.

To avoid monopolies, the national government should provide financial and fiscal support to small-scale farmers in procuring inputs, outputs, and credit (ZELA, 2020). Zimbabwean farmers are spending more of their earnings to cover the costs. Agricultural activities, labour, and transportation should allow farmers to remain connected with their input suppliers during austere circumstances. There is already a backlog on production due to the disruption of operations in 2020. Providing the farmers with public transportation will encourage the farmers to continue with productivity. Zimbabwean farmers must have mechanization and automation to lessen their labour constraints. Digital technology is essential for farmers in ordering inputs inclusive of fertilisers and pesticides (OECD, 2020). Zimbabwean farmers can purchase and have the inputs delivered at their farms as it saves the cost of traveling during lockdowns. It is also essential in sorting out financial transactions regarding input and output payments and wage and income payments from institutions (OECD, 2020). The design

of agricultural policies should include large-scale technological investments, digital education support, and encourage farmer input market linkages.

Financial infrastructure needs to be expanded in Zaka areas to increase the digital financial technology as it is necessary to build resilience for farmers against future economic threats. Zaka farmers have primary forms of financial capital (see Figure 5.17). For instance, equipping Zaka farmers with smart mobile phones can save them time and cost to locate inputs. It allows them better entrance to government payment schemes, and they can directly earn their payments.

COVID-19, socio-economic risk management, and climate change policy have made us understand the interrelated risks of small-scale farmers' livelihoods. A comprehensive perception of these risks will help create integrated risk management measures for smallholder farmers, especially farmers that do not have access to productive resources and opportunities (FAO, 2020).

6.6. Conclusion

From the analysis and discussion chapter, it is clear that the amalgamation of pest outbreaks, erratic rains, delayed seasonal rainfall, and high temperatures makes it strenuous for Zaka rural farmers to engage in purposeful agricultural production. Rainfed farmers are indeed more exposed compared to irrigation farmers. The arguments presented here agree with the claims presented in the thematic considerations. In the face of increased climatic conditions, increased crop failure, increased income instability, job insecurity, and increased expenditures, the developments have exposed several Zaka households to high levels of extreme poverty, food insecurity, and low nutrition. We found that the advancement of the socio-economic 2019/2020 and COVID-19 impacts had extended the manifestation of these developments.

Zaka farmers can generate stable income to procure livelihood outcomes such as education, health, emergencies, food, transport, water services, livestock, and personal use. However, their capability is constrained. Despite the onset of hazards, Zaka farmers are active people and use their resources to sustain their livelihoods against such circumstances. They adopted asset combinations comprised of human, natural, and physical capital to deal with the risks to

their crop production and then endorsed financial and social capital to manage the risks targeting their livelihood outcomes. The farmers acquired resources based on institutional factors, affordability, land policies, diversification, and infrastructure, and we are aware that some systems and processes support their adaptation. We are mindful of the structures ZSS adopted and their prospective arrangements. Although, certain aspects of it require more adjustments based on the problems identified.

The results of this investigation were pleasing. There were no regrets in conducting this investigation. The study confirms that climate change will continue to create prospects for small-scale farmers, especially if they adopt reactive strategies to mitigate them. Governments, sustainable livelihood practitioners, and policymakers must continue to assess the level of adaptation of small-scale farmers to climate change. The effects of climate-induced hazards will continue to worsen, yielding more extreme ramifications that will threaten food security and make meaningful production unmanageable to achieve.

The policymakers need to acquire vital information that allows them to monitor and predict future risks. Agriculture is a significant sector in Zimbabwe and the foundation of many rural livelihoods. Thus, we must continue to devise systems to assist rural farmers against future climatic risks. They are the producers at the forefront of increasing food security. Therefore, understanding the challenges they face and detecting what is mandatory for their adaptation is significant to improving resilience at a community and national level.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

'*It is strange that only extraordinary men make the discoveries, which later appear so easy and simple'. –*
Georg C. Lichtenberg
(1742-1799).

7.1. Introduction

This chapter discusses the various avenues through which adaptive capacity can be enhanced for small-scale farmers in Masvingo, Zimbabwe. It is in light of the significance of climate change in Zaka farmers' income generation issues. The chapter accordingly surveys the diverse ways in which we can revise Zaka farmers' adaptation.

The study found that the empirical evidence agrees with the thematic considerations. Indeed, the amalgamation of climate-induced hazards has fostered a series of developments such as enhanced crop failure, raised income instability, job insecurity, and increased expenses. On top of that, the Zimbabwean socio-economic climate (2019-2020) and COVID-19 impacts have exposed several Zaka rural households to high poverty incidences. However, we can see that despite these advancements, Zaka farmers continue to actively defend their livelihoods using a combination of assets such as human, physical, and natural capital to promote their crop production and a merger of financial and social capital to improve their income generation.

In light of the above viewpoints, the current chapter sought to provide recommendations for practitioners, policymakers, and academia to foster an intercession through which adaptation can hopefully improve. The chapter begins by presenting a summary of the research findings, with the implications of the findings in the context of Southern Africa, accompanied by the

overall conclusion of the research study. Recommendations to improve adaptation for Zaka farmers are presented along with the possible areas of future research.

7.2. Summary of Research Findings

The study was acquainted by the main research question and subsequent questions:

I. How do water scarcity and drought episodes affect the livelihood outcomes for small-scale farmers in Zaka District in Masvingo province?

7.2.1. Subsequent Questions

I. What livelihood assets are accessible for small-scale farmers in adapting and sustaining their livelihood outcomes against water scarcity and drought?

II. What other constraints do small-scale farmers face in adapting to water scarcity and drought?

III. What institutional systems, structures, and processes are in place in which the small-scale farmers' adaptive capacity and resilience in Zaka District can be pursued?

IV. What are the implications of the findings of this study in the broader context, particularly in Southern Africa?

7.2.2. The effects of water scarcity and drought on the livelihood outcomes for small-scale farmers in Zaka District.

The study's main research question was to investigate the effects of water scarcity and drought on the livelihood outcomes for small-scale farmers in the Zaka District in Masvingo province. The study answered the research question in the empirical evidence chapter. The study found that the combination of pest outbreaks, high temperatures, erratic rains, and delayed seasonal rainfall made it difficult for Zaka rural farmers to make meaningful agricultural productivity. Rainfed farmers are more vulnerable than irrigation farmers due to their reliance on inaccessible precipitation. Such hazards have fostered increased income instability, job insecurity, and increased expenditures. The advancements made it difficult for Zaka farmers to generate income to sustain their livelihood outcomes such as education, health, emergencies, food, transport, water services, livestock, and personal spending. In the face of increased climatic changes, income instability, job insecurity, and heightened expenditures, this expansion has resulted in rural household exposure to poverty. The

implication is that increased climate-induced hazards will worsen farmers' livelihood outcomes putting Zaka farmers in jeopardy. If there are no strategic measures that target income insecurity, job insecurity, and increased expenses for the farmers, agricultural schemes may experience breakdowns. It will erase the ten-year food security and employment progress that the agriculture sector has made.

7.2.3. Livelihood assets that are accessible for small-scale farmers.

The second research question was to investigate the livelihood assets accessible for small-scale farmers in adapting and sustaining their livelihood outcomes against water scarcity and drought effects. The study achieved this objective in the empirical evidence chapter. The study found that despite the livelihood impacts climate change created, Zaka rural farmers are not passive actors but were actively looking for ways to adapt to the impacts of climate change-induced weather events. One way is through the manipulation of the five assets. Zaka farmers adopted asset combinations comprised of human, natural, and physical capital to improve crop production and endorsed financial and social capital to manage the risks targeting their livelihood outcomes. The resources are available but are subject to institutional factors, affordability, land policies, limited diversification, and financial infrastructure. Zaka rural farmers who are formally attached to ZSS have systems and processes that support their adaptation. The conclusion is that farmers cannot cope with climate change without all five assets. Each asset is imperative, and one cannot function without the other. The reality is that rural farmers need a formal attachment to institutions to acquire long-term access to assets. It is clear, without institutional support, farmers have little to no resources to develop fixed livelihood strategies on their own.

7.2.4. Constraints small-scale farmers face in building adaptation against climate change.

Question three of the research questions was to investigate the other constraints small-scale farmers face in adapting to water scarcity and drought. The study observed that the socio-economic climate 2019/2020 and COVID-19 were constraints to Zaka farmers' adaptation. Zaka farmers faced cash shortages, farm thefts, slow revenue collection, price volatility of inputs and commodities, mobility restrictions, risks of exposure to the COVID-19 virus, which weakened their livelihood strategies and resource base. The implication is that without proper proactive measures in place, Zaka farmers' livelihoods remain susceptible to external

shocks because they lack the means to deal with circumstances beyond their control. Even for irrigation farmers, their livelihoods are not outside the impacts of the socio-economic climate and the COVID-19 pandemic. Zaka farmers are deeply concerned about these shocks because they fear income discontinuity. Income discontinuity is a critical factor that requires careful consideration when devising adaptive measures. Farmers have to use their previous earnings or savings to meet the harsh economic demands forcing them into the path of poverty.

7.2.5. Institutional systems, structures, and processes supporting adaptive capacity.

The fourth question of the study was to identify the institutional and policy framework through which adaptive capacity and resilience of poor rural people can be promoted with interpretation measures for small-scale rural farmers. The question was achieved in chapter two and chapter five. The study found several systems that encouraged adaptation for small-scale farmers.

The systems are :

I. Providing drought-resistant seeds to the farmers. Studying the seeds and teaching the farmers how to grow and harvest them.
II. Providing education and training on climate-smart agriculture and water use efficiency to the farmers. Equipping farmers with farming tools would aid in achieving high productivity.
III. Providing market support, that will enable farmers with a yearly payment. It would support the initiative of poverty alleviation and promotion of food security for the region.
IV. Studying the various diseases and pest outbreaks and researching alternatives.

These initiatives are the systems in place that facilitate the adaptation process for Zaka small-scale farmers. Applying these initiatives fostered positive livelihood changes. It provided job security, income, direct market access, land, and training. These outcomes equipped the farmers to be better prepared against the risks of climate change. However, farmers' livelihoods are still susceptible to the effects of climate change and non-climate-related shocks. There is a lack of adequate financial resources from the institution to keep the measures sustainable.

Zimbabwe Super Seeds as an institution has proposed additional structures that require reform in the ZNCP policy for increasing small-scale farmers adaptive capacity, and these are namely:

I. Improve on physical, human, financial, and natural capitals.
II. Increase the adoption of climate smart agriculture- practicing more conservation agriculture and shifting agriculture.
III. Shifting from subsistence to commercial agriculture- increase land plot sizes and redesign irrigation schemes to suit commercial markets.

The proposed alternatives do possess advantages that fostered adaptive capacity for small-scale farmers. Although some factors need to be carefully considered by the policy makers to ensure full effectiveness of their climate policies.

7.2.6. Implications of the findings in the context of Southern Africa

The impacts of water scarcity and drought episodes negatively alter the facets that support the farmer's livelihood security. Like a domino effect, as one facet is affected, the other facets become affected. In this context, water scarcity and drought episodes altered Zaka farmers' crop production, which modified their crop payment. An adverse alteration on their crop payment restrains the farmers' from performing the daily tasks necessary for their survival. The implication of this in the Southern African context is that as long as rural farmers remain reliant on perennial crops, their livelihoods will remain susceptible to the effects of climate change because it is the source of their income. The study finds irrigation a proper coping mechanism in reducing low crop productivity, but if there is an interruption with irrigation, farmers' crops and livelihoods become exposed to the vulnerability indices.

Resources are available to the rural population, but each resource comes with calculated conditions set by governing factors and institutions. Although, the determinants are context-dependent. Zaka farmers' resources were available based on institutional factors, affordability, land policies, limited diversification, and financial infrastructure. These findings cannot be extrapolated to other case studies, as each case study is unique in the context of resource accessibility. The meaning of these findings in the context of Southern

Africa is that the governing institutions and governing factors either have a positive or negative relationship with farmers' accessibility. The relationship could either foster improved resilience or increased vulnerability. If the governing institutions and governing factors do not support the increase of access to resources to farmers, it minimises the effectiveness of their livelihood strategies to shield them from climate change and poverty effects.

Rural farmers face different types of complications in their livelihoods. These complications come from the current trends taking place in their environment. In the study, Zaka farmers had to deal with the impacts of the socio-economic climate and COVID-19. It was a challenge because they did not have the means to cope. Besides, there were no existing systems and structures to help deal with the effects. The current systems in place only address the impacts of climate change. The implication of this finding in the Southern African context is that if there are no additional adaptation structures to cater to negative economic trends, the farmers will be susceptible to high poverty incidences.

Policymakers need to devise an integrated plan that demonstrates how rural populations in the agricultural sector should cope with the effects of the socio-economic climate and COVID-19. In Southern Africa, many policies address climate change for the various sectors in the country. Although, there are no policies that explain how agriculture should cope with inflation, price volatility, cash shortages, lockdown restrictions, and risks associated with COVID-19 exposure. An integrated plan that caters to the socio-economic climate and COVID-19 trends fosters strategic adaptation plans that governing institutions will adopt to safeguard rural farmers from its effects. Systems and structures need to protect rural farmers from socio-economic and health-threatening circumstances. Rural farmers are food producers of the country. Protecting their livelihoods is key to maintaining food security for the nation.

The structures and systems are formulated by the country's climate change and development policies. The current systems only provide generic adaptation. The current systems are satisfactory but not effective for the long term. The environment is invariably changing, and it is evident with the onset of the COVID-19 global pandemic. The lack of preparedness against COVID-19 has put the institution and small-scale farmers of ZSS in a reactive state, whereby they are working on short-term measures to cope with the immediate risks while developing long-term measures for future risks. Whether the proposed measures will ensure

resilience in the future is a different question. Therefore, for future planning, systems and structures need to be continuously readjusted to suit the environment.

7.3. Conclusion

In conclusion, the study answered all the objectives presented in the frames of reference. The research agrees with the thematic considerations in that climate change is a fractious hazard that worsens the state of livelihood outcomes for small-scale farmers. The study cannot assume that the findings apply to all the other rural farmers across the globe. Nevertheless, the study provided a picture of the vulnerabilities rural farmers endure with climate change.

Remember that the findings only apply to Zaka farmers from Wards 1-3 and 15, and they are interpreted based on their experiences and interpretations of climate change. The conclusions do not provide information on how other farmers, particularly communal farmers in Masvingo and other districts, are progressing or whether their experiences are similar to those described in this study. More qualitative exploratory research is required to comprehend the livelihood-vulnerability-adaptation reality in Zimbabwe and other developing countries. The study finds that governments propose adaptation measures in policy but lack effect on the ground.

Income generation, employment, and debts are significant constituents that require attentiveness in the adaptation debate. The study can see why some common themes amongst practitioners and academics are the angles to tackling vulnerability. If sustainable practitioners do not find ways to decrease vulnerability attributes in livelihoods, there will be little progress in achieving adaptation at the community scale. Income is the one resource that provides mobility for farmers to explore their livelihood outcomes. The sad reality is that its development is subject to climatic conditions for rural farmers. Rural farmers know how to maximize profits through crop production, but it is not a sustainable profit alternative. Employment provides livelihood stability. It is comforting for farmers to have an institution that supports them with resources that improve their livelihood conditions. The last thing they want is to lose that attachment because of climate change. The study can see for Zaka farmers that employment is a factor they deeply care about, and it is a constituent that the government should prioritize for other farmers that are not part of the ZSS scheme.

Adaptation is not a straightforward concept. There are indeed different perspectives of it, and its application is subjective. The study finds that a community's adaption to climate change is subjective even if they possess all five capitals. The misconception in the literature is that a community's livelihood is exempt from climatic conditions if they have all the five resources presented in the SLAF framework. The study recognized that farmers can still be vulnerable despite having resources. The study agrees with the theoretical perspectives and literature review. Assets are the critical components to building adaptive capacity, but it does not guarantee resilience.

The study coincides with Katherine Vincent (2007) that having all the assets does not translate to long-term adaptation against internal and external vulnerabilities. It translates to generic adaptive capacity. The study accepts that the effectiveness of adaptive capacity depends on the depth and intensity of the aggravating stressors operating in the environment. Problem-solving on each aggravating stressor is required. Sustainable practitioners can identify the root cause, repetitive nature, characteristics, and level of damage, then draft adaptation measures. All the stressor's possible forms would have been thoroughly exhausted. However, even doing this does not guarantee adaptive capacity. It just points practitioners to the entry points. The study believes that tackling each aggravating factor minimises the current damages. Strategic solutions can be created and tested to provide resilience for small-scale farmers. Unfortunately, this will take time because the environment is consistently changing, and it is difficult to predict the nature of hazards. More extensive research on uncertainties, dangers, and adaptation in livelihoods is required. It is an ongoing relationship that requires continuous evaluation.

7.4. Recommendations

The study suggests several recommendations towards achieving adaptive capacity for small-scale farmers within rural settings. The findings in chapter five propose that the level of adaptive capacity for small-scale farmers is satisfactory. Zaka farmers have an institution that can assist the farmers with their needs, and to some degree, they have adequate access to assets. Although it does not exclude them from vulnerability, they are active actors in building their adaptive capacity. Here is a summary of the measures to improve adaptation, considering the constraints and challenges Zaka farmers face in their environment.

I. The government, private sector, and agricultural institutions need to design integrated pest management systems. IPMS aims to contain the pest populations below the economic damage level. IPMS will assist farmers in deciding whether an action is required. It will help them monitor and recognize pests that are a threat or non-threat at an earlier stage. IPMS will prevent pest outbreaks by encouraging farmers to adopt effective and cost-efficient methods that apply control measures. IPMS will aid in minimizing the risks in crop production.

II. Water is a critical resource in agriculture. Whether it comes as rainfall or water from the dam, ensuring its security is necessary for securing livelihoods. There is a need to design robust integrated water management systems (IWRM). IWRM ensures that the current water resource systems promote the country's social, economic, and ecosystem development. IWRM is a key to improving adaptive capacity for small-scale farmers, particularly for dryland farmers. Thus, small-scale farmers should be involved in the participatory approach. The government should allocate funding to land and water development assessments. Zaka district does have an ample share of drought transferring from rainfed to irrigated agriculture can relieve this. Designing irrigated systems could prevent future systematic, market and credit, and water scarcity risks for the small-scale farmers. Finding a convenient and secure water supply is key to improving their coping capacity against drought.

III. Another important recommendation to the national government is that the agricultural policy should address land flexibility for small-scale farmers. Farm size plays a significant role in agricultural productivity and adaptation.

IV. Innovations and technologies of CSA practice need to be adopted and spread out throughout the country. The government need to direct their public funding towards crop and livestock diversification.

V. The government needs to ensure that small-scale farmers have access to timely weathered information and weather insurance indexes. Small-scale farmers need the opportunity to utilise varied resilient seeds and practice livestock rearing. The problem is that many farmers are aware of the benefits of drought-resistant seeds, but the majority of them are not exploring all of them to their full potential. The government should continue to promote CSA agriculture through public extension programs. Although, the effectiveness of CSA needs to be met with sufficient financial funding.

VI. Microfinance is significant to climate adaptation. Zimbabwean climate and agricultural policies needs to address the traditional structure of financial systems in areas receptive to climate change. Developing traditional financial design outlines the missing elements needed to make financial services sustainable for small-scale farmers. Financial institutions and the government should make farmers' income one of their main priorities.

VII. Fixed-price controls are imperative, especially during periods of hyperinflation and price volatility. The government can assist in implanting fixed price controls on critical farm inputs, especially with the Grain Market Board when the economy is unstable. Farmers do not have the bargaining power to negotiate input prices. The majority of their income is for sustaining basic household amenities. The farmers have very little or no room at all to finance inputs. With fixed-price controls, farmers have a chance to budget, save and prepare. If all the other variables, including land size, seeds, water, are met, farmers will have survival chances to produce meaningful agricultural production.

VIII. There is a need to strengthen and expand the input support program (ISP) because the current input subsidies from institutional-government arrangements have weakened to yield low meaningful gains. Results suggest that farmers struggle with accessing fertilizers and pesticides due to commodity shortages and price fluctuations. Delays in the administration of inputs and ineffectual input packages render adaptation to climate change less productive.

IX. The government should provide social protection and safety net interventions to strengthen rural livelihoods, especially vulnerable groups from the socio-economic climate and COVID-19.

7.5. Future Research Areas

The impacts of climate change on small-scale farmers' livelihood portfolios in Zimbabwe remains an under-researched phenomenon. There is a need to have more climate change adaptation-vulnerability studies investigated because climate change is an ongoing phenomenon that will continue to yield future risks and uncertainties for rural livelihoods. The future risks and uncertainties are unpredictable, and thus looking at livelihood-vulnerability studies presents a framework that outlines the areas where adaptation is critical.

This principle in itself will generate positive outcomes by recognizing and perhaps eliminating any possible future barriers to adaptation.

But of paramount importance, there is a need to:

I. Firstly, conduct qualitative and quantitative research on the remaining wards governed by Zimbabwe Super Seeds that remained unexplored due to the COVID-19 pandemic. Investigating the other wards growing different seeds other than maize will provide a deep-seated and more comprehensive status regarding the levels of vulnerability, food security, and adaptation of small-scale farmers' livelihood outcomes. The data will provide vulnerability and adaptation issues that may not have been incorporated in this investigation but serve as a foundation for adjusting Zimbabwe's National Climate policies.

II. The power of institutions in building small-scale farmers' adaptive capacity requires exploration. The findings show that institutions play an influential role in small-scale farmers in guiding their coping measures against internal and external shocks and yet the concept of institutionalism, agriculture, and adaptation remains poorly understood in the climate change debate.

III. An investigation on the effects of COVID-19 and other extreme shocks on small-scale farmers' livelihoods is a phenomenon that requires in-depth exploration. Shocks continue to affect rural farmers significantly. We must learn how the farmers coping with the aftereffects of COVID-19 in other countries to conclude how we should strategise adaptive capacity and include it in climate change policies.

IV. More qualitative studies about how policymakers perceive adaptive capacity for small-scale farmers are required. They are the fathers at the forefront of climate change and agricultural policies. Understanding their perceptiveness provides a picture of how they identify critical areas and design initiatives to improve them. It provides insight into whether they have the financial means to support the initiatives for the Sustainable Development Goals Agendas.

V. More studies on asset attributes are required. There is an ample amount of investigations on the influence of access on small-scale farmers' adaptive capacity. There are less investigations on the influence of asset attributes on small-scale farmers' adaptive capacity.

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Appendices

Appendix 1

University of Witwatersrand Human Research Ethics Committee Approval Letter (Non-Medical)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Mpala

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H19/05/15**
PROJECT TITLE	Perspectives on adaptation to water scarcity and drought of small-scale farmers in Masvingo, Zimbabwe
INVESTIGATOR(S)	Miss T Mpala
SCHOOL/DEPARTMENT	Geography, Archaeology and Environmental Studies/
DATE CONSIDERED	24 May 2019
DECISION OF THE COMMITTEE	Approved Permission letters required before data collection can commence
EXPIRY DATE	03 October 2022

DATE 04 October 2019 **CHAIRPERSON** _____
(Professor J Knight)

cc: Supervisor : Professor M Simatele

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ _____/_____/_____
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

Appendix 2

Approval Letter from Ministry of Lands, Agriculture, Water, Climate and Rural Settlement

All correspondence should be addressed to
"The Permanent Secretary"
Telephone: 706081/9
Fax: 734646

Telex: ZIM AGRIC: 22455 ZW

MINISTRY OF LANDS, AGRICULTURE, WATER, CLIMATE AND RURAL RESETTLEMENT
1 Borrowdale Road
Private Bag 7701
Causeway
Harare

15 March 2019

TO WHOM IT MAY CONCERN

RE: Request for Assistance for Thandiwe Mpala to Perform Field Research in Zaka District

This letter serves to introduce Ms Thandiwe Mpala to you, a PhD student who has been assigned by the Climate Change Management Department to carry out climate change related studies in preparation for her PhD and also present the findings for national reporting to the United Nations.

The Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement, Climate Change Management Department has no objections to Thandiwe Mpala doing her Ph.D. field research in Zaka District, Masvingo to complete her Ph.D. degree at the University of Witwatersrand.

I would like to inform you that the information provided will be treated as confidential and will not be used for any other purposes apart from the fulfilment of the Ph.D. degree.

Should you require any clarifications on this exercise please do not hesitate to get in touch with, Mr Washington Zhakata, Director, Climate Change Management Division, on 04-701681/3, 701691/2.

Washington Zhakata
Director, Climate Change Management Department
For: Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement

DIRECTOR-CLIMATE CHANGE MANAGEMENT
Min of Environment, Water & Climate
15 MAR 2019
P. BAG 7753, CAUSEWAY, HARARE
ZIM. TEL: 04-701681-2/701691-3

Appendix 3

Zimbabwe Super Seeds Contract

Zimbabwe Super Seeds
Seed Production Agreement
(to be completed in duplicate)

This contract is made between Zimbabwe Super Seeds and ____ Ltd_____ of _____ for the production of seed of ____**Maize ZM521_____.**

The conditions of this contract agreement by which the seed crop will be grown are as follows.

Technical

1. The farmer belongs to a farmer group that is benefiting from the Zimbabwe Super Seeds programme. He/She has seen and he/she supports the group contract.
2. The farmer agrees that he will attend all Zimbabwe Super Seeds meetings and that all crop production activities will be followed in accordance with Zimbabwe Super Seeds recommendations and instructions.
3. The company shall provide __50___ kg of stock seed to the Farmer wherefrom the Farmer shall produce a seed crop from the said stock seed and seed crop grown therefrom at all times to remain the property of Zimbabwe Super Seeds.
4. The stock seed shall be provided to the Grower at a cost of US$0.6_____ per kg.
5. The farmer is expected to obtain a minimum yield of _____ 3500kg/ha (__50__ kg from __2ha).Failure to attain this target will result in decreased profits for the farmer.
6. The Farmer agrees that he shall at his own expense and in a proper manner sow, cultivate, weed, spray, harvest, thresh and clean the said seed crop.
7. The Farmer will be required to grade the harvested seed to remove foreign matter, rotten, discoloured, damaged or under-developed seed and insects. The seed should be at a maximum 12 % moisture content, consist of 99 % pure seed and have a minimum germination of 90 %.

Financial

8. In the event that seed and fertilizer are supplied on credit to the farmer by Zimbabwe Super Seeds and at ruling cost price at time of delivery, it will be recovered at delivery of the seed crop.
9. Repayment of all inputs will be done with an equivalent value of the seed crop.
10. The farmer will be instructed to deliver the seed to a central collection point by Zimbabwe Super Seeds supervisor. All repayments will be completed within 30 days after delivery.
11. Zimbabwe Super Seeds reserves the 'right of first refusal' on the seed produced ***in excess*** of the input repayment amount. This means that the farmer must first offer the surplus produce to Zimbabwe Super Seeds before selling to another market.
12. It is not possible to predict the price for the seed at planting and therefore Zimbabwe Super Seeds cannot advise the farmer the price in advance. The farmer is advised that the price as at ___15 December 2017_____ is US$___600.00_____ per tonne. At harvest the price may be greater or less than this indicative price.

Conditions

Conditions

1. The crop is being grown for seed, and must be kept pure and free from any mixtures with other crop seed.
2. The farmer agrees to allow Zimbabwe Super Seeds officials to weigh all of the seed that is harvested from his plot
3. The farmer agrees to deliver the full amount of seed harvested from his/her field to Zimbabwe Super Seeds.
4. If the farmer does not deliver the required amount of seed to cover the value of loaned inputs, he agrees to repay his loan in some other way that is acceptable to him and Zimbabwe Super Seeds.
5. Side-marketing occurs when the farmer sells the seed crop to another buyer before notifying Zimbabwe Super Seeds. If the farmer is found to be side-marketing he will be prosecuted in the traditional or civil courts.
6. If the farmer does not repay his input loans he may be excluded from future programmes. He also puts his group at risk of losing Zimbabwe Super Seeds support in future.
7. The farmer guarantees to use all inputs on the contracted crop of seed.
8. The farmer will supply any extra management required in the growing of the seed crop.
9. The farmer agrees to permit representatives of Zimbabwe Super Seeds free access to his/her fields without prior notice for inspection of the seed crop.
10. The Grower shall permit the Company and the Seed Services to withdraw crop seed samples for testing before acceptance of the seed by the Company.
11.

If you wish to grow seed on the above terms and conditions please complete this form and return it to the company before ___/____/_____so that your quota of _____ ha can be reserved.

Farmer's Name__ (ID No.:_____N/A_____)
Signature_____

Date: ___19__/_11____/__2017_____

_____
For Zimbabwe Super Seeds
Date: ___19__/_11____/__2017_____ : Address :22 Marula Street, Rhodene, Masvingo.
Phone:0772125022

Appendix 4 A

Focus Group Questions

Focus Group Discussion Guide for the Seed Farmers

University of the Witwatersrand

Faculty of Science

School of Geography, Archaeology and Environmental Studies

Research Topic: Perspectives on adaptation to water scarcity and drought of small-scale farmers in Masvingo, Zimbabwe

Research Objectives

I. Identify the impacts of climate induced hazards on small-scale farmers household livelihoods portfolio.

II. Establish ways and means through which small- scale rural farmers adapt and build their resilience against water scarcity and climate extremes.

III. Identify the different asset combinations that play a key role in building adaptive capacity against climate change and water scarcity.

IV. Identify the institutional and policy framework through the which adaptive capacity and resilience of poor rural people can be promoted with interpretation measures for small- scale rural farmers.

INTERVIEW PROCEDURE

Open – ended questions will be utilized with additional probing questions employed to obtain clarity.

A. Perceptions and Realities of Drought and Water Scarcity

1. What is your understanding of climate change?
2. How has drought affected you as farmers and your livelihoods? What are the experiences you went through with drought?
3. How did you know that this was drought?
4. How is the water situation in Zaka?
5. Where do you source your water for farming and feeding your family from?
6. What resources do you use to support your farming and households? Which ones are important to you?
7. How has the water situation affected you as farmers and your family?
8. What is the status of food security within your community/family?
9. What opportunities can you identify that would aid your community adapt to climatic changes?
10. What do you do to survive in the face of climate change and water scarcity?

B. Local institutions and their assistance in helping farmers cope with drought and water scarcity?

1. Do you think farmers should be involved in the decision making with institutions when it comes to solving problems to do with droughts and water scarcity? (Please explain)
2. Do you own land for farming? (Please explain how you acquired it if your response is yes and why if no)
3. How would you describe your experience working with institutions as a farmer? Have they been helpful in solving issues with water and farming?

4. What has been the role of institutions especially local ones in enhancing farmers adaptation to drought and water scarcity?

C. Capacity development

1. As a community, what role do you think you can play to ensure food and water security?
2. As a community, what can be done to strengthen the role of farmers in ensuring food and water security?
3. Have you had opportunities availed that have enhanced your awareness on climate change? (state the type of organisation/institution that offered the forums)
4. What do you think Capacity development institutions need to do to secure farmers livelihoods in the face of climate change?

Appendix 4 B

Interview Questions for Management

Interview Guide for Key Informants- Seed Farming Management

University of the Witwatersrand

Faculty of Science

School of Geography, Archaeology and Environmental Studies

Research Topic: Perspectives on adaptation to water scarcity and drought of small-scale farmers in Masvingo, Zimbabwe

Objective: Identify the institutional and policy framework through the which adaptive capacity and resilience of poor rural people can be promoted with interpretation measures for small- scale rural farmers.

INTERVIEW PROCEDURE

Open – ended questions will be utilized with additional probing questions employed to obtain clarity.

A. Demographic Information

1. What is the name of your organisation?
2. What is your current position in your organisation?
3. How long have you worked for this organisation?
4. How did this organisation called the Seed Farming Project come about?

1. Basic Understanding of the systems in place in the Seed Farming Project

1. How many farmers in the Seed Farming Project?
2. How do you recruit the farmers in to the Project?
3. Is Zaka the only district with the Seed Farming Project?
4. What resources does your organisation provide for the seed farmers in your project?
5. How many hectares of land do these farmers farm?
6. What type of seeds do the farmers grow?
7. Are there any additional activities that the Seed Farming Project does other than farm the crops?
8. How do you monitor the progress of these farms and the farmers?
9. Where do you acquire your bulk water supply for irrigation?
10. How is the water infrastructure structured? What kind of irrigation systems do you in place?
11. How is the water shared amongst the farmers?
12. What happens when the crops are ready for harvest?
13. How has crop production been over the last ten years?
14. Does your organisation provide them with a link to the market?

B. Knowledge and action on climate change

1. What is your general view of climate change in Masvingo?
2. What challenges does your organisation face in combatting drought and water shortages?
3. Are there any gaps in the Zimbabwe National Climate policies that you feel need to be addressed?
4. What adaptation measures has your organisation put in place to counter the challenges associated with drought and water scarcity?
5. What would be your best view of adaptation for the seed farming project?

C. Knowledge and action on climate change adaptation for food security

1. What are your views with regards to the role of farmers in attaining food and livelihood security?

2. How can rural farmers be strengthened to achieve food and water security and what has your organisation done in helping with food security in Zaka?

Appendix 4C

Interview Guide for Zaka Farmers



Interview Guide for Key Informants- Zaka Seed Farmers

University of the Witwatersrand

Faculty of Science

School of Geography, Archaeology and Environmental Studies

Research Topic: Perspectives on adaptation to water scarcity and drought of small-scale farmers in Masvingo, Zimbabwe

Objective 1: Identify the impacts of climate induced hazards on small scale farmers livelihoods portfolio.

Objective 2: Establish the ways and means in which small-scale farmers adapt and build resilience to drought and water scarcity.

Objective 3. Identify the different asset combinations that play a key role in building adaptive capacity.

INTERVIEW PROCEDURE

Open – ended questions will be utilized with additional probing questions employed to obtain clarity.

A. Farming in Zaka district

1. How old are you?
2. When did you start farming and how did you hear about the project?
3. What do you farm?
4. Do you farm by yourself or you farm with your family?
5. What resources do you use for farming?
6. Since you joined the seeds Project in Masvingo? Has it helped you? If yes how has it helped you? If no, please kindly explain why?

B. Perceptions and Realities of Drought and Water Scarcity

1. What is your understanding of climate change?
2. How has drought affected you as a farmer?
3. How did you know that this was drought?
4. Where do you source your water from?
5. How has the water situation affected you as a farmer?
6. What opportunities can you identify that would aid your community adapt to climatic changes?

C. Assets and Methods of Adaptation

1. What resources do you use to help your farm in the times of drought and water scarcity?
2. Have these resources helped you in fighting against drought and water shortages?
3. If yes- How have they helped you?
4. If no- Why haven't they helped you?
5. Which resources would you have wanted more of to help you as farmer produce and to help you maintain your family's needs?
6. What other strategies do you use to defend your crops against drought and water scarcity?
7. What challenges do you face in defending your crops against these climate conditions?
8. What social challenges do you face at home with your family?

D. Seed Farmers Association

1. I heard there is a Seed Farmers' Association that has helps with representation and addressing issues that your face with your farms?
2. Has this association helped you? And how has it helped you?