

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SOCIAL SCIENCES AND HUMANITIES

PEACE AND GOVERNANCE



***EVALUATING THE EFFECTS OF CLIMATE CHANGE ON FOOD SECURITY: A
CASE STUDY OF CHIMANIMANI, ZIMBABWE.***

By

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR BACHELOR OF SCIENCE HONOURS DEGREE IN PEACE
AND GOVERNANCE**

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March 2025

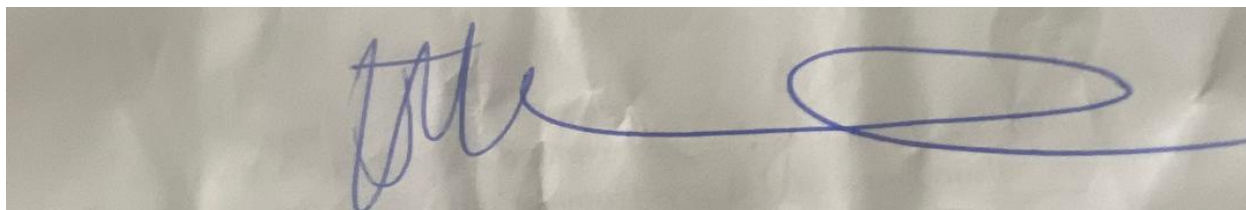
ABSTRACT

Climate change poses significant threats to food security in Zimbabwe, particularly in rural areas. This study examines the impacts of climate change on agricultural practices and food production in Chimanimani, Zimbabwe. Using a qualitative research approach, the study explores the experiences and perceptions of smallholder farmers and household heads. The findings reveal that climate change has led to changes in temperature and precipitation patterns, resulting in reduced crop yields and increased food insecurity. The study identifies several adaptive strategies and coping mechanisms employed by farmers and households, including conservation agriculture and climate-smart agriculture. The study concludes by proposing several policy recommendations to enhance resilience and sustainability in food production systems.

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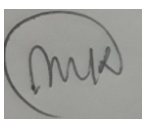
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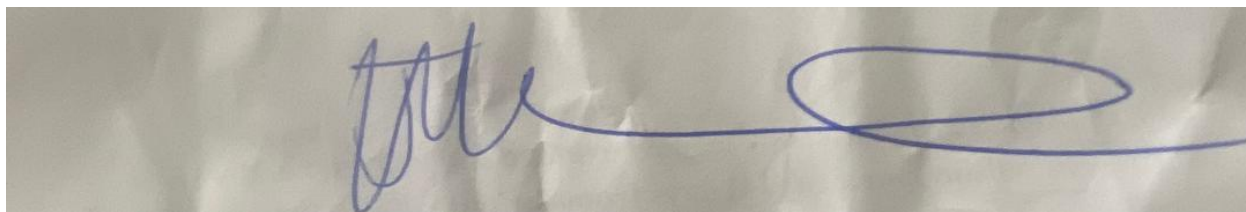


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DEDICATION

To my family, whose love and support made this journey possible.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor, for guidance and support throughout this research journey. I also acknowledge the contributions of my participants, who shared their experiences and insights with me. Additionally, I thank Bindura University providing resources and facilities to support my research.

LIST OF ABBREVIATIONS AND ACRONYMS

FAO:	Food and Agriculture Organization
IPCC:	Intergovernmental Panel on Climate Change
MoALGR:	Ministry of Agriculture, Lands, and Rural Resettlement
NGOs:	Non-Governmental Organizations
UNDP:	United Nations Development Programme
ZINWA:	Zimbabwe National Water Authority

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Climate change significantly affects global food security and water availability. This has created barriers to achieving Sustainable Development Goals, this study pays particular attention to SDG 15, 2 and 6. According to the Intergovernmental Panel on Climate Change (IPCC, 2022), rising temperatures and new rainfall patterns threaten agricultural productivity particularly in vulnerable regions (IPCC, 2022). The IPCC (2022) report emphasizes that climate-related impacts disrupt food systems, leading to increased food insecurity and malnutrition. FAO (2021) report explores these dynamics noting that climate change exacerbates existing vulnerabilities in food production, especially in developing nations. Their analysis indicates that shifts in climatic conditions can result in crop failures, thus impacting livelihoods and food access (FAO, 2021). This creates a cyclical challenge where diminished food security leads to increased pressure on water resources, complicating efforts to secure adequate hydration and sanitation.

Regional organizations like the African Union (AU) and the Economic Commission for Africa (ECA) emphasize the critical intersection of climate change and food security in Africa. The AU (2021) emphasizes that climate variability could reduce agricultural yields by up to 50% by 2030, severely impacting food availability across the continent. Similarly, the Economic Commission for Africa reports that approximately 256 million people in Africa are currently food insecure, with climate change exacerbating this crisis through increased droughts and erratic rainfall patterns (ECA, 2022). ECA further notes that agricultural sectors which employ over 60%

of the continent's population are particularly vulnerable emphasizing the urgency of adopting climate-resilient agricultural practices. These statistics illustrate the dire implications of climate change on food security and stress the need for comprehensive strategies to mitigate these challenges and promote sustainable development. Southern African Development Community (SADC) has also highlighted implications mentioning that climate change disproportionately affects southern Africa, where many depend on rain-fed agriculture (SADC, 2020).

The Zimbabwe National Climate Policy highlights the alarming potential for climate change to reduce agricultural productivity by 10-20% by 2050, threatening food security in a nation where approximately 70% of the population relies on agriculture for their livelihoods (Government of Zimbabwe, 2019; Ministry of Agriculture, 2020). Zimbabwe's Nationally Determined Contributions (NDCs) commit to reducing greenhouse gas emissions by 33% by 2030, integrating adaptive strategies to bolster resilience in agriculture (Government of Zimbabwe, 2020). The Food and Nutrition Security Policy reveals that over 5.3 million Zimbabweans face food insecurity annually, highlighting the need for cohesive approaches that connect climate adaptation with food availability (Ministry of Lands, Agriculture, Fisheries, Water and Rural Resettlement, 2021). Collectively, these frameworks reflect a proactive stance aimed at fostering sustainability and securing livelihoods. This shows the need for integrated policies that address the complex interplay between climate change and food production.

The impacts of climate change on food security in Chimanimani are illustrated by several assessments and studies. The 2021 Chimanimani District Vulnerability Assessment conducted by the Zimbabwe Vulnerability Assessment Committee (ZimVAC) reveals that approximately 60% of households are food insecure, largely due to climatic shocks such as droughts and floods, which have resulted in a 30% reduction in crop yields over the past decade (ZimVAC, 2021. Nyoni (2020)

in his study found that over 70% of local farmers experience adverse effects from climate variability, emphasizing the urgent need for community-based adaptation strategies, however, Oxfam (2021) reports that up to 40% of households have resorted to emergency coping mechanisms such as reducing meal sizes due to compounded food insecurity and economic instability. The Zimbabwe Environmental Law Association (ZELA, 2022) notes that 70% of farmers lack access to climate-resilient seeds. This study was essential as it addressed the critical link between climate change and food security in Chimanimani where a significant portion of households face food insecurity due to climatic shocks. With rising temperatures and changing rainfall patterns threatening agricultural productivity, there is an urgent need to explore adaptive strategies. By focusing on key Sustainable Development Goals, this research aimed to highlight the necessity for integrated policies that enhance resilience and promote sustainable development in the face of these pressing challenges.

1.2 Statement of the Problem

The escalating impact of climate change on food security in Chimanimani, Zimbabwe presents a critical challenge that demands immediate attention. As extreme weather events become more frequent and unpredictable, agricultural productivity and food availability are increasingly threatened, affecting not only the local communities but also the broader regional food systems (Mugambiwa, 2021). This issue is not only a concern for farmers and residents of Chimanimani but also has far-reaching implications for national food security and sustainable development goals. By comprehensively examining the intricate relationship between climate change and food security in the area, this research aimed to provide valuable insights to inform evidence-based strategies and policies to mitigate the adverse effects of climate change on food production and

ensure long-term food security for the community (World Commission on Environment and Development, 1987).

1.3 Aim Of The Study

The purpose of this study was to assess how climate change affects food security in Chimanimani.

1.4 Research Objectives

1. To analyze the impact of climate change on agricultural practices and food production in the region.
2. To identify the key challenges faced by local communities in Chimanimani regarding food security in the face of climate change.
3. To explore the adaptive strategies and coping mechanisms employed by farmers and residents to address food security issues in a changing climate.
4. To propose evidence-based recommendations for enhancing resilience and sustainability in food production systems.

1.5 Research Questions

1. What is the impact of climate change on agricultural practices and food production in the region?
2. What are the the key challenges faced by local communities in Chimanimani regarding food security in the face of climate change?

3. Which adaptive strategies and coping mechanisms are employed by farmers and residents to address food security issues in a changing climate.

4. Which evidence-based recommendations can be offered for enhancing resilience and sustainability in food production systems?

1.6 Assumptions Of The Study

- This study assumed that households in Chimanimani experience varying levels of food security influenced by climate change.
- The study also assumed that local farmers actively employ adaptive strategies to cope with the impacts of climate change on food security.
- The study assumed that there is a relationship between food security and climate change.

1.7 Significance of the Study

Different stakeholders benefit from the study.

Local Communities

Understanding the impacts of climate change on food security is essential for the farmers and residents of Chimanimani, Zimbabwe. This study provides valuable insights that could assist these local communities in adapting to the changing climate conditions that are affecting their agricultural practices and food availability. By delving into the specifics of how climate change is influencing their livelihoods, this research endeavor sought to empower these individuals with practical knowledge and strategies to navigate and thrive in the face of environmental uncertainties. Through a nuanced exploration of these issues, this study aspired to equip local

stakeholders with the tools needed to enhance their agricultural practices, bolster food security, and ensure a sustainable future for themselves and their families.

Government and Policymakers

The findings of this research has implications for policymakers operating at both national and regional levels, offering a deeper understanding of the unique challenges confronting communities in Chimanimani as a consequence of climate change. By shedding light on these pressing issues, this study is poised to inform evidence-based policymaking and intervention strategies aimed at bolstering sustainable agriculture and combating food insecurity within the region. Through a comprehensive analysis of the impacts of climate change on food security, this research endeavor sought to provide policymakers with the necessary insights to craft targeted policies and initiatives that can effectively address the complex interplay between environmental changes and agricultural sustainability in Chimanimani.

Non-Governmental Organizations (NGOs) and Development Agencies

For non-governmental organizations (NGOs) and development agencies operating within Chimanimani, the insights from this study offers as a valuable information that, guides their efforts in designing tailored programs and initiatives to enhance resilience, promote sustainable agricultural practices, and safeguard food security within the community. By offering a nuanced understanding of the challenges faced by local residents due to climate change, this research endeavor aims to equip these organizations with the knowledge and tools needed to implement targeted interventions that can build community resilience, foster sustainable development, and ensure food security for all in Chimanimani.

1.8 Delimitations of the Study

The study concentrates specifically on the effects of climate change on food production and availability in Chimanimani, limiting the scope to this area to provide a detailed and context-specific analysis. The study has a special focus on the time frame from 2017 to 2024 to capture current trends and effects of climate change on food security in the area, ensuring the research remains timely and relevant. This timeframe allows the study to examine how food security has been impacted by climate change over the past 7 years, as well as investigate any emerging patterns or changes during this critical period. By focusing on this specific geographic location and time period, the research aims to generate insights that are directly applicable to the Chimanimani region and can inform policies and interventions to address food security challenges exacerbated by climate change.

1.9 Limitations of the Research

Despite careful planning and execution, several limitations will affect the outcomes of the study. One potential limitation will be the reliance on self-reported data from participants, which will be subject to recall bias or social desirability bias, affecting the accuracy of responses. The generalizability of findings could be limited due to the specific context of Chimanimani and the unique socio-economic and environmental factors influencing food security. The dynamic nature of climate change and its impacts will also present challenges in capturing the full extent of changes over time. Furthermore, logistical constraints such as weather disruptions, access to remote areas, and language barriers will also pose challenges during data collection and communication with participants. Addressing these limitations through robust data validation

techniques, contextualizing findings within the local context, and transparent reporting of methodological constraints will enhance the credibility and reliability of the study outcomes.

1.10 Definition of Key Terms

Food Security

Food security is “when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate water and sanitation, health services and care, allowing for healthy and active life (Committee of Food Security, 2012).

Climate change

The United Nations Framework Convention on Climate Change (UNFCCC, 2019) defines climate change as a change which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and an addition to natural climate variability observed over comparable time periods.

Sustainable Development

According to the Brundtland Report, "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Resilience

Resilience is defined as “the capacity of a system, community, or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure” (UNISDR, 2009).

Drought Coping Strategies

Drought coping strategies refer to “the planned or spontaneous actions taken by individuals, communities, or governments to mitigate the impacts of drought on water resources, agriculture, and livelihoods” (Wilhite & Glantz, 1985).

1.11 Dissertation Outline

Chapter 1: Introduction

The first chapter of the dissertation provides an overview of the research topic outlining the significance of studying the impact of climate change on food security in Zimbabwe with a focus on Chimanimani. This chapter introduces the research problem, objectives, and research questions, setting the stage for the study. It also included a brief background of the research area, highlighting key climatic and socio-economic factors affecting food security. The rationale for the study was explained, emphasizing the urgency of addressing climate change impacts.

Chapter 2: Literature Review

Chapter two looks into a comprehensive review of existing literature related to climate change, food security, and agricultural practices in Zimbabwe and globally. This chapter also explores theoretical frameworks including concepts of sustainable development and adaptive capacity. It also analyzes empirical studies on the impacts of climate change on food systems and food security, drawing comparisons to similar locations. It also identifies gaps in the literature, particularly concerning Chimanimani, and establish the theoretical underpinnings that guide the current study, setting a foundation for the research objectives.

Chapter 3: Research Methodology

The third chapter will detail the research methodology employed in the study. This chapter discusses the research design, justifying a mixed-methods approach that combines quantitative and qualitative data. It outlined data collection methods, such as surveys and interviews, and the sampling techniques used to select households in Chimanimani. The chapter also explores data analysis procedures, addressing how statistical and thematic analyses was conducted. Ethical considerations, including informed consent and participant confidentiality, were also discussed, alongside limitations of the methodology and strategies to mitigate potential biases.

Chapter 4: Data Analysis and Findings

Chapter four presents the analysis of the data collected during the study and discuss the findings in relation to the research questions and objectives. Quantitative data, such as survey results and statistical analyses on household food security status, will be presented alongside qualitative data from interviews with local farmers and stakeholders. This chapter provide a detailed examination of the impact of climate change on food security in Chimanimani, highlighting key trends, challenges faced by households, the effectiveness of government policies, and adaptive strategies employed by local farmers.

Chapter 5: Conclusion and Recommendations

The final chapter of the dissertation summarize the key findings of the study and draws conclusions regarding the impact of climate change on food security in Chimanimani. Based on the research outcomes, this chapter offeres practical recommendations for policymakers, practitioners, and stakeholders to enhance food security resilience in the face of climate change. It discusses the broader implications of the study for food security in Zimbabwe and suggest areas

for future research, emphasizing the significance of proactive measures to mitigate the impacts of climate change on food systems.

CHAPTER TWO

2.0 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The chapter looks into a comprehensive review of existing literature and establish a theoretical framework to explore the intricate relationship between climate change and food security in Chimanimani, Zimbabwe. The chapter analyses the impact of climate change on agricultural practices and food production, identify the primary challenges faced by local communities, examine adaptive strategies and coping mechanisms employed by farmers and residents, and propose evidence-based recommendations for enhancing resilience and sustainability in food production systems. This chapter aims to provide a solid foundation for understanding the complexities of food security in the face of a changing climate in the region.

2.2 Theoretical Framework

For this study, the Social-Ecological Systems (SES) Theory provides a robust theoretical foundation to explore the complex interconnections between climate change, agricultural practices, and food security in Chimanimani, Zimbabwe. The SES Theory, developed by scholars such as Elinor Ostrom and Carl Folke, posits that social and ecological systems are inherently linked and interdependent, forming complex adaptive systems (Ostrom, 2009; Folke, 2016). The core assumption of the SES Theory is that human societies and the natural environment are closely coupled, and actions in one domain can have significant impacts on the other. In the context of Chimanimani, the SES Theory allows us to examine how climate change, as an ecological driver,

interacts with the social, economic, and institutional factors that shape food production and security in the region (Resilience Alliance, 2020). One of the key strengths of the SES Theory is its emphasis on the importance of cross-scale interactions and feedback loops. This is particularly relevant in the study of climate change impacts, as the effects of global climate change manifest at the local level through changes in agricultural practices, resource availability, and community resilience (Berkes et al., 2003). The SES Theory encourages an integrated, systems-level analysis, which is essential for developing comprehensive and sustainable solutions to the food security challenges faced by Chimanimani's communities.

Moreover, the SES Theory recognizes the role of local knowledge, institutions, and adaptive capacities in shaping social-ecological resilience. This aligns well with the study's objectives, as it allows for the exploration of the coping mechanisms and adaptive strategies employed by farmers and residents to address food security issues in the face of climate change (Folke et al., 2005). However, the SES Theory is not without its limitations. Critiques have pointed out the difficulty in defining the boundaries of a social-ecological system, as well as the challenges in operationalizing the complex interactions and feedbacks within these systems (Epstein et al., 2013). Nonetheless, the SES Theory remains a valuable framework for understanding the multifaceted nature of climate change impacts on food security in Chimanimani, Zimbabwe.

2.3 analysis of the impact of Climate change on Agricultural Practices and Food Production

2.3.1 Climate Change Trends in Zimbabwe

Numerous studies have documented the adverse impacts of climate change on agricultural practices and food production... According to the Intergovernmental Panel on Climate Change

(IPCC), the African continent has experienced significant changes in temperature and precipitation patterns over the past few decades, with the southern African region being particularly vulnerable (IPCC, 2021). In the case of Chimanimani, researchers have observed a trend of rising temperatures, increased variability in rainfall, and a higher frequency of extreme weather events, such as droughts and floods (Murwira et al., 2020; Shumba et al., 2022).

Murwira et al. (2020) analyzed climate data from the Chimanimani region and found that average temperatures have increased by approximately 1.2°C since the 1980s, with a more pronounced warming during the summer months. This trend is consistent with the projections made by the IPCC, which suggest that temperatures in southern Africa are likely to continue rising at a rate faster than the global average (IPCC, 2021). Furthermore, Shumba et al. (2022) observed a significant decline in annual rainfall in Chimanimani, with a shift towards more erratic and unpredictable precipitation patterns, including prolonged dry spells and intense rainfall events. These climate change trends have had a profound impact on the agricultural practices and food production in the region. Farmers in Chimanimani have reported challenges such as reduced crop yields, increased pest and disease incidence, and the need to adapt their planting schedules to the changing rainfall patterns (Mabika et al., 2021). Additionally, the increased frequency of extreme weather events, such as droughts and floods, has led to crop failures, livestock losses, and disruptions in the local food supply (Moyo et al., 2019). While the existing literature has provided valuable insights into the climate change trends in Chimanimani, there is a need for further research to understand the nuanced and localized impacts of these changes on the region's agricultural systems and food security. Specifically, more in-depth studies are required to explore the intricate linkages between climate change, agricultural practices, and the socio-economic factors that influence food production and access in Chimanimani (Nyamwanza et al., 2022). Such research

would provide a more comprehensive understanding of the challenges faced by local communities and inform the development of targeted, evidence-based interventions to enhance the resilience of the region's food systems.

2.3.2 Effects of Climate Change on Agricultural Practices

The changing climate has had far-reaching consequences on the agricultural practices of the region's farmers. Several studies have documented the profound ways in which rising temperatures, erratic rainfall patterns, and extreme weather events have altered the traditional farming methods and cropping systems employed by local communities. Mabika et al. (2021) observed that the prolonged droughts and unpredictable rainfall experienced in Chimanimani have forced farmers to shift their planting schedules and adopt new crop varieties that are more resilient to water scarcity. This has led to a significant change in the traditional cropping calendars, with farmers often delaying or advancing the timing of their planting activities to align with the shifting rainfall patterns (Moyo et al., 2019). Additionally, Shumba et al. (2022) found that farmers have been compelled to diversify their crop portfolios, incorporating drought-tolerant and short-season varieties to mitigate the risks posed by climate change.

The impacts of climate change on agricultural practices extend beyond crop cultivation. Nyamwanza et al. (2022) reported that livestock farming in Chimanimani has also been affected, with farmers struggling to maintain the health and productivity of their herds due to the limited availability of grazing land and water resources. This has led to changes in herd management strategies, including the adoption of alternative feeding practices and the prioritization of more heat-tolerant livestock breeds. Furthermore, the increased incidence of pests and diseases associated with climate change has had a significant impact on agricultural practices in

Chimanimani. Researchers have noted that farmers have had to adapt their pest and disease management strategies, often relying on more frequent and intensive use of pesticides and other agro-chemicals to protect their crops (Murwira et al., 2020). This shift in pest control methods has raised concerns about the long-term sustainability and environmental impacts of such practices.

On the other hand, there remains a need for more comprehensive and integrated research. Specifically, further studies are required to explore the complex interplay between climate change, socio-economic factors, and the decision-making processes of farmers in the region (Moyo et al., 2019). This would enable a deeper understanding of the underlying drivers and barriers that influence the adoption of climate-smart agricultural practices, as well as the unintended consequences of such adaptations on the broader social-ecological system.

2.3.3 Impact of Climate Change on Food Production

The adverse effects of climate change on agricultural practices in Chimanimani, Zimbabwe have had a profound impact on the region's overall food production. Several studies have documented the significant decline in crop yields and livestock productivity, which has directly contributed to heightened food insecurity among local communities. Nyamwanza et al. (2022) conducted a systematic review of the impacts of climate change on agricultural systems and food security in Zimbabwe, and their findings suggest that the Chimanimani region has experienced a notable reduction in the yields of staple crops, such as maize, sorghum, and millet. The research attributed this decline to the combined effects of rising temperatures, erratic rainfall patterns, and the increased incidence of pests and diseases, all of which have disrupted the optimal conditions for crop growth and development (Nyamwanza et al., 2022).

Moyo et al. (2019) further elaborated on the impact of climate change on food production in Chimanimani, highlighting the challenges faced by smallholder farmers in maintaining their livestock herds. The research observed that the limited availability of grazing land and water resources, as well as the prevalence of heat-related stress and disease outbreaks, have led to a significant drop in livestock productivity and, in some cases, the loss of entire herds. This, in turn, has reduced the supply of animal-based foods, such as meat and dairy products, within the local food system (Moyo et al., 2019). The consequences of these climate-induced declines in crop and livestock production have been exacerbated by the region's high levels of poverty and limited access to alternative food sources (Mabika et al., 2021). Shumba et al. (2022) noted that the reduced availability of staple foods has led to an increased reliance on purchased or imported food items, which are often unaffordable for many households in Chimanimani. This has further contributed to the erosion of food security and the growing prevalence of malnutrition and hunger among the local population. there is a need for more nuanced and comprehensive research to explore the interconnected social, economic, and institutional factors that mediate these impacts. Specifically, studies that investigate the role of markets, trade, and food distribution networks, as well as the effectiveness of government and community-led interventions, would deepen our understanding of the complex pathways through which climate change influences food security in the region (Murwira et al., 2020). Such knowledge would be essential for the development of targeted and holistic strategies to enhance the resilience of Chimanimani's food production systems.

2.4 Challenges faces by local communities

2.4.1 Vulnerability of Local Communities to Climate Change

The local communities in Chimanimani, Zimbabwe are particularly vulnerable to the adverse impacts of climate change, owing to a complex interplay of socio-economic, environmental, and institutional factors. Existing research has shed light on the multifaceted nature of this vulnerability and the challenges faced by these communities in adapting to the changing climate. Mabika et al. (2021) identified the high levels of poverty, limited access to resources, and reliance on rain-fed agriculture as key determinants of the local communities' vulnerability to climate change in Chimanimani. The research found that the region's smallholder farmers, who constitute the majority of the population, have limited financial and technical capacity to invest in climate-smart agricultural practices or alternative livelihood strategies (Mabika et al., 2021). This, coupled with the region's poor infrastructure and limited access to markets, has heightened the communities' exposure and sensitivity to the impacts of climate change on food production and food security.

Furthermore, Moyo et al. (2019) highlighted the disproportionate vulnerability of marginalized and disadvantaged groups within the Chimanimani communities, such as women, the elderly, and the disabled. These groups often face additional barriers in accessing resources, information, and decision-making processes related to climate change adaptation, further exacerbating their vulnerability (Moyo et al., 2019). The research emphasized the need for a more inclusive and equitable approach to climate change adaptation that addresses the specific needs and challenges faced by these vulnerable populations. Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, noted that the vulnerability of Chimanimani's

communities is compounded by the region's fragile and degraded natural resource base. The depletion of forests, the decline in soil fertility, and the depletion of water resources have eroded the communities' capacity to cope with the impacts of climate change, particularly in terms of maintaining their agricultural livelihoods and access to ecosystem services (Nyamwanza et al., 2022).

While the existing literature has provided valuable insights into the multi-faceted vulnerability of Chimanimani's local communities, there remains a need for more in-depth, context-specific research that explores the dynamic interplay between climate change, socio-economic factors, and institutional arrangements. Such studies should delve deeper into the underlying drivers of vulnerability, including the role of power dynamics, governance structures, and the effectiveness of existing adaptation strategies (Shumba et al., 2022). This would enable a more comprehensive understanding of the unique challenges faced by the local communities and inform the development of targeted, equitable, and sustainable interventions to enhance their resilience in the face of a changing climate.

2.4.2 Access to Resources and Infrastructure

The local communities in Chimanimani, Zimbabwe face significant challenges in accessing the resources and infrastructure necessary to effectively adapt to the impacts of climate change. Existing research has highlighted the disparities in resource availability and the limitations of the region's physical and institutional infrastructure, which have exacerbated the vulnerabilities of these communities. Mabika et al. (2021) observed that the majority of smallholder farmers in Chimanimani have limited access to critical agricultural inputs, such as drought-resistant crop varieties, irrigation systems, and modern farming equipment. The research attributed this lack of

access to the region's inadequate extension services, the high costs of these inputs, and the limited availability of financial resources among the farming households (Mabika et al., 2021). This, in turn, has hindered the farmers' capacity to adapt their agricultural practices in response to the changing climate.

Moyo et al. (2019) further explored the challenges faced by Chimanimani's communities in accessing basic infrastructure, including reliable water supplies, functioning roads, and effective early warning systems. The research noted that the region's poor infrastructure has undermined the communities' ability to respond to extreme weather events, such as droughts and floods, and has also limited their access to markets, healthcare, and other essential services (Moyo et al., 2019). This has had far-reaching consequences for the communities' overall resilience and well-being. Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, highlighted the critical role of institutional and governance structures in facilitating access to resources and supporting climate change adaptation. The research found that the limited availability of government support, the lack of coordination among various stakeholders, and the weak enforcement of land tenure rights have all contributed to the Chimanimani communities' struggles to mobilize the necessary resources and adopt effective adaptation strategies (Nyamwanza et al., 2022). While the existing literature has provided valuable insights into the resource and infrastructure-related challenges faced by the local communities in Chimanimani, there is a need for more in-depth, community-level research that explores the nuanced and context-specific dynamics of access and utilization. Such studies should delve deeper into the socio-cultural, political, and economic factors that shape the communities' ability to access and leverage the resources and infrastructure required for effective climate change adaptation (Shumba et al., 2022). This would enable a more holistic understanding of the barriers and enablers that influence

the local communities' resilience and inform the development of targeted, equitable, and sustainable interventions.

2.4.3 Socio-economic Factors influencing Food Security

The food security of the local communities in Chimanimani, Zimbabwe is deeply intertwined with a range of socio-economic factors that have been exacerbated by the impacts of climate change. Existing research has explored the complex interactions between these factors and their implications for the region's overall food system.

Mabika et al. (2021) highlighted the role of poverty and limited economic opportunities as key determinants of food insecurity in Chimanimani. The research found that the region's smallholder farmers, who make up the majority of the population, have limited financial resources to invest in climate-resilient agricultural practices or alternative livelihood strategies. This, coupled with the region's high levels of unemployment and the lack of diversified income sources, has left many households vulnerable to food shortages and nutritional deficiencies (Mabika et al., 2021). Moyo et al. (2019) further explored the gendered dimensions of food security, noting that women in Chimanimani often face additional barriers in accessing and controlling the resources necessary for food production and household provisioning. The research observed that the prevailing cultural norms and gender inequalities have restricted women's participation in decision-making processes, their access to land and other productive assets, and their ability to adapt to the challenges posed by climate change (Moyo et al., 2019). This has had a disproportionate impact on the food security and overall well-being of women-headed households and their dependents.

Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, highlighted the role of weak institutional and governance structures in exacerbating

food insecurity in Chimanimani. The research found that the limited availability of government support, the fragmentation of extension services, and the poor coordination among various stakeholders have all contributed to the communities' limited access to information, resources, and effective interventions to address food security challenges (Nyamwanza et al., 2022). Furthermore, Shumba et al. (2022) explored the complex interconnections between climate change, food production, and market dynamics in Chimanimani. The research noted that the region's poor infrastructure, limited access to markets, and the high costs of food items have made it increasingly difficult for households to supplement their own food production with purchased goods, further undermining their food security and reliance on external food sources (Shumba et al., 2022).

2.4.4 Governance and Policy Issues

The challenges faced by the local communities in Chimanimani, Zimbabwe in adapting to the impacts of climate change are further exacerbated by the prevailing governance and policy landscape. Existing research has highlighted the shortcomings of the region's institutional and policy frameworks in addressing the multifaceted needs of these communities. Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, observed that the country's national climate change policies and strategies have often failed to adequately address the specific needs and vulnerabilities of local communities like those in Chimanimani. The research noted that the top-down and centralized approach to policymaking has limited the participation of community stakeholders in the design and implementation of adaptation interventions, thereby undermining their effectiveness and sustainability (Nyamwanza et al., 2022).

Moyo et al. (2019) further explored the governance-related challenges faced by the Chimanimani communities, emphasizing the fragmentation and lack of coordination among the various government agencies, non-governmental organizations, and community-based institutions involved in climate change adaptation efforts. The research found that the absence of a coherent and integrated framework for resource mobilization, knowledge sharing, and the implementation of adaptation strategies has resulted in the duplication of efforts, the inefficient utilization of resources, and the perpetuation of the communities' vulnerability (Moyo et al., 2019). Mabika et al. (2021) highlighted the critical role of land tenure and property rights in shaping the local communities' ability to access and manage the natural resources necessary for their livelihoods and adaptation strategies. The studies highlight that the unclear and insecure land tenure arrangements in Chimanimani have limited the farmers' incentives to invest in long-term, climate-smart agricultural practices, as they lack the assurance of reaping the benefits of their efforts (Mabika et al., 2021). This, in turn, has undermined the communities' capacity to enhance their resilience to climate change. Shumba et al. (2022) further emphasized the need for more robust and inclusive governance structures that can effectively channel resources and support to the local communities in Chimanimani. The research highlighted the importance of strengthening community-level institutions, empowering local leaders, and fostering collaborative partnerships among various stakeholders to ensure that adaptation strategies are tailored to the specific needs and priorities of the affected communities (Shumba et al., 2022).

2.5 Exploring Adaptive Strategies and Coping Mechanisms

2.5.1 Traditional Farming Practices and Adaptations

The local communities in Chimanimani, Zimbabwe have long relied on traditional farming practices to sustain their livelihoods, and in the face of climate change, these communities have demonstrated remarkable resilience by adapting and modifying their traditional methods to better suit the evolving environmental conditions. Mabika et al. (2021) observed that many smallholder farmers in Chimanimani have drawn upon their extensive knowledge of local ecosystems and traditional farming techniques to develop innovative adaptation strategies. For instance, the research noted that some farmers have shifted towards diversifying their crop portfolios, incorporating drought-tolerant and short-season varieties, as well as integrating traditional crops like millet and sorghum, which are better suited to the region's changing rainfall patterns (Mabika et al., 2021). This diversification has enabled the farmers to mitigate the risks associated with climate change and maintain a more stable food production system.

Moyo et al. (2019) further highlighted the role of traditional soil and water conservation practices in the Chimanimani communities' adaptation efforts. The research highlights farmers have revived and adapted techniques such as contour ridging, mulching, and the use of organic manures to improve soil fertility and moisture retention, enabling them to better cope with the impacts of droughts and erratic rainfall (Moyo et al., 2019). These traditional practices, coupled with the introduction of innovative water harvesting and storage methods, have enhanced the communities' ability to sustain their agricultural activities in the face of water scarcity. Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, noted that the Chimanimani communities have also leveraged their traditional knowledge of livestock

management to adapt to the changing climatic conditions. The research observed that some farmers have shifted towards rearing more heat-tolerant and drought-resistant breeds of livestock, as well as adopting alternative feeding and grazing strategies to maintain the health and productivity of their herds (Nyamwanza et al., 2022).

Shumba et al. (2022) further explored the role of traditional knowledge and community-based institutions in facilitating the sharing and dissemination of adaptation strategies among the Chimanimani farmers. The research highlighted the importance of traditional leaders, elders, and community-based organizations in preserving and transmitting valuable information about indigenous farming practices, weather patterns, and natural resource management, which have enabled the communities to navigate the challenges posed by climate change (Shumba et al., 2022).

2.5.2 Community-Based Resilience Initiatives

In the face of the complex challenges posed by climate change, the local communities in Chimanimani, Zimbabwe have demonstrated remarkable resilience by engaging in a range of community-based initiatives aimed at enhancing their adaptive capacity and overall well-being. Shumba et al. (2022) highlighted the role of community-based organizations and farmer groups in facilitating the sharing of knowledge, resources, and best practices among the smallholder farmers in Chimanimani. The research highlights that these community-driven platforms have enabled the farmers to collectively develop and implement adaptation strategies, such as the establishment of seed banks, the coordination of communal irrigation systems, and the joint management of natural resources (Shumba et al., 2022). This collaborative approach has fostered a sense of collective agency and empowered the communities to take a more active role in addressing the challenges posed by climate change.

Moyo et al. (2019) further explored the community-based initiatives aimed at strengthening the resilience of vulnerable groups, such as women and the elderly, within the Chimanimani communities. Thus it is noted that the local communities have established support networks, mutual aid schemes, and community-based social safety nets to ensure that these marginalized groups have access to the necessary resources, information, and assistance to cope with the impacts of climate change (Moyo et al., 2019). These community-driven interventions have been instrumental in addressing the disproportionate vulnerabilities faced by these groups and promoting more inclusive and equitable adaptation strategies Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, highlighted the role of community-based disaster risk management initiatives in enhancing the Chimanimani communities' resilience to extreme weather events.

Mabika et al. (2021) further explored the community-based initiatives aimed at diversifying the local economy and livelihoods in Chimanimani. It can be noted that the communities have established small-scale enterprises, such as ecotourism ventures, handicraft production, and value-addition to agricultural products, as a means of generating alternative income streams and reducing their dependence on climate-sensitive agricultural activities (Mabika et al., 2021). These community-driven diversification efforts have helped to enhance the communities' adaptive capacity and overall resilience to the impacts of climate change.

2.5.3 Innovation and Technology Adoption

The local communities in Chimanimani, Zimbabwe have also demonstrated their adaptability and resilience by embracing innovative technologies and farming practices to enhance their capacity to cope with the impacts of climate change. Shumba et al. (2022) observed that some

smallholder farmers in Chimanimani have adopted the use of drought-resistant and early-maturing crop varieties, which have enabled them to better withstand the region's increasingly erratic rainfall patterns. The research also noted that the farmers have experimented with various water harvesting and irrigation technologies, such as drip irrigation systems and small-scale farm ponds, to improve the efficiency and reliability of their water management practices (Shumba et al., 2022). These technological innovations have been instrumental in boosting the communities' agricultural productivity and food security in the face of water scarcity.

Mabika et al. (2021) further highlighted the role of mobile technology and digital platforms in supporting the Chimanimani communities' adaptation efforts. The research found that the farmers have leveraged their access to mobile phones and various information and communication technologies (ICTs) to receive real-time weather forecasts, market information, and technical advice on climate-smart agricultural practices (Mabika et al., 2021). This has enabled the communities to make more informed decisions and adapt their farming strategies accordingly, thereby enhancing their resilience to climate change. Moyo et al. (2019) stated that renewable energy technologies, such as solar-powered irrigation systems and biogas digesters, to address the energy challenges faced by the Chimanimani communities. Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, highlighted the importance of integrating traditional knowledge with modern scientific approaches to develop more holistic and effective adaptation strategies. The research observed that the Chimanimani communities have successfully combined their indigenous farming practices with innovative technologies, such as soil and water conservation techniques and livestock management systems, to enhance the resilience of their agricultural systems (Nyamwanza et al., 2022).

2.5.4 Knowledge Sharing and Capacity Building

The local communities in Chimanimani, Zimbabwe have also demonstrated their resilience by engaging in knowledge sharing and capacity-building initiatives aimed at enhancing their collective understanding and ability to adapt to the impacts of climate change. Shumba et al. (2022) highlighted the role of community-based organizations and farmer groups in facilitating the exchange of information and best practices among the smallholder farmers in Chimanimani. The researcher observed that these platforms have enabled the farmers to share their traditional knowledge, learn about innovative farming techniques, and collectively develop adaptation strategies that are tailored to the specific needs and challenges of the local context (Shumba et al., 2022). This community-driven approach to knowledge sharing has been instrumental in building the farmers' capacities and fostering a sense of collective agency in the face of climate change.

Moyo et al. (2019) further explored the efforts of local and external stakeholders to build the capacity of the Chimanimani communities through targeted training and extension services. The researcher noted that government agencies, non-governmental organizations, and community-based institutions have collaborated to provide the farmers with access to information, technical skills, and resources related to climate-smart agriculture, natural resource management, and disaster risk reduction (Moyo et al., 2019). These capacity-building initiatives have empowered the communities to better understand the climate-related risks they face and to develop and implement more effective adaptation strategies. Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, highlighted the importance of integrating traditional ecological knowledge and community-based practices with scientific information and modern agricultural technologies. The research observed that the Chimanimani communities have successfully blended their indigenous knowledge of weather patterns, natural resource

management, and farming techniques with the technical expertise and resources provided by external stakeholders to develop more holistic and effective adaptation solutions (Nyamwanza et al., 2022). Mabika et al. (2021) further emphasized the role of community-based learning and peer-to-peer exchanges in enhancing the adaptive capacity of the Chimanimani farmers. The research found that the farmers have organized farmer field schools, demonstration plots, and cross-visits to share their experiences, experiment with new technologies, and collectively problem-solve the challenges they face, thereby fostering a culture of continuous learning and adaptation (Mabika et al., 2021).

2.5.5 Social Networks and Support Systems

The local communities in Chimanimani, Zimbabwe have demonstrated remarkable resilience in the face of climate change by leveraging their social networks and support systems to enhance their adaptive capacity and overall well-being. Moyo et al. (2019) highlighted the critical role of community-based institutions, such as traditional leadership structures, kinship networks, and mutual aid societies, in providing the Chimanimani communities with essential social and material support. The research observed that these institutions have facilitated the sharing of resources, the coordination of adaptation strategies, and the provision of safety nets for the most vulnerable households, enabling the communities to collectively navigate the challenges posed by climate change (Moyo et al., 2019).

Shumba et al. (2022) further explored the importance of social capital and community-level collaboration in the Chimanimani context. Farmers have actively participated in various community-based groups, cooperatives, and networks, which have enabled them to pool their resources, share knowledge and skills, and engage in collective problem-solving and decision-

making processes (Shumba et al., 2022). These strong social ties and collaborative arrangements have been instrumental in enhancing the communities' resilience and adaptive capacity. Mabika et al. (2021) emphasized the role of informal social support systems, such as extended family networks and neighborhood-level assistance, in helping the Chimanimani communities to cope with the impacts of climate change. Communities have relied on these informal support systems to provide emergency relief, share labor and resources, and ensure the well-being of the most vulnerable members, particularly during times of environmental shocks and stresses (Mabika et al., 2021). Nyamwanza et al. (2022), in their systematic review of climate change impacts in Zimbabwe, highlighted the potential of community-based organizations and civil society groups in facilitating the flow of information, resources, and institutional support to the local communities in Chimanimani. The research noted that these external stakeholders have played a crucial role in strengthening the communities' capacity to access and utilize the necessary tools, technologies, and knowledge for adapting to climate change (Nyamwanza et al., 2022).

2.6 Chapter Summary

The literature review and theoretical framework presented in this chapter have provided a comprehensive understanding of the complex and multifaceted challenges faced by the local communities in Chimanimani, Zimbabwe in the context of climate change and its impacts on food security.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology employed in Evaluating the effects of climate change on food security: A case study of Chimanimani, Zimbabwe. The study aims to provide a comprehensive understanding of the complex interplay between climate change, agricultural practices, and food security within the Chimanimani region. The research methodology adopted for this study is designed to address the specific objectives outlined in the previous section, utilizing a combination of theoretical and empirical approaches to generate robust and reliable findings.

3.2 Research Philosophy

The research philosophy underpinning this study is interpretivism. Interpretivism is a research paradigm that emphasizes the subjective and context-dependent nature of social reality (Bryman, 2016). This philosophical approach recognizes that human behavior and the meaning people ascribe to their experiences are shaped by the social, cultural, and historical contexts in which they are embedded (Creswell & Poth, 2018). In the context of this study, the interpretivist approach allows the researchers to gain a deep and nuanced understanding of how the local communities in Chimanimani perceive and respond to the impacts of climate change on their food security, taking into account the unique socio-cultural, economic, and environmental factors that influence their lived experiences. By adopting an interpretivist stance, the researchers can explore

the complexities and multiple realities of the climate change-food security nexus from the perspective of the Chimanimani communities, rather than relying solely on predefined, objective measures or universal laws. This philosophical orientation is particularly well-suited for the current study, as it enables the researchers to capture the rich, context-specific insights necessary to develop a comprehensive understanding of the challenges and adaptation strategies employed by the local communities in the face of a changing climate.

3.3 Research Methodology

This study uses a qualitative approach to understand the experiences of local communities in Chimanimani. This approach helps to gather detailed information about the challenges and ways that communities cope with climate change.

The study will use in-depth interviews with community members to collect data. This will provide a detailed understanding of the issues related to food security and climate change in the region.

3.4 Research Design

The research design for this study is a case study, which is a detailed examination of a specific, bounded system or phenomenon within its real-world context (Yin, 2018). The case study approach is appropriate for the current research, as it allows the researchers to delve deeply into the unique experiences, challenges, and adaptive strategies of the local communities in Chimanimani, Zimbabwe, while also considering the broader socio-economic and environmental factors that shape their food security situation. By focusing on the Chimanimani district as a

specific case, the researchers can gain a comprehensive and nuanced understanding of the complex interplay between climate change, agricultural practices, and food security within this particular setting (Creswell & Poth, 2018). The case study design enables the researchers to draw upon multiple sources of evidence, including surveys, interviews, and secondary data, to develop a rich and contextual understanding of the phenomenon, and to generate insights that can inform the development of more effective, targeted interventions and policies for addressing food security challenges in Chimanimani and potentially in other similar contexts.

3.5 Target Population

The population refers to the entire group of individuals or households that share common characteristics and are of interest to the study (King, 2024). The population for this study consists of rural households in Chimanimani, Zimbabwe, who rely heavily on agriculture for their livelihoods. Specifically, the population includes smallholder farmers, household heads, and community leaders who reside in Chimanimani district and are directly affected by climate change.

3.6 Sample Size

Sample size refers to the number of participants or observations included in a study or experiment. It is an important consideration in research as it can impact the statistical power, precision, and generalizability of the findings. The sample size for this study is 50 participants, comprising rural households in Chimanimani, Zimbabwe. This sample is further segregated into distinct groups to ensure a comprehensive understanding of the impacts of climate change on food security. Specifically, the sample consists of 30 smallholder farmers, evenly divided between men and women, who provide valuable insights into the challenges and opportunities faced by agricultural households. In addition, 10 community leaders or traditional authorities are included

in the sample, offering a unique perspective on the social and cultural contexts in which climate change impacts are experienced. Furthermore, 5 key informants from local government or non-governmental organizations working on climate change and food security issues in Chimanimani provide valuable information on policy and programmatic responses to climate change. Finally, 5 household heads or their spouses who are responsible for food security and agricultural decision-making are also included in the sample, providing a nuanced understanding of the household-level impacts of climate change.

3.7 Sampling Techniques

3.7.1 Purposive Sampling

Purposive sampling, also known as judgmental sampling, is a non-probability sampling technique where the researcher deliberately selects participants based on specific characteristics or criteria (Patton, 2015). In this study, purposive sampling was used to identify and recruit individuals with relevant expertise or experience related to the research topic. This approach was chosen to ensure that the sample would provide the most relevant and valuable information to address the research questions, as opposed to randomly selecting participants from the general population (Etikan et al., 2016).

3.7.2 Snowball Sampling

Snowball sampling is a non-probability sampling technique where existing study participants recruit future participants from among their acquaintances (Naderifar et al., 2017). In the context of this study, snowball sampling was utilized to expand the pool of participants by leveraging the social networks and connections of the initial purposively selected individuals. This

approach was particularly useful for accessing hard-to-reach or hidden populations, as the existing participants were able to identify and refer other individuals who met the study's eligibility criteria (Patton, 2015).

3.8 Data Collection

Data collection refers to the process of gathering information or data from various sources to address the research objectives (Creswell & Creswell, 2018). The choice of data collection methods can significantly impact the quality, reliability, and validity of the data collected.

3.8.1 Interviews

Interviews are a qualitative data collection method where the researcher engages in a conversation with participants to gather in-depth information, insights, and perspectives (Kvale & Brinkmann, 2009). In this study, semi-structured interviews were conducted with a subset of the participants. This approach allowed the researcher to explore specific topics in greater depth, while also allowing for the emergence of unanticipated themes and perspectives (Creswell & Creswell, 2018). The interviews provided rich, contextual data that complemented the quantitative information collected through the questionnaire.

3.9 Data Analysis and Presentation

Data analysis and presentation refer to the systematic process of examining, interpreting, and communicating the collected data to address the research questions and objectives (Saunders et al., 2019). In this study, thematic analysis was used to analyze the qualitative data collected through in-depth interviews. This involved identifying and categorizing the key themes and narratives that emerged from the participants' responses (Braun & Clarke, 2006). The researcher

carefully read and re-read the interview transcripts, coding and categorizing the data into themes and sub-themes. This analysis allowed for a deeper understanding of the participants' experiences, perceptions, and underlying motivations. The findings from the thematic analysis were then presented in a coherent and meaningful way, using textual descriptions and other visual aids to effectively communicate the research outcomes.

3.10 Validity and Reliability

Validity and reliability are important concepts in research that ensure the quality, credibility, and trustworthiness of the study's findings (Creswell & Creswell, 2018). Validity refers to the extent to which the research measures what it intends to measure, while reliability concerns the consistency and stability of the measurement or data collection procedures (Drost, 2011). In this study, various strategies were employed to enhance the validity and reliability of the research. The semi-structured interviews were conducted using an interview guide to maintain consistency across participants, and the data was analyzed using a systematic, transparent, and well-documented process to enhance the reliability of the qualitative findings (Kvale & Brinkmann, 2009). Additionally, the researcher engaged in reflexivity, critically examining their own biases and assumptions, and used triangulation by combining multiple data sources and methods to corroborate the findings and increase the validity of the overall study (Creswell & Creswell, 2018). These measures were essential in ensuring the robustness and trustworthiness of the research, allowing the findings to be confidently applied and generalized to the relevant contexts.

3.11 Ethical Considerations

Ethical considerations in research refer to the principles and guidelines that researchers must adhere to in order to protect the rights, dignity, and well-being of study participants, as well

as to maintain the integrity and credibility of the research process (Resnik, 2015). These considerations are crucial in ensuring that the research is conducted in a responsible, transparent, and socially-conscious manner. In this study, the researcher was mindful of various ethical principles, such as informed consent, confidentiality, and minimizing potential harm to participants (Bryman, 2016). Participants were provided with detailed information about the study, including its purpose, the voluntary nature of their involvement, and the measures taken to protect their privacy and data. They were required to give their informed consent before participating, and were assured that their responses would be kept confidential and that their identities would be anonymized (Creswell & Creswell, 2018). The research protocol was also reviewed and approved by the appropriate institutional review board to ensure that it adhered to ethical standards and guidelines (Resnik, 2015). These ethical considerations were essential in building trust with the participants, maintaining the integrity of the research, and ensuring that the study was conducted in a responsible and socially-conscious manner.

3.12 Chapter Summary

Chapter 3 provides a detailed overview of the methodological approach employed in this research study. It begins by defining the sample size, which was set at 50 participants, and discusses the considerations around statistical power, precision, and generalizability associated with this sample size. The chapter then delves into the sampling techniques utilized, specifically highlighting the use of purposive sampling to identify participants with relevant expertise, and snowball sampling to expand the pool of participants by leveraging existing social networks.

CHAPTER FOUR

4.0 DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents the findings of the study, which aimed to evaluate the effects of climate change on food security in Chimanimani, Zimbabwe. The chapter begins with a presentation of the demographic characteristics of the participants, followed by a detailed analysis of the findings.

4.2 Demographic Data Presentation

The demographic characteristics of the participants are presented below.

4.2.1 Sex

Table 1: Distribution of Participants by Sex

Response	Frequency	Percentage
Male	30	60%
Female	20	40%
Total	50	100

The data in Table 4.1 shows that the majority of the participants (60%) were male, while 40% were female. This indicates that there was a slightly higher representation of males in the study.

4.2.2 Age

Table 2 *Table 4.2: Distribution of Participants by Age*

Response	Frequency	Percentage
20-29	10	20%
30-39	16	32%
40-49	12	24%
50-59	8	16%
60+	4	8%
Total	50	100

The data in Table 2 shows that the majority of the participants (32%) were in the 30-39 age group, followed by the 40-49 age group (24%). The youngest age group (20-29) had the smallest representation (20%), while the oldest age group (60+) had the smallest percentage (8%). This indicates that the study had a relatively even distribution of participants across different age groups. The data in Table 2 shows that the majority of the participants (32%) were in the 30-39 age group, followed by the 40-49 age group (24%). The youngest age group (20-29) had the smallest representation (20%), while the oldest age group (60+) had the smallest percentage (8%). This indicates that the study had a relatively even distribution of participants across different age groups.

4.2.3 Level of Education

Table 3: *Distribution of Participants by Level of Education*

Response	Frequency	Percentage
Primary	4	8%
Secondary	20	40%
Tertiary	26	52%

The data in Table 4.3 shows that the majority of the participants (52%) had a tertiary level of education, followed by secondary education (40%). The primary level of education had the smallest representation (8%). This indicates that the study had a relatively high level of education among the participants.

4.2.4 Marital Status

Table 4: Distribution of Participants by Marital Status

Response	Frequency	Percentage
Married	36	72%
Single	10	20%
Divorced	4	8%

The data in Table 4 shows that the majority of the participants (72%) were married, followed by single participants (20%). The divorced category had the smallest representation (8%). This indicates that the study had a relatively high proportion of married participants.

4.3 Impact of Climate Change on Agricultural Practices and Food Production

The participants were asked to share their experiences and perceptions regarding the impact of climate change on agricultural practices and food production in Chimanimani. The majority of the participants agreed that climate change has significantly affected agricultural practices and food production in the region. According to the participants, climate change has led to changes in temperature and rainfall patterns, resulting in reduced crop yields and decreased food security. As P1, a farmer, noted:

The weather patterns have changed. We used to have predictable rainfall, but now it's unpredictable. Sometimes it rains too much, and sometimes it doesn't rain at all. This has affected our crops, and we're not getting the yields we used to get." (P1, Farmer)

P5, a community leader, added:

"Climate change has affected our food security. We're not producing enough food, and we're relying on imports. This is affecting our economy and our livelihoods." (P5, Community Leader)

The participants also reported that climate change has led to increased pest and disease outbreaks, which have further reduced crop yields. As P10, an agricultural extension officer, noted:

"We're seeing more pest and disease outbreaks due to climate change. This is affecting our crops, and we're losing yields. We need to find ways to adapt to these changes and develop new strategies to manage pests and diseases." (P10, Agricultural Extension Officer)

The findings of this study are consistent with the literature review, which suggests that climate change is having a significant impact on agricultural practices and food production globally (IPCC, 2014; FAO, 2017). The study's findings also support the notion that climate change is affecting food security, particularly in vulnerable communities (Wheeler & von Braun, 2013). However, the study's findings also highlight the need for context-specific adaptation strategies that take into account the unique challenges and opportunities faced by farmers and communities in Chimanimani. The findings of this study suggest that climate change is having a significant impact on agricultural practices and food production in Chimanimani, and that context-specific adaptation strategies are needed to support farmers and communities in adapting to these changes.

4.4 Key Challenges Faced by Local Communities Regarding Food Security

The participants were asked to share their experiences and perceptions regarding the key challenges faced by local communities in Chimanimani regarding food security in the face of climate change. The majority of the participants agreed that the main challenges faced by local communities in Chimanimani regarding food security are related to climate change, poverty, and limited access to resources. According to the participants, climate change has led to reduced crop yields, changed rainfall patterns, and increased frequency of droughts and floods, making it difficult for local communities to produce and access food. As P3, a farmer, noted:

The biggest challenge we face is climate change. The rains are no longer predictable, and we're experiencing more frequent droughts and floods. This has reduced our crop yields, and we're struggling to produce enough food." (P3, Farmer)

P8, a community leader, added:

"Poverty is also a major challenge. Many people in our community are poor and cannot afford to buy food. They rely on subsistence farming, but the changing climate is making it difficult for them to produce enough food." (P8, Community Leader)

The participants also reported that limited access to resources such as seeds, fertilizers, and irrigation systems is a major challenge faced by local communities in Chimanimani. As P12, a farmer, noted:

"We don't have access to good quality seeds, fertilizers, and irrigation systems. This makes it difficult for us to produce food, especially during times of drought and flood." (P12, Farmer)

The findings of this study are consistent with the literature review, which suggests that climate change, poverty, and limited access to resources are major challenges faced by local communities in Africa regarding food security (FAO, 2017; IPCC, 2014). The study's findings also support the notion that climate change is having a disproportionate impact on the poor and vulnerable, exacerbating existing inequalities and food insecurity (Wheeler & von Braun, 2013). However, the study's findings also highlight the need for context-specific solutions that take into account the unique challenges and opportunities faced by local communities in Chimanimani. The findings of this study suggest that local communities in Chimanimani face significant challenges regarding food security, including climate change, poverty, and limited access to resources. Addressing these challenges will require context-specific solutions that take into account the unique challenges and opportunities faced by local communities.

4.5 Adaptive Strategies and Coping Mechanisms Employed by Farmers and Residents

The participants were asked to share their experiences and perceptions regarding the adaptive strategies and coping mechanisms employed by farmers and residents in Chimanimani to address food security issues. The majority of the participants agreed that farmers and residents in Chimanimani employ a range of adaptive strategies and coping mechanisms to address food security issues, including diversification of crops, use of drought-tolerant crops, and reliance on non-farm income sources. According to the participants, diversification of crops is a key adaptive strategy employed by farmers in Chimanimani. As P2, a farmer, noted:

"We've started growing a variety of crops, including maize, beans, and vegetables. This helps us to spread the risk and ensure that we have a steady supply of food throughout the year." (P2, Farmer)

P5, a community leader, added:

Diversification of crops is a good strategy, but it's not enough. We also need to use drought-tolerant crops, such as sorghum and millet, which can withstand the changing climate conditions." (P5, Community Leader)

The participants also reported that reliance on non-farm income sources is a common coping mechanism employed by residents in Chimanimani.

As P10, a resident, noted:

Many people in our community rely on non-farm income sources, such as remittances from family members working in towns and cities. This helps us to supplement our income and buy food during times of scarcity." (P10, Resident)

P15, a farmer, added:

"We also rely on non-farm income sources, such as selling crafts and other products. This helps us to diversify our income and reduce our reliance on farming alone." (P15, Farmer)

The findings of this study are consistent with the literature review, which suggests that diversification of crops, use of drought-tolerant crops, and reliance on non-farm income sources are common adaptive strategies and coping mechanisms employed by farmers and residents in Africa to address food security issues (FAO, 2017; IPCC, 2014). However, the study's findings also highlight the need for more sustainable and long-term solutions to address food security issues in Chimanimani. As P18, a community leader, noted:

While these adaptive strategies and coping mechanisms are helpful, they are not enough. We need to find more sustainable and long-term solutions to address food security issues in our community." (P18, Community Leader)

The study's findings also suggest that there is a need for more support and resources to be provided to farmers and residents in Chimanimani to help them adapt to climate change and address food security issues. As P20, a farmer, noted:

We need more support and resources to help us adapt to climate change and address food security issues. This could include training and extension services, as well as access to credit and other financial resources." (P20, Farmer)

The findings of this study suggest that farmers and residents in Chimanimani employ a range of adaptive strategies and coping mechanisms to address food security issues, including diversification of crops, use of drought-tolerant crops, and reliance on non-farm income sources. However, the study's findings also highlight the need for more sustainable and long-term solutions to address food security issues in Chimanimani, as well as the need for more support and resources to be provided to farmers and residents.

4.6 Suggestions for Enhancing Resilience and Sustainability in Food Production Systems

The participants were asked to propose recommendations for enhancing resilience and sustainability in food production systems in Chimanimani. The majority of the participants agreed that there is a need for a multi-faceted approach that involves government, non-governmental organizations, and local communities to enhance resilience and sustainability in food production systems. According to the participants, one of the key recommendations is to improve access to climate-resilient agricultural technologies and practices. As P3, a farmer, noted:

"We need access to climate-resilient crops and agricultural practices that can help us adapt to the changing climate. This can include drought-tolerant crops, conservation agriculture, and agroforestry. (P3, Farmer)"

P8, a community leader, added:

"We also need training and extension services to help us learn about these new technologies and practices. This can include workshops, demonstrations, and on-farm training." (P8, Community Leader)"

The participants also recommended that there is a need to improve access to markets and credit facilities to enhance the resilience and sustainability of food production systems. As P12, a farmer, noted:

We need access to markets to sell our produce and get a fair price. We also need access to credit facilities to help us purchase inputs and equipment." (P12, Farmer)

P15, a community leader, added:

We also need to strengthen our community-based organizations and cooperatives to help us negotiate better prices and access to markets and credit facilities." (P15, Community Leader)

The findings of this study are consistent with the literature review, which suggests that improving access to climate-resilient agricultural technologies and practices, markets, and credit facilities can enhance the resilience and sustainability of food production systems (FAO, 2017; IPCC, 2014). The findings of this study suggest that enhancing resilience and sustainability in food production systems in Chimanimani requires a multi-faceted approach that involves improving access to climate-resilient agricultural technologies and practices, markets, and credit facilities, as well as strengthening community-based organizations and cooperatives. The study's findings also highlight the need for a more nuanced and context-specific approach that takes into account the unique challenges and opportunities faced by local communities in Chimanimani.

4.8 Chapter Summary

This chapter presented the findings from the study on the impact of climate change on food security in Chimanimani, Zimbabwe. The key findings indicate that climate change is having a

significant impact on agricultural practices and food production in Chimanimani, with reduced crop yields, changed rainfall patterns, and increased frequency of droughts and floods being major challenges faced by farmers and residents. The findings also highlight the importance of adaptive strategies and coping mechanisms, such as diversification of crops, use of drought-tolerant crops, and reliance on non-farm income sources, in enhancing resilience and sustainability in food production systems. The study's findings have implications for policy and practice, including the need for climate-resilient agricultural policies, increased investment in agricultural research and development, and strengthened community-based initiatives to support farmers and residents in adapting to climate change. Future research should focus on developing and testing context-specific adaptation strategies and technologies, as well as exploring the potential for climate-resilient agriculture to contribute to sustainable development and poverty reduction in Zimbabwe.

CHAPTER FIVE

5.0 SUMMARY, RECOMMENDATIONS , CONCLUSIONS AND AREAS OF STUDY

5.1 Introduction

This chapter presents the summary, conclusions, and recommendations of the study on evaluating the effects of climate change on food security in Chimanimani, Zimbabwe. The chapter synthesizes the key findings from the preceding chapters, highlighting the impact of climate change on agricultural practices and food production, the challenges faced by local communities, and the adaptive strategies and coping mechanisms employed by farmers and residents. The chapter also draws conclusions based on the research findings, provides evidence-based recommendations for enhancing resilience and sustainability in food production systems, and identifies areas for further research.

5.2 Summary of the Study

This study evaluated the effects of climate change on food security in Chimanimani, Zimbabwe. The research was motivated by the growing concern about the impacts of climate change on agricultural productivity and food security, particularly in vulnerable communities. Chapter 1 introduced the research problem, objectives, and significance of the study, highlighting the need to investigate the effects of climate change on food security in Chimanimani.

Chapter 2 reviewed the literature on climate change, agriculture, and food security, highlighting the complex relationships between these variables. The chapter discussed the impacts

of climate change on agricultural productivity, including changes in temperature and precipitation patterns, increased frequency of extreme weather events, and shifts in growing seasons. The chapter also examined the concept of food security, including its dimensions, indicators, and measurement frameworks.

Chapter 3 presented the research methodology, including the research design, study area, population, sampling strategy, and data collection methods. The chapter explained the use of the qualitative approach to data collection and analysis methods. The chapter also discussed the procedures for data analysis, including descriptive statistics, inferential statistics, and thematic analysis.

Chapter 4 presented the research findings, including the impacts of climate change on agricultural practices and food production, the challenges faced by local communities, and the adaptive strategies and coping mechanisms employed by farmers and residents. The chapter highlighted the significant impacts of climate change on agricultural productivity, including reduced crop yields, changed planting seasons, and increased food insecurity. The chapter also identified the key challenges faced by local communities, including limited access to climate information, inadequate irrigation systems, and poor agricultural infrastructure.

5.3 Conclusion

Impact of Climate Change on Agricultural Practices and Food Production

The study concludes that climate change has significantly impacted agricultural practices and food production in Chimanimani, Zimbabwe. Climate change has led to changes in temperature and precipitation patterns, resulting in reduced crop yields, changed planting seasons, and increased food insecurity. Temperature increases have led to changes in the growing seasons,

with some crops being planted earlier or later than usual. Changes in precipitation patterns have resulted in droughts and floods, which have negatively impacted crop yields.

Key Challenges Faced by Local Communities

The study concludes that local communities in Chimanimani face numerous challenges related to food security in the face of climate change. These challenges include limited access to climate information, inadequate irrigation systems, poor agricultural infrastructure, and limited access to credit and other financial services. These challenges exacerbate the impacts of climate change on food security, making it difficult for households to adapt and cope.

Adaptive Strategies and Coping Mechanisms

The study concludes that farmers and residents in Chimanimani employ a range of techniques to address food security issues in a changing climate. These strategies include conservation agriculture, agroforestry, and climate-smart agriculture. Additionally, farmers and residents employ coping mechanisms such as diversifying their income sources, using savings and credit to purchase food and other essential items, and relying on social networks for support.

5.4 Recommendations

Based on the findings of this study, the following recommendations are made to enhance resilience and sustainability in food production systems in Chimanimani:

To the Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement

To the Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement, it is crucial to establish a climate information and advisory service that provides farmers with timely and accurate climate information to inform their agricultural decision-making. This service would

enable farmers to adapt to the changing climate conditions, ultimately enhancing their resilience and productivity. Additionally, the ministry should invest in irrigation infrastructure and other agricultural technologies, such as drip irrigation and greenhouses, to support farmers in adapting to changes in precipitation patterns. Furthermore, the ministry should provide training and support to farmers on climate-resilient agricultural practices, such as conservation agriculture and agroforestry.

To the Ministry of Finance and Economic Development

The Ministry of Finance and Economic Development also has a vital role to play in supporting farmers adapt to climate change. The ministry should provide financial support to farmers, such as subsidies and loans, to support them in adapting to climate change. Moreover, the ministry should support the development of social protection programs, such as cash transfers and food assistance, to support vulnerable households in achieving food security.

To the Zimbabwe National Water Authority

The Zimbabwe National Water Authority should invest in water harvesting and storage infrastructure, such as dams and reservoirs, to support farmers in adapting to changes in precipitation patterns. This investment would ensure that farmers have access to reliable water sources, enabling them to maintain productivity even in the face of changing climate conditions.

To the Non-Governmental Organizations (NGOs) and Development Partners

Non-Governmental Organizations (NGOs) and development partners can also contribute to supporting farmers adapt to climate change. NGOs and development partners should support the development of climate-resilient agricultural practices, such as conservation agriculture and agroforestry. Moreover, NGOs and development partners should provide financial support to

farmers, enabling them to access the resources they need to adapt to the changing climate conditions.

5.5 Area for Further Study

Further studies are needed to investigate the impacts of climate change on livestock production and animal health in Chimanimani, as well as to examine the role of climate change in shaping migration patterns and food security outcomes in the district. Additionally, research is needed to develop and test climate-resilient agricultural technologies and practices, such as drought-tolerant crop varieties and conservation agriculture, and to assess their potential to enhance food security and livelihoods in the face of climate change. Furthermore, studies are required to investigate the effectiveness of climate information and advisory services in supporting farmers in making informed decisions about planting, harvesting, and other agricultural practices, and to identify the most effective strategies for scaling up these services to reach more farmers.

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ANNEXTURES

ANNEX 1: CONSENT FORM

Researcher Information

Researcher Name:

Institution: Bindura University of Science Education

Contact Information:

Title of Study: *Evaluating the Effects of Climate Change on Food Security: A Case Study of Chimanimani, Zimbabwe*

Participant Consent

I, have read and understood the information provided about the study. I voluntarily agree to participate in this research. I understand that my participation is voluntary, and I have the right to withdraw at any time without penalty. I understand that my responses will be kept confidential and used for research purposes only.

Participant Signature:

Date

ANNEX 2 : INTERVIEW GUIDE

SECTION A: Impact of Climate Change on Agricultural Practices and Food Production

1. How has climate change affected agricultural practices in Chimanimani?
2. In your opinion, what specific impacts has climate change had on food production in the region?
3. Have you observed any changes in crop yields or quality due to climate change? If yes, please elaborate.
4. Do you believe that climate change has influenced the availability of water for agricultural purposes in Chimanimani?

Section B: Key Challenges Faced by Local Communities Regarding Food Security

1. What are the main challenges faced by local communities in Chimanimani in ensuring food security in the face of climate change?
2. How have changing weather patterns impacted food access and availability in the region?
3. Have you noticed any shifts in food consumption patterns among community members due to climate-related factors? If yes, please explain.
4. What are the major obstacles hindering food security initiatives in Chimanimani?

Section C: Adaptive Strategies and Coping Mechanisms Employed by Farmers and Residents

1. What strategies have farmers and residents adopted to cope with the challenges posed by climate change in relation to food security?

2. Have you observed any innovative practices being implemented to enhance food security in Chimanimani? If yes, please provide examples.

3. How do farmers and residents collaborate to address food security issues in the region?

4. In your opinion, what are the most effective coping mechanisms employed by the community to adapt to changing climatic conditions and ensure food security?

Section D: Recommendations for Enhancing Resilience and Sustainability in Food Production Systems

1. Based on your experience, what recommendations would you propose to enhance resilience and sustainability in food production systems in Chimanimani?

2. How can government policies and interventions support the efforts of farmers and residents in addressing food security challenges exacerbated by climate change?

3. What role can local organizations and community initiatives play in promoting sustainable food production practices in Chimanimani?

4. In your view, what are the key priorities for future actions to improve food security resilience in the region?

SIMILARITY REPORT

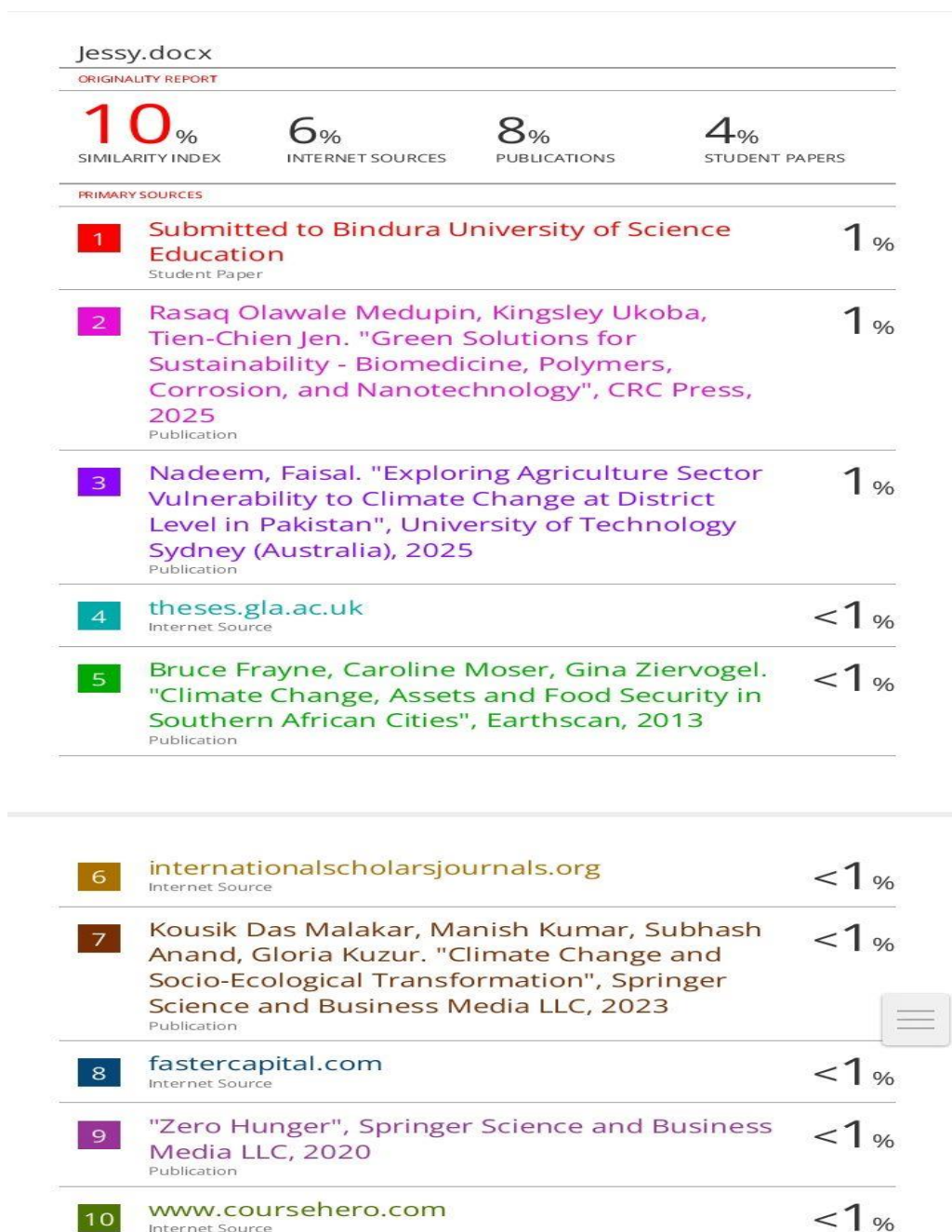


Figure 1 Similarity report