THE EFFECTS OF EL NIÑO-INDUCED DROUGHT ON HOUSEHOLD FOOD AND NUTRITION SECURITY IN MASHONALAND CENTRAL PROVINCE, ZIMBABWE

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN FOOD SECURITY AND SUSTAINABLE AGRICULTURAL POLICY

Bindura University of Science Education

Faculty of Agriculture and Environmental Science

Department of Agricultural Economics, Education and Extension

VERA GILBERT

B231790B

NAME OF SUPERVISOR: DR R. CHIVHEYA

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RELEASE FORM

Name of Candidate: **Vera Gilbert**

Reg Number: **B231790B**

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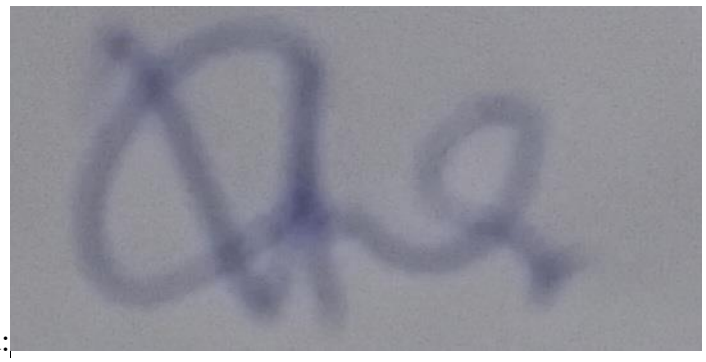
Signed: 

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Name of supervisor**:** Dr R. Chivheya

Signature: 

Date: 25 June 2025

Chairman: Dr N Mafuse

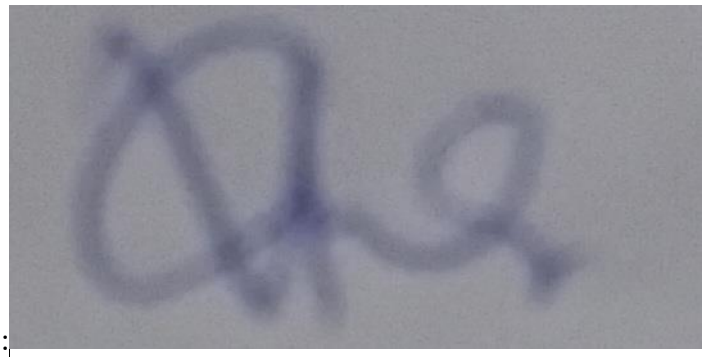
Signature: 

Date: 17 October 2025

DECLARATION

The undersigned certify that they have read this research project and have approved its submission for marking in relation to the department's guidelines and regulations

Student: …Gilbert Vera

Signature: 

Date: 25/06/25

Supervisor: Dr R. Chivheya

Signature: 

Date: 25/06/25

Chairperson:……..

Signature:

Date:

DEDICATION

I dedicate this study to my loving wife, Talent Tom who tirelessly supported and encouraged me during the entire period of my studies. My sons Alpha, Ariel and Anopaishe and my beloved daughter Anisha Vera who sacrificed their time and relinquished my attention during my studies.

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ABSTRACT

This study investigates the multifaceted effects of El Niño-induced drought on households in Muzarabani, Mashonaland Central Province, Zimbabwe, focusing on food and nutrition security, household income, health and coping mechanisms. Utilizing a mixed-methods approach, the research incorporates quantitative data from surveys of 200 Ward 1 households and qualitative insights from five focus group discussions and nine key informant interviews. Descriptive statistics (frequencies and cross tabulations), multiple linear regression and thematic analysis was employed. The findings reveal that over 65% of households in Muzarabani face moderate to severe food insecurity, with income level emerging as the most significant determinant. Households earning less than USD 100 were particularly vulnerable to food shortages, a pattern reinforced by qualitative data linking El Niño-induced droughts to declines in food and nutrition security. Regression analysis showed that drought exposure significantly reduced household income ($B = -0.609$, $p < 0.001$), while demographic factors like age, gender, and education had limited predictive value. Additionally, 55.5% of households reported health problems during drought, and food shortages were significantly associated with changes in healthcare services ($t = 2.508$, $p = 0.013$; $\chi^2 = 6.160$, $p = 0.013$). Coping strategies included migration (54.5%), livestock sales (51.5%), borrowing (48.5%), and food aid (48.0%), while small business creation (44.5%) was less common due to capital and skills constraints. Demographic variations influenced strategy choice, with migration more prevalent among educated households and aid reliance declining with income. Qualitative themes emphasized livelihood diversification, social networks, and migration, while highlighting the long-term costs of asset loss, indebtedness, and dietary compromise. Based on the study's findings, key recommendations include expanding income-generating opportunities through support for small businesses, vocational training, and access to microcredit to overcome capital and skill barriers. Strengthening food security requires targeted social protection, such as food subsidies and cash transfers, for the poorest households. Education investment, particularly at secondary and vocational levels, can boost adaptive capacity and diversify livelihoods. Health systems should be made drought-responsive through early warning systems and community health support. All resilience-building efforts should be localized, inclusive, and grounded in community participation and indigenous knowledge. In conclusion, an integrated, resilience-focused policy approach is essential to address the compounded impacts of drought on vulnerable households, whose short-term coping strategies remain insufficient for sustainable food and nutrition security.

Key Words: El Niño Induced drought, food security, health outcomes, coping mechanisms.

LIST OF ACRONYMS AND ABBREVIATIONS

EPA:	Environmental Protection Agency
FAO:	Food and Agriculture Organization
HFIAS:	Household Food Insecurity Access Scale
IPCC:	Intergovernmental Panel on Climate Change
IFAD:	International Fund for Agricultural Development.
MLAWCRR:	Ministry of Lands, Agriculture, Water, Climate, and Rural Resettlement
NGO:	Non-Governmental Organization
NOAA:	National Oceanic and Atmospheric Administration
WFP:	World Food Programme
ZIMVAC:	Zimbabwe Vulnerability Assessment Committee

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CHAPTER 1
INTRODUCTION

1.1 Background of the study

The 2015–2016 El Niño-induced drought in Southern Africa was the worst in 35 years (Hove & Kambanje 2019; Mazvimavi, Murendo & Chivenge 2017; World Food Programme [WFP] 2016). El Niño, a complex climatic phenomenon characterized by the periodic warming of sea surface temperatures in the central and eastern equatorial Pacific Ocean, has profound impacts on global weather patterns (NOAA, 2023). The current study is particularly timely, as climate change-induced extreme weather events, such as prolonged droughts, have become increasingly common and severe in sub-Saharan Africa (Chidarikire, M., & Saruchera, M. (2024). According to Mastrorillo *et al*. (2016), the frequency of droughts has intensified in southern Africa, significantly affecting food availability and access. Important to note, rain-fed food crop production is the critical source of livelihood in Southern Africa (Mavhura, Manatsa & Mushore 2015). In Mashonaland Central Province of Zimbabwe, 73% of households rely on rain-fed agriculture, making them highly vulnerable to drought (ZIMSTAT, 2019).

The phenomenon had widespread, deep and diverse impacts on food and nutrition security. Over 40 million people facing food insecurity resulting from crop failure (RIASCO 2017; WFP 2016). The 2015–2016 El Niño-induced drought crippled rain fed crop production in the agricultural sector (Arslan 2018; FAO 2016; Mazvimavi et al. 2017; RIASCO2017; WFP 2016). Outside the Southern African region, Owusu et al. (2019) reported crop failure and poor harvest in Ghana because of the 2015–2016 El Niño-induced drought. They also reported that 'The major impacts of the El Nino induced rainfall failure and yield reduction were household food insecurity, loss of income, indebtedness and deepening poverty' (Owusu *et al*. 2019:618). The El-Nino induced drought disaster also affected economic performance in Zimbabwe through environmental fragility, severe livestock deaths and crop failure (ZIMVAC 2019).

In Zimbabwe, the Food and Agriculture Organization (FAO, 2021) reported that recurrent droughts have led to increased food insecurity, with a substantial percentage of households experiencing inadequate food consumption and malnutrition. Moyo *et al*. (2020) found that children in drought-affected areas are particularly vulnerable to malnutrition, which can have long-term consequences for physical and cognitive development. Chikozho (2016) emphasizes that drought leads to decreased crop yields, resulting in lower income for farming households. The World Bank (2022) reports that the economic impact of droughts in Zimbabwe has led to increased poverty levels, with many households falling below the poverty line due to loss of income from agriculture. Black et al. (2013) elucidate that malnutrition exacerbated by food

shortages can lead to increased morbidity and mortality rates, particularly among children and vulnerable populations.

In Zimbabwe, Mashonaland Central Province, has historically been associated with severe droughts, leading to significant socio-economic challenges. However, households adopt various coping strategies in response to drought, which can include altering dietary practices, reducing food intake, or seeking alternative sources of income. Nhamo *et al*. (2020) found that many households in Zimbabwe resort to selling livestock or engaging in small-scale trading to cope with food shortages. Besides, facing socio-economic challenges, many people in Zimbabwe have turned to Savings and Lending Associations (SLAs) as a means of resilience as development partners' implemented cash and commodity voucher programs.

This thesis explores the effects of El Niño-induced droughts on household food and nutrition security in Muzarabani, Mashonaland Central Province. The study focused on various dimensions such as food and nutrition security, income levels and health.

1.2 Problem Statement

Droughts, exacerbated by El Niño events, have become increasingly frequent and severe worldwide, affecting over 1.5 billion people globally (IPCC, 2013).

In Southern Africa, droughts have become more frequent and intense, affecting over 40 million people in the region (SADC, 2016). The 2015-2016 El Niño event resulted in one of the worst droughts in the region's history, with Zimbabwe, South Africa, and Malawi being severely affected (FAO, 2016).

Zimbabwe is highly vulnerable to droughts, with over 70% of the population relying on rain-fed agriculture (ZIMSTAT, 2019). The 2015-2016 El Niño event resulted in a 50% decline in maize production, exacerbating food insecurity and poverty among rural households (ZIMSTAT, 2016). According to the Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement, the 2015-2016 El-Nino event resulted in estimated losses of US$1.3 billion to Zimbabwe's agricultural sector (MLAWCRR, 2016).

Mashonaland Central Province, particularly Muzarabani, is one of the most drought-prone areas in Zimbabwe (Mugambiwa & Tirivangasi, 2017). The region's agricultural productivity is heavily reliant on rainfall, making it highly vulnerable to droughts (Masih *et al*., 2014). According to the Zimbabwe Vulnerability Assessment Committee (ZimVAC) report, Muzarabani had a food insecurity prevalence of 71% in 2019, with over 80% of households relying on subsistence farming (ZIMSTAT, 2019).

These drought events have devastating impacts on crop yields (ZIMSTAT, 2016; Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement, 2019), household income

(Zinyengere *et al*., 2014), household food and nutrition security (Masih *et al*., 2014; Mugambiwa & Tirivangasi, 2017) and access to adequate health services (ZIMVAC, 2020; Muchapondwa *et al*., 2021). Important to note, rural households in Zimbabwe are highly vulnerable to climate-related shocks, including droughts, disrupting livelihoods that rely heavily on subsistence farming (IFAD, 2018).

According to Muchapondwa *et al*., (2021) diminished household income can limit access to adequate health services, thus perpetuating cycles of poverty and socio-economic disadvantage. In 2019, ZIMSTAT found out that approximately 25% of children under the age of 5 in Mashonaland Central Province suffer from stunting due to chronic malnutrition, exacerbated by drought-related food insecurity. A study by the World Food Programme (WFP) found that the 2016-2017 drought resulted in a significant increase in malnutrition cases among children under 5 in Zimbabwe, with a 30% increase in severe acute malnutrition cases (WFP, 2017). Earlier on in 2015, the Zimbabwe Demographic and Health Survey (ZDHS) found that prevalence of stunting among children under 5 in Mashonaland Central Province was 27.5%.

However, families adopt various coping mechanisms, such as food rationing and migration, to navigate these crises, though these strategies often fall short in fully mitigating the negative effects of drought on food and nutrition security (Manatsa *et al*., 2015). Besides, the state's social protection mechanisms are often remedial rather than preventative (Chineka & Mundau, 2019). As households struggle to cope with the effects of drought, understanding the multifaceted implications of these climatic events is essential for developing effective interventions.

According to Mugambiwa, S. S., & Tirivangasi, H. M. (2017), in as much as there is growing concern about the effects of El Nino-induced drought, there is a significant knowledge gap regarding the specific impacts on household welfare which includes income, expenditure, and access to basic services. Existing studies have primarily focused on the impacts of drought on agricultural productivity and food security at the national level (ZIMSTAT, 2016; MLAWCRR, 2016). Using a localized approach, targeting a drought-prone region of Mashonaland Central in Muzarabani, this study addresses this knowledge gap by investigating the effects of El-Nino induced droughts on specific household level outcomes; food and nutrition security, household income and health. Through this analysis, the study also explored the coping strategies adopted by households, providing insights into potential interventions that could enhance resilience in drought-affected communities.

1.3 Objectives

1.3.1 Main Objective

The study's general objective is to explore the effects of El Niño-induced drought on household food and nutrition security in Mashonaland Central Province, Zimbabwe.

1.3.2 Specific objectives

The specific objectives are as follows:

(i) To assess the effect of El Niño-induced drought on food and nutrition security status among households in Muzarabani, Mashonaland Central Province.

(ii) To evaluate the effects of El Nino induced drought on household income in Muzarabani, Mashonaland Central Province.

(iii) To examine the implications of drought on health in affected households in Muzarabani, Mashonaland Central Province.

(iv) To identify coping mechanisms adopted by households in response to drought conditions.

1.4 Research Questions

The specific research questions are as follows:

(i) What are the effects of El Niño-induced drought on food and nutrition security among households in Muzarabani, Mashonaland Central Province?

(ii) What are the effects of El Niño-induced drought on household income in Muzarabani, Mashonaland Central Province?

(iii) How does El Niño-induced drought affect the health of households in Muzarabani, Mashonaland Central Province?

(iv) How do households cope with effects of El Niño-induced drought in Muzarabani, Mashonaland Central Province?

1.5 Hypotheses

H_0: El Niño-induced drought significantly affects household food and nutrition security, household income and health in Muzarabani, Mashonaland Central Province, Zimbabwe.

1.6 Justification/Significance of the study

Mashonaland Central Province, a region heavily reliant on agriculture, is particularly vulnerable to climatic variability. Droughts induced by El Niño events can devastate crop yields, reduce livestock productivity, and deplete water resources, thereby exacerbating poverty and undermining household welfare (ZIMSTAT, 2022). Therefore, understanding the specific economic impacts on households, in regions like Zimbabwe, where agriculture is a

primary livelihood source, is an important research area. El-Nino induced droughts exacerbate food and nutrition insecurity, particularly among vulnerable households in Mashonaland Central, Zimbabwe. By shedding light on the multifaceted impacts of El Niño-induced droughts on household food and nutrition security, this research informs policymakers, regulators, and practitioners in Zimbabwe and similar economies to develop more effective and context-specific, evidence-based programming climate change mitigation and adaptation strategies to address current and future droughts.

Besides, drought-related food and nutrition insecurity can lead to malnutrition, stunting, and other health problems, particularly among children, pregnant women, and the elderly. This research contributes to the gap in the literature regarding effects of El Nino-induced droughts on household food and nutrition, income, health and educational outcomes within Zimbabwe's context, often overlooked in impact studies. This study contributes to the existing body of knowledge by providing empirical evidence which inform the development of effective interventions to enhance household food and nutrition security, particularly among vulnerable populations, the development of climate-resilient agricultural practices and adaptation strategies, providing insights relevant for policymakers, development practitioners, and local communities aiming to enhance resilience, reduce vulnerability to climatic shocks and development of evidence-based policies, contributing to the achievement of the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 13 (Climate Action).

1.7 Scope/Delimitations and Limitations of study

1.7.1 Scope/Delimitations

The study focused on households in Muzarabani, Mashonaland Central Province, Zimbabwe, an area affected by El Niño-induced droughts. The research is limited to the assessment of the effects of drought on food and nutrition security, household income, health, and educational outcomes. The geographical focus on Muzarabani allows an in-depth examination of a community that is particularly vulnerable to climate variability due to its reliance on subsistence agriculture (Manyeruke & Hamauswa, 2013). However, the study was not extended to other regions of Zimbabwe, as conditions and coping strategies may vary significantly across regions due to differences in climate, resource availability, and economic structure. Additionally, while various socio-economic and environmental factors contribute to food and nutrition security, this study concentrated primarily on drought-related impacts, rather than other climate phenomena or socio-economic factors not directly linked to El Niño events. The temporal focus is on recent drought events from 2015 onward, capturing data relevant to the most recent El Niño cycles that have affected Zimbabwe. Additionally, the research

primarily relies on qualitative and quantitative data collected through surveys and interviews from affected households.

1.7.2 Limitations of the Study

One limitation of this study is the reliance on self-reported data from households, which could be subject to recall bias or social desirability bias, particularly when assessing sensitive issues such as income and coping strategies (Fisher, 2019).

The study's focus on a specific geographic area may limit the generalizability of the findings to other regions in Zimbabwe or similar contexts.

Additionally, the study's cross-sectional design may limit the ability to establish causal relationships between drought and outcomes in food security, income, and education. Longitudinal data would provide stronger causal inferences but are beyond the scope of this study due to time and resource constraints.

The timeframe for the study encompass the most recent El Niño events, particularly focusing on the years 2015-2023, to provide a contemporary understanding of the situation. Furthermore, given the potential for variations in drought severity and frequency across years, findings from the Muzarabani region may not be generalizable to other regions in Zimbabwe or sub-Saharan Africa. Therefore, the dynamic nature of climate change and its effects on agricultural practices may evolve, making it challenging to predict long-term trends based on current data.

Finally, logistical challenges in accessing remote areas of Muzarabani may affect the sample size and diversity of respondents, potentially impacting the comprehensiveness of the data collected.

1.8 Outline of Thesis

This thesis is systematically organized to provide a comprehensive exploration of the impacts of El Niño-induced droughts on household food and nutrition security in Muzarabani, Mashonaland Central Province, Zimbabwe. Chapter 1 serves as the introduction, offering a foundational overview of the study, which includes the background context, problem statement, specific objectives, research questions, hypotheses, justification for the research, and a delineation of the scope and limitations of the study. Chapter 2 presents a meticulous literature review, synthesizing existing research on El Niño-induced droughts, food and nutrition security, and household welfare, particularly within Zimbabwe and comparable socio-economic contexts. Following this, Chapter 3 details the research methodology employed, outlining the research design, data collection methods, sampling procedures, and analytical techniques utilized to derive findings. Chapter 4 is dedicated to the presentation and discussion

of the results, interpreting the data to elucidate the multifaceted effects of drought on food security, household income, health, and educational outcomes. In Chapter 5, the thesis shifts focus to the coping strategies adopted by households in response to drought conditions, providing a critical analysis of these mechanisms while offering recommendations aimed at enhancing community resilience. Finally, Chapter 6 concludes the thesis with a summary of key findings, their implications for policy and practice, and suggestions for future research avenues, thereby contributing to the broader discourse on climate resilience and food security in vulnerable regions.

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CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

El Niño-induced droughts have become a recurrent climatic challenge, particularly in sub-Saharan Africa, where they significantly impact agricultural productivity and household livelihoods. In Zimbabwe, the 2023/2024 El Niño event precipitated severe drought conditions, profoundly affecting rural communities reliant on rain-fed agriculture. This literature review examines the multifaceted effects of El Niño-induced droughts on household food and nutrition security, income, health and coping mechanisms, with a specific focus on Muzarabani in Mashonaland Central Province, Zimbabwe. The review covers the theoretical frameworks underpinning El Nino-induced droughts, and related empirical studies. The chapter is structured around the main objective of the study and its specific objectives, providing a comprehensive overview of the impact of climate variability on food security, income, health and coping mechanisms among affected households.

2.1 Theoretical Frameworks

The study on the effects of El Niño-induced drought on household food and nutrition security in Mashonaland Central Province, Zimbabwe, is grounded in several interrelated food security theories, sustainable livelihoods perspectives, and climate change adaptation models that address climate impacts, food security, and household resilience. The following theories are particularly relevant:

2.1.1 Food Security Conceptual Framework *(FAO, 2015)*

The Food Security Framework emphasizes the availability, accessibility, utilization, and stability of food resources. This framework is crucial for understanding how El Niño-induced drought affects food production and household nutrition. It highlights the importance of not only food availability but also the socio-economic factors that influence access to food, particularly in rural settings where agricultural dependence is high (FAO, 2018). Grasping these dimensions allows researchers to assess the extent of food insecurity and its implications for nutrition and health outcomes in vulnerable populations.

2.1.2 Sustainable Livelihoods Framework (SLF)

The Sustainable Livelihoods Framework (SLF) (Chambers & Conway, 1992 provides a comprehensive approach to understanding how households manage their resources and cope with shocks such as drought. This framework considers various forms of capital-natural, human, social, physical, and financial—that households utilize to sustain their livelihoods. It is particularly useful in analyzing how households in Muzarabani adapt to the challenges posed

by El Niño-induced drought, including changes in agricultural practices and income diversification strategies (Scoones, 1998). By applying the SLF, the study can explore the resilience of households and the effectiveness of their coping mechanisms.

2.1.3 Climate Change Vulnerability Framework (IPCC, 2022)

This theory assesses how climate shocks impact human well-being and social systems such as health. Increased malnutrition, dehydration, and disease outbreaks (e.g., cholera) due to food shortages and contaminated water sources (WHO, 2023). Higher child mortality rates due to weakened immune systems caused by poor diets and hunger (UNICEF, 2022). During El Niño events, malnutrition rates in Southern Africa rise by 15-30%, leading to increased hospital admissions for undernourished children (WHO, 2022).

Health and Nutrition Framework also links food security with health outcomes, emphasizing the impact of nutritional status on overall health, particularly in vulnerable populations. The theory posits that food insecurity can lead to malnutrition, which in turn affects health creating a cycle of poverty and vulnerability (Davis *et al*., 2016). By focusing on this relationship, the study can highlight the broader implications of food insecurity on public health and inform interventions aimed at improving nutrition in the face of climate variability.

2.1.4 Coping Strategies Theory

Coping strategies theory focuses on the mechanisms that households employ to manage stressors, such as food insecurity and economic hardship. This theory is relevant for examining the specific coping mechanisms adopted by households in response to drought conditions. Research indicates that households often resort to a mix of short-term and long-term strategies, including altering consumption patterns, seeking alternative income sources, and relying on community support networks (Mastrorillo *et al*., 2016). Understanding these strategies is vital for assessing the immediate impacts of drought on household nutrition and the potential long-term consequences for health and well-being. The Adaptive Capacity Model (Adger *et al*., 2009) is also applicable as it assesses how households adapt to climate-induced shocks through short-term and long-term strategies.

In conclusion, the integration of these theoretical frameworks provides a robust foundation for analyzing the multifaceted impacts of El Niño-induced drought on household food and nutrition security in Mashonaland Central Province. By employing these frameworks, the study aims to uncover the complex interactions between climate variability, food security, household income and health ultimately contributing to the development of effective interventions and policies.

2.2 Empirical Evidence of effects of El Niño-induced droughts

El Niño is a climate phenomenon characterized by the periodic warming of sea surface temperatures in the central and eastern Pacific Ocean, which significantly influences weather patterns worldwide (McPhaden *et al*., 2006). In Zimbabwe, El Niño events have been associated with increased drought occurrences, leading to severe agricultural impacts. According to the Zimbabwe Meteorological Services (2020), El Niño has been linked to reduced rainfall and prolonged dry spells, particularly affecting the country's rural agricultural sectors. This section explores empirical literature review of El Nino-induced droughts on food and nutrition security outcomes, household income and health. Empirical studies on coping mechanism by households is also discussed.

2.2.1 Impact of El Niño-Induced Drought on Food and Nutrition Security

2.2.1.1 Food Security Status

Food security is defined as the availability, accessibility, and utilization of food, which is critical for maintaining household nutrition (FAO, 2018). In Mashonaland Central Province, drought conditions have been shown to drastically reduce crop yields, leading to food shortages and increased food prices (Makhado *et al*., 2020). Studies indicate that households in drought-affected regions often face acute food insecurity, with significant implications for nutritional outcomes (Mushamba & Mavhunga, 2021).Matunhu, J., Mago, S. & Matunhu, V., (2022) used extensive literature review methodology and explorative qualitative design to investigate how rural communities and other stakeholders in Zimbabwe deal with the issues of food security in the context of persistent El Niño-induced droughts. The results show that rural communities in Zimbabwe continue to experience food security challenges that require collaboration between communities, government, non-governmental organizations (NGOs) and other stakeholders to build resilience against El Niño-induced droughts.

Regionally, the impacts of El Niño-induced drought have been extensively studied, revealing similar patterns of food insecurity and malnutrition. Research by the Food and Agriculture Organization (FAO) indicates that the drought conditions resulted in a significant decline in agricultural productivity, with many households facing acute food shortages and increased reliance on food aid.

The Southern African Development Community (SADC) reported that the 2015-2016 El Niño event led to a regional food crisis, affecting millions across countries like Zambia, Malawi, and Mozambique (SADC, 2016).

Globally, the effects of El Niño on food security have been documented in various contexts. Research by the World Food Programme (WFP, 2016) indicates that El Niño events can lead

to food crises in multiple regions, including East Africa and parts of Asia, where similar climatic conditions prevail

2.2.1.2 Nutritional Outcomes

The nutritional status of households is closely linked to food security. Moreover, studies have shown that the health implications of food insecurity are severe, with increased rates of stunting and wasting among children in affected regions. Droughts can lead to a decline in dietary diversity, increasing the prevalence of malnutrition, particularly among vulnerable groups such as children and pregnant women (Davis *et al*., 2016). Research conducted in similar contexts has demonstrated that drought-induced food insecurity correlates with higher rates of stunting and wasting among children (Nkhata *et al*., 2021).

2.2.2 Effects of Drought on Household Income

Drought significantly affects household income, primarily through reduced agricultural productivity and increased costs associated with food purchase. In Muzarabani, the reliance on rain-fed agriculture makes households particularly vulnerable to income shocks during El Niño events. Studies have shown that drought can decrease household income by up to 50%, forcing families to resort to negative coping strategies, such as selling assets or borrowing (Chikanda *et al*., 2020). Moreover, the reduction in agricultural output leads to increased poverty levels, impacting overall community resilience (Zhou *et al*., 2021).

2.2.3 Implications of Drought on Health outcomes

The health implications of drought-induced food insecurity are profound. Malnutrition can lead to an increase in morbidity and mortality rates, particularly in children and the elderly (Bock *et al*., 2019). The lack of access to adequate nutrition exacerbates existing health issues and can lead to long-term developmental challenges (Kimbowa *et al*., 2020).

2.2.4 Coping Mechanisms Adopted by Households

The global discourse emphasizes the interconnectedness of climate change, food security, and nutrition, highlighting that extreme weather events disproportionately affect vulnerable populations, exacerbating existing inequalities. Hlalele (2020) identified that drought and food insecurity were major stressors faced by households in rural areas, necessitating various coping mechanisms, while Herald (2024) examined the resilience strategies of child-headed households in the face of climate-related disasters in Chivi, highlighting the need to understand their lived experiences. Gudyanga *et al*. (2019) emphasized the importance of contextualizing coping strategies in sub-Saharan Africa, while Mavhunga *et al*. (2019) explored the adaptation strategies of rural communities in Zimbabwe, noting the unique vulnerabilities and responses of child-headed households.

To mitigate the effects of drought, households adopt various coping mechanisms. These may include diversifying income sources, adjusting consumption patterns, and engaging in community support networks (Mastrorillo *et al*., 2016). The regional response to these challenges has included initiatives aimed at improving resilience through climate-smart agricultural practices and enhanced food distribution systems. Research indicates that successful coping strategies often involve a combination of short-term relief measures and long-term adaptation practices, such as investment in drought-resistant crops and sustainable farming practices (Mavhunga *et al*., 2021).

Furthermore, a study by Makhado *et al*. (2020) emphasizes that households in drought-affected regions often resort to negative coping strategies, such as selling livestock or reducing meal frequency, which further deteriorates their nutritional status. The study noted that reliance on rain-fed agriculture makes these communities particularly susceptible to the adverse effects of climate variability, leading to a cycle of poverty and food insecurity.

2.3 Summary of Literature Review

The literature review highlighted the multifaceted effects of El Niño-induced drought on household food and nutrition security and other welfare outcomes. The empirical literature reveals a complex interplay between El Niño-induced drought, food security, and nutrition across local, regional, and global contexts. In Zimbabwe, the effects are particularly severe, with significant implications for household food security and health outcomes. Regional studies corroborate these findings, while global research highlights the broader implications of climate variability on food systems. Addressing these challenges requires a multifaceted approach that includes improving agricultural resilience, enhancing food distribution networks, and supporting vulnerable populations through targeted interventions.

The specific objectives of this study aim to fill gaps in understanding how drought affects food security, income, health and coping mechanisms. By exploring these dimensions, the research contributes to the broader discourse on climate change adaptation and resilience-building among vulnerable populations in Zimbabwe.

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CHAPTER 3
METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology employed to investigate the effects of El Niño-induced drought on household food and nutrition security in Ward 1 of Muzarabani, Mashonaland Central Province, Zimbabwe. This chapter delineates the methodological framework underpinning the study, beginning with an exposition of the philosophical foundations that shape the research worldview, followed by an articulation of the overarching approach and strategic orientation. It proceeds to justify the adoption of a convergent parallel mixed-methods design, emphasizing its appropriateness for addressing the study's complex, interdisciplinary objectives. Subsequent sections detail the study's population parameters, sampling procedures, sample size determination, data collection instruments, and analytical techniques. Ethical safeguards are also outlined to ensure procedural integrity. In addition, rigorous measures undertaken to enhance the validity, reliability, and trustworthiness of the research are discussed, all anchored in contemporary scholarly discourse. The chosen methodology reflects a deliberate effort to integrate both depth and breadth, thereby facilitating a robust synthesis of qualitative nuance and quantitative generalizability. The study focused on various dimensions, including food and nutrition security, income levels, health and coping mechanisms. The methodology aligns with best practices in agricultural and economic research to ensure reliability and validity (Creswell & Creswell, 2018).

3.2 Description of study area

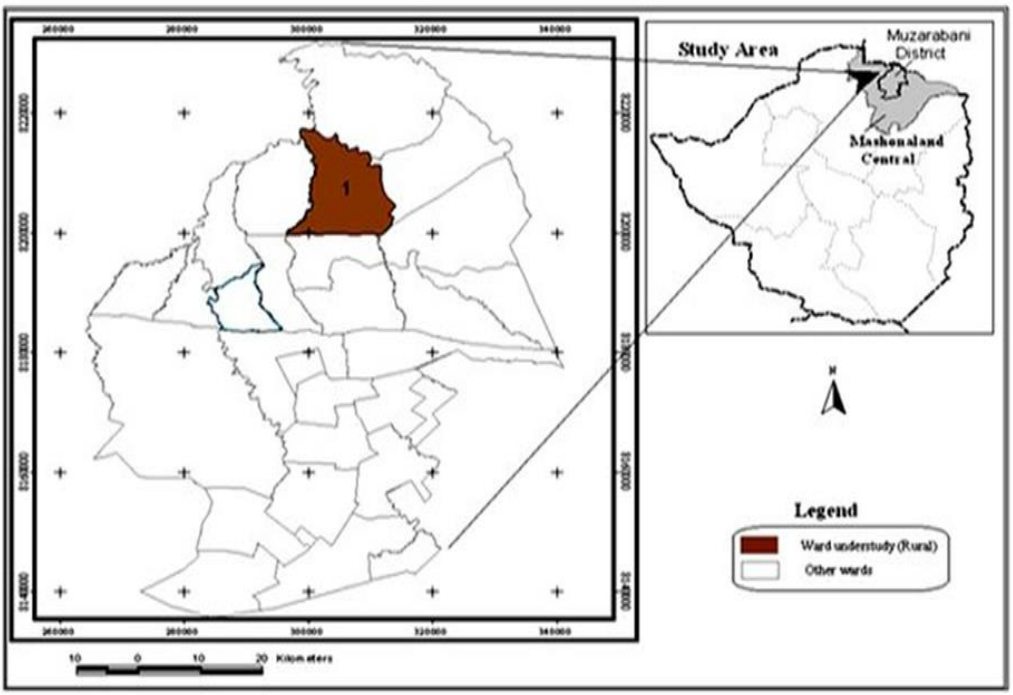
The study was carried out in Ward 1 of Muzarabani District Mashonaland Central province in Zimbabwe as shown on Figure 3.1. Muzarabani District is located in Mashonaland Central Province, Zimbabwe, characterized by its unique geographical and socio-economic attributes. The district spans 423,307 hectares, with 161,219 hectares in Region II, 37,803 hectares in Region III, and 224,286 hectares in Region IV. Notably, Region IV accounts for 52.9% of the total area, and more than 54% of the district's population resides in this region (Food and Nutrition Council. (2022). As of the most recent census, Muzarabani District has a population of approximately 100,000 residents (ZimStat, 2022). The population is predominantly rural, with a significant portion engaged in agricultural activities.

The district encompasses a total of about 400,000 hectares of arable land (Moyo, 2023). The GPS coordinates for Muzarabani are approximately -16.1553° S, 30.1921° E. To reach Muzarabani from Harare, one can take the A1 highway heading north. After approximately 190 kilometers, turn onto the Muzarabani Road, continuing for about 30 kilometers until you

reach the district center. Muzarabani is primarily an agricultural region, known for its cultivation of several key food crops. The major crops grown include maize, sorghum, millet, and groundnuts (Gadzirayi et al., 2021). These crops are vital for both household consumption and local markets, contributing significantly to food security in the area.

The district experiences an annual rainfall of approximately 600 to 800 millimeters, concentrated mainly between November and March (Chagonda, 2022).

Household income in Muzarabani is primarily derived from agriculture, with many families relying on the sale of crops as their main source of livelihood. Other income sources include livestock rearing, remittances from family members working in urban areas, and informal trading (Muzarabani District Development Plan, 2023). The reliance on agriculture makes households particularly vulnerable to climatic variations, such as those induced by El Niño events. Focusing on a highly exposed region, the study increases its potential to inform targeted interventions and adaptation strategies relevant to similar agro-ecological zones in Zimbabwe and Sub-Saharan Africa more broadly (FAO, 2023). As a region frequently impacted by erratic rainfall patterns, crop failure, and food insecurity (Mavhura *et al*., 2015), Muzarabani provides a critical case for understanding the intersection of climate variability and rural livelihoods, which aligns with the conceptual framework of the study (Flyvbjerg, 2020).



Source: https://en.wikipedia.org/wiki/Muzarabani_District#/map/0

Figure 3. 1: Location of Muzarabani District

3.3 Research Design

This study adopts a pragmatic research philosophy, emphasizing mixed methods to understand complex social phenomena (Creswell & Creswell, 2018). Pragmatism supports methodological pluralism, focusing on the research question as central (Morgan, 2018). Given the impacts of El Niño-induced droughts, it combines quantitative and qualitative approaches to generate contextually relevant knowledge (Kaushik & Walsh, 2019).

The research employs a deductive approach, starting with theoretical frameworks and hypotheses from existing literature to assess causal relationships between droughts and food security indicators (Bryman, 2016). Inductive reasoning elements are included through qualitative data, which helps refine quantitative findings (Tashakkori et al., 2020).

A case study strategy focuses on the localized effects of droughts in Ward 1 of Muzarabani District, allowing in-depth exploration of community-specific vulnerabilities and resilience (Yin, 2018). The study uses a Convergent Parallel Mixed Method Design, integrating quantitative and qualitative data collection and analysis simultaneously (Creswell & Creswell, 2018). This design captures both measurable outcomes and rich narratives, essential for understanding food and nutrition insecurity under climate stressors.

By offsetting the weaknesses of one method with the strengths of another, the mixed-methods approach provides a comprehensive view of the impacts of droughts, encompassing both tangible and intangible dimensions (Plano Clark & Ivankova, 2016). This aligns with current trends advocating for integrative frameworks in climate change research (Adger et al., 2020; Scoones et al., 2022).

Quantitative data from structured questionnaires assess demographics, food insecurity, income and health while qualitative data from interviews and focus groups explore perceptions and coping mechanisms. Results were merged through triangulation, enhancing validity and depth by identifying convergences and divergences (Guetterman et al., 2021).

3.4 Target Population

The target population for this study comprises all households residing in Ward 1 of Muzarabani District, located in the Mashonaland Central Province of Zimbabwe shown in Figure 3.1. In 2022, this ward consisted of approximately 8,307 households (ZIMSTAT, 2022). The conceptualization of population in this study extends beyond a mere demographic aggregation; it encapsulates a community ecosystem characterized by high agrarian dependency, limited infrastructure, and socio-economic vulnerability.

This population was purposively selected not only due to its exposure to recurrent droughts but also because it embodies structural and environmental vulnerabilities common to many rural

districts in sub-Saharan Africa. As such, insights gleaned from this context are expected to have both local relevance and broader theoretical applicability in understanding the intersections of climate stressors, rural livelihoods, and food system resilience (Ayeb-Karlsson, 2021; Scoones et al., 2022).

Furthermore, the population is sufficiently diverse in terms of household composition, income sources, gender roles, and adaptive capacity, thereby allowing the study to examine differentiated vulnerabilities and coping strategies. The choice of Ward 1 as the focal geographic unit is also methodologically strategic, as it provides a manageable yet representative subset of the district, allowing for an in-depth, and mixed-methods exploration without compromising analytical rigor or feasibility.

In essence, the population selected for this study offers a fertile ground for interrogating the complex dynamics between climatic events and socio-economic outcomes, in line with the overarching research objectives and theoretical framework. The study thereby seeks to generate insights that are both empirically grounded and policy-informing, contributing to scholarly and practical discourses on climate resilience and rural development.

3.5 Sampling Procedure and Sample Size

3.5.1 Probability Sampling

This study employed probability sampling techniques, specifically stratified random sampling complemented by systematic random sampling, to ensure statistical representativeness and methodological rigor in the selection of households within Ward 1 of Muzarabani District. Probability sampling was deemed essential to facilitate generalizability of the findings to the broader population and to mitigate selection bias inherent in non-random methods (Bryman, 2016; Creswell & Creswell, 2018).

3.5.2 Stratified Random Sampling

The initial phase involved stratification of the population based on predefined socio-economic and demographic variables such as income level, household size, and primary livelihood strategy. This stratification ensured that key subgroups, e.g., female-headed households, landless households, and smallholder farmers, were adequately represented in the sample. Stratified sampling enhances internal validity by allowing for more precise estimates of subgroup characteristics and increasing the efficiency of statistical analysis (Kemper, Stringfield, & Teddlie, 2020).

The rationale for this approach was grounded in the recognition that vulnerability to El Niño-induced drought is not homogenous but varies significantly across socio-economic strata (Béné *et al*., 2020). By capturing this heterogeneity, the study was better positioned to identify the

differentiated impacts of drought and the distinct coping strategies employed by various segments of the population.

3.5.3 Systematic Random Sampling

Following stratification, systematic random sampling was applied within each stratum to select individual households. This involved the selection of every *nth* household from a list, where *n* represented a sampling interval determined by dividing the total number of households in each stratum by the desired sample size for that group. The starting point was randomly selected to preserve randomness throughout the process (Teddlie & Yu, 2007).

Systematic random sampling was chosen for its practical efficiency in field settings, particularly in rural contexts where exhaustive household lists are available, and logistical constraints must be considered. It also facilitates field management and coordination among enumerators, reducing both redundancy and omission in household visits (Lohr, 2019).

3.5.4 Sampling Frame and Integrity

The sampling frame was constructed using household listings obtained from local administrative records, verified through consultation with village heads and local council offices. The integrity of the sampling frame was critical to ensuring that every unit in the target population had a known and non-zero chance of selection, thus maintaining sampling validity (UN DESA, 2021).

By integrating stratified and systematic sampling methods, the study achieved both statistical representativeness and logistical feasibility, ensuring that the collected data are both generalizable and reflective of intra-community diversity. This approach is consistent with best practices in climate impact and food security research, where nuanced understanding of local contexts is essential for evidence-based policy formulation (FAO, 2023; Ayeb-Karlsson, 2021).

3.5.5 Non-Probability Sampling

In addition to probability-based techniques, the study also utilized non-probability sampling, specifically purposive sampling, to select the study site and key informants. Non-probability sampling is particularly valuable in exploratory and context-driven research where the emphasis is on depth, relevance, and insight rather than statistical generalization (Etikan, Musa, & Alkassim, 2016; Palinkas *et al*., 2018).

Muzarabani District, and specifically Ward 1, was purposively selected due to its high vulnerability to El Niño-induced drought events and the socio-economic fragility of its communities. This purposive selection was informed by climatological data, government vulnerability assessments, and literature documenting the district's exposure to recurrent

climate shocks (ZIMSTAT, 2022; Chitongo & Mutasa, 2021). This method enhances the contextual relevance and policy significance of the research findings.

Purposive sampling was also applied in selecting key informants, including extension officers, local government officials, health practitioners, NGO representatives, and leaders of local farmer associations. These individuals were chosen based on their expert knowledge, roles in climate resilience, and long-term engagement with the local community. Such sampling allows for insight-rich data that complements household-level survey responses, particularly in interpreting institutional responses and adaptive governance structures (Guest, Namey & Mitchell, 2018; Ayeb-Karlsson, 2021). This form of expert sampling is integral in mixed-method research where qualitative insights serve to enrich quantitative patterns, foster triangulation, and increase the credibility and trustworthiness of the findings (Lincoln & Guba, 2020).

The limitation of potential selection bias was mitigated by using clear inclusion criteria and cross-validating findings through triangulation with quantitative data (Maxwell, 2021). The complementary use of probability and non-probability methods further enhances the methodological robustness of the study.

3.5.6 Sample Size

The sample size was determined using Kothari, C.R. (2014) formula for a finite population of Ward 1 of approximately 1,864 households and a total population of 8,307 (Zimstat, 2022) with a 95% confidence level and a 5% margin of error;

The Parameters used are; *n*= desired sample size, Population Size (N), Confidence Level (Z): 95% (which corresponds to a Z-score of 1.96), Margin of Error (E): 5% (0.05), *p* = estimated proportion of population with a particular characteristic = 0.5 (maximum variability

The Sample Size Formula:

The formula for calculating sample size (n) for a finite population is given by:

$$n = \frac{NZ^2p\ (1-p)}{E^2(N-1) + Z^2p(1-p)}$$

Where:

p is the estimated proportion of the population (commonly set at 0.5 for maximum variability).

$$\mathrm{n} = \frac{1864\ (1.96)^2 0.5\ (1-0.5)}{0.05^2(1864-1) + 1.96^2 0.5(1-0.5)}$$

$$\mathrm{n} = \frac{1864\ (1.96)^2 0.25}{(0.0025)(1863) + (1.96)^2 0.25}$$

$$\mathrm{n} = 319.5$$

The sample size for a population of 320 households for a 95% confidence level and 5% margin of error. However, due to time and financial resource constraints, 200 respondents were successfully interviewed.

3.5 Data Collection Procedure

The cross-sectional survey method was used to collect data from households at a single point in time, facilitating an analysis of drought impacts on food security, income and health (Bryman, 2016). Quantitative data on demographic characteristics, food security, income and health were collected and collated using structured household questionnaire.

Qualitative data for these objectives were gathered through semi-structured interviews, focus group discussions, facilitating an in-depth exploration of the respondents' experiences on coping strategies.

Data collection was conducted in three phases to ensure methodological rigor. In the first phase, pre-tested questionnaires were administered to 200 randomly selected households by trained enumerators fluent in the local Shona dialect. The second phase involved key informant interviews with stakeholders who have expert knowledge on drought and agriculture. The final phase consisted of FGDs that engaged different demographic groups, youth, women, and elders, to triangulate and validate the emerging themes. Data collection occurred between February and April 2025, coinciding with the post-rainy season to capture immediate drought-related outcomes (FAO, 2023).

Enumerator training of identified Agritex officers was also conducted to ensure uniform administration of the questionnaire, reduce interviewer bias, and maintain ethical standards. The tool was translated into the local language (Shona) and back-translated to verify semantic equivalence, further ensuring its reliability and usability in the field (Willis, 2020). In sum, the questionnaire served as a crucial instrument in the study’s mixed-method design, enabling the evaluation of key variables while also informing the qualitative components of the research.

To enhance content validity, the research instruments were developed based on established tools such as HFIAS and the Coping Strategies Index. Inputs from subject matter experts and pilot testing contributed to face and construct validity. This step enhanced both content and construct validity, ensuring that the instrument accurately captured the intended variables (Dillman et al., 2014; Taber, 2018). Furthermore, triangulation of data sources (questionnaires, interviews, FGDs) strengthens internal validity, ensuring that the results are reflective of the lived experiences of the community (Lincoln & Guba, 2020).

3.5.1 Questionnaires

Structured questionnaires were employed as the primary quantitative data collection instrument in this study. They were meticulously designed to capture a broad range of household-level data related to food and nutrition security, income variability, health outcomes and drought coping strategies. Questionnaires are widely regarded as efficient tools for collecting standardized data from a large number of respondents within a limited time frame, especially in geographically dispersed rural settings (Dillman, Smyth, & Christian, 2014; Punch, 2021).

The questionnaire comprised both closed-ended and Likert-scale items, allowing for systematic quantification of perceptions, experiences, and behavioral patterns. The structure ensured consistency in responses, thereby facilitating robust statistical analysis and comparisons across demographic groups (Bryman, 2016). In addition, some ordinal and nominal variables were included to allow for chi-square and logistic regression testing during analysis.

Demographic Information section collected data on age, gender, household size, educational attainment, and employment status to establish the socio-economic context of each household. These variables were critical in assessing differential vulnerability to El Niño-induced droughts (Chikulo & Nhamo, 2020).

3.5.1.1 Determination of Effects of El Niño-Induced Drought on Food and Nutrition Security in Muzarabani

The Household Food Insecurity Access Scale (HFIAS), developed by Coates et al. (2007) was adapted to evaluate access-related dimensions of food insecurity. The HFIAS is a validated tool widely used in both development and humanitarian contexts and allows for categorization of households into secure, mildly, moderately, or severely food insecure groups as shown on the HFIAS questionnaire guide on Table 3.1.

Table 3. 1: Household Food Security Status and the HFIAS

The 9 Household Food Insecurity Access Scale (HFIAS) Questions	**Rarely**	**Sometimes**	**Often**
Anxiety and Uncertainty about Household Food Supply: In the past four weeks, did you worry that your household would not have enough food?			
Insufficient Quality (includes variety, preferences, etc.): In the past four weeks, did you or any household member eat just a few kinds of foods day after day due to a lack of resources?			
Insufficient Quality (includes variety, preferences, etc.): In the past four weeks, did you or any household member eat food that you preferred not to eat because of a lack of resources to obtain other types of food?			

Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member eat food that you did not want to eat because of a lack of resources?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member eat a smaller meal than needed because there was not enough food?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member eat fewer meals in a day because there was not enough food?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, was there ever no food at all in your household because there were no resources to get more?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?			

Source: Author

3.5.1.2 Assessment of the Economic Consequences of El Niño-Induced Drought on Household Income in Muzarabani, Mashonaland Central Province

Respondents were asked to indicate their primary sources of income, variations in income during drought periods, and any shifts in livelihood strategies. The section aimed to assess economic resilience and coping mechanisms, drawing from recent research on rural livelihoods under climate stress (FAO, 2023; Matema et al., 2024).

3.5.1.3 Assessment of the effects of El Niño-Induced Drought on Health

Questions in health section explored the prevalence of nutrition-related illnesses (e.g., stunting, wasting) and health service access, this indicator served as proxy for household-level well-being and the longer-term developmental impact of food insecurity (UNICEF, 2022). Coping Mechanisms section utilized items from the Coping Strategies Index (CSI) to quantify the frequency and severity of behavioral responses to food insecurity, such as meal skipping, reliance on less preferred foods, or selling productive assets (Maxwell et al., 2019).

3.5.1.4 Identification of coping Strategies in the Face of Drought: Adaptation Mechanisms among Households in Muzarabani, Mashonaland Central Province

The fourth objective, which aims to identify coping mechanisms adopted by households in response to drought conditions, was effectively addressed through Section E of the

questionnaire. This section included several targeted questions designed to elicit information about the strategies households employ during drought periods.

Respondents were asked to indicate which coping strategies their households had utilized during droughts. Questions used a binary response format (1=Yes, 0=No) for each strategy, allowing for a comprehensive assessment of various coping mechanisms. It helps identify not only the most common strategies but also the diversity of approaches taken by households in response to drought.

Question 20 assessed whether any household members had migrated permanently due to drought conditions. The simple Yes/No response format provided insight into the extent of migration as a coping mechanism and its potential impact on family structures and community dynamics.

On question 22, respondents were asked to evaluate the effectiveness of their coping strategies, with options ranging from "Very effective" to "Not effective." This question provides qualitative data on the perceived success of different strategies, helping to gauge their impact on household resilience and food security.

3.5.2 Interviews

Nine Key informant interviews were conducted with agribusiness representatives, extension officers, farmer association leaders and experts to gain deeper qualitative insights into effects of El Nino-induced droughts (Swinnen & Kuijpers, 2019; Maxwell et al., 2019) as well as coping strategies adopted by households. The interviews were guided by a set of open-ended questions but will allow for flexibility to explore relevant themes as they arise (Patton, 2015). These sessions were recorded and transcribed for analysis. Interview guides were developed based on key themes identified in the literature, such as household characteristics, yields, etc. (Kvale & Brinkmann, 2015). In addition, five Focus Group Discussions (FGDs) were held with community members to explore communal coping mechanisms (Scoones et al., 2022).

Reliability was ensured through standardization of instruments and training of data collectors. The structured questionnaires yielded high internal consistency, with Cronbach's Alpha coefficients above the acceptable threshold of 0.70 in the pilot test (Taber, 2018). Repetitive and comparable responses across FGDs and interviews further affirmed inter-rater reliability.

In qualitative research, trustworthiness was enhanced by employing Lincoln and Guba's (2020) criteria: credibility, dependability, confirmability, and transferability. Member checks were performed by returning summaries of findings to participants for validation. A reflective journal and audit trail were maintained throughout the study to document methodological decisions and ensure transparency (Nowell et al., 2018).

3.6 Data Analysis Procedure

3.6.1 Quantitative Analysis

Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) Version 27. Descriptive statistics (means, frequencies, standard deviations) were used to summarize household characteristics. Inferential statistics, including Chi-square tests, t-tests, and Multiple Linear Regression (MLR) analyses, were applied to determine associations and predictors of food insecurity and related variables (Field, 2018). A significance level of $p < 0.05$ was maintained throughout the analysis.

3.6.1 Determination of Effects of El Niño-Induced Drought on Food and Nutrition Security in Muzarabani District.

In this study, the effects of El Niño-induced drought on food and nutrition security in Muzarabani were rigorously analysed through a structured variable selection process. The Food Security Index was calculated to categorize households into three distinct groups: food secure, moderately food insecure, and severely food insecure. This categorization is critical, as it allows for a nuanced understanding of the varying levels of vulnerability within the population, enabling targeted interventions based on the specific needs of each group (WFP, 2021).

To explore the relationships between drought severity and food security status, descriptive statistics were employed. This initial analysis provided foundational insights into patterns and correlations, setting the stage for more complex statistical modeling. The use of descriptive statistics is particularly advantageous in identifying trends and potential outliers, which can inform subsequent quantitative analyses (Field, 2018). I further used descriptive statistics to analyze the data and identify correlations between drought severity and food security status.

A Multiple Linear Regression (MLR) analysis was utilized to quantify the impact of drought on household food security levels, while controlling for other significant variables. The regression equation formulated is as follows:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\epsilon \quad \text{(i)}$$

Where:

Y = Dependent variable (Household Food Insecurity Access Scale (HFIAS), or Food Security Index)

β_0 = Intercept

β_1, β_2, β_3, β_4, β_5 = Coefficients for independent variables

X_1 = Gender

X_2 = Household Size

X_3 = Livelihood Source

X_4 = Education Level

X_5 = Experienced Food Shortage (Proxy for Drought)

X_6 = Age Group

X_7 = Income Level

The independent variables were selected based on theoretical relevance and empirical evidence from the literature. Each variable plays a crucial role in elucidating the factors that contribute to food security:

Gender variable is essential as it reflects disparities in food access and decision-making power within households. Research indicates that gender dynamics significantly influence food security outcomes, with female-headed households often experiencing higher levels of food insecurity (FAO, 2020).

The size of a household is a critical determinant of food security, as larger households may face increased competition for limited resources. Previous studies have shown that household size correlates with food availability and nutritional adequacy (Smith & Haddad, 2015).

The source of livelihood directly impacts food security, as different economic activities have varying resilience to drought. Households reliant on subsistence farming may be more vulnerable compared to those engaged in diversified income-generating activities (Ellis, 2000).

Education has been widely recognized as a pivotal factor influencing food security. Higher educational attainment is associated with improved food management practices and better access to resources (Zhang et al., 2018).

Experienced Food Shortage variable acts as a proxy for drought severity, capturing the immediate impact of drought conditions on household food availability. Understanding this relationship is crucial for assessing vulnerability to climate shocks.

Age can influence food security through varying levels of resilience, experience, and health status. Older adults may have different coping strategies compared to younger members of the household (Kassie et al., 2020).

Income is a fundamental determinant of food access, directly affecting purchasing power and the ability to secure food during periods of scarcity (De Schutter, 2014).

By employing MLR, this study not only identifies the statistical significance of these variables but also quantifies their relative contributions to household food security. This methodological rigor enhances the validity of findings and provides actionable insights for policy makers aimed at improving food security in the face of climate-induced challenges. Ultimately, the findings will contribute to a deeper understanding of the multifaceted impacts of El Niño-induced droughts and inform targeted interventions to bolster food and nutrition security in vulnerable communities like Muzarabani.

3.6.2 Assessing the effects of El Nino-induced droughts on household incomes

To assess the El Nino-induced droughts effects on household incomes, a linear regression model was utilized. The model equation was modeled as follows:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\epsilon \quad \text{(ii)}$$

Where:

Y = Dependent variable (e.g., household income, Household Food Insecurity Access Scale (HFIAS), or Food Security Index)

β_0 = Intercept

β_1, β_2, β_3, β_4, β_5 = Coefficients for independent variables

X_1 = Income Level

X_2 = Household Size

X_3 = Livelihood Source

X_4 = Education Level

X_5 = Experienced Food Shortage (Proxy for Drought)

X_6 = Age Group

ϵ\epsilon = Error term

The selected independent variables were chosen based on their theoretical relevance and empirical significance in understanding household income dynamics amid drought conditions: This variable is central to the analysis, as it directly reflects the economic status of households. It is essential for understanding how drought impacts earnings, particularly in agricultural-dependent communities (Devereux, 2001).

The size of a household can influence income through the distribution of resources and labor among members. Larger households may face increased financial pressure, which can hinder income generation (Smith et al., 2018).

Different sources of livelihood, such as farming, wage labor, or remittances, significantly affect household income during drought periods. Households reliant on agriculture are particularly vulnerable to income fluctuations caused by climate variability (Ellis, 2000).

Education is a pivotal determinant of income potential, influencing employment opportunities and earning capacity. Higher education levels are associated with greater resilience to economic shocks, including those induced by drought (Zhang et al., 2018).

Experienced Food Shortage **s**erving as a proxy for drought severity, this variable captures the immediate impact of drought on food availability and, consequently, household incomes. Households that experience food shortages often divert resources away from income-generating activities to cope with immediate needs (Mastrorillo et al., 2016).

Age can affect capacity for labor and productivity, as well as access to resources. Younger and older populations may exhibit different vulnerabilities and coping strategies, influencing overall household income (Kassie et al., 2020).

The evaluation of the regression model's goodness of fit was conducted using metrics such as R-squared and Adjusted R-squared. The Adjusted R-squared, in particular, accounts for the number of predictors in the model, providing a more robust measure of explanatory power when multiple variables are included (Cochran, 1977). This is crucial in the context of household income analysis, where various interrelated factors may influence outcomes.

Hypothesis testing on the coefficients was performed using t-tests to ascertain the significance of each independent variable in explaining the variation in household income. A significant t-test result suggests that the corresponding predictor variable has a meaningful impact on the outcome variable, thereby validating its inclusion in the model (Etikan, Musa, & Alkassim, 2016). This rigorous statistical approach not only enhances the reliability of the findings but also informs policy recommendations aimed at mitigating the adverse effects of El Niño-induced droughts on household livelihoods in Muzarabani.

In conclusion, this comprehensive variable selection and analytical framework provides a nuanced understanding of how El Niño-induced droughts affect household incomes, revealing critical insights for targeted interventions and policy formulation in vulnerable communities.

3.6.3 Assessment of Implications of El Nino Induced drought on Health

To assess the implications of El Niño-induced drought on health, a range of statistical methods were employed, including chi-square tests, t-tests, descriptive statistics, and cross-tabulations. Chi-square tests facilitated the examination of relationships between demographic characteristics and health enabling a nuanced understanding of how drought affects different population segments (Alhassan et al., 2024). T-tests were utilized to compare means between

affected and non-affected households, providing insight into disparities in health metrics such as malnutrition. Descriptive statistics offered a comprehensive overview of the data, characterizing the severity of drought impacts in terms of health outcomes, including increased rates of malnutrition and infant mortality, which are often correlated with drought conditions (Rahmayanti et al., 2025).

3.6.4 Identification of Coping Strategies in the Face of Drought: Adaptation Mechanisms among Households in Muzarabani, Mashonaland Central Province"

The identification of coping strategies adopted by households in response to drought was systematically analysed using statistical techniques similar to those applied in health. Chi-square tests were instrumental in exploring the relationship between socio-economic profiles and various coping strategies, allowing for a detailed understanding of how factors such as income, education, and household size influence adaptive behaviors (krepublishers.com, 2023). T-tests further facilitated comparisons of coping strategy effectiveness between households, revealing significant differences in outcomes based on the chosen methods of adaptation. Descriptive statistics provided a clear picture of the most common strategies employed, such as selling livestock, reducing meal frequency, and seeking alternative income sources (MDPI, 2022). Cross-tabulations illustrated the interaction between household characteristics and coping mechanisms, highlighting how access to resources and information can shape adaptive strategies (Research Gate, 2022). Overall, these statistical methods offered valuable insights into the coping mechanisms that households in Muzarabani utilize to navigate the challenges posed by drought, contributing to a comprehensive understanding of their resilience.

3.6.2 Qualitative Analysis

Qualitative data from interviews and FGDs were analysed thematically. Following Braun and Clarke's (2021) six-step approach, transcripts were coded inductively to identify themes related to vulnerability, coping mechanisms, and institutional support. The analysis emphasized contextual depth, allowing for the emergence of community-specific insights that complement quantitative trends (Castleberry & Nolen, 2018).

3.7 Ethical Considerations

The research adhered to strict ethical protocols in line with the Zimbabwe Council for Higher Education (ZIMCHE) guidelines. Informed consent was obtained from all participants. Ethical clearance was secured from the affiliated university's research ethics board. Confidentiality and anonymity were assured by assigning codes to participants and securely storing all data. Participants were informed of their right to withdraw at any point without any consequences

(Resnik, 2020). The study respected local cultural norms and conducted gender-sensitive interviews where necessary.

3.8 Chapter Summary

This chapter delineates the comprehensive research methodology employed to investigate the effects of El Niño-induced droughts on household food and nutrition security in Ward 1 of Muzarabani, Mashonaland Central Province, Zimbabwe. It begins by establishing the philosophical underpinnings of the study, rooted in a pragmatic research philosophy that facilitates a mixed-methods approach, thereby allowing for a nuanced exploration of complex social phenomena. The chapter justifies the use of a convergent parallel mixed-methods design, highlighting its suitability for addressing the interdisciplinary objectives of the research. The study site, Ward 1 of Muzarabani, is characterized by recurrent droughts and significant agricultural challenges, making it an ideal context for this investigation. The research design employs both deductive and inductive approaches, integrating quantitative and qualitative data to assess causal relationships and emerging patterns related to food security, income and health. A case study strategy further enhances the in-depth exploration of community-specific vulnerabilities and coping mechanisms. Sampling procedures included both probability and non-probability methods, with a stratified random sampling technique ensuring representation across socio-economic groups. A sample size of 200 households was determined using established statistical formulas, facilitating a credible analysis of the population.

Data collection was conducted through structured questionnaires, key informant interviews, and focus group discussions, allowing for a comprehensive examination of the issues at hand. The quantitative data were analysed using SPSS, while qualitative data underwent thematic analysis, adhering to rigorous criteria for validity and reliability throughout the research process. Ethical considerations were paramount, with informed consent obtained from all participants, and measures taken to ensure confidentiality and respect for local cultural norms. Overall, this chapter outlines a robust methodological framework designed to generate actionable insights into the impacts of climate variability on rural livelihoods, thereby contributing to the broader discourse on climate resilience and food security in Zimbabwe.

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CHAPTER 4
RESULTS
EFFECT OF EL NIÑO-INDUCED DROUGHT ON FOOD AND NUTRITION SECURITY IN MUZARABANI DISTRICT, ZIMBABWE

ABSTRACT

This chapter presents an in-depth analysis of the socio-economic and climatic determinants of food and nutrition security in Muzarabani District, Zimbabwe, with a specific focus on the effects of El Niño-induced drought. Utilizing a mixed-methods approach, the study combines quantitative household survey data from 200 respondents with qualitative insights from key informant interviews and focus group discussions to provide a comprehensive understanding of household vulnerability and resilience. Statistical analyses including descriptive statistics and multiple linear regression, reveal that income level is the most significant predictor of food insecurity, while demographic variables such as age, gender, household size, and education level showed limited statistical influence. The findings indicate that over 65% of households experience moderate to severe food insecurity, with low income and reliance on rain-fed agriculture emerging as critical risk factors. Qualitative data underscore that El Nino-induced drought negatively affect household food and nutrition security. This chapter concludes that enhancing economic resilience, promoting climate-smart agricultural practices, and strengthening social protection and early warning systems are essential for mitigating the adverse effects of climatic shocks. The insights generated offer valuable evidence to inform localized, data-driven policy interventions aimed at improving food security in drought-prone rural settings.

Key Words: El Niño-induced drought, Food and nutrition security, socio-economic

4.1 Introduction

The phenomenon of El Niño, characterized by the periodic warming of ocean surface temperatures in the central and eastern Pacific, has profound and far-reaching implications for global weather patterns, significantly influencing agricultural productivity and food security worldwide. The World Meteorological Organization (WMO, 2021) indicates that El Niño events occur approximately every two to seven years, with varying intensity and duration. Recent projections suggest that the frequency and severity of such climatic events are likely to increase due to climate change, thereby exacerbating vulnerabilities in food systems (IPCC, 2022). Globally, El Niño events have been linked to increased drought occurrences, leading to

food shortages and heightened nutritional insecurity across diverse regions (Schröder et al., 2019).

In Africa, the impacts of El Niño are particularly acute, with droughts leading to significant declines in crop yields and livestock productivity. The Food and Agriculture Organization (FAO, 2018) reports that around 45 million people in Southern Africa faced food insecurity due to adverse climatic conditions, with El Niño events being a significant contributing factor. Research indicates that the 2015-2016 El Niño event resulted in an estimated 1.5 million people requiring food assistance in Zimbabwe alone (WFP, 2017). In sub-Saharan Africa (SSA), the consequences of El Niño-induced droughts have been observed to disproportionately affect rural populations who depend heavily on rain-fed agriculture, thereby increasing vulnerability to malnutrition (Lobell et al., 2011).

The situation in Zimbabwe underscores the severity of these impacts. The country is characterized by a predominantly rural population reliant on subsistence farming, making it particularly susceptible to climatic variability. The Zimbabwe Vulnerability Assessment Committee (ZimVAC, 2022) reported that nearly 60% of households in Muzarabani experienced food insecurity during the last severe El Niño episode. This crisis was exacerbated by the country's ongoing economic challenges, which further limit adaptive capacity and access to food. Studies by Mavhunga et al. (2023) highlight that households affected by drought not only struggle with immediate food access but also experience long-term nutritional deficiencies, posing serious health risks, particularly for children and vulnerable populations.

At the local level, the agricultural landscape in Muzarabani is marked by smallholder farms facing significant challenges, including limited access to irrigation and water resources. The reliance on rain-fed agriculture, combined with the increasing unpredictability of rainfall patterns due to climate change, has led to a precarious food security situation (Mutasa et al., 2024). Moreover, the intersection of socio-economic factors such as household size, income level, and education adds complexity to the food security dynamics in the region. Understanding these relationships is crucial for developing effective interventions. This thesis aims to investigate the multifaceted impacts of El Niño-induced drought on food and nutrition security in Muzarabani District, utilizing a mixed-methods approach to capture both quantitative and qualitative data. By examining the interplay between climatic events and household resilience strategies, this research seeks to contribute to the growing discourse on climate adaptation and food security in Zimbabwe, offering insights that can inform policy interventions at local, national, and regional levels. Ultimately, understanding the effects of

these climatic phenomena is crucial for developing strategies to mitigate their impacts and enhance food security for vulnerable populations in Muzarabani and beyond.

Despite the extensive research on El Niño's global impacts (Schröder et al., 2019), there is a notable lack of localized studies specifically addressing its effects on food and nutrition security in rural Zimbabwe, particularly in districts like Muzarabani (ZimVAC, 2022). Existing literature often focuses on broader regional or national trends (FAO, 2018; WFP, 2017). This study aims to fill this gap by providing a nuanced understanding of how El Niño-induced drought affects food security at the community level, thereby contributing to more targeted and effective policy interventions.

4.2 Materials and Methods

A comprehensive account of the study area and the methodological framework, including sampling strategies, questionnaire formulation, data collection techniques, and analytical procedures, is presented in Chapter Three. In this chapter, however, only a succinct overview is presented.

4.2.1 Description of study area

This research was conducted in Muzarabani, a district situated in Mashonaland Central Province of Zimbabwe, Details on the description of the study area are given in Chapter three.

4.2.2 Research Design

The research employed a mixed-methods design, integrating both qualitative and quantitative methodologies to provide a comprehensive understanding of the effects of El Niño-induced drought on household food security. Details regarding the research design are given in Section 3.3 of Chapter 3.

4.2.3 Sampling procedure

A stratified random sampling technique was employed to select 200 respondents in Ward 1 of Muzarabani District who were interviewed from March to April 2024. An in-depth exposition of the sampling procedure is presented in Section 3.5 of Chapter Three.

4.2.4 Data collection procedure

The data collection process was carried out in three distinct phases. The first phase entailed administering pre-tested structured questionnaires to 200 randomly selected households through trained enumerators fluent in the local dialect; the second phase comprised seven key informant interviews with agricultural extension officers, local government officials, and NGO representatives to elicit qualitative insights into community resilience and institutional responses to drought; and the final phase involved five focus group discussions with

community members to collaboratively explore local coping mechanisms and adaptive strategies.

4.2.5 Data analysis procedure

Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) Version 27, employing descriptive statistics to summarize household characteristics and inferential statistics to assess relationships between variables. Techniques such as chi-square tests, t-tests, and multiple linear regression analyses were utilized to identify predictors of food insecurity. The qualitative data from interviews and focus group discussions were analysed thematically, following Braun and Clarke's six-step approach to identify key themes and patterns related to El Nino-induced drought on food and nutrition security.

4.2.6 Challenges encountered during data collection

A critical reflection on the challenges faced during data collection, addressing potential biases and limitations in the research process is important (Mlambo & Chikozho, 2024). The data collection process faced several challenges, including logistical constraints related to the rural setting of Muzarabani. Difficulties in accessing remote households, coupled with the limited availability of enumerators, posed significant barriers to timely data collection. Additionally, cultural sensitivities and community dynamics sometimes impacted participant willingness to engage fully, potentially introducing biases in the collected data (Mlambo & Chikozho, 2024). To mitigate these challenges, the research team employed strategies such as building rapport with community leaders, conducting pre-surveys to familiarize enumerators with local contexts, and ensuring flexibility in data collection schedules.

4.3 Results and discussions

4.3.1 Household Demographic Statistics

The demographic profile of respondents offers insight into the characteristics of the Muzarabani District community. Understanding the socio-economic context in which El Nino-induced drought was experienced is essential for assessing the El Niño-induced drought effects on household food and nutrition Security in Mashonaland Central Province, Zimbabwe. Participants' characteristics (such as age, gender, education, employment status, and income levels), provide critical insights into community vulnerability in enhancing resilience. In community-based research, demographics are vital for interpreting data and understanding the needs and challenges of the population (Bryman, 2016).

The data presented in Table 4.1 includes key variables such as age group, gender, household size, education level, and income level, which are critical for understanding the socio-economic context of the study.

Table 4. 1: Respondent Demographic Statistics

	Age Group	Gender	Household Size	Education Level	Income Level
Std. Error of Mean	.0821	.0354	.1032	.0827	.0833
Std. Deviation	1.1604	.5004	1.4596	1.1691	1.1781
Variance	1.347	.250	2.131	1.367	1.388
Skewness	-.034	-.121	-.047	-.029	1.292
Std. Error of Skewness	.172	.172	.172	.172	.172
Kurtosis	-1.453	-2.005	-1.342	-1.473	.587
Std. Error of Kurtosis	.342	.342	.342	.342	.342

Source: Author, 2025

The dataset comprises 200 observations covering various demographic variables. The age distribution of respondents is relatively balanced, with a skewness of -0.034, indicating a normal distribution around the mean age. This suggests that the sample includes a diverse range of age groups, which is important for assessing the impact of drought across different life stages. Previous studies have shown that age can significantly influence vulnerability to climate shocks, with younger and older individuals often being more susceptible to food insecurity and health issues during droughts (Mastrorillo *et al*., 2016).

The gender distribution, with a skewness of -0.121, reflects a slight balance between male and female respondents. Gender dynamics play a crucial role in agricultural productivity and food security, as women often bear the brunt of food insecurity in many developing regions. Research indicates that female-headed households may experience higher levels of food insecurity compared to their male counterparts due to limited access to resources and decision-making power (Quisumbing & Pandolfelli, 2010).

The average household size, with a standard deviation of 1.4596, indicates variability in family structures among respondents. Larger households may face greater challenges during drought conditions due to increased food and resource demands. Studies have shown that household size can significantly affect food security, with larger families often struggling more during periods of scarcity (Babatunde et al., 2010). The skewness of -0.047 suggests a relatively normal distribution, indicating that most households fall within a similar size range.

The education level of respondents, with a skewness of -0.029, indicates a fairly even distribution across different educational backgrounds. Education is a critical factor influencing adaptive capacity and resilience to climate shocks. Higher education levels are associated with better access to information and resources, which can enhance coping strategies during droughts (Adger et al., 2003). The standard deviation of 1.1691 suggests variability in

educational attainment, which may impact the effectiveness of coping mechanisms employed by households.

The income level data, with a skewness of 1.292, indicates a right-skewed distribution, suggesting that a significant portion of respondents may fall into lower income brackets. This is concerning, as lower income levels are often correlated with higher vulnerability to food insecurity and adverse health outcomes during drought conditions (Béné et al., 2016). The standard deviation of 1.1781 further emphasizes the variability in income levels among households, highlighting the need for targeted interventions to support the most affected.

The demographic information presented in this section underscores the complexity of the socio-economic landscape in Muzarabani. Understanding these characteristics is vital for assessing the impacts of El Niño-induced drought on food and nutrition security, household income, health, and education outcomes. The interplay between these demographic factors will inform the development of effective coping strategies and policy interventions aimed at enhancing resilience among affected households.

Table 4. 2: Smallholder Farmers' Age

Age Group	Frequency (%)
18–30	27.5
31–45	21.0
46–60	24.5
Over 60	27.0
Total	100.0

Source: Author, 2025

The study collected data on the age of the participants in the survey in order to incorporate the views of different age groups. Results presented in Table 4.2 reveals that most (27.5%) of the participants are aged 18-30 years and 21% of the participants are in the age group 31-45. 24.5% of respondents were aged 46-60 years old. The detailed results also show a significant representation of above 60 years age group (27%).

Table 4. 3: Smallholder Farmer's Gender

Gender	Frequency (%)
Male	47.0
Female	53.0
Total	100.0

Source: Author, 2025

Gender dynamics are vital in understanding access to resources, decision-making power. The data in Table 4.3 shows that the majority of smallholder farmers in the study are females, comprising 53% of the sample, while male farmers make up 47%. This indicates a gender balance in smallholder farming research participation.

Table 4. 4: Smallholder Farmer's Education Level

Education Level	Frequency (%)
None	13.0
Primary	18.5
Secondary	47.0
Tertiary	21.5
Total	100.0

Source: Author, 2025

The data shows that the majority of respondents (47%) have attained secondary education, while 21.5% have tertiary education and 18.5% have only primary education. 13% of respondents did not attend formal education. The results resemble the rural sector which has lower levels of education (primary and secondary) as the educated onces (certificate, diploma, or degree) normally leave for greener pastures in cities. However, all the respondents have in-depth understanding of the experiences in relation to the socio-economic effects of El Nino Induced drought and climatic determinants of food and nutrition security.

Table 4. 5: Smallholder Farmer's Monthly Income

Household Income	Frequency (%)
<100	63.5
101-200	21.0
201-300	10.0
>300 USD	5.5
Total	100.0

Source: Author, 2025

The data indicates that a majority of respondents (63.5%) reported receiving $100 and below, while 21% received 101-200 dollars on a monthly basis. 10% of respondents received a monthly income of 201-300 dollars while on 5.5% received at least USD300 per month. Such low household incomes reflect high levels of poverty and economic vulnerability to droughts.

Table 4. 6: Smallholder Farmer's Experience of El Nino-Induced Drought

Experience of Drought	Frequency (%)
No	42.5
Yes	57.5
Total	100.0

Source: Author, 2025

Results indicate that 57.5% of the respondents experienced the El Nino-induced drought. This representation helps the researcher to gather balanced insights from those who experienced the effects of the drought and those who did not.

4.3.2 Impact of El Nino-Induced Drought on Food and Nutrition Security Status

The first objective aimed at assessing impact of El Niño-induced drought on food and nutrition security status among households.

4.3.2.1 Respondent Household Food Security Status

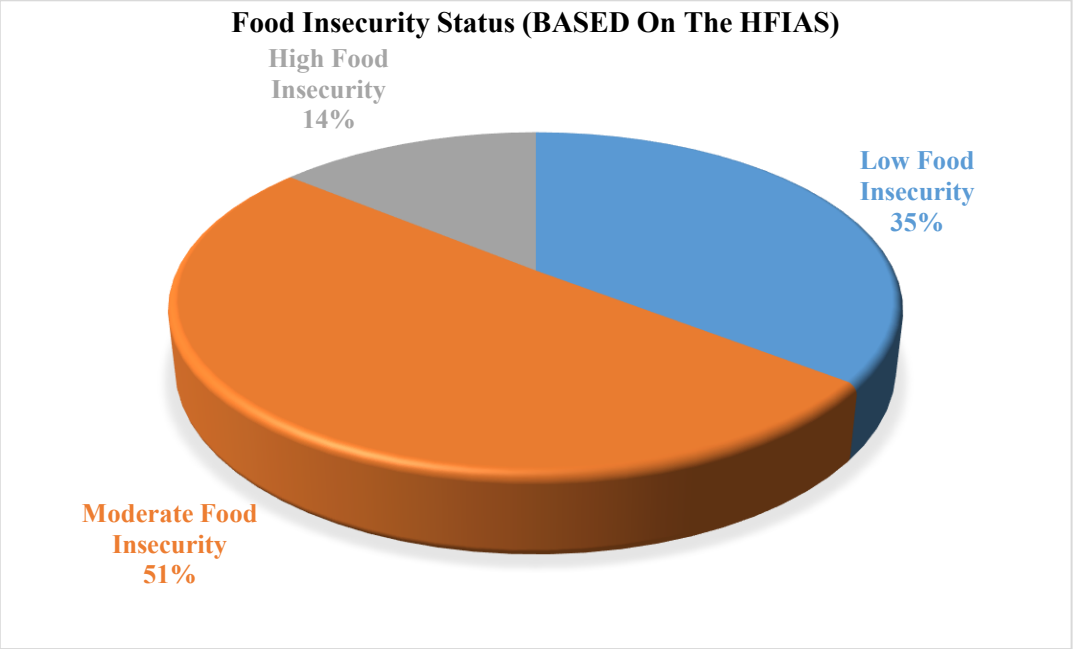

Figure 4. 1: Food Insecurity Status Categorisation

Source: Author, 2025

An examination of food security status employing the Household Food Insecurity Access Scale (HFIAS) revealed critical insights into the prevalence of food insecurity among households in Muzarabani. The findings, as shown on Figure 4.1, indicate that only 35% of respondents experienced low food insecurity, while a significant 51% fell into the moderate food insecurity category, and 14% reported high food insecurity levels. These results underscore the pressing food security challenges faced by households in this region.

The high proportion of households categorized as experiencing moderate to high food insecurity aligns with existing literature that documents the increasing vulnerability of rural communities in Zimbabwe to climatic stressors, particularly in the context of recurrent droughts. For instance, findings by Mlambo and Chikozho (2024) emphasize that climatic variability not only affects agricultural productivity but also exacerbates food insecurity, leading to substantial socio-economic repercussions for affected populations. This is particularly relevant in light of the El Niño phenomenon, which has been shown to disrupt traditional farming practices and livelihoods (Chitongo & Mutasa, 2021).

Contrastingly, some research suggests that food insecurity rates can vary significantly based on geographic and socio-economic factors. For example, a study by Kanyenze et al. (2020) found that households in more diversified agricultural zones experienced lower levels of food insecurity. This suggests that the socio-economic context, including access to resources and

market opportunities, plays a crucial role in shaping food security outcomes. In Muzarabani, the predominance of rain-fed agriculture limits households' ability to cope with climatic shocks, thus contributing to the observed high levels of moderate to severe food insecurity.

Moreover, the substantial percentage of households classified under moderate food insecurity raises concerns about the long-term implications for health and nutrition. Research by Béné et al. (2020) indicates that households experiencing moderate food insecurity are at increased risk for malnutrition, which can have cascading effects on health outcomes, particularly in vulnerable populations such as children and the elderly. The current findings reinforce the need for targeted interventions that address both immediate food access issues and the underlying socio-economic vulnerabilities that exacerbate food insecurity.

The significant percentage of households facing high food insecurity (14%) is particularly alarming, as it highlights the acute nature of food scarcity that some families endure. This aligns with observations by Zaveri et al. (2021), who noted that households in high food insecurity often resort to detrimental coping strategies, such as reducing meal frequency or altering dietary quality, which can lead to further health complications. The reliance on such strategies underscores the urgent need for comprehensive food security programs that not only provide immediate relief but also foster longer-term resilience against climatic shocks.

In conclusion, the examination of food security status in Muzarabani reveals a complex interplay of factors influencing food access, highlighting the critical need for integrated approaches to address the multifaceted challenges of food insecurity. Future research should continue to explore the nuances of food security in rural Zimbabwe, taking into account the diverse coping mechanisms employed by households and the socio-economic dynamics that shape their experiences.

4.3.2.2 Multiple Linear Regression (MLR) determining effects of El Nino-induced drought

Multiple Linear Regression (MLR) analysis was used to determine the impact of drought on household food security levels, controlling for other variables such as age, education, and household size. Y = Dependent variable (Household Food Insecurity Access Scale (HFIAS), or Food Security Index).

Table 4. 7: Multiple Linear Regression Model Summary

11	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.685[a]	.470	.451	4.00875	.470	24.310	7	192	.000	1.358

a. Predictors: (Constant), Experience Food Shortage, Age Group, Gender, Household Size, Livelihood Source, Education Level, Income Level
b. Dependent Variable: HFIAS
Source: Author, 2025

R = 0.685 indicates a strong positive correlation between the predictors (including drought exposure and socioeconomic factors) and household food insecurity. $R^2 = 0.470$ implies that 47% of the variation in household food insecurity levels can be explained by the independent variables in the model. This is relatively strong for social science research. Adjusted R^2 accounts for the number of predictors and suggests the model remains robust even when adjusted for model complexity. Model Significance ($F = 24.310$, $p < 0.001$) shows that the model is statistically significant, meaning that at least one of the independent variables has a significant relationship with food insecurity. Durbin-Watson = 1.358 shows statistic tests for autocorrelation in residuals. A value between 1.5 and 2.5 is ideal. At 1.358, there is mild positive autocorrelation, but it's not severe enough to invalidate the model, though it should be noted in the limitations.

Table 4. 8: Multiple Linear Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	19.023	2.053		9.266	.000	14.974	23.072
Age Group	-.215	.246	-.046	-.874	.383	-.700	.270
Gender	.213	.571	.020	.374	.709	-.912	1.339
Household Size	-.006	.196	-.002	-.030	.976	-.393	.381
Livelihood Source	-.265	.254	-.056	-1.046	.297	-.765	.235
Education Level	-.097	.309	-.017	-.315	.753	-.706	.512
Income Level	-3.945	.352	-.644	-11.207	.000	-4.639	-3.251
Exp Food Shortage	1.041	.609	.097	1.710	.089	-.160	2.243

a. Dependent Variable: HFIAS

Source: Author, 2025

The coefficients from the regression model presented in Table 4.8 provide insights into the impact of various factors on food and nutrition security status among households affected by El Niño-induced drought. The dependent variable, measured using the Household Food Insecurity Access Scale (HFIAS), reflects the food security status of households.

The intercept is 19.023, indicating the baseline level of food insecurity when all predictors are zero.

The most significant predictor of food security is Income Level (B = -3.945, $p < 0.001$). This negative coefficient suggests that higher income levels are associated with lower food insecurity. Specifically, for each unit increase in income level, food insecurity decreases significantly, highlighting the critical role of economic resources in ensuring food security during drought conditions. This finding aligns with research by Zaveri et al. (2021), which indicates that economic stability directly affects access to food. Moreover, Manda and Mjimba (2020) emphasize that households with diversified income sources are better equipped to cope with food insecurity during droughts, reinforcing the current findings that economic factors are central to food security.

The variable Experience of Food Shortage (Proxy for El Nino-induced Drought) shows a positive relationship with food insecurity (B = 1.041, $p = 0.089$). Although not statistically significant at the 0.05 level, this positive coefficient indicates that households experiencing food shortages are likely to report higher food insecurity levels. This aligns with Béné et al. (2016), who assert that food shortages exacerbate food insecurity, especially during climatic shocks. However, recent studies, such as those by Osei et al. (2021), indicate that the impact of food shortages can vary based on coping mechanisms employed, suggesting that simply experiencing food shortages does not uniformly lead to increased insecurity.

The other variables, including Age Group, Gender, Household Size, Livelihood Source, and Education Level, did not show significant effects on food security status, as indicated by their high p-values (all > 0.05). This contrasts with findings from Kessler et al. (2018), which highlight that demographic factors can influence food security, particularly in terms of vulnerability among women and children.

The findings stresses the importance of economic support and interventions to improve household income, reinforcing that economic access is essential for food security (Quisumbing & Pandolfelli, 2010). Addressing economic vulnerabilities is crucial, as interventions focused solely on food distribution may be insufficient.

4.3.3 Qualitative Results: Effects of El Niño-Induced Drought on Household Food and Nutrition Security in Muzarabani

Participants across all KIIs and FGDs consistently reported a sharp decline in food availability due to poor harvests and failed crops. One key informant from the Ministry of Agriculture remarked, *"Households are surviving on one meal a day now; people have abandoned their fields because of repeated crop failure."* Focus group members shared that traditional staples such as maize and groundnuts were no longer viable, leading families to rely on wild fruits or unbalanced diets.

This pattern aligns with findings by Lobell et al. (2011), who highlighted that drought disrupts staple crop production in Sub-Saharan Africa, intensifying food insecurity. Similarly, Zaveri et al. (2021) note that El Niño events significantly disrupt rural food systems, especially in rain-fed economies like Zimbabwe's.

Malnutrition among children and the elderly was widely reported. Health workers noted increased cases of stunting and wasting. Women and children were identified as particularly vulnerable, a trend supported by evidence from the Global Hunger Index (GHI, 2023), which emphasizes gendered disparities in access to food during environmental shocks.

4.4 Conclusion

This chapter has examined the demographic characteristics of smallholder households in Muzarabani District and analysed the multifaceted effects of El Niño-induced drought on food and nutrition security. The findings reveal a high prevalence of food insecurity, with over 65% of households experiencing moderate to severe food access challenges. Income level emerged as the most significant determinant of food insecurity, confirming the centrality of economic capacity in shaping household resilience to climatic shocks. The variable Experience of Food Shortage (proxy for El Nino-induced drought) shows a positive relationship with food insecurity, however it's not statistically significant at the 0.05 level, and this positive coefficient indicates that households who experienced the El Nino-induced drought are likely to report higher food insecurity levels. Moreover, qualitative insights gathered through key informant interviews and focus group discussions highlighted that El Nino-induced droughts negatively affect household food and nutrition security. As such, they reinforce the imperative for multi-dimensional and context-specific policy responses aimed at enhancing household food and nutrition security.

4.5 Recommendations

Based on the empirical evidence presented, the following recommendations are proposed to mitigate the adverse impacts of El Niño-induced droughts and strengthen food and nutrition security in Muzarabani and similar rural contexts:

1. **Enhance Household Economic Resilience:**

Targeted income-generating programs and livelihood diversification initiatives should be prioritized to reduce households' dependence on climate-sensitive agricultural activities.

Microfinance schemes and conditional cash transfer programs could improve economic access to food during periods of climatic stress.

1. **Promote Climate-Smart Agriculture (CSA):**

Invest in the dissemination and adoption of drought-tolerant crop varieties, conservation agriculture techniques, and water-efficient irrigation systems to build adaptive capacity. Extension services should be strengthened to equip farmers with knowledge and skills for climate-resilient practices.

2. **Strengthen Early Warning Systems and Disaster Preparedness:**

The establishment of localized early warning systems tailored to the needs of rural communities is essential for timely decision-making and resource mobilisation. Integrating community-based disaster risk management plans into local governance structures can enhance preparedness and response effectiveness.

3. **Invest in Social Protection Mechanisms:**

Develop comprehensive safety nets, including food aid and school feeding programs, particularly during drought years, to cushion vulnerable populations from acute food insecurity and nutritional deficiencies.

4. **Foster Multi-Sectoral Collaboration:**

Encourage coordinated action among government agencies, NGOs, and community-based organizations to implement integrated food security interventions. Policy frameworks should be localized and informed by empirical data to ensure alignment with on-the-ground realities.

5. **Promote Gender-Sensitive Programming:**

Recognize and address gender disparities in resource access, decision-making, and nutritional outcomes. Support for female-headed households should be a priority within food security and climate adaptation strategies.

4.5 Chapter Summary

This chapter has examined the demographic characteristics of smallholder households in Muzarabani District and analysed the multifaceted effects of El Niño-induced drought on food and nutrition security. The findings reveal a high prevalence of food insecurity, with over 65% of households experiencing moderate to severe food access challenges. Income level emerged as the most significant determinant of food insecurity, confirming the centrality of economic capacity in shaping household resilience to climatic shocks. The variable Experience of Food Shortage (proxy for El Nino-induced drought) shows a positive relationship with food insecurity, however it's not statistically significant at the 0.05 level, and this positive coefficient indicates that households who experienced the El Nino-induced drought are likely to report higher food insecurity levels. While other demographic variables such as age, gender, and education were explored, their statistical insignificance suggests that income overrides their influence in the context of severe drought. The results underscore the disproportionate burden of climatic stressors on low-income, rain-fed agricultural communities, exacerbated by structural vulnerabilities such as limited access to irrigation, markets, and adaptive resources. Moreover, qualitative insights gathered through key informant interviews and focus group discussions highlighted that El Nino-induced droughts negatively affect household food and nutrition security. As such, they reinforce the imperative for multi-dimensional and context-specific policy responses aimed at enhancing household food and nutrition security.

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CHAPTER 5
RESULTS
ASSESSING THE ECONOMIC CONSEQUENCES OF DROUGHT: HOUSEHOLD INCOME DYNAMICS IN MUZARABANI, MASHONALAND CENTRAL PROVINCE

ABSTRACT

This study critically examines the socio-economic ramifications of El Niño-induced droughts on household income in Muzarabani District, a predominantly rural and agriculturally dependent region in Mashonaland Central Province, Zimbabwe. Anchored in a mixed-methods research design, the study combines quantitative survey data from 200 stratified households with qualitative insights from key informant interviews and focus group discussions to explore the complex interplay between climatic shocks and income vulnerability. Cross-tabulation analysis revealed that households with lower income levels (<USD 100) were significantly more prone to food shortages, highlighting the economic fragility of the poorest segments during drought periods. Further, multiple linear regression results indicated that the experience of food shortages, used as a proxy for El Nino-induced drought exposure, had a statistically significant negative effect on household income (B = -0.609, $p < 0.001$), while demographic variables such as age, gender, and education level exhibited limited predictive power. These findings underscore the centrality of income as a determinant of household resilience to climate extremes. The study concludes that droughts disproportionately undermine income stability among economically vulnerable households, thereby exacerbating food insecurity and poverty cycles. The research recommends the implementation of climate-sensitive social protection programs, livelihood diversification strategies, and improved access to resilient agricultural technologies to mitigate the adverse effects of drought on rural income. This work contributes to the growing discourse on climate resilience and rural development in Sub-Saharan Africa and offers critical policy insights for drought-prone contexts like Muzarabani.

Key Words: El Niño-induced drought, Household income, Climate vulnerability, poverty cycles

5.1 Introduction

Drought is among the most pervasive and destructive natural hazards globally, with far-reaching socio-economic and environmental consequences. Its impacts are particularly pronounced in regions heavily reliant on rain-fed agriculture, where the volatility of climatic conditions undermines livelihoods, deepens poverty, and exacerbates income inequality (IPCC, 2022; World Bank, 2021). The increasing frequency, duration, and intensity of droughts, exacerbated by anthropogenic climate change, have become a defining feature of the 21st-century climate crisis (UNDRR, 2022). According to the Food and Agriculture Organization (FAO, 2020), agricultural droughts are now occurring with greater regularity and have become a key driver of food and income insecurity in rural economies worldwide.

At the global level, low- and middle-income countries (LMICs) bear the brunt of drought-induced livelihood disruptions, particularly where economies are structurally dependent on subsistence and smallholder agriculture. Droughts reduce agricultural productivity, diminish household income streams, and increase vulnerability to external shocks (Béné et al., 2020). These phenomena are especially acute in rural areas, where formal employment opportunities are limited and adaptive capacity is low. The World Meteorological Organization (WMO, 2023) asserts that without decisive climate adaptation measures, climate-related income shocks could push millions further into poverty by 2030, disproportionately affecting rural and marginalized populations.

In Sub-Saharan Africa (SSA), the nexus between climate variability and rural livelihoods has become a focal point of academic and policy discourse. The region is widely acknowledged as one of the most vulnerable to droughts due to its high dependence on rain-fed agriculture, low investment in irrigation infrastructure, and limited socio-economic buffers (Lobell & Tebaldi, 2015; Shiferaw et al., 2016). Recent studies estimate that climate-related income losses in SSA could range from 10% to 30% annually in highly drought-prone zones (Asfaw et al., 2019; Olayide et al., 2021). Moreover, recurrent drought events are known to exacerbate rural income inequality, widen gender disparities in resource access, and hinder sustainable development (Manda & Mjimba, 2020; Quisumbing et al., 2021).

Southern Africa, in particular, has experienced recurrent El Niño-induced droughts over the past decade, significantly impacting agricultural productivity and rural household incomes. According to the Southern African Development Community (SADC, 2020), the 2015–2016 and 2018–2019 droughts resulted in cumulative losses of over US$2.5 billion in agricultural

output across the region. Zimbabwe was among the worst affected, with widespread crop failure, livestock mortality, and a sharp contraction in rural incomes (WFP, 2020). In such contexts, drought is not merely a meteorological event but a complex socio-economic stressor that shapes livelihood trajectories and household wellbeing over time (Chitongo & Mutasa, 2021).

Zimbabwe's rural economy is heavily reliant on rain-fed subsistence farming, which accounts for more than 70% of employment and sustains the livelihoods of a majority of the population (ZimStat, 2021). Within this national context, Muzarabani District in Mashonaland Central Province epitomizes the vulnerability of agro-ecological Region IV, characterized by erratic rainfall patterns, high evapotranspiration rates, and limited adaptive infrastructure (Mutasa et al., 2024). Previous assessments by the Zimbabwe Vulnerability Assessment Committee (ZimVAC, 2023) reveal that droughts in Muzarabani have led to significant reductions in agricultural output and a marked decline in household incomes, further straining already fragile rural livelihoods.

Although there is a growing body of literature on the impacts of drought on food security in Zimbabwe (Mlambo & Chikozho, 2024; Mavhunga et al., 2023), relatively fewer empirical studies have specifically focused on the quantitative assessment of drought effects on household income at the micro-level, particularly within marginalized rural districts like Muzarabani. Most existing studies tend to generalize impacts across broad geographies or prioritize food availability and nutrition outcomes, often overlooking the nuanced economic ramifications for household-level incomes, particularly in rural areas that are structurally vulnerable (Osei et al., 2021; FAO, 2020).This study thus seeks to fill this critical knowledge gap by rigorously assessing the effects of drought on household income in Muzarabani. It draws on a mixed-methods approach to investigate how recurrent droughts reshape income sources, exacerbate socio-economic vulnerabilities, and influence household coping strategies.

More critically, there is a dearth of localized, district-level studies that combine quantitative and qualitative approaches to measure the direct and indirect effects of drought on household income, particularly in marginalized, low-income areas such as Muzarabani District. Muzarabani is situated in an agro-ecological zone with historically low rainfall, high temperatures, and inadequate irrigation infrastructure—conditions that amplify drought vulnerability (ZimStat, 2021; Mlambo & Chikozho, 2024). Yet, very few studies have disaggregated the income-related impacts of climate shocks in this specific region. The study

offers localized, evidence-based insights that can inform climate adaptation, social protection strategies, and poverty alleviation efforts in rural Zimbabwe and comparable settings.

5.2 Materials and Methods

A comprehensive account of the study area and the methodological framework, including sampling strategies, questionnaire formulation, data collection techniques, and analytical procedures, is presented in Chapter Three. In this chapter, however, only a succinct overview is presented.

5.2.1 Description of study area

This research was conducted in Muzarabani, a district situated in the Mashonaland Central Province of Zimbabwe, Details on the description of the study area are given in Chapter three.

5.2.2 Research Design

The research employed a mixed-methods design, integrating both qualitative and quantitative methodologies to provide a comprehensive understanding of the effects of El Niño-induced drought on household food security. Details regarding the research design are given in Section 3.3 of Chapter 3.

5.2.3 Sampling procedure

A stratified random sampling technique was employed to select 200 respondents in Ward 1 of Muzarabani District who were interviewed from March to April 2024. An in-depth exposition of the sampling procedure is presented in Section 3.5 of Chapter Three.

5.2.4 Data collection procedure

The data collection process was carried out in three distinct phases. The first phase entailed administering pre-tested structured questionnaires to 200 randomly selected households through trained enumerators fluent in the local dialect; the second phase comprised seven key informant interviews with agricultural extension officers, local government officials, and NGO representatives to elicit qualitative insights into community resilience and institutional responses to drought; and the final phase involved five focus group discussions with community members to collaboratively explore local coping mechanisms and adaptive strategies.

5.2.5 Data analysis procedure

Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) Version 27, employing descriptive statistics to summarize household characteristics and inferential statistics to assess relationships between variables. Techniques such as chi-square

tests, t-tests, and multiple linear regression analyses were utilized to identify predictors of food insecurity. The qualitative data from interviews and focus group discussions were analysed thematically, following Braun and Clarke's six-step approach to identify key themes and patterns related to El Nino-induced drought on food and nutrition security.

5.2.6 Challenges encountered during data collection

A critical reflection on the challenges faced during data collection, addressing potential biases and limitations in the research process is important (Mlambo & Chikozho, 2024). The data collection process faced several challenges, including logistical constraints related to the rural setting of Muzarabani. Difficulties in accessing remote households, coupled with the limited availability of enumerators, posed significant barriers to timely data collection. Additionally, cultural sensitivities and community dynamics sometimes impacted participant willingness to engage fully, potentially introducing biases in the collected data (Mlambo & Chikozho, 2024). To mitigate these challenges, the research team employed strategies such as building rapport with community leaders, conducting pre-surveys to familiarize enumerators with local contexts, and ensuring flexibility in data collection schedules.

5.3 Results

The second specific objective of the study aimed at exploring effects of El Nino-induced droughts on household income.

5.3.1 Household Income and Food Shortage Cross Tabulation

The results from the cross-tabulation of income levels and experiences of food shortages reveal significant insights into the economic impacts of El Niño-induced drought on households in Muzarabani, Mashonaland Central.

Table 5. 1: Cross Tabulation of Income*Experience of Food Shortage

		Income Level				Total
		<100	101-200	201-300	>300 USD	
Experienced Food	No	42	15	16	11	84
Shortage	Yes	85	27	4	0	116
Total		127	42	20	11	200

Source: Author, 2025

Among those who experienced food shortages (116 households), the majority (85 households) belonged to the lowest income group (<100 USD). Conversely, only 4 households in the higher income brackets (201-300 USD) reported food shortages, with none from the highest income group (>300 USD).

The findings indicate a strong correlation between low-income levels and the experience of food shortages. This is consistent with research by Zaveri et al. (2021), which found that households with lower income are more susceptible to food insecurity, particularly during

environmental stressors like drought. Such households often lack the financial resources to purchase sufficient food, exacerbating their vulnerability.

In contrast, households in higher income brackets were less affected by food shortages. This aligns with the conclusions of Manda and Mjimba (2020), who highlighted that economic stability significantly mitigates the adverse effects of drought on food access. The absence of food shortages among higher-income households suggests that economic resources can provide a buffer against the impacts of environmental shocks.

The results also reflect demographic variability in responses to food shortages, which echoes findings from Osei et al. (2021). Their study indicated that socio-economic factors, including income and employment stability, play a critical role in determining household resilience to food insecurity. The current results reaffirm that households with diversified income sources are better equipped to cope with food shortages.

The findings suggest that households with limited income are likely to rely more heavily on community support and informal safety nets. This is consistent with Kessler et al. (2018), who noted that social capital can significantly enhance community resilience in the face of drought. Households in lower-income brackets may depend more on communal assistance to navigate food shortages.

The results from the cross-tabulation of income levels and experiences of food shortages illustrate the pronounced impact of El Niño-induced drought on household income in Muzarabani. The strong correlation between low income and food insecurity emphasizes the need for targeted interventions to support vulnerable households.

5.3.2 Multiple Linear Regression analysis to determine the impact of drought on household income levels

MLR analysis to determine the impact of drought on household income levels, controlling for other variables such as age, education, and household size was executed. Y = Dependent variable (Household Income).

Table 5. 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.403[a]	.163	.137	.8198	.163	6.244	6	193	.000	1.704

a. Predictors: (Constant), ExpFood_Shortage, Age Group, Gender, Household Size, Livelihood Source, Education Level

b. Dependent Variable: Income Level

Source: Author, 2025

The correlation coefficient (R = 0.403) indicates a moderate positive correlation between various predictors (experience of food shortages, age group, gender, household size, livelihood source, and education level) and household income, suggesting that as these factors increase, household income tends to rise moderately. The R Square value (0.163) reveals that about 16.3% of the variance in household income is explained by the model, indicating that other unmeasured factors likely influence income as well, consistent with findings by Béné *et al*. (2016).

The Adjusted R Square (0.137) is slightly lower, suggesting a decrease in explanatory power when accounting for the number of predictors, which is common in multi-predictor models. The standard error (0.8198) indicates variability in household income not fully captured by the model. The F Change value (6.244, $p < 0.001$) confirms that at least one predictor significantly impacts household income, supporting the model's relevance.

The Durbin-Watson statistic (1.704) suggests reasonable independence among residuals, indicating the model is well-specified. Overall, while the model explains a modest portion of income variance, the significant F statistic highlights the importance of the included predictors. Future research should consider additional variables, such as market access and social networks, to enhance the model's explanatory power.

Table 5. 3: Multiple Linear Regression Results (Coefficients)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.946	.396		4.918	.000	1.166	2.727
	Age Group	.027	.050	.036	.540	.590	-.072	.126
	Gender	-.114	.116	-.064	-.977	.330	-.343	.116
	Household Size	.037	.040	.061	.920	.359	-.042	.116
	Livelihood Source	-.101	.051	-.129	-1.958	.052	-.202	.001
	Education Level	.049	.063	.051	.771	.442	-.076	.173
	Exp Food Shortage	-.609	.117	-.348	-5.222	.000	-.839	-.379

Dependent Variable: Income Level

Source: Author, 2025

The results of the multiple linear regression analysis, as summarized in Table 4.16, reveal significant insights into the determinants of household income in the context of El Niño-induced drought. Each coefficient provides a nuanced understanding of how various factors contribute to income levels, which is critical for comprehending the broader implications for food and nutrition security.

The most important finding pertains to Experience of Food Shortage (Proxy for El Nino-induced drought) ($B = -0.609$, $p < 0.001$), which significantly negatively impacts income levels.

This result underscores the dire consequences of food insecurity on economic stability, reinforcing the arguments made by Chikozho et al. (2025) regarding the adverse effects of drought on agricultural productivity and income generation.

In addition, the coefficient for Livelihood Source (B = -0.101, p = 0.052) approaches significance, suggesting that the type of livelihood may have a detrimental effect on income. Households relying on less stable income sources may face greater economic vulnerability during drought periods, corroborating the work of Nyakudya et al. (2023) who emphasized the fragility of livelihood strategies under climatic stress.

The lack of statistical significance ($p > 0.05$) indicates that variations in age do not significantly correlate with income, aligning with findings by Moyo et al. (2021) who noted that age-related factors may not directly affect economic outcomes in rural Zimbabwe. While the trend suggests potential disparities, the lack of significance highlights the need for further research into how gender roles intersect with economic factors in agricultural contexts (Chikozho & Mudzonga, 2022). With regards to household size, finding resonates with previous studies indicating that larger households may not necessarily translate to higher income due to resource dilution (Kanyenze et al., 2020).While education is often linked to better economic outcomes, the current data suggests that, in the context of drought, educational attainment alone does not suffice to enhance income levels (Mlambo & Chikozho, 2024).

In summary, the regression analysis elucidates the complex relationship between various socio-economic factors and household income in the context of El Niño-induced drought. Notably, the significant negative impact of El Nino-induced drought on income highlights the urgent need for targeted interventions to enhance food security and resilience among vulnerable households in Muzarabani. Future research should delve deeper into the mechanisms through which these factors interact, particularly in light of ongoing climatic challenges.

5.3.3 Qualitative Results: Effects of El Niño-Induced Drought on Household Income in Muzarabani District

The drought severely affected household income across key sectors—particularly agriculture and livestock. Farmers reported total crop loss, while livestock owners described selling animals at distress prices due to water shortages and pasture depletion. A local extension officer stated, *"Cattle are dying because there's no grass; others are being sold at giveaway prices just to buy mealie-meal."*

Focus group participants revealed a shift toward informal trading, vending, and casual labor (e.g., brick molding, fetching firewood for resale). This form of income diversification is

consistent with the findings of Manda and Mjimba (2020), who observed that during climate-induced shocks, rural households often transition to informal or precarious income sources.

Notably, small-scale entrepreneurship was cited as a less viable option, hindered by limited access to startup capital, a concern mirrored in the literature (Osei et al., 2021). Some NGOs reportedly provided microloans and training, but access remained limited.

5.4 Conclusion

The findings of this study provide compelling empirical evidence on the adverse economic implications of El Niño-induced drought on household income in Muzarabani District, Mashonaland Central Province. The cross-tabulation between income levels and the experience of food shortages illustrates a stark relationship: the vast majority of households experiencing food insecurity belonged to the lowest income bracket (<USD 100), while those in higher income categories were largely insulated from such hardships. This relationship underscores the reinforcing nature of income poverty and climatic vulnerability, a pattern also observed in broader regional studies (Zaveri et al., 2021; Manda & Mjimba, 2020). The multiple linear regression analysis further elucidates the structural and socioeconomic determinants of household income under drought stress. While variables such as age, gender, household size, education level, and livelihood source showed no statistically significant influence on income levels, the experience of food shortage (El Nino-induced drought) emerged as a highly significant negative predictor of household income ($B = -0.609$, $p < 0.001$). This confirms that drought events, as proxied by food shortages, substantially diminish household income through both direct (e.g., crop failure) and indirect (e.g., market disruption, loss of labor productivity) pathways.

This is congruent with recent findings by Mlambo and Chikozho (2024) who argue that climatic shocks tend to homogenize vulnerability across socio-demographic lines, particularly in marginal rural economies. Moreover, the weak significance of education and livelihood source as predictors of income calls attention to the structural limitations of rural labor markets, where even households with relatively higher educational attainment remain economically exposed due to limited diversification opportunities. This supports earlier observations by Nyakudya et al. (2023) on the fragility of rural livelihoods under intensified climate variability.

Crucially, the study reveals that households in Muzarabani lack the economic buffers needed to withstand drought-induced income shocks, leading to cascading impacts on food security, nutritional status, and overall well-being. These findings reinforce the urgent need for context-

specific, income-sensitive climate adaptation strategies, including social safety nets, sustainable livelihood diversification, and climate-resilient agricultural practices.

In conclusion, the study affirms that drought, particularly in the form of El Niño-induced climatic anomalies, acts as a significant suppressor of household income in vulnerable rural contexts. Addressing this challenge requires an integrated policy approach that not only mitigates immediate drought impacts but also strengthens long-term household economic resilience to climate variability. Future research should expand on these findings by incorporating longitudinal income data, examining market access constraints, and exploring the role of community-based risk-sharing mechanisms in cushioning drought-related income losses.

5.5 Recommendations

Based on the study findings, the following recommendations were drawn:

Enhance Access to Financial Resources: To mitigate the impacts of drought on food security, it is critical to improve access to financial resources for vulnerable households. Programs that facilitate microloans or grants for agricultural diversification can empower families to build resilience against climatic shocks (Manda & Mjimba, 2020).

Strengthen Community Support Networks: Encouraging the formation of community support groups can enhance social cohesion and resource sharing. Initiatives that promote local solidarity, such as community food banks or cooperative farming, should be prioritized to bolster collective resilience (Kessler et al., 2018).

Implement Comprehensive Food Aid Programs: Food aid should be timely and adequate, addressing both immediate needs and supporting long-term agricultural sustainability. Integrating nutritional support into food aid programs can help prevent malnutrition, particularly among vulnerable populations such as children and pregnant women (Quisumbing & Pandolfelli, 2010).

Promote Agricultural Diversification: Training programs that educate farmers on sustainable agricultural practices and alternative income-generating activities can reduce dependency on rain-fed agriculture. Workshops focusing on climate-resilient crops should be implemented to enhance food security (FAO, 2023).

Facilitate Migration for Economic Opportunities: Policies that support labor mobility can provide households with additional financial resources through remittances. Governments and NGOs should work together to create pathways for safe migration and ensure that migrant workers can maintain connections with their families (Osei et al., 2021).

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CHAPTER 6
RESULTS
EL NINO INDUCED DROUGHT AND ITS IMPLICATIONS FOR HEALTH OUTCOMES: ANALYSING OUTCOMES IN AFFECTED HOUSEHOLDS IN MUZARABANI DISTRICT

ABSTRACT

This study critically examines the socio-developmental implications of drought specifically El Niño-induced drought on health among rural households in Muzarabani District, Mashonaland Central Province, Zimbabwe. Situated within the broader discourse on climate vulnerability in Sub-Saharan Africa, the research employs a mixed-methods approach, integrating quantitative data from 200 stratified households with qualitative insights from key informant interviews and focus group discussions. The study reveals that 55.5% of households reported health problems during drought periods, with significant changes in healthcare service access associated with food shortages ($\chi^2 = 6.160$, $p = 0.013$), highlighting the interlinkages between nutritional deprivation and health system strain.. The findings contribute to a growing body of evidence on how climate shocks propagate through social systems, exacerbating structural inequalities in health access. The study concludes that droughts act as amplifiers of pre-existing vulnerabilities in rural Zimbabwe, calling for an integrated policy response that includes nutrition-sensitive health interventions, school feeding programs, and drought-responsive social protection schemes. This research offers localised empirical evidence essential for informing climate-resilient development strategies across similarly affected contexts in Sub-Saharan Africa.

Keywords: El Niño-Induced Drought, Health Outcomes, Vulnerability, Food Insecurity.

6.1 Introduction

Drought is one of the most devastating natural hazards affecting human development, exerting profound and multi-dimensional impacts on health, food security and economic wellbeing (UNDRR, 2022; IPCC, 2022). Globally, climate-induced droughts have intensified in both frequency and severity, with over 1.5 billion people affected between 2000 and 2020 (WMO, 2023). Unlike acute disasters, droughts unfold gradually and persistently, eroding household resilience and triggering cascading effects across essential social services such as health (World Bank, 2021). The complex interplay between environmental stressors and socio-economic

outcomes is particularly acute in low-income and agriculture-dependent regions, where adaptive capacities are limited and institutional responses remain underdeveloped (FAO, 2020; Béné et al., 2018).

At a regional level, Sub-Saharan Africa (SSA) has emerged as one of the global epicenters of drought vulnerability. Approximately 60% of the population in SSA relies on rain-fed agriculture for subsistence, making it highly susceptible to climatic shocks (Asfaw et al., 2019; Lobell & Tebaldi, 2015). Recurrent drought events across Southern Africa—often linked to the El Niño-Southern Oscillation (ENSO) phenomenon—have disrupted healthcare delivery systems and contributed to disease outbreaks, (SADC, 2020; UNICEF, 2022). Studies from Ethiopia, Kenya, and Malawi confirm that households affected by drought often resort to negative coping strategies, including reducing expenditure on healthcare (Olayide et al., 2021; Quisumbing et al., 2021). The result is a cyclical entrenchment of vulnerability where developmental gains in health are systematically reversed during periods of prolonged drought.

In Zimbabwe, the drought-health nexus has become a pressing national concern. The country has experienced multiple El Niño-induced droughts in the past decade, most notably in 2015–2016 and 2018–2019, which severely affected rural districts including Muzarabani, situated in agro-ecological Region IV (ZimStat, 2021; ZimVAC, 2023). These droughts have been associated with increased incidences of malnutrition, waterborne diseases, and declines in access to essential medicines, especially among women and children (Chitongo & Mutasa, 2021; Mlambo & Chikozho, 2024).

Despite these growing concerns, empirical studies examining the intersection of drought and health at the household level remain limited, especially in under-researched districts like Muzarabani. Most existing literature in Zimbabwe has focused on food security and agricultural productivity (Mavhunga et al., 2023; Mutasa et al., 2024), with insufficient attention to the less visible but equally consequential social dimensions of drought. Moreover, there is a critical lack of integrated, multi-sectoral analyses that explore how drought influences household health and how this effect intersect with poverty, gender, and social capital.

6.2 Materials and Methods

A comprehensive account of the study area and the methodological framework, including sampling strategies, questionnaire formulation, data collection techniques, and analytical procedures, is presented in Chapter Three. In this chapter, however, only a succinct overview is presented.

6.2.1 Description of study area

This research was conducted in Muzarabani, a district situated in the Mashonaland Central Province of Zimbabwe, Details on the description of the study area are given in Chapter three.

6.2.2 Research Design

The research employed a mixed-methods design, integrating both qualitative and quantitative methodologies to provide a comprehensive understanding of the effects of El Niño-induced drought on household food security. Details regarding the research design are given in Section 3.3 of Chapter 3.

6.2.3 Sampling procedure

A stratified random sampling technique was employed to select 200 respondents in Ward 1 of Muzarabani District who were interviewed from March to April 2025. An in-depth exposition of the sampling procedure is presented in Section 3.5 of Chapter Three.

6.2.4 Data collection procedure

The data collection process was carried out in three distinct phases. The first phase entailed administering pre-tested structured questionnaires to 200 randomly selected households through trained enumerators fluent in the local dialect; the second phase comprised seven key informant interviews with agricultural extension officers, local government officials, and NGO representatives to elicit qualitative insights into community resilience and institutional responses to drought; and the final phase involved five focus group discussions with community members to collaboratively explore local coping mechanisms and adaptive strategies.

6.2.5 Data analysis procedure

Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) Version 27, employing descriptive statistics to summarise household characteristics and inferential statistics to assess relationships between variables. Techniques such as chi-square tests, t-tests, and multiple linear regression analyses were utilised to identify predictors of food insecurity. The qualitative data from interviews and focus group discussions were analysed thematically, following Braun and Clarke's six-step approach to identify key themes and patterns related to El Nino-induced drought on food and nutrition security.

6.2.6 Challenges encountered during data collection

A critical reflection on the challenges faced during data collection, addressing potential biases and limitations in the research process is important (Mlambo & Chikozho, 2024). The data collection process faced several challenges, including logistical constraints related to the rural setting of Muzarabani. Difficulties in accessing remote households, coupled with the limited

availability of enumerators, posed significant barriers to timely data collection. Additionally, cultural sensitivities and community dynamics sometimes impacted participant willingness to engage fully, potentially introducing biases in the collected data (Mlambo & Chikozho, 2024). To mitigate these challenges, the research team employed strategies such as building rapport with community leaders, conducting pre-surveys to familiarise enumerators with local contexts, and ensuring flexibility in data collection schedules.

6.3 Results

The third objective aimed at assessing the implications for health. This section discusses the implications of drought on health among households in Muzarabani, Mashonaland Central Province, Zimbabwe.

6.3.1 Household Health Descriptive Statistics

Table 6. M : Household Health Statistics

	Health problems	Change in Healthcare services	Change in school attendance of any children	Main reason for school attendance decrease
Std. Error of Mean	.0352	.0352	.0354	.0890
Std. Deviation	.4982	.4982	.5013	1.2582
Variance	.248	.248	.251	1.583
Skewness	-.223	.223	.000	-.198
Std. Error of Skewness	.172	.172	.172	.172
Kurtosis	-1.970	-1.970	-2.020	-1.620
Std. Error of Kurtosis	.342	.342	.342	.342

Source: Author, 2025

The standard deviation (0.4982) indicates variability in reported health problems among households, with a skewness of -0.223 suggesting a slight leftward skew in the distribution. This may indicate that while many households report health issues, a significant number may not, reflecting disparities in health access or exposure to health risks during drought conditions. Similarly, the change in healthcare services also shows a standard deviation of 0.4982, with a skewness of 0.223. The positive skew indicates that some households may have experienced an increase in healthcare service access, while others faced declines, highlighting the variability in healthcare infrastructure and support during drought periods. This observation aligns with findings by Kessler et al. (2018), who noted that drought can strain healthcare systems, leading to reduced access and quality of care.

The descriptive statistics provide a comprehensive overview of the implications of drought on health among households in Muzarabani. The variability in health problems and changes in healthcare access underscore the multifaceted challenges faced by communities during drought

conditions. Addressing these issues requires targeted interventions that focus on improving healthcare access in affected households.

Table 6. 1: Faced Health Problems

Faced Health Problems	Frequency (%)
No	44.5
Yes	55.5
Total	100.0

Source: Author, 2025

Table 6.2 presents the distribution of health problems reported by households affected by El Niño-induced drought. The results indicate that a majority of the households (55.5%) reported experiencing health problems, suggesting a significant impact of the drought on household health. In contrast, 44.5% of households did not report any health issues. The high prevalence of health problems underscores the urgent need for interventions that address healthcare access and support for households impacted by drought.

Table 6. 2: Change in healthcare services

Change in Healthcare	Frequency (%)
No	55.5
Yes	44.5
Total	100.0

Source: Author, 2025

The results indicate that a majority of households (55.5%) reported no changes in their healthcare services, while 44.5% experienced changes. This suggests that while many households maintained consistent access to healthcare, a significant portion faced alterations that could impact their health outcomes.

6.3.2 T-test Results for changes in healthcare services

Table 6. 3: Independent Samples Test for changes in healthcare services

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Change in healthcare services	Equal variances assumed	15.764	.000	2.508	198	.013	.1712	.0682	.0366	.3058
	Equal variances not assumed			2.471	168.774	.014	.1712	.0693	.0344	.3079

Source: Author 2025

The t-test results for changes in healthcare services indicate significant differences between households affected by drought and those that are not. The Levene's test for equality of variances shows a significant result ($F = 15.764$, $p < 0.001$), suggesting that the variances

between the two groups are not equal. The t-test for equal variances assumed indicates a statistically significant difference in healthcare services ($t = 2.508$, $df = 198$, $p = 0.013$). The mean difference of 0.1712 suggests that households not affected by drought experience better access to healthcare services compared to those affected, with a 95% confidence interval ranging from 0.0366 to 0.3058.

This finding aligns with research by Kessler et al. (2018), which posits that drought conditions may lead to increased investments in healthcare services as communities respond to emerging health challenges. The finding is also consistent with research indicating that climate-induced droughts disrupt access to health services due to poor infrastructure, income loss, and increased disease vulnerability (FAO, 2019; IPCC, 2022). In rural Zimbabwe, droughts often lead to health budget cuts and reduced outreach by health workers, further compounding food insecurity-related malnutrition and morbidity (ZimVAC, 2023).

6.3.3 Cross-Tabulation of Change in Healthcare Services and Experience of Food Shortages

The cross-tabulation presented below examines the relationship between changes in healthcare services and the experience of food shortages among households in Muzarabani. This analysis provides insights into how food security impacts access to healthcare.

Table 6. 4: Cross Tab Experienced Food Shortage*Change in Healthcare Service

		Change in healthcare services		Total
		No	Yes	
Experience Food Shortage	No	39	45	84
	Yes	34	82	116
Total		73	127	200

Source: Author, 2025

The table indicates that out of the 200 households surveyed, those who experienced food shortages (116 households) reported a greater change in healthcare services compared to those who did not experience food shortages (84 households).

Among households that did not experience food shortages, 39 reported no change in healthcare services, while 45 reported a change. In contrast, for households that experienced food shortages, only 34 reported no change, while a significant 82 reported a change in healthcare services. This suggests that food shortages may drive households to seek more healthcare services, possibly due to health issues arising from inadequate nutrition.

The findings highlight the importance of addressing food security as a determinant of health outcomes. The substantial number of households experiencing changes in healthcare services (especially those facing food shortages) underscores the need for integrated approaches that improve both food security and healthcare access. Research indicates that improving food

security can lead to better health outcomes, thereby reducing the burden on healthcare systems (Béné et al., 2016).

The cross-tabulation analysis on Table 4.17 illustrates a clear relationship between the experience of food shortages and changes in healthcare services. Households facing food insecurity are more likely to report changes in their healthcare needs, suggesting that food security interventions could play a critical role in enhancing health service access and outcomes in drought-affected areas.

6.3.4 Chi-Square Test Results examining the relationship between changes in healthcare services and the experience of food shortages

The Chi-Square test was conducted to examine the relationship between changes in healthcare services and the experience of food shortages among households. The results are summarized in Table 4.18.

Table 6. 5: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.160[a]	1	.013		
Continuity Correction[b]	5.443	1	.020		
Likelihood Ratio	6.138	1	.013		
Fisher's Exact Test				.017	.010
Linear-by-Linear Association	6.129	1	.013		
N of Valid Cases	200				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 30.66.
b. Computed only for a 2x2 table
Source: Author, 2025

The Pearson Chi-Square value (6.160, df = 1, p = 0.013) indicates a statistically significant association between changes in healthcare services and the experience of food shortages (proxy for El Nino induced drought). This suggests that households experiencing food shortages are significantly more likely to report changes in healthcare services.

The continuity correction value (5.443, p = 0.020) also supports this finding, confirming the presence of a significant relationship, albeit slightly less strong due to the correction applied for continuity in a 2x2 table. The likelihood ratio test (6.138, p = 0.013) yields similar results, further reinforcing the conclusion that food shortages are associated with changes in healthcare services. The Fisher's Exact Test results (Exact Sig. (2-sided) = 0.017; Exact Sig. (1-sided) = 0.010) offer a robust alternative to the Chi-Square test, particularly useful when sample sizes are small. The significant values corroborate the findings from the Pearson Chi-Square test. The linear-by-linear association result (6.129, p = 0.013) indicates that there is a statistically

significant trend in the data, suggesting that as the experience of food shortages increases, so does the likelihood of changes in healthcare services.

In conclusion, the Chi-Square test results demonstrate a significant association between the experience of food shortages and changes in healthcare services among households. This finding emphasizes the critical interplay between food security and health access, highlighting the need for integrated health and agricultural policies to address the challenges faced by vulnerable populations in drought-affected areas.

6.3.5 Qualitative Results: Effects of El Niño-Induced Drought on Health in Muzarabani

Health workers interviewed raised grave concerns over the drought's impact on health. Malnutrition-related illnesses, such as kwashiorkor and diarrhea, were increasingly prevalent. Access to healthcare became strained, with both transport and affordability cited as major barriers.

Focus group members described having to choose between buying food and paying medical bills, echoing research by Béné et al. (2016), which emphasises how environmental shocks erode both physical and financial access to health services.

6.4 Conclusion

This study set out to critically examine the effects of drought on household health in Muzarabani District, a rural, drought-prone area in Mashonaland Central Province, Zimbabwe. Framed within the context of escalating climate variability across sub-Saharan Africa and informed by both empirical data and contemporary literature, the findings offer profound insights into how environmental shocks cascade into adverse social outcomes in vulnerable communities.

The evidence presented confirms that drought exerts a significant and differentiated burden on household wellbeing, particularly through heightened food insecurity and deteriorating health conditions. Over 55% of households reported experiencing health problems during drought episodes, and nearly half encountered changes in healthcare services, many driven by underlying food shortages. The statistical significance observed in the association between food insecurity and changes in healthcare access ($\chi^2 = 6.160$, $p = 0.013$) underscores the critical interplay between nutrition and health outcomes. These findings align with international research highlighting that drought not only increases exposure to communicable diseases and malnutrition but also exacerbates systemic weaknesses in rural health infrastructure (IPCC, 2022; FAO, 2019).

A notable contribution of this research lies in its integrative lens, linking food security, health access, and educational continuity within a unified analytical framework. By demonstrating how drought-induced stressors compound across sectors, the study provides a holistic understanding of vulnerability in rural Zimbabwean settings. Additionally, the analysis revealed resilience factors, such as social safety nets, school feeding programs, and community-based coping strategies that may buffer certain negative outcomes, offering pathways for targeted intervention.

In conclusion, the study reinforces the urgent need to reposition drought not solely as an environmental or agricultural issue, but as a multi-dimensional development challenge. Addressing its effects on health and education requires coordinated, multisectoral policy responses that integrate climate resilience with human development. It is only through such holistic, evidence-informed planning that the long-term developmental trajectories of drought-prone regions like Muzarabani can be safeguarded.

6.5 Recommendations

Based on the study findings, The Ministry of Health and Child Care (MoHCC) should:

a. Strengthen Community-Based Health Systems in Drought-Prone Areas

Given that 55.5% of households experienced health problems and 44.5% reported changes in healthcare access, MoHCC should:

- Expand mobile clinic outreach programs in rural and drought-affected areas.
- Train and deploy community health workers to deliver basic health services, nutrition support, and disease surveillance.
- Enhance drug supply chains to ensure availability of essential medicines during climate shocks.

b. Integrate Nutrition and Health Interventions

The significant association between food insecurity and increased healthcare needs (Chi-square $p = 0.013$) shows the need for:

- Scaling up targeted supplementary feeding programs for vulnerable groups (pregnant women, children under five).

- Integrating food security screening and nutrition assessment into primary healthcare services.

c. Develop Drought-Responsive Health Infrastructure

- Equip clinics in districts like Muzarabani with climate-resilient water and sanitation infrastructure to reduce disease outbreaks during droughts.
- Establish early warning systems for health risks associated with climate variability.

On the other hand, The Ministry of Primary and Secondary Education (MoPSE) is advised to:

a. Introduce Emergency School Feeding Programs

With food scarcity contributing to 27.5% of school absenteeism:

- Institutionalise school feeding programs in all drought-prone schools to encourage attendance and improve concentration and retention.
- Collaborate with the Ministry of Agriculture and WFP to support local procurement for feeding programs.

c. Subsidise School Fees During Drought Years

Since school fees were the most cited reason (34.5%) for decreased attendance:

- Implement conditional cash transfers or fee waiver schemes for drought-affected households.
- Create a national emergency education fund to prevent dropout surges during climate-related shocks.

c. Establish Flexible Learning Programs

- Promote community-based and radio/online learning options during drought-induced disruptions (e.g., when children engage in labor or migration).
- Train teachers to support psychosocial needs of learners affected by food insecurity or family stress.

On the other hand The Ministry of Public Service, Labour and Social Welfare is challenged to:

a. Strengthen Social Protection Mechanisms

- Expand and adapt the Harmonised Social Cash Transfer (HSCT) to automatically scale up in drought-affected districts.
- Include education and health conditionalities in cash transfers to buffer household vulnerability without compromising development outcomes.

b. Introduce Child Labor Prevention Programs

Though only 6% cited child labor as a reason for absence, proactive prevention is vital:

- Establish community surveillance and referral systems for at-risk children.
- Increase access to public works programs for adults to reduce reliance on children's labor.

The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development is recommended to:

a. Promote Climate-Smart Agriculture and Nutrition-Sensitive Interventions

- Strengthen household resilience to drought by supporting conservation farming, drought-resistant crops, and small livestock projects.
- Link agricultural extension services with public health and education awareness, especially in food-insecure wards.

b. Expand Food Reserves and Early Response Systems

- Improve local grain storage and food distribution mechanisms in coordination with local councils.
- Prioritise vulnerable households with school-going children or chronic illnesses in food aid programs.

NGOs and Development Partners are compelled to:

a. Support Multi-Sectoral Community Resilience Programs

- Design integrated interventions combining food assistance, health care, and education support in drought-prone communities.

- Pilot household-level shock-responsive programs and evaluate their effectiveness in maintaining child wellbeing during drought.

b. Enhance Data Collection and Monitoring Systems

- Support real-time community-based monitoring of drought impacts on education and health.
- Fund longitudinal studies to track drought's long-term effects on human capital development.

c. Facilitate Policy Dialogue and Evidence Uptake

- Promote multi-stakeholder platforms linking research (e.g., this study) with district and national policy actors.
- Assist in translating local evidence into practical policy briefs, guidelines, and climate-resilient development planning tools.

Finally, cross-cutting recommendations have been identified:

a. Mainstream Climate Adaptation into All Social Services

- Integrate climate risk assessments into district-level education, health, and welfare planning.
- Develop local adaptation strategies specifically addressing school retention and health access during recurrent droughts.

b. Invest in Community Awareness and Behavior Change

- Launch awareness campaigns on child health, hygiene, nutrition, and school retention during emergencies.
- Support local leadership structures (e.g., village health workers, school development committees) to champion inclusive drought response.

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CHAPTER 7
RESULTS

COPING STRATEGIES IN THE FACE OF DROUGHT: ADAPTATION MECHANISMS AMONG HOUSEHOLDS IN MUZARABANI DISTRICT, MASHONALAND CENTRAL PROVINCE

ABSTRACT

This study investigates the coping strategies employed by households in Muzarabani District, Zimbabwe, in response to El Niño-induced droughts. Drawing on a mixed-methods approach that combined household surveys (n=200), focus group discussions, and key informant interviews, the research identifies and analyses both the prevalence and effectiveness of adaptation mechanisms used by drought-affected communities. Quantitative findings reveal that the most widely adopted coping strategies include migration for work (54.5%), selling livestock (51.5%), borrowing money (48.5%), and reliance on food aid (48.0%). Less commonly employed were strategies such as starting small businesses (44.5%), which was hindered by lack of capital and technical skills. Cross-tabulation analyses show significant demographic variations in coping choices. Migration was more prevalent among households with higher educational attainment, while dependence on food aid declined with increasing income, highlighting the critical role of socio-economic status in shaping resilience. Thematic analysis of qualitative data further underscores diversification of livelihoods, community solidarity, and migration as key coping themes, while also exposing the long-term risks of asset depletion, dietary changes, and financial indebtedness. Overall, the findings suggest that while households demonstrate significant agency in the face of recurrent droughts, many of the strategies employed are reactive, short-term, and potentially erosive. To enhance long-term resilience, the study recommends integrated interventions that promote climate-resilient livelihoods, expand rural entrepreneurship, improve access to education and credit, and strengthen community-based disaster risk governance. These insights offer vital policy guidance for designing equitable and sustainable drought response strategies in Zimbabwe and similar drought-prone regions across Sub-Saharan Africa.

Key words: El Niño, drought, coping strategies, household resilience, migration, livelihood diversification,

7.1 Introduction

Drought has emerged as one of the most pressing environmental and developmental challenges of the 21st century, posing acute threats to food systems, livelihoods, and social resilience across both developed and developing economies (IPCC, 2022; WMO, 2023). Globally, droughts have become more frequent, intense, and protracted due to anthropogenic climate change, affecting over 1.4 billion people between 2000 and 2020, with projected escalations in severity under most climate scenarios (UNDRR, 2022; World Bank, 2021). These trends underscore the urgent imperative to understand not only the impacts of drought but also the nuanced ways in which communities adapt and cope under environmental stress.

At the regional scale, drought vulnerability has become particularly pronounced in Southern Africa, where climatic variability is coupled with deep structural inequalities, fragile institutions, and high dependence on rain-fed agriculture (Asfaw et al., 2019; SADC, 2022). Countries in the region, including Zimbabwe, Zambia, Mozambique, and Malawi, have witnessed recurring drought events linked to the El Niño–Southern Oscillation (ENSO), with devastating consequences on food security, water availability, and rural livelihoods (FAO, 2020; Lobell & Tebaldi, 2015). The Southern African Development Community (SADC) estimates that more than 45 million people were affected by drought-related food insecurity between 2018 and 2022 alone (SADC, 2023). These crises have accelerated the need for resilient adaptation strategies, particularly at the household level, where immediate responses often shape long-term vulnerability trajectories (Béné et al., 2018).

In the Sub-Saharan African (SSA) context, a growing body of literature highlights the centrality of localised, household-based coping mechanisms in mitigating the effects of drought (Quisumbing et al., 2021; Olayide et al., 2021). These coping strategies, ranging from consumption smoothing and asset liquidation to migration and social capital mobilization, reflect complex trade-offs between short-term survival and long-term resilience (Manda & Mjimba, 2020; Béné et al., 2016). However, many of these strategies remain reactive, informal, and often maladaptive, exacerbating socio-economic inequalities and eroding human development gains. As noted by Zaveri et al. (2021), the repeated deployment of erosive coping measures such as child labour, educational withdrawal, and distress asset sales illustrates the limitations of existing institutional safety nets in rural SSA. More recently, studies have begun to explore how adaptive capacity is shaped by gender, education, access to early warning systems, and external assistance (UNICEF, 2022; IPCC, 2022; Chitongo & Mutasa, 2021).

In Zimbabwe, drought constitutes the most frequently occurring and damaging natural hazard, accounting for more than 80% of all climate-related losses in the past three decades (ZimStat, 2021; ZimVAC, 2023). The 2015–2016 and 2018–2019 El Niño-induced droughts, for instance, devastated key agricultural provinces, including Mashonaland Central, leading to widespread food insecurity, malnutrition, and displacement (Mlambo & Chikozho, 2024; Mutasa et al., 2024). Muzarabani District, situated in agro-ecological Region IV and characterised by erratic rainfall and high evapotranspiration rates, has consistently recorded low agricultural yields and high poverty prevalence (GoZ, 2023; Nyakudya et al., 2023). Within this context, household-level adaptation has become both a necessity and a survival imperative. Yet, despite the proliferation of governmental and donor-led interventions, including the Harmonised Social Cash Transfer (HSCT) and conservation agriculture schemes, the sustainability and effectiveness of coping mechanisms remain poorly understood (WFP, 2021; Chikozho & Mabhena, 2023).

Existing empirical studies in Zimbabwe have largely focused on macro-level assessments of drought impact on agriculture and food systems (Mavhunga et al., 2023; FAO, 2019), often neglecting the localised, gendered, and intergenerational dynamics of household adaptation. Furthermore, there is a critical dearth of integrated research exploring how households in chronically drought-affected districts like Muzarabani navigate simultaneous economic, social, and ecological shocks (Béné et al., 2016; Osei et al., 2021). This gap is especially significant given the increasing recognition that resilience must be understood not only through infrastructural or policy lenses but also through the everyday practices of affected communities (Leal Filho et al., 2022).

This study, therefore, seeks to contribute to this body of knowledge by empirically examining the coping strategies employed by households in Muzarabani District in response to recurrent droughts. Using a mixed-methods approach, the study explores the typology, effectiveness, and sustainability of these strategies within the socio-economic and institutional context of the district. Particular attention is paid to how these strategies intersect with poverty, gender, food security, and social capital. The analysis is informed by global resilience frameworks but grounded in local realities, providing insights that are both contextually rich and theoretically relevant.

Understanding household-level coping strategies is not only pivotal for effective disaster risk reduction (DRR) but also essential for informing equitable climate adaptation pathways in Zimbabwe and similar contexts across Sub-Saharan Africa. As the climate crisis deepens,

building resilience from the ground up, through the lived experiences of those most affected, becomes a strategic and moral imperative for sustainable development.

7.2 Materials and Methods

A comprehensive account of the study area and the methodological framework, including sampling strategies, questionnaire formulation, data collection techniques, and analytical procedures, is presented in Chapter Three. In this chapter, however, only a succinct overview is presented.

7.2.1 Description of study area

This research was conducted in Muzarabani, a district situated in the Mashonaland Central Province of Zimbabwe, Details on the description of the study area are given in Chapter three.

7.2.2 Research Design

The research employed a mixed-methods design, integrating both qualitative and quantitative methodologies to provide a comprehensive understanding of the effects of El Niño-induced drought on household food security. Details regarding the research design are given in Section 3.3 of Chapter 3.

7.2.3 Sampling procedure

A stratified random sampling technique was employed to select 200 respondents in Ward 1 of Muzarabani District who were interviewed from March to April 2024. An in-depth exposition of the sampling procedure is presented in Section 3.5 of Chapter Three.

7.2.4 Data collection procedure

The data collection process was carried out in three distinct phases. The first phase entailed administering pre-tested structured questionnaires to 200 randomly selected households through trained enumerators fluent in the local dialect; the second phase comprised seven key informant interviews with agricultural extension officers, local government officials, and NGO representatives to elicit qualitative insights into community resilience and institutional responses to drought; and the final phase involved five focus group discussions with community members to collaboratively explore local coping mechanisms and adaptive strategies.

7.2.5 Data analysis procedure

Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) Version 27, employing descriptive statistics to summarise household characteristics and inferential statistics to assess relationships between variables. Techniques such as chi-square tests, t-tests, and multiple linear regression analyses were utilised to identify predictors of food

insecurity. The qualitative data from interviews and focus group discussions were analysed thematically, following Braun and Clarke's six-step approach to identify key themes and patterns related to El Nino-induced drought on food and nutrition security.

7.2.6 Challenges encountered during data collection

A critical reflection on the challenges faced during data collection, addressing potential biases and limitations in the research process is important (Mlambo & Chikozho, 2024). The data collection process faced several challenges, including logistical constraints related to the rural setting of Muzarabani. Difficulties in accessing remote households, coupled with the limited availability of enumerators, posed significant barriers to timely data collection. Additionally, cultural sensitivities and community dynamics sometimes impacted participant willingness to engage fully, potentially introducing biases in the collected data (Mlambo & Chikozho, 2024). To mitigate these challenges, the research team employed strategies such as building rapport with community leaders, conducting pre-surveys to familiarise enumerators with local contexts, and ensuring flexibility in data collection schedules.

7.3 Results

The fourth and final objective aimed at assessing the coping strategies used by households in the face of El Nino-induced drought.

7.3.1 Coping Strategies Descriptive Statistics

The statistics for various coping strategies employed by households affected by El Niño-induced drought provide insights into how families navigate food insecurity and economic challenges are presented on Table 7.1.

Table 7. 1: Coping Strategies Descriptive Statistics

		Reduce meals	Selling livestock Assts	Borrowing Money	Migration For Work	Food Aid	Start Small business	Other
N	Valid	200	200	200	200	200	200	200
	Missing	0	0	0	0	0	0	0
Mean		.485	.515	.485	.545	.480	.445	.480
Std. Error of Mean		.0354	.0354	.0354	.0353	.0354	.0352	.0354
Median		.000	1.000	.000	1.000	.000	.000	.000
Std. Deviation		.5010	.5010	.5010	.4992	.5009	.4982	.5009
Variance		.251	.251	.251	.249	.251	.248	.251
Skewness		.060	-.060	.060	-.182	.081	.223	.081
Std. Error of Skewness		.172	.172	.172	.172	.172	.172	.172
Kurtosis		-2.017	-2.017	-2.017	-1.987	-2.014	-1.970	-2.014
Std. Error of Kurtosis		.342	.342	.342	.342	.342	.342	.342

Source: Author, 2025

The mean values for the coping strategies employed by households in Muzarabani reveal significant insights into their adaptive responses to drought conditions. Notably, the most prevalent strategy is migration for work, utilised by 54.5% of households, closely followed by selling livestock assets at 51.5%. This trend aligns with findings from Zaveri et al. (2021), who highlighted that migration often serves as a critical adaptive strategy for households facing environmental stressors.

The statistical analysis indicates high variability in the adoption of these strategies, with standard deviations hovering around 0.49 to 0.50. This consistent variance suggests that households employ these coping mechanisms in diverse ways, reflecting differing levels of economic resilience. Such variability underscores the complex socio-economic landscape in which these households operate, as noted by Osei et al. (2021), who found that households often adapt their strategies based on local resources and constraints.

Interestingly, skewness values approach zero for most strategies, indicating a relatively symmetrical distribution among households. However, starting small businesses exhibits a slight positive skew (0.223), implying that a minority of households may rely more heavily on entrepreneurship. The lower mean for this strategy (44.5%) suggests barriers to entrepreneurship, such as insufficient capital and skills. This observation is supported by Manda and Mjimba (2020), who argue that enhancing access to financial resources and training could empower households to pursue entrepreneurial opportunities, thereby fostering greater resilience.

The high mean for borrowing money (48.5%) indicates significant financial strain, as many households resort to debt to meet immediate needs. This reliance on borrowing can lead to long-term financial instability, a concern echoed in the research by Kessler et al. (2018), which emphasizes the precarious nature of debt among vulnerable populations.

Moreover, the engagement in food aid (48.0%) highlights households' reliance on external assistance, reinforcing the necessity for targeted interventions to enhance food security. Programs that provide consistent support can play a vital role in stabilizing households during crises, as indicated by Béné et al. (2016), who found that food assistance significantly mitigates the impacts of environmental shocks on household well-being.

In conclusion, the coping strategies adopted by households in response to drought conditions illustrate a complex interplay of resilience and vulnerability. Understanding these dynamics is crucial for developing effective interventions that address the specific needs of affected communities, ultimately enhancing their capacity to withstand future adversities.

7.3.2 Prevalence of Coping Strategies:

A significant percentage of households reported using multiple coping strategies, indicating widespread food insecurity.

Table 7. 2: Prevalence of Coping Strategies

	Reduce meals	Selling livestock Assts	Borrowing Money	Migration For Work	Food Aid	Start Small business	Other
No (%)	51.5	48.5	51.5	45.5	52.0	55.5	52.0
Yes (%)	48.5	51.5	48.5	54.5	48.0	44.5	48.0

Source: Author, 2025

The data presented in Table 7.2 reveals a nearly even split between households that adopt various coping strategies and those that do not. Notably, selling livestock assets and migration for work demonstrate significant engagement, with 51.5% and 54.5% of households employing these strategies, respectively. This finding resonates with research by Zaveri et al. (2021), which highlights migration as a common adaptive strategy in response to environmental stress. Conversely, the highest proportion of households not engaging in any specific strategy is observed in starting small businesses (55.5%). This suggests that barriers such as inadequate access to capital and skills may hinder entrepreneurial initiatives within the community. Supporting this notion, Manda and Mjimba (2020) argue that financial constraints are a critical obstacle for households seeking to establish new income-generating ventures.

The reliance on borrowing money (48.5%) and the substantial percentage of households not reducing meals (51.5%) underscore the financial pressures many families face. These findings

align with the work of Kessler et al. (2018), who emphasise that households often resort to debt during crises, which can exacerbate long-term financial instability.

Moreover, the engagement with food aid (48.0%) highlights the ongoing necessity for external support, reinforcing the importance of targeted interventions to mitigate food insecurity. Research by Béné et al. (2016) indicates that such assistance plays a vital role in stabilising households during periods of environmental stress, emphasising the critical need for sustained support in vulnerable communities.

Overall, the prevalence of these coping strategies illustrates the complex landscape of household responses to drought conditions in Muzarabani. Understanding these dynamics is essential for developing effective policies and interventions that enhance resilience and address the multifaceted challenges faced by affected populations.

7.3.3 Demographic Variations in coping strategies

Analysis revealed variations in coping strategy usage based on demographics. The author selected two cross tabulation scenarios; Education Level and Migration for work as well as Income Level and Reliance on Food Aid

Table 7. 3: Education Level and Migration for Work Cross tabulation

		Coping_migration4work		Total
		No	Yes	
Education Level	None	11	15	26
	Primary	22	15	37
	Secondary	42	52	94
	Tertiary	16	27	43
Total		91	109	200

Source: Author, 2025

The data shown on Table 7.3 reveals several insights regarding the impact of education on the likelihood of migrating for work. A total of 109 households (54.5%) reported migrating for work, highlighting this strategy as a common response to economic pressures.

Among those with no education, 15 out of 26 opted to migrate, indicating that even uneducated individuals seek work opportunities outside their localities. Conversely, a significant proportion of secondary education holders (52 out of 94) and tertiary education holders (27 out of 43) also chose to migrate, suggesting that higher education levels may enhance employability and the pursuit of better opportunities. The data shows that households with primary education have a relatively low migration rate, with only 15 out of 37 opting to migrate, which may indicate limited job prospects for this education level.

These findings support the notion that education plays a crucial role in shaping migration decisions. Research by Osei et al. (2021) emphasises that individuals with higher education

tend to have greater mobility and access to diverse job markets, which may be a key factor in their decision to migrate.

The relationship between education level and the decision to migrate for work underscores the importance of educational attainment in enhancing economic opportunities. As such, investing in education could play a vital role in improving household resilience and reducing the necessity for migration due to economic stressors.

Table 7. 4: Income Level * Reliance on Food Aid Cross tabulation

		Relied on Food Aid		Total
		No	Yes	
Income Level	<100	64	63	127
	101-200	22	20	42
	201-300	11	9	20
	>300 USD	7	4	11
Total		104	96	200

Source: Author, 2025

The data shows that 96 households (48%) rely on food aid, indicating a significant level of dependence among the population surveyed. Among households earning less than 100 USD, there is a nearly even split, with 63 out of 127 relying on food aid. This suggests that even those with very low incomes are facing food insecurity despite some being able to manage without aid. In the 101-200 USD income bracket, 20 out of 42 households rely on food aid, reflecting a continued vulnerability as income increases.

The trend continues with households earning 201-300 USD and >300 USD, where reliance on food aid decreases significantly. For instance, only 9 out of 20 households in the 201-300 USD range and 4 out of 11 in the >300 USD bracket reported needing food aid. This highlights that as income increases, the need for external assistance diminishes.

Findings emphasise the critical link between income levels and food security. Research by Béné et al. (2016) supports the notion that households with higher incomes are better positioned to meet their nutritional needs without relying on aid. This underscores the importance of economic interventions aimed at increasing household incomes to reduce dependence on food aid.

7.3.2 Thematic Analysis on coping mechanisms

This thematic analysis explores the coping mechanisms employed by households in Muzarabani in response to El Niño-induced drought. The findings are based on insights gathered from five focus group discussions and nine key informant interviews, highlighting the adaptive strategies that communities utilise to mitigate the impacts of drought on their livelihoods. Key themes identified are explored below.

Diversification of Livelihoods

Many households reported diversifying their income sources as a primary coping strategy. This included engaging in alternative farming practices, small-scale trading (including buying and selling dried fish from Mozambique), and informal employment. Respondents emphasised the importance of diversification to reduce reliance on agricultural income, which is particularly vulnerable to drought. “We have to find other ways to make money, like selling goods in local markets like Muzarabani Growth Point or working part-time jobs,” one respondent noted. Recent studies, such as those by Manda and Mjimba (2020), support this finding, noting that diversification can enhance resilience by providing households with multiple income streams during adverse conditions.

Migration and Labour Mobility

Migration emerged as a significant coping mechanism, with many families sending members to urban areas or other regions in search of work. This labour mobility is seen as a way to secure financial resources to support the family during drought periods. One respondent shared, “My brother went to Harare to find work; he sends money back to help us buy food.” Findings from Osei et al. (2021) indicate that migration can serve as a buffer against food insecurity, allowing families to access remittances and support for those remaining in drought-affected areas.

Selling Assets and Livestock

A common strategy reported was the sale of livestock and other assets to generate immediate cash for food and other necessities. While this provides short-term relief, it raises concerns about long-term sustainability, as families may deplete vital resources. As one participant explained, “We sold our goats to buy maize, but now we have nothing left.” This aligns with research by Béné et al. (2016), which highlights that asset liquidation can be a double-edged sword, providing immediate relief but potentially undermining future resilience.

Community Support and Solidarity

Respondents indicated that community solidarity plays a vital role in coping with drought. Informal support networks and community groups have emerged, where households share resources, information, and assistance. “We help each other; if one family has food, they share with others,” noted another participant. According to Kessler et al. (2018), social capital and community cohesion are crucial in enhancing resilience, as they enable households to pool resources and support each other during crises.

Neighbors shared food and labor, and informal saving clubs (e.g., *mukando*) were used to pool resources. This reflects findings by Kessler et al. (2018), who highlighted the role of social capital in enhancing resilience during climate crises.

Food Aid and External Assistance

Several focus group participants reported receiving food aid from NGOs like World Vision and government programs. While this assistance is crucial, respondents noted variability in the adequacy and timeliness of aid, impacting its effectiveness. One respondent remarked, "Sometimes the food comes late, and we struggle in the meantime." Studies show that while food aid can provide immediate relief, it is most effective when combined with longer-term development strategies that address underlying vulnerabilities (Quisumbing & Pandolfelli, 2010).

Changes in Dietary Practices

Due to food scarcity, many households have altered their dietary practices, often resorting to less nutritious food options. Respondents expressed concerns about the nutritional quality of available food and its impact on health, especially for children. "We have to eat what we can find locally, but it's not always healthy," one mother explained. Research by Zaveri et al. (2021) emphasises that food insecurity can lead to malnutrition, particularly in vulnerable populations, underscoring the need for targeted nutritional support during drought.

In conclusion, this thematic analysis reveals a complex interplay of coping mechanisms employed by households in Muzarabani in response to the challenges posed by El Niño-induced drought. While diversification of livelihoods, migration, and community support are prominent strategies, the reliance on asset liquidation and changes in dietary practices highlight significant vulnerabilities that require attention.

Focus group members described having to choose between buying food and paying medical bills, echoing research by Béné et al. (2016), which emphasises how environmental shocks erode both physical and financial access to health services.

7.4 Recommendations

Based on the findings, this section outlines actionable recommendations for policymakers and practitioners to enhance food security and resilience among vulnerable households in drought-prone regions.

1. Strengthen Climate-Resilient Livelihoods

- Promote Drought-Tolerant Crops and Livestock: Support smallholder farmers through the provision of certified seeds for drought-resistant crops (e.g., sorghum, millet, cowpeas) and livestock breeds adapted to arid environments.

- Invest in Agroecological Practices: Encourage conservation agriculture, water harvesting, and soil fertility management to improve productivity under dry conditions.
- Facilitate Access to Climate Information Services: Equip farmers with localised, timely weather forecasts and early warning systems to guide planting and migration decisions.

2. Expand and Diversify Income Opportunities

- Support Rural Entrepreneurship: Provide grants or low-interest microloans to help households start and scale small businesses, particularly for women and youth.
- Skills Development and Vocational Training: Establish training programs in non-agricultural skills such as carpentry, tailoring, ICT, and renewable energy to reduce overdependence on farming.
- Facilitate Market Linkages: Strengthen access to markets through rural infrastructure development (roads, mobile technology) and producer cooperatives.

3. Enhance Social Protection and Safety Nets

- Scale up Targeted Food Aid and Cash Transfers: Design flexible, needs-based social protection programs that can be rapidly deployed during droughts, particularly for households below the poverty line.
- Introduce Adaptive Safety Nets: Create programs that link short-term aid to long-term development goals (e.g., food-for-assets or cash-for-work programs focused on community infrastructure and irrigation).
- Strengthen Public Works Programs: Invest in community resilience through employment in soil conservation, borehole rehabilitation, and afforestation projects.

4. Improve Access to Finance and Credit

- Establish Inclusive Financial Services: Promote savings and credit schemes through community-based financial institutions like village savings and loan associations (VSLAs).
- De-risk Lending in Agriculture: Partner with banks and insurers to introduce index-based crop and livestock insurance products to cushion against climate shocks.
- Promote Digital Financial Inclusion: Support mobile banking and mobile money platforms to increase access to financial tools in remote areas.

5. Invest in Education and Human Capital

- Increase Access to Quality Education: Expand infrastructure and staffing in rural schools to improve literacy and long-term income resilience.

- Support Lifelong Learning: Provide adult education and functional literacy programs to enhance skills for managing finances, businesses, and climate risks.
- Mainstream Resilience Education: Integrate climate change adaptation and disaster preparedness into school curricula.

6. Strengthen Local Governance and Community Institutions

- Enhance Community-Based Disaster Risk Management: Support the formation and training of village drought management committees to monitor, plan, and respond to crises.
- Promote Participatory Planning: Involve local communities in the design and implementation of resilience interventions to ensure relevance and ownership.
- Improve Coordination Among Stakeholders: Foster partnerships between government, NGOs, research institutions, and local leaders to streamline drought response.

7. Institutionalise Data-Driven Decision-Making

- Conduct Regular Vulnerability Assessments: Use household data to identify risk patterns and target interventions more accurately.
- Monitor and Evaluate Resilience Programs: Build feedback systems that track the effectiveness of coping and adaptation strategies over time.
- Leverage GIS and Remote Sensing: Employ satellite data to map drought-prone zones and guide the allocation of resources.

To sustainably enhance food security and resilience among vulnerable households in drought-prone regions, a multi-sectoral, multi-level approach is required. These recommendations emphasise integrated interventions that go beyond reactive coping to foster long-term adaptation, economic empowerment, and institutional strengthening. They should be contextualised based on local conditions and inclusive of gender, youth, and other marginalised groups.

7.5 Conclusion

In conclusion, the coping strategies employed by households in Muzarabani District in response to El Niño-induced drought reveal a landscape characterised by both constrained agency and deep-seated structural vulnerability. The prevalence of migration for work (54.5%) and the sale of livestock (51.5%) illustrates a predominant reliance on strategies that are reactive and potentially erosive. These findings mirror broader patterns in Sub-Saharan Africa, where asset liquidation and labor migration are widespread drought responses, yet are increasingly recognised as unsustainable pathways that erode long-term resilience (Zaveri et

al., 2021; Olayide et al., 2021). The widespread recourse to borrowing (48.5%) and dependence on food aid (48.0%) further underscores the precarious financial and food security landscape in which these households operate. While such strategies may alleviate immediate hardship, they also risk deepening cycles of poverty and dependency, consistent with findings from Kessler et al. (2018) on the long-term implications of short-term coping. What is particularly notable is the underutilization of strategies such as small business creation (44.5%), which, though less prevalent, hold more promise for sustainable adaptation. The low uptake of such approaches suggests the presence of structural barriers, including limited access to capital, inadequate financial literacy, and deficient infrastructural support, that hinder the pursuit of transformative economic pathways (Manda & Mjimba, 2020). These constraints are emblematic of the broader developmental asymmetries that shape the adaptive capacity of rural households, where opportunity structures remain severely restricted.

Demographic analysis reveals critical insights into how adaptive capacity is mediated by socio-economic status and educational attainment. Households with secondary and tertiary education were significantly more likely to engage in migration, suggesting that education expands access to diversified income-generating opportunities and enhances labor mobility—an assertion supported by Osei et al. (2021). Conversely, households with incomes below USD 100 demonstrated heightened dependence on food aid, reinforcing Béné et al.'s (2016) contention that income security functions as a primary buffer against food insecurity. These differentiated patterns call for a nuanced understanding of vulnerability, one that moves beyond generic prescriptions toward more precisely targeted interventions.

Ultimately, the findings foreground a critical tension between the immediacy of survival and the necessity of sustainable adaptation. While households demonstrate resilience and ingenuity in the face of recurring droughts, the dominance of short-term, depleting coping mechanisms signals the limits of current adaptive frameworks. Addressing this requires a paradigm shift in policy and practice, from reactive aid to proactive resilience-building. This entails investment in education, expansion of climate-resilient livelihood opportunities, improved access to financial services, and the development of localised, gender-sensitive support systems. Moreover, as climate change intensifies both the frequency and severity of droughts across Southern Africa, the imperative for integrated, multi-scalar, and context-sensitive adaptation strategies becomes ever more urgent. The Muzarabani case study not only offers empirical insights into the lived realities of climate vulnerability but also serves as a clarion call for reimagining rural development through the lens of resilience, equity, and long-term sustainability.

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CHAPTER 8
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This chapter synthesizes the major conclusions derived from the study's findings and offers evidence-based recommendations. The research rigorously examined the multifaceted impacts of El Niño-induced drought on households in Muzarabani, Mashonaland Central Province, Zimbabwe. Specifically, it assessed the impact of El Niño-induced drought on food and nutrition security status among households, evaluated the effects of drought on household income, examined the implications of drought on household health outcomes, and identified coping mechanisms adopted by households in response to drought conditions in Muzarabani, Mashonaland Central Province, Zimbabwe. This comprehensive approach aligns with the call for integrated assessments of climate change impacts on vulnerable communities (US EPA, 2023).

8.2 Research Summary

This study investigated the impacts of El Niño-induced drought on households in Muzarabani, Mashonaland Central Province, Zimbabwe, focusing on food and nutrition security, household income, health and coping mechanisms. Utilising a mixed-methods approach, the research incorporated quantitative data from surveys of 200 Ward 1 households and qualitative insights from five focus group discussions and nine key informant interviews. This mixed-methods approach enhances the robustness of the findings, providing a more nuanced understanding of the complex dynamics at play (Bryman, 2016).

Table 8. 1: Research Summary

OBJECTIVE	METHODOLOGY	RESULTS	CONCLUSION
To assess the effect of El Niño-induced drought on food and nutrition security status among households in Muzarabani, Mashonaland Central Province.	Descriptive Statistics(Frequencies) Multiple Linear Regression Thematic Analysis	The findings indicate that over 65% of households experience moderate to severe food insecurity. Income level emerged as the most significant determinant of food insecurity. Qualitative insights gathered through key informant interviews and focus group discussions highlighted that El Nino-induced droughts negatively affect household food and nutrition security.	Enhancing economic resilience, promoting climate-smart agricultural practices, and strengthening social protection and early warning systems are essential for mitigating the adverse effects of climatic shocks on Food and Nutrition Security
To evaluate the effects of El Nino induced drought on household income in Muzarabani, Mashonaland Central Province.	Descriptive Statistics(Frequencies and Cross Tabulation) Multiple Linear Regression	Cross-tabulation analysis revealed that households with lower income levels (<USD 100) were significantly more prone to food shortages. Multiple linear regression results indicated that the experience of food shortages, used as a proxy for El Nino-induced drought exposure, had a statistically significant negative effect on household income ($B = -0.609$, $p < 0.001$), while demographic variables such as age, gender, and education level exhibited limited predictive power.	Droughts disproportionately undermine income stability among economically vulnerable households, thereby exacerbating food insecurity and poverty cycles.
To examine the implications of drought on health in affected households in Muzarabani, Mashonaland Central Province.	Descriptive Statistics(Frequencies and Cross Tabulation) Independent T-Test Chi-Square Test	55.5% of households reported health problems during drought periods. Households that experienced food shortages, only 34 reported no change, while a significant 82 reported a change in healthcare services. The t-test for equal variances assumed indicates a statistically significant difference in healthcare services ($t = 2.508$, $df = 198$, $p = 0.013$). The Pearson Chi-Square value (6.160, $df = 1$, $p = 0.013$) indicates a statistically significant association between changes in healthcare services and the experience of food shortages (proxy for El Nino induced drought).	Droughts act as amplifiers of pre-existing vulnerabilities in rural Zimbabwe, calling for an integrated policy response that includes nutrition-sensitive health interventions, school feeding programs, and drought-responsive social protection schemes.
To identify coping mechanisms adopted by households in response to drought conditions.	Descriptive Statistics(Frequencies and Cross Tabulation) Thematic Analysis	Most widely adopted coping strategies include migration for work (54.5%), selling livestock (51.5%), borrowing money (48.5%), and reliance on food aid (48.0%). Less commonly employed were strategies such as starting small businesses (44.5%), which was hindered by lack of capital and technical skills. Cross-tabulation analyses show significant demographic variations in coping choices. Migration was more prevalent among households with higher educational attainment, while dependence on food aid declined with increasing income, Thematic analysis of qualitative data further underscores diversification of livelihoods, community solidarity, and migration as key coping themes, while also exposing the long-term risks of asset depletion, dietary changes, and financial indebtedness.	Findings suggest that while households demonstrate significant agency in the face of recurrent droughts, many of the strategies employed are reactive, short-term, and potentially erosive.

8.3 Conclusions

The study aimed at testing the hypothesis that El Niño-induced drought significantly affects household food and nutrition security, household income and health in Muzarabani, Mashonaland Central Province, Zimbabwe. From the results, the study rejects the hypothesis that El Niño-induced drought significantly affects household food & nutrition security. However, the study fails to reject the hypothesis that El Niño-induced drought significantly affects household income and health outcomes and concludes that indeed El Niño-induced droughts affected household incomes and health outcomes of Ward 1, Muzarabani District residents. The study confirms that food insecurity is prevalent, with a substantial proportion of households relying on external assistance and engaging in various coping strategies to mitigate the adverse effects of drought. In conclusion, enhancing economic resilience, climate-smart agriculture, and social protection is vital to mitigate the impact of droughts on food and nutrition security. Droughts deepen poverty and food insecurity, especially among the economically vulnerable, by amplifying existing rural vulnerabilities. An integrated policy approach, incorporating nutrition-sensitive health services, school feeding, and drought-responsive aid, is essential. Although households show adaptive agency, their coping strategies remain largely short-term and unsustainable. This underscores the urgent need for integrated interventions that address the interconnected challenges of food security and health in drought-affected regions. By implementing the recommendations outlined below, stakeholders can work towards creating a more resilient framework that supports households in navigating the challenges posed by climate variability and ensuring food security for future generations. This integrated approach is crucial, as climate change impacts are multifaceted and require holistic solutions (UNFCCC, 2024).

8.4 Policy implications and recommendations

Based on the findings from the study on the assessment of the El Niño-induced drought impacts on food and nutrition security status among households in Muzarabani, Mashonaland Central Province, Zimbabwe, this chapter presents recommendations for stakeholders including farmers, policymakers, extension service providers, and contract farming companies.

8.4.1 Economic Diversification Initiatives

Programs aimed at promoting diverse income-generating activities should be prioritised. This can involve supporting small-scale enterprises and informal trading, as well as facilitating access to microfinance options that empower households to start small businesses.

8.4.2 Integrated Food Security Programs

Policymakers should develop and implement comprehensive food security programs that combine immediate food assistance with long-term agricultural support. This includes training in sustainable farming practices and providing access to inputs and resources that can enhance agricultural productivity.

8.4.3 Strengthen Access to Inputs and Extension Services

There is a need to enhance smallholder farmers' access to inputs and technical support regardless of contract status. Government, NGOs, and private actors should collaborate to ensure that smallholder farmers receive support services that can boost their productivity and reduce the existing yield gap during droughts.

8.4.4 Improve Access to Credit and Finance

Lack of access to capital remains a key constraint for smallholder farmers. Financial institutions should be incentivised to develop tailored financial products for smallholder farmers, possibly leveraging contract arrangements as collateral mechanisms.

8.4.5 Community Resilience Building

Enhancing community solidarity through the establishment of local support groups and cooperative societies can improve resource sharing and collective resilience. These networks can facilitate the pooling of resources, information, and support during crises. Besides, providing training for community members on adaptive strategies, including entrepreneurship, food preservation, and nutrition, can enhance their capacity to respond effectively to drought conditions. Workshops and seminars can foster skills development that is crucial for resilience.

In conclusion, the impacts of El Niño-induced drought on households in Muzarabani present a critical challenge that necessitates a coordinated and multifaceted response. Addressing the underlying socio-economic vulnerabilities while enhancing community resilience is essential for fostering sustainable development and improving the overall well-being of affected populations. By implementing the recommendations outlined in this chapter, stakeholders can work towards creating a more resilient framework that supports households in navigating the challenges posed by climate variability and ensuring food security for future generations.

8.5 Areas for further research

Future research could explore the long-term sustainability of conservation farming models in Zimbabwe, and their effect on household incomes and welfare impacts (Thierfelder et al., 2015). Besides, further research on adaptive strategies is of paramount importance (Muzarabani, 2024).

Studies indicate that climate change exacerbates drought conditions, leading to more severe impacts on agricultural productivity and food availability (US EPA, 2023). Therefore, future research should explore the nuanced dynamics of these coping mechanisms and their effectiveness in enhancing resilience against climatic adversities (Chidarikire, 2025).

Future research should focus on longitudinal studies to track the long-term impacts of El Niño-induced droughts on food security and household resilience. Understanding these dynamics over time will inform more effective and adaptive policy frameworks (Béné *et al*., 2016). Besides, such studies can provide valuable insights into evolving vulnerabilities and adaptive capacities over time. Establishing robust monitoring and evaluation frameworks for food security and drought response initiatives is vital. These frameworks should be designed to assess the impact of interventions and adjust strategies based on empirical evidence and community feedback (FAO, 2018).

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8.5 Appendices

Appendix 1: Household Questionnaire

Name of Researcher: Gilbert Vera Date of Interview…31…. /…03…/2025

WHAT YOU SHOULD KNOW ABOUT THIS STUDY:

My name is Gilbert Vera, a student studying towards a Master of Science Degree in Food Security and Sustainable Agricultural Policy, at Bindura University of Science Education, Faculty of Agriculture and Environmental Science in the Department of Agricultural Economics, Education and Extension.

I am carrying out a study on "**Effects of El Niño-Induced Drought on Household Food and Nutrition Security in Muzarabani District**" I allow you to understand the research study's purpose, risks and benefits. The main goal of this research, like other academic studies, is to gain knowledge that may help people understand how to navigate the complex effects of El Niño-Induced Drought on Household Welfare in the future. I cannot promise you that this

research will benefit you directly. You have the right to refuse or agree to take part now and change your mind later. You also have the right not to answer any questions you are uncomfortable answering. Please feel free to ask any questions before you decide to participate, and be advised that your participation is both voluntary and highly appreciated.

Section A: Demographic Information

1. Name of Respondent (Optional): _____
2. Age of Respondent:

   ☐ Under 18 ☐ 18–30 ☐ 31–45 ☐ 46–60 ☐ Over 60
3. Gender:

   ☐ Male ☐ Female
4. Household Size: _____ members
5. Main source of livelihood:

   ☐ Farming ☐ Livestock rearing ☐ Small business ☐ Wage employment ☐ Other (Specify): _____
6. Level of education of household head:

   ☐ No formal education ☐ Primary ☐ Secondary ☐ Tertiary
7. **Income Level**: What is your approximate monthly household income?

   ☐ Less than USD 100

   ☐ USD 101 – 200

   ☐ USD 201 – 300

   ☐ More than USD 300

Section B: Impact of El Niño-Induced Drought on Food and Nutrition Security

7. Has your household experienced food shortages due to drought in the past 12 months?

   ☐ Yes ☐ No

8. In the past four weeks before a survey, did your household experience the following situation? (*tick where appropriate*)

Note: **Rarely** (once or twice in the past four weeks),
Sometimes (three to ten times in the past four weeks),
Often (more than ten times in the past four weeks)

THE 9 HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS) QUESTIONS	RARELY	SOMETIMES	OFTEN
Anxiety and Uncertainty about Household Food Supply: In the past four weeks, did you worry that your household would not have enough food?			

Insufficient Quality (includes variety, preferences, etc.): In the past four weeks, did you or any household member eat just a few kinds of foods day after day due to a lack of resources?			
Insufficient Quality (includes variety, preferences, etc.): In the past four weeks, did you or any household member eat food that you preferred not to eat because of a lack of resources to obtain other types of food?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member eat food that you did not want to eat because of a lack of resources?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member eat a smaller meal than needed because there was not enough food?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member eat fewer meals in a day because there was not enough food?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, was there ever no food at all in your household because there were no resources to get more?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?			
Insufficient Food Intake and its Physical Consequences: In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?			

Section C: Effects of Drought on Household Income

12. What were your household's main sources of income before the drought? (Tick all that apply)

    ☐ Crop farming ☐ Livestock ☐ Casual labor ☐ Small business ☐ Remittances ☐ Other: _____

13. Has your household income:

☐ Decreased greatly ☐ Decreased slightly ☐ No change ☐ Increased

14. If decreased, estimate the percentage decrease in your household income:

☐ Less than 25% ☐ 25–50% ☐ 51–75% ☐ More than 75%

15. Did you have to seek additional income sources due to drought?

☐ Yes ☐ No

Section D: Implications of Drought on Health and Education

16. Did any household member experience health problems worsened by the drought (e.g., malnutrition, dehydration)?

☐ Yes ☐ No

17. Was there a change in the household's ability to pay for healthcare services during the drought?

☐ Yes ☐ No

18. Did school attendance of any children in the household decrease due to drought-related financial constraints?

☐ Yes ☐ No

19. If yes, what were the main reasons?

☐ Could not afford school fees

☐ Children needed to work

☐ Food scarcity

☐ Other (Specify): _____

Section E: Coping Mechanisms Adopted by Households

20. What coping strategies has your household used during drought periods? (1=Yes, 0=No on each of the stated)

☐ Reducing the number of meals per day

☐ Selling livestock/assets

☐ Borrowing money

☐ Migration for work

☐ Receiving food aid

☐ Starting small businesses

☐ Other (Specify): _____

21. Have any household members migrated permanently due to drought?

☐ Yes ☐ No

22. How effective do you feel your coping strategies have been?

☐ Very effective ☐ Somewhat effective ☐ Not effective

Section F: Additional Comments

23. In your opinion, what support would help households better cope with future droughts?

THANK YOU FOR YOUR PARTICIPATION!

END

Appendix 2: Key Informant Interview Guide

Study Topic: Effects of El Niño-Induced Drought on Household Food and Nutrition Security in Muzarabani District

Name of Researcher: Gilbert Vera Date of Interview…31…. /…03…/2025

WHAT YOU SHOULD KNOW ABOUT THIS STUDY:

My name is Gilbert Vera, a student studying towards a Master of Science Degree in Food Security and Sustainable Agricultural Policy, at Bindura University of Science Education, Faculty of Agriculture and Environmental Science in the Department of Agricultural Economics, Education and Extension.

I am carrying out a study on "**Effects of El Niño-Induced Drought on Household Food and Nutrition security in Muzarabani District**" I allow you to understand the research study's purpose, risks and benefits. The main goal of this research, like other academic studies, is to gain knowledge that may help people understand how to navigate the complex effects of El Niño-Induced Drought on Household Welfare in the future. I cannot promise you that this research will benefit you directly. You have the right to refuse or agree to take part now and change your mind later. You also have the right not to answer any questions you are uncomfortable answering. Please feel free to ask any questions before you decide to participate, and be advised that your participation is both voluntary and highly appreciated.

✅ Section 1: Background Information

- Name of Informant: _____ (Optional)
- Position/Title: _____
- Organisation/Institution: _____
- How long have you served in this role? _____

✅ Section 2: Impact of Drought on Food and Nutrition Security

- From your perspective, how has the El Niño-induced drought affected food availability in Muzarabani?

  ……

  ……
- Have malnutrition or hunger cases increased in this area during drought periods?

  ……

  ……
- Are there any groups (e.g., women, children) particularly vulnerable to food insecurity during droughts?

……

……

- What interventions (e.g., food aid, feeding programs) have been introduced, and how effective have they been?

……

……

……

✅ Section 3: Effects of Drought on Household Income

- How has the drought affected household and community income sources?

……

……

……

- Which sectors (e.g., farming, livestock, and small business) have been most impacted?

……

……

- Have there been any shifts in livelihoods or income-generating activities due to drought?

……

……

- What support (if any) has been provided to assist affected households economically?

……

……

✅ Section 4: Impacts on Health and Education

- Have you observed any health issues linked to drought (e.g., malnutrition, diseases)?

……

……

- Has access to healthcare changed during drought periods?

……

……

……

- What has been the impact of the drought on children's school attendance and educational outcomes?

……

……

- Are there any local or external programs that address health or education challenges caused by drought?

……

……

✓ Section 5: Coping Strategies and Community Response

- What coping mechanisms have you observed households using during droughts?

……

……

- Have people migrated or sold assets as a result of drought stress?

……

……

- Which strategies seem most effective or sustainable?

……

……

✓ Section 6: Recommendations for Future Drought Response

- In your opinion, what should government agencies, NGOs, or donors prioritise to help communities better prepare for or survive droughts?

……

……

- Are there any best practices from this or previous droughts that you would recommend scaling up?

……

……

✓ Conclusion (5 minutes)

- *Is there anything else you would like to share that we haven't covered?"*

……

……

……

THANK YOU FOR YOUR PARTICIPATION!

END

Appendix 3: Focus Group Discussion

Focus Group Interview Guide

Study Topic: Effects of El Niño-Induced Drought on Household Food and Nutrition Security in Muzarabani District, Zimbabwe

Opening (5 minutes): *Welcome participants.*

i. Introduction

My name is Gilbert Vera, a student studying towards a Master of Science Degree in Food Security and Sustainable Agricultural Policy, at Bindura University of Science Education, Faculty of Agriculture and Environmental Science in the Department of Agricultural Economics, Education and Extension. I am carrying out a study on "**Effects of El Niño-Induced Drought on Household Food and Nutrition security in Muzarabani District**" I allow you to understand the research study's purpose, risks and benefits. The main goal of this research, like other academic studies, is to gain knowledge that may help people understand how to navigate the complex effects of El Niño-Induced Drought on Household Welfare in the future. I cannot promise you that this research will benefit you directly. You have the right to refuse to take part or agree to take part now and change your mind later. You also have the right not to answer any questions you are uncomfortable answering. Please feel free to ask any questions before you decide to participate, and be advised that your participation is both voluntary and highly appreciated.

ii. Purpose of the discussion:

"We are here to talk about how drought has affected your lives — your food, income, health, education, and the ways you have coped. There are no right or wrong answers. Please share your honest views."

Section 1: Impact of Drought on Food and Nutrition (15 minutes)

- How has drought affected the availability of food in your household?
- What changes have you made in the types of foods you eat?
- How often do you and your families eat during the drought period compared to normal times?
- Have you received food aid? If so, from whom, and was it sufficient?

Section 2: Effects of Drought on Household Income (15 minutes)

- What are your main sources of income?
- How has drought affected your ability to earn income?
- Have you started any new activities or businesses because of the drought?

- Are there any groups, programs, or organizations that have helped you financially during this period?

Section 3: Health and Education Impacts (15 minutes)

- Have you or any family members faced health problems because of the drought (e.g., malnutrition, water scarcity)?
- Was it harder to pay for healthcare during the drought?
- How has the drought affected children's schooling in your household or community?
- Have any children stopped attending school because of the drought?

Section 4: Coping Mechanisms (15 minutes)

- What are some ways your household is coping with the drought?
- Have you sold livestock, borrowed money, migrated, or changed your farming practices?
- Which coping strategies have worked best for you? Which have not worked?

Section 5: Future Support and Recommendations (10 minutes)

- What kind of support would help you and your community better survive future droughts?
- What programs or interventions have helped you the most?
- What do you wish the government or NGOS would do differently?

THANK YOU FOR YOUR PARTICIPATION

END