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**Bindura University
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**INVESTIGATING RURAL RESILIENCE ON CLIMATE CHANGE. A CASE OF
CHIMANIMANI DISTRICT MANICALAND PROVINCE
ZIMBABWE**

Submitted by

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**A Dissertation Submitted in Partial Fulfillment of the Requirements of the Bachelor of
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RELEASE FORM

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APPROVAL FORM

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DECLARATION

I, Tatenda Lennyfios Mangirazi, declare that this dissertation titled "Investigating rural resilience on climate change" is my original work and has not been submitted elsewhere for any degree or qualification. I confirm receiving guidance and support from my supervisor, Dr. V.T. Munyati. I also used other academic staff throughout this research process. However, the intellectual content, analysis, and presentation of this dissertation are entirely my own original work. In preparing this dissertation, I have exactly adhered to Bindura University of Science Education's policies on plagiarism and academic integrity. I have consulted all my sources and have been appropriately cited and referenced. The work presented herein is a true reflection of my independent research and scholarly efforts.

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DEDICATION

I dedicate this research to my parents, Mr. and Mrs. Mangirazi for their unwavering support and motivation that have been active in the completion of this project.

ACKNOWLEDGEMENT

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Lastly, I appreciate my family for their unwavering love and support. Their confidence in my abilities provided me with the strength to pursue this research.

Thank you all for being a part of this significant work

ABSTRACT

This research investigates the impact of increasing cyclone frequency on food security among rural households. The study is emphasizing the importance of socio-economic factors that influence resilience. It discourses the critical issue of food insecurity intensified by climate change. This poses significant risks to vulnerable populations. A quantitative research design was employed and the study used both utilizing linear and binary logistic regression analyses to examine the core relation between various demographic and economic factors and food security outcomes. Structured surveys were done for the data collection process and was conducted with a sample of rural households in cyclone-prone areas.

The findings revealed that male-headed households, higher levels of education, larger farm sizes, and more frequent meals were positively associated with food security. Larger household size tended to have a negative impact. These results give emphasis to the need for targeted interventions aimed at enhancing resilience in affected communities. Key conclusions designate the need to overlook at gender disparities. Such would lead to improving access to education could significantly improve food security outcomes. From such insights, recommendations are made based on stakeholders, including policymakers and NGOs. This will promote gender equality, develop educational programs, and enhance resource access for vulnerable households. This research provides significant insights into the correlation between climate change and food security, guiding future strategies to support rural communities facing environmental challenges.

Keywords: cyclone frequency, food security, rural households, socio-economic factors, climate change, resilience.

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LIST OF ACRONYMS AND ABBREVIATIONS

AGRITEX	Agricultural Technical and Extension Services
ARDA	Agriculture AND RURAL Development Authority
SES	Social-ecological system framework
CSP	Climate Smart Practices
IPCC	Intergovernmental Panel on Climate Change
GHGs	Green House Gases

CHAPTER 1

INTRODUCTION

1.1 Background

In the 21st century climate change is a significant challenge affecting ecosystems, economies, and communities globally. Rural populations particularly in Zimbabwe, are the ones vulnerable because of their dependence on agriculture. For the past decade, Zimbabwe has experienced a rise in extreme weather events, including floods and cyclones. This has disrupted the livelihoods of farmers. According to the Intergovernmental Panel on Climate Change (IPCC, 2021), these shifts threaten food security and exacerbate poverty, particularly in rural areas reliant on agricultural practices.

The Chimanimani District in Manicaland Province represents these challenges, following Cyclone Idai in March 2019. The area faced severe destructions to infrastructure such as building and storage facilities and agriculture both crops and animals (Mastorillo M., 2016). This situation led to the vulnerabilities of subsistence farming which was already strained by climate change. The increasing frequency of climate-related disasters poses serious threats to food security and water supply have been the threats posed by these climate related disasters due to the increasing frequency where heavy rainfall contributing to soil erosion and flooding (Zhou *et al.*, 2020).

In response to the climate related disasters, local farmers have adopted to resilience strategies, on traditional knowledge and community networks. The local farmers have implemented Climate-smart practices which involves intercropping and conservation agriculture. by so doing it enhances soil health and crop yields (Hassan, R., & Nhemachena, C., 2008). These initiatives like rainwater harvesting are increasingly becoming of significance for adapting to fluctuating precipitation patterns (Mastorillo M., 2016).

1.2 Problem Statement

The Chimanimani District in Manicaland province is particularly increasing vulnerable to climate change. This is especially due to extreme weather events that threaten rural livelihoods and food security. The impact of Cyclone Idai in 2019 highlighted these issues, and this led to increased poverty and insufficient disaster preparedness. Although there have been initiatives aimed at building resilience, a significant gap remains in understanding the

factors that enhance community resilience. Essential questions include the influence of local knowledge, community dynamics, and the support provided by governmental and non-governmental organizations.

In an ideal world, communities would successfully adapt to climate impacts, securing food stability. This can be done through traditional knowledge, robust networks, and external assistance. This research seeks to observe the mechanisms that foster resilience. This can be done through offering insights for policy development and community empowerment to improve adaptability.

While some local adaptation strategies are in place, comprehensive research on the factors determining resilience in Chimanimani is still needed. This research will focus on local knowledge systems, community dynamics, and the significance of external support. This in the long run contributes to more effective policies and interventions for enhancing rural resilience.

1.3 Research Questions

This study examines rural resilience to climate change in the Chimanimani District of Zimbabwe, focusing on the following questions:

1. What specific impacts did Cyclone Idai have on agricultural productivity and food security in Chimanimani?
2. What coping strategies did rural households use to mitigate the effects of climate change?
3. How effective are local community networks in enhancing resilience among these populations?

1.4 Objectives

1.4.1 Main Objective

Evaluate the impacts of climate change on rural communities and assess the effectiveness of their resilience strategies in Chimanimani.

1.4.2 Specific Objectives

1. Assess the effects of increased cyclone frequency on household food security.
2. Evaluate the coping strategies implemented by rural households in response to climate change.
3. Explore the effectiveness of local systems in strengthening resilience.

1.5 Hypothesis

Objective 1: Assess the Effects of Increased Frequency of Cyclones on Household Livelihoods and Food Security

H0: The increasing frequency of cyclones does not have a significant impact on household livelihoods and food security in the Chimanimani District.

H1: The increasing frequency of cyclones has a significant negative impact on household livelihoods and food security in the Chimanimani District.

Objective 2: Analyze the Coping Strategies Adopted by Rural Households in Response to Climate Change

H0: Rural households do not implement effective coping strategies in response to climate change and its related disasters.

H1: Rural households implement effective coping strategies in response to climate change and its related disasters.

Objective 3: Investigate the Effectiveness of Local Systems in Enhancing Resilience

H0: Local systems, including community participation, do not have a significant effect on enhancing resilience among rural communities in the Chimanimani District.

H1: Local systems, including community participation, have a significant positive effect on enhancing resilience among rural communities in the Chimanimani District.

1.6 Justification

Researcher

This study addresses a crucial gap in understanding how rural communities in Chimanimani adapt to climate change. The researcher aims to provide useful insights that can help improve local adaptation strategies.

Chimanimani Community

The community in Chimanimani is vulnerable to climate change, especially after recent cyclones. Understanding their resilience factors is crucial for helping them adapt and sustain their livelihoods. Engaging with the community allows for the identification of locally relevant solutions and the empowerment of residents. Insights gained from this study can foster community-led initiatives that strengthen resilience and improve overall well-being.

Government

The findings from this research can guide government policies to strengthen community resilience. By using this information, the government can better support programs that address the specific needs of rural households. Policymakers can utilize the insights to allocate resources more efficiently, prioritize funding for adaptation projects, and implement strategies that promote sustainability in rural communities. This alignment can lead to more cohesive and impactful climate action initiatives.

1.7 Scope and Limitations of the Study

1.7.1 Scope

The study is based on Chimanimani District in Manicaland Province, excluding other regions that may experience different climate change impacts and resilience strategies. This limited geographical focus allows for an in-depth exploration of local dynamics. By so doing it may limit the broader applicability of the findings. Additionally, the research is based on a specific time period. This had an influence the relevance of the findings to future conditions. It assessed particular climate change impacts and hazards affecting rural communities.it targeted insights while potentially overlooking other critical environmental factors. Furthermore, the research focused on specific socioeconomic groups within rural communities. The study may present a narrow view of the broader socioeconomic influences on resilience.

1.7.2 Limitations

Several limitations affect the study's findings such as limited access to comprehensive data or socioeconomic indicators. This compromises the reliability and availability of information, potentially skewing the results. Cultural and social barriers may hinder engagement with researchers. These barrier include impacting trust and communication, which can lead to incomplete or biased data collection.

The political context and existing policies may also influence the climate adaptation strategies of rural communities.it is of potentially limiting the effectiveness of proposed solutions. Understanding climate change and assessing resilience requires long-term monitoring, as strategies evolve over time. The study's time-frame may not capture the full scope of these adaptation processes.

1.8 Organization of Thesis

Chapter 1: Introduction

Chapter 2: Literature Review

Chapter 3: Methodology

Chapter 4: Results and Discussions

Chapter 5: Conclusions and Recommendations

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on rural resilience within climate change. It is specifically focusing on the Chimanimani District in Manicaland province in Zimbabwe. Climate change significantly affects agriculture, food security, and community well-being. It particularly affects rural areas that are reliant on natural resources for their livelihoods. The community adaptation is of significant in developing effective resilience strategies. This chapter includes definitions of key terms, an empirical review of relevant studies, a theoretical framework, and a summary of implications.

2.2 Definition of Key Terms

2.2.1 Climate Change

Climate change refers to long-term alterations in climate patterns, primarily due to human activities that increase greenhouse gas concentrations. It describes long-term changes in weather patterns and temperatures, which can occur naturally due to significant volcanic eruptions or variations in solar activity (NASA/JPL-Caltec, 2024).

It also refers to a persistent pattern of shifts in the earth's overall weather caused by an average increase in the earth's surface temperature, commonly known as global warming. The increase in temperature is usually caused by greenhouse gases that will be emitted into the air by different human activities. (Nel, T. L., & Khosa , 2025)

2.2.2 Rural Resilience

Rural resilience is the capacity of rural communities to withstand, adapt to, and recover from environmental and socio-economic shocks, ensuring the continuity of livelihoods and social systems. (Poltorak, A., Bodnar, O., Rybachuk, I., & Statsenko, V. , 2024)

(Li, 2023) Rural resilient refers to a rural area's ability to cope with its inherent, economic, ecological and cultural vulnerabilities.

2.2.3 Traditional Knowledge

Traditional knowledge encompasses the cumulative knowledge and practices developed by indigenous communities over generations, essential for resource management and climate adaptation. (Lake, F. K., Wright, V., Morgan, P., McFadzen, M., McWethy, D., & Stevens-Rumann, C. , 2017)

Refers to the knowledge, know-how, skills, and practices developed, maintained, and passed down from one generation to another. These practices are frequently integral to the community's cultural or spiritual identity (Vajiram, 2025)

2.2.5 Coping Strategy

Coping strategies are actions and approaches that individuals or communities use to manage and respond to stressors or challenges, particularly in adverse conditions (Aldrich, 2012).

2.3 Empirical Review

2.3.1 Effects of Increased Cyclone Frequency on Household Livelihoods

The (O'Connor, D., Boyle, P., Ilcan, S., & Oliver, M. , 2017) conducted a study assessing the effects of increased cyclone frequency on household livelihoods in Mozambique. Using a vulnerable assessment framework, the study collected economic data and employed descriptive statistics to compare affected and unaffected households. The results indicated that 70% of households reported significant losses in crop production, leading to increased food insecurity.

(P Schwerdtle, K Bowen, C McMichael , 2018) Examined climate risk in coastal areas using integrated risk assessment methods to analyze the effects of cyclones on livelihoods and food security. Their findings showed that higher vulnerability in coastal communities correlated with increased cyclone frequency. Additionally, (Mastrorillo M., 2016) emphasized the increased vulnerability of rural populations following extreme weather events like Cyclone Idai, which devastated crops and infrastructure in Zimbabwe, exacerbating food insecurity and economic distress.

2.3.2 Coping Strategies Adopted by Rural Households in response to climate change.

(Reddy, I. C., & Prabakar, C. , 2024) Highlighted the importance of crop diversification in regions with increasing cyclone frequency. Their research, utilizing a diversification model and linear regression analysis, demonstrated a correlation between climate change perception and the adoption of diversified crops. Households that diversified crops experienced less income volatility. Similarly, (E Mavhura, T Manyangadze , 2021) studied coping strategies adopted by households in response to climate change. Using probit regression analysis, they assessed factors influencing the adoption of climate-resilient crops, finding that 60% of farmers adopting drought-resistant varieties reported improved yields.

2.3.3 Effectiveness of Local Systems in Enhancing Resilience

(Mastrorillo M., 2016) Conducted research using multi-linear regression analysis to investigate access to extension services in Zimbabwe. The findings revealed that crop yields increased by 20% from the previous year. This was influenced by access to extension services, highlighting their role in enhancing resilience in rural communities. (Mavhura, 2020) Focused on feedback mechanisms in extension services, employing thematic analysis to examine economic data. The results indicated that effective feedback enhances service delivery and farmer satisfaction.

Furthermore, (Pindai M Sithole, Moses chundu, 2020) also conducted a research on how indigenous knowledge systems were used to predict rainfall and for disaster preparedness. The researcher used thematic analysis to examine the economic data that he received from qualitative data from the local households through interviews and focus group discussion with the local elders. The research found out that indigenous systems are no longer effective in determining disaster preparedness and predicting rainfall patterns.

2.4 Theoretical Framework

This research used the Social-Ecological Systems (SES) framework, the framework emphasizes on the interconnectedness of human and environmental systems. According to the SES framework, resilience is a dynamic process shaped by social, economic, and environmental factors (Berkes & Folke, 1998).

The framework has some of its key components which include community social structure, ecological context, governance systems, and economic conditions. These may have a broader

understanding of these interactions offers valuable insights into resource management and adaptive capacity.

Additionally, the framework emphasizes the significance of local knowledge and agency in building resilience. By using community perspectives, the interventions can become more contextually relevant and of effectiveness. The SES framework is illustrated in the diagram below.

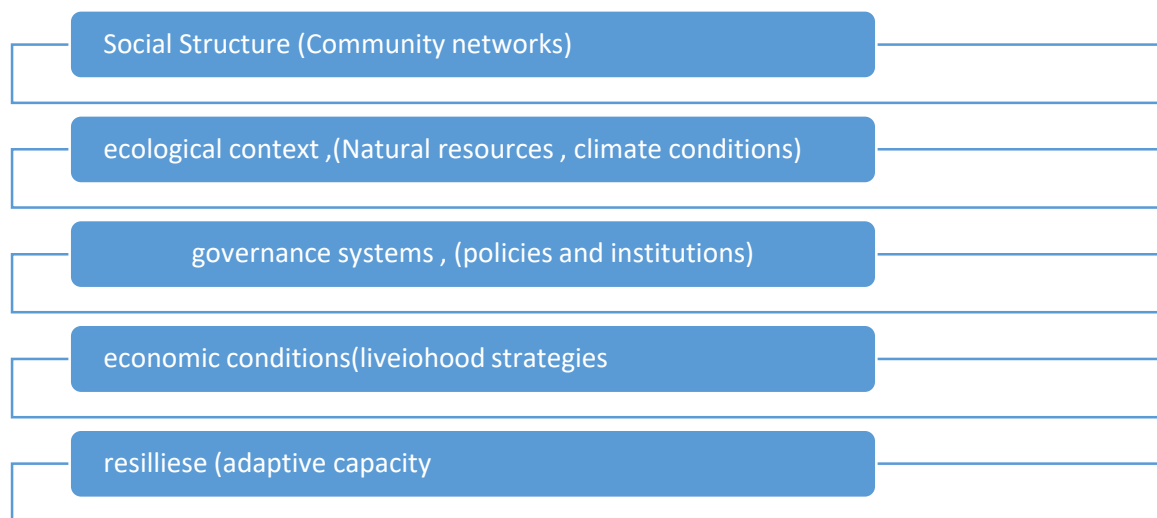


Fig 1: SES theoretical framework 1

2.5 Conceptual Framework

The conceptual framework for this study illustrates the relationships among key variables that influence rural resilience in the context of climate change. It shows the interconnected dynamics that shape the adaptive capacity of rural communities in Chimanimani.

This framework serves as a guiding structure for analyzing the factors contributing to resilience. By exploring the interactions between these variables, researchers can identify effective strategies for enhancing resilience and mitigating the impacts of climate change.

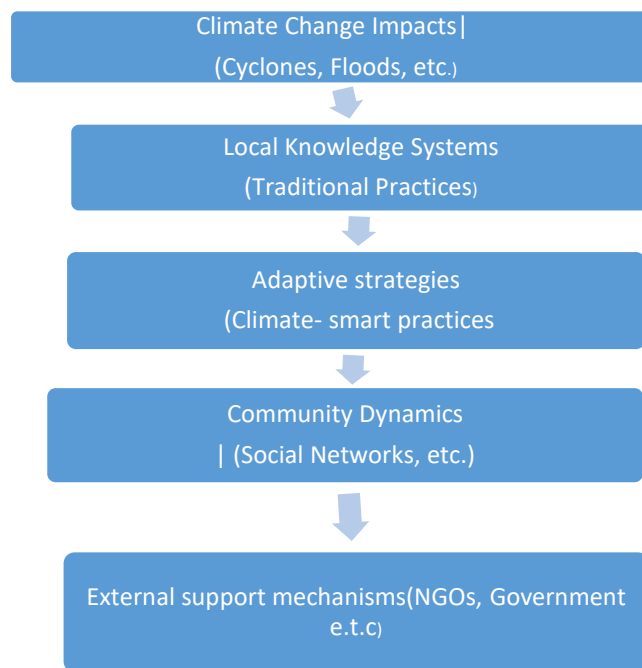


Fig 2: conceptual framework 1

2.6 Insights of Literature Review

This literature review emphasizes on understanding the complex challenges that climate change poses to rural communities in Chimanimani. The chapter establishes a foundation for investigating the determinants by defining key terms, examining empirical evidence of resilience in the face of changing climatic conditions. In order to explore on the interactions between local knowledge, adaptation strategies and external support mechanism, the theoretical framework and conceptual framework is of significant in providing such structured approach.

These insights provides an in view of the significance of strengthening resilience in rural communities to mitigate the negative impacts of climate change and promote sustainable livelihoods. Future research should continue to examine the dynamics of rural resilience, integrating local knowledge with broader strategies to enhance adaptive capacity. This approach will better prepare communities to navigate the complexities of climate change and safeguard their well-being in an uncertain future.

CHAPTER THREE

RESEARCH METHODOLOGY

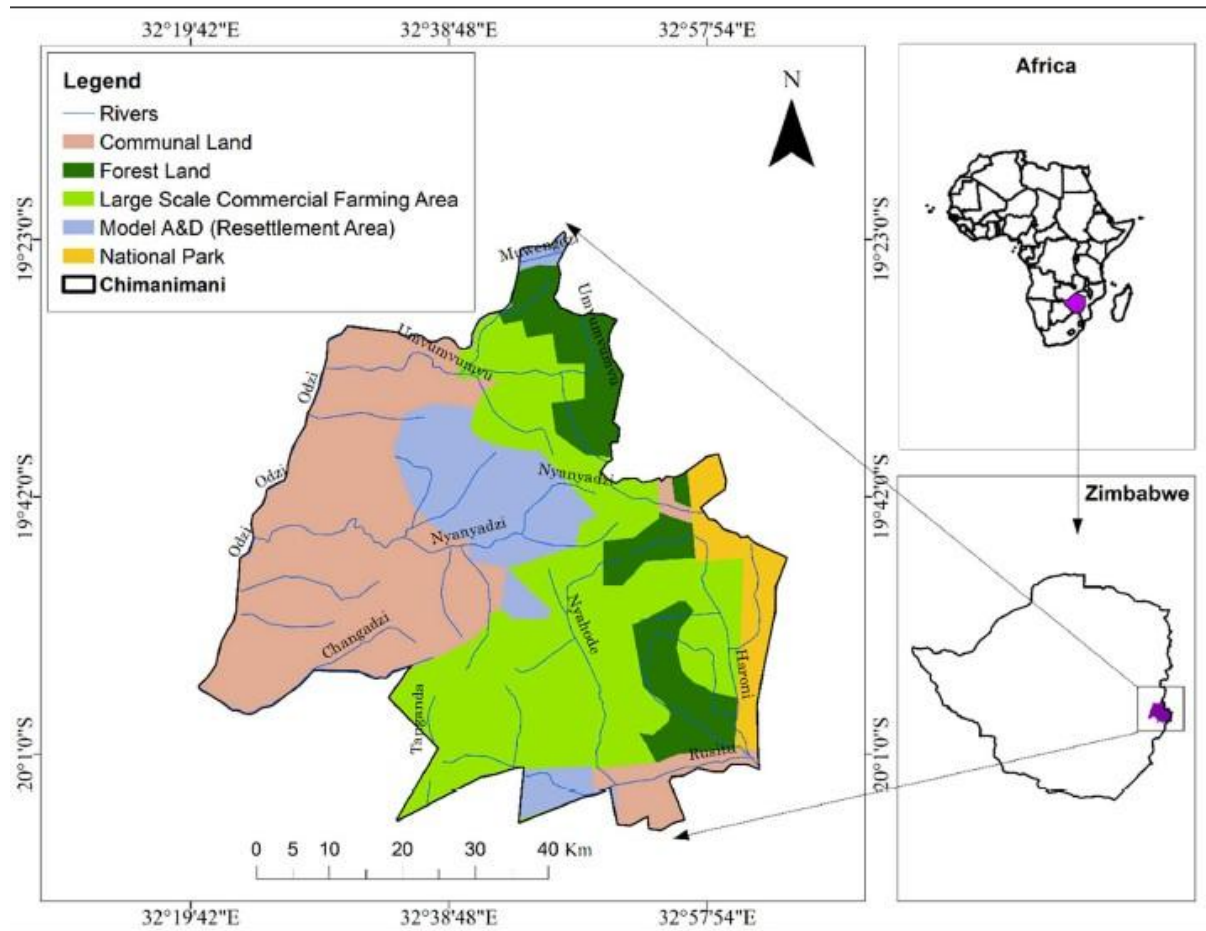
3.1 Research Design

This the research study used a mixed-methods design to assess on the resilience of rural communities in Chimanimani in response to climate change. For the primary data collection phone surveys, virtual interviews, observations, and focus group discussions were used to gather the data.it employed a random sampling technique from the Chimanimani community households. This triangulation of data enhances reliability and enriches the understanding of community dynamics (Clark, Creswell , 2018)). Secondary data was collected from publications, academic journals, and reports from organizations such as AGRITEX and ARDA, providing essential contextual background.

3.2 Study Area

The Chimanimani District in Manicaland Province in Zimbabwe is 3,450.14 km² with a population of approximately 134,939 residents (ZIMSTAT, 2012) and having 90% rural household, most of whom are engaged in agriculture. It is situated in a semi-arid region. It is characterized by distinct seasonal rainfall with an average precipitation of 126mm annually and periodic droughts (atlas, 2024). Farmers typically cultivate drought-resistant crops such as maize, sorghum, and legumes that are well-suited to these conditions. The area experiences temperatures ranging from 15°C to 30°C (atlas, 2024). It significant increases during the dry season, impacting agricultural practices and necessitating effective water management strategies.

The predominant loamy and clay soils in the region are fertile and capable of retaining moisture (Nyathi). Loamy soils provide good drainage and aeration, while clay soils are nutrient-rich, both of which influence crop selection. The study area has a population of approximately 134,939 residents (ZIMSTAT, 2012) and having 90% rural household, most of whom are engaged in agriculture. This diverse demographic, encompassing various ethnic and cultural backgrounds.It the importance of sustainable practices and coping strategies to enhance resilience.



A map showing Chimanimani District, Zimbabwe

Fig 3: chimanimani map 1

Chimanimani has faced significant cyclones, particularly Cyclone Eline in 2000 and Cyclone Idai in 2019. Cyclone Eline resulted in widespread destruction, severe flooding, loss of life, and long-term effects on agricultural productivity (Mavhura, 2020). Cyclone Idai further intensified vulnerabilities, causing extensive infrastructure damage, displacing communities, and increasing food insecurity (IFRC, 2020). These historical events underscore the urgent need to strengthen community resilience against recurring climate-related disasters.

3.3 Target Population

The target population for this research encompasses rural communities in the Chimanimani District. This focus allows for a comprehensive understanding of the factors influencing resilience and adaptation strategies. The study aimed to gather insights from diverse demographics, including gender, age, and socio-economic status, which are essential for understanding the complexities of resilience (Mastrorillo, 2018).

3.4 Sampling Methods

A cross-sectional survey design was developed, with a sample of 211 households selected. Multistage sampling techniques were applied to ensure a representative sample. The sample size was determined using Cochran's formula:

$$n = \frac{z^2 \times \sigma^2}{\epsilon^2}$$

Where:

- **n** = required sample size
- **Z** = Z-score (1.96 for 95% confidence)
- **σ** = estimated population standard deviation (assumed to be 0.5)
- **E** = desired margin of error

To find a sample size n when

Z=1.96 (for 95% level of confidence)

σ =0.5 (assuming a population standard deviation of 0.5)

e=? (Is the margin error of corresponding to a sample size of 211?)

Re arrange the formula to solve e

$$E = z^2 \times \sigma^2 / n$$

$$E = 1.96^2 \times 0.5^2 / 211$$

$$E = 3.8416 \times 0.25 / 211$$

$$E = 0.9604 / 211$$

$$E = 0.0045$$

$$E = 0.0674$$

So, a sample size of 211 corresponds to a margin of error of approximately 0.067 (or 6.74)

Hence to find sample size

$$N = z^2 * \sigma^2 / e^2$$

$$N = 1.96^2 * 0.5^2 * 0.108^2$$

$$N = 0.9604 / 0.00454276$$

$$N = 212.21$$

This approach ensured that the sample accurately represented the diversity of the community, facilitating more reliable conclusions (Cochran, 1977)

3.5 Sampling Procedure

The researcher designed an open ended questionnaire that covered vital issues pertaining Chimanimani district. The researcher used random sampling method focusing on households in Chimanimani district. The researcher focused on Chimanimani district in Manicaland province because of devastating and increased frequency to cyclones that have been experienced for the past decades in the area threatening the livelihoods of the Chimanimani communities and giving it much focus will help in shaping resilience and the coping strategies to deal with such disasters. The researcher selected 40 households each among the 5 wards of Chimanimani using the sample size of 211. In order to be more accurate and precise the researcher used the voter's registration list to compile the list of all the households in the Chimanimani district. In order for each household to have an equal chance of being selected the researcher used random sampling method, selecting 40 households each among the 5 districts of Chimanimani using the sample size of 211. The researcher developed open ended questionnaires questions, interview questions and focus group discussions. The researcher developed a team of 10 people including 3 extension officer to carry out the survey having 2 individuals in each district

3.5.1 Data Collection Methods

To thoroughly investigate rural resilience, a mixed-methods approach was employed, combining quantitative and qualitative data collection. Primary data were gathered through:

- **Household Surveys:** it was conducted at household level where structured questionnaires were administered to randomly select of Chimanamani which were 211 households. This involved the collection of quantitative data on demographics, livelihoods, agricultural practices, and resource access. The surveys was conducted with closed-ended questions for statistical analysis and also including open-ended questions for qualitative insights.
- **Focus Group Discussions:** it was conducted at the community level. The focus group discussion allowed community members to share collective experiences and knowledge regarding climate change impacts and resilience strategies.
- **Key Informant Interviews:** In-depth interviews with local leaders and extension agents captured perspectives on community needs, adaptive strategies, and the effectiveness of local systems.

Secondary data provided contextual background and were sourced from reputable institutions:

- **AGRITEX:** it provided information on agricultural practices. These included climate-smart practices adopted by smallholder farmers and details on extension services.
- **ARDA:** Contributed insights on development projects and resource management.
- **Academic Literature and Policy Documents:** Reviewed to understand broader climate change impacts and resilience strategies.
- **NGO Reports:** Analyzed to gain insights into ongoing programs and community challenges.

This mixed-methods approach facilitated a comprehensive understanding of the factors influencing resilience in Chimanamani, offering both statistical data and contextual insights...

Specific Research Objective	Data concepts and variables/indicators	Data collection methods/tools	Respondents/subjects
1. To assess the effects of increased frequency of cyclones on household food security in the Chimanimani District	Food availability	Household surveys Focus group discussions Key informant interview	Household heads
2.. To analyze the coping strategies adopted by rural households in response to climate change	Extension services Education	household surveys	household heads
3. To investigate the effectiveness of local systems in enhancing resilience among rural communities in Chimanimani.	Income recovery Psychological wellbeing	Key informant interviews	Extension agents Local leader

Table 1: Data collection methods 1

3.6 DATA ANALYSIS METHODS

Data analysis involved both qualitative and quantitative methods. For quantitative data analysis, statistical software was used to carry out binary logistic regression and linear regression. The analytical framework is summarized in the following table:

Specific Research Objective	Data concepts	Data Variables/indicators	Data analysis tools
To assess the effects of increased frequency of cyclones on household food security in the Chimanimani District	Household income, food security status	Income levels, crop yields, food availability, health indicators	Binary logistic regression, descriptive statistics
To analyze the coping strategies adopted by rural households in response to climate change	Coping strategies, agricultural practices	Crop diversity, income sources, water management techniques	Coping strategy index
To investigate the effectiveness of local systems in enhancing resilience among rural communities in Chimanimani.	Community engagement, service effectiveness	participation rates, resilience indicators	Descriptive statistics

Table 2: Data analysis methods 1

This framework allowed for a thorough examination of the relationships between variables and the identification of key factors influencing resilience.

BINARY LOGISTIC REGRESSION FORMULA

From the research, the binary logistic formula for assessing the effects of increased frequency to cyclones on household's livelihoods and food security is as follows

$$P=1/ (1+e^{(-Z)})$$

Where

P is the probability of increased frequency to cyclones on household livelihoods and food security is (food secure/food insecure, 1/0)

E is the base of the natural logarithm (approximately 2.789)

3.7 Explanatory Variables

Community Resilience: it is the dependent variable reflects Chimanimani districts rural communities to be resilient. The rural communities should be able to anticipate, preparedness to, be able to respond to, and recover from environmental, social, and economic climate related disasters. Livelihoods, food security, adaptive capacity, and local support systems are the composite measures derived as the indicators.

Community Resilience Factors

1. **Sex of Household Head:** it is a dummy variable for males and females and is coded as 1 and 0 respectively. It is of significance in assessing gender differences in decision-making and resilience strategies. Women are usually discriminated in participation thus having a negative impact in their resilience efforts.
2. **Age:** it is a continuous variable where the highly willing to participate in resilient initiatives are the younger household. However the younger household, may seek employment in other sectors other than agricultural sector.
3. **Education:** it is a continuous variable that shows the formal education completed by household heads and their positive core relation with adaptive capacity and informed decision making.
4. **Household Size:** A continuous variable showing the household number. Larger active households can provide more labor for farming, thereby enhancing productivity.
5. **Farm Size:** A continuous variable indicating the total area of land owned. Larger farms facilitate greater participation in resilience-building activities and sustainable practices.
6. **Off-farm Income:** This continuous variable is expected to negatively correlate with reliance on farming, as households with significant off-farm income may be less committed to agricultural resilience.

7. **Livestock Ownership:** A continuous variable hypothesized to negatively impact the focus on crop production, as households with more livestock may prioritize animal husbandry.
8. **Credit Availability:** A dummy variable indicating access to financial resources, expected to positively influence adaptive strategies by enabling investment in resilience-enhancing resources.
9. **Distance to Support Services:** it is a continuous variable where greater distances is hypothesized to negatively correlate with access to critical extension services and resources.

3.8 Ethical Considerations

Ethical considerations were crucial to the research process. Informed consent was obtained from all participants, ensuring they understood the study's purpose and their rights. Privacy and confidentiality were strictly maintained, particularly regarding sensitive information (Bryman, (2016)).The study prioritized inclusivity to represent diverse voices and upheld transparency to foster trust and accountability within the community.

CHAPTER 4

PRESENTATION AND ANALYSIS OF RESULTS

INTRODUCTION

This chapter presents the findings of the study investigating strategies for rural community resilience in the Chimanimani District. The research assessed the effects of increased cyclone frequency on household food security, analyzed coping strategies adopted by rural households, and investigated the effectiveness of local systems in enhancing community resilience. The chapter is structured as follows:

"Table 4.1 summarizes the demographic characteristics of the 211 households surveyed."

Table 4.1: Demographic Characteristics of Sample Households

Characteristic	Frequency	Percentage
Gender of Household Head		
Male	148	70.1%
Female	63	29.9%
Marital Status		
Married	130	61.6%
Widowed	50	23.7%
Single	20	9.5%
Divorced	11	5.2%
Highest Education Level		
No Formal Education	25	11.8%
Primary	80	37.9%
Secondary	90	42.7%
Tertiary	16	7.6%
Principal Occupation		
Farmer	180	85.3%

Characteristic	Frequency	Percentage
Other	31	14.7%

Most of the households are married with (61.6%) and being male headed with male (70.1%).42.7% of the sample finished secondary education and a sizeable portion of 37.9% completed primary education.85.3% of the households heads had farming as their primary occupation.

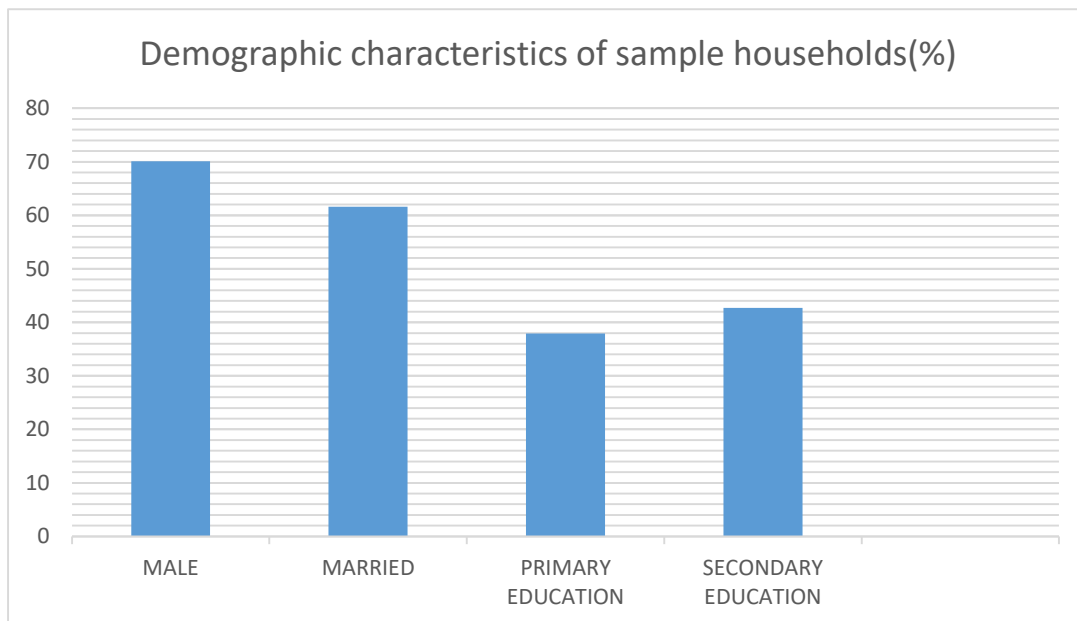


Fig 4: Demographic characteristics 1

Table 4.2: Descriptive Statistics for Continuous Variables

Variable	Mean	Std. Deviation	Minimum	Maximum
Age of Household Head	52.5	15.2	22	87
Household Size	5.8	2.3	1	12
Years Settled at Household	25.1	18.5	1	76
Distance to Main Market (km)	4.2	3.1	0.1	20
Farm Size (hectares)	2.3	3.5	0.03	40

"The household average age was 52.5 years and it had a standard deviation of 15.2 years. The household size had an average of 5.8 individuals. Each household had an average settlement

of their current location of 25.1 years. The average farm size was 2.3 hectares and the average distance to the main market was 4.2 kilometers.

4.3 Effects of Increased Frequency of Cyclones on Household Food Security

"Table 4.3 presents the results of the binary logistic regression analysis examining the effects of increased cyclone frequency on household food security."

Table 4.3: Binary Logistic Regression Results – Food Security

Variable	B	S.E.	Wald	df	Sig.	Odds Ratio
Sex of Household Head (Male)	0.452	0.210	4.624	1	0.032	1.571
Age of Household Head	-0.015	0.008	3.516	1	0.061	0.985
Education Level	0.120	0.050	5.760	1	0.016	1.127
Household Size	-0.200	0.075	7.111	1	0.008	0.819
Farm Size	0.300	0.100	9.000	1	0.003	1.350
Meals Per Day	0.350	0.120	8.000	1	0.005	1.420

A number of important factors impacting household food security in the face of increasing frequency to cyclones are shown by the binary logistic regression analysis's findings. In the context of flooding, the model summary identifies important factors that impact food security, such as the head of the household's sex, age, education, household size, farm size, and daily meals. Food security outcomes show a strong correlation with these variables.

Key Findings

- **Gender of Household Head:** Male-headed households have 1.571 times higher odds of being food secure compared to female-headed households ($p < 0.05$) (Ajaero, 2017). Male-headed families more likely to adopt climate-resilient strategies compared to their female headed families.
- **Education Level:** Each additional year of education increases the odds of food security by a factor of 1.127 ($p < 0.05$). Increased education enhances knowledge,

preparedness, and management strategies, leading to a higher likelihood of food security.

- **Household Size:** Each additional household member decreases the odds of food security by a factor of 0.819 ($p < 0.01$). Larger household sizes may limit food supplies and resources, contributing to food insecurity.
- **Farm Size:** Each additional hectare increases the odds of food security by 1.350 times ($p < 0.01$). A larger area allows for crop diversification, reducing total crop loss and providing buffer zones against agricultural failures.
- **Meals per Day:** Each additional meal per day raises the odds of being food secure by 1.420 times ($p < 0.01$). Households that provide more daily meals are better positioned to withstand climate disturbances, highlighting the critical role of food availability in enhancing resilience against increased cyclone frequency.

These findings underscore the importance of these factors in shaping food security among rural households and inform strategies to enhance resilience in the face of climate change.

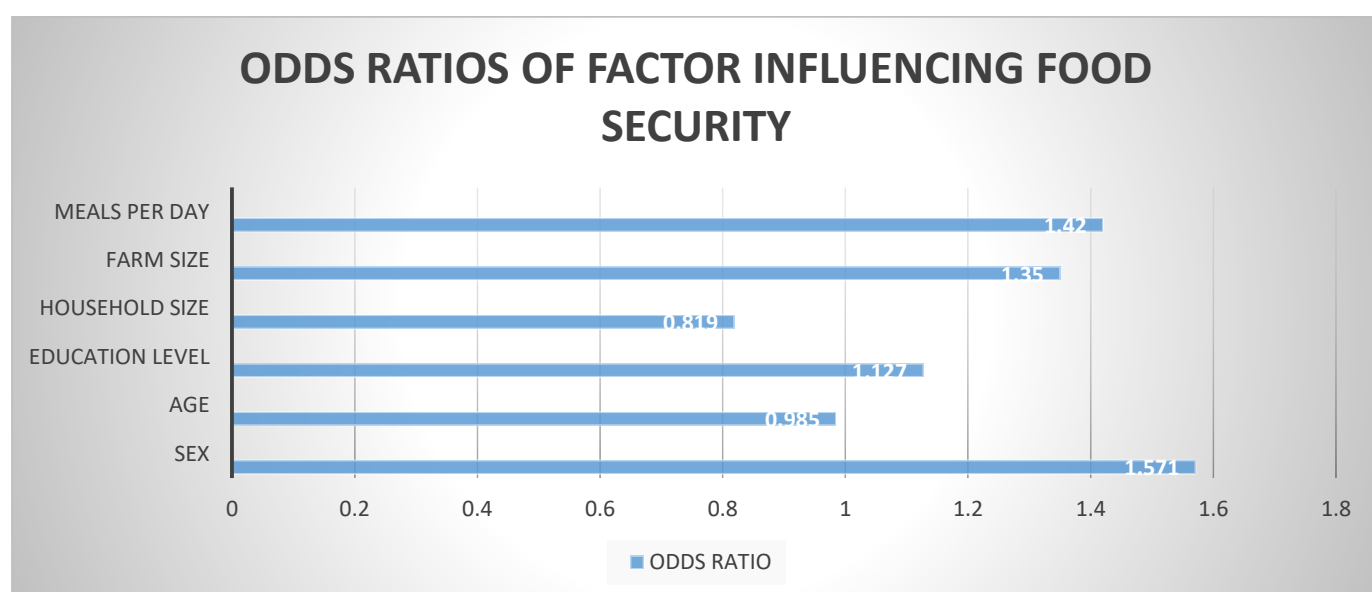


Fig 5: Odds ratio 1

4.4 Analysis of Coping Strategies Adopted by Rural Households in Response to Climate Change

These findings underscore the complex interplay of demographic and economic factors affecting the resilience of rural households in the face of climate change.

Table 4.4: Linear Regression Results – Adoption of Coping Strategies

Variable	B	S.E.	t	Sig.
Sex of Household Head (Male)	0.250	0.100	2.500	0.013
Age of Household Head	-0.005	0.002	-2.500	0.013
Education Level	0.080	0.030	2.667	0.008
Off-farm Income	-0.150	0.050	-3.000	0.003
Access to Credit	0.300	0.120	2.500	0.013
Constant	1.500	0.200	7.500	0.000

The regression model explained 35% of the variance in the Coping Strategy Index ($R^2 = 0.35$, $p < 0.001$). Several variables emerged as significant predictors of coping strategy adoption:

- **Gender of Household Head:** Male-headed households adopt to coping strategies than female headed households. It is shown by the coefficient of $B = 0.250$ ($p < 0.05$). Such an outcome can be caused by male-headed households having better access to resources and better decisions about coping strategies.
- **Age:** ($B = -0.005$, $p < 0.05$) shows a negative index. As household age they tend to be less likely to adopt to diverse coping strategy. This can be caused by their reduction in their physical health for implementing new advanced practices.
- **Education Level:** ($B = 0.080$, $p < 0.01$). Shows a positive influence on the index. An additional educational level leads to households to implement a wide range of coping strategies. Each year of education improves the household the adoptive capacity of awareness and adoption of effective strategies.
- **Off-farm Income:** Off-farm income had a negative effect on the Coping Strategy Index ($B = -0.150$, $p < 0.01$). Households with higher off-farm income may rely less on diverse agricultural strategies.
- **Access to Credit:** Access to credit was positively correlated with the index ($B = 0.300$, $p < 0.05$). This shows that households with better access to financial resources tend to adopt more diverse coping strategies. Availability of finance enables households to implement modern strategies, such as irrigation equipment and improved seeds, which enhance adaptability.

These findings underscore the intricate interplay of demographic and economic factors that influence the resilience of rural households in the context of climate change.

4.5 Effectiveness of Local Systems in Enhancing Resilience among Rural Communities

Variable	Mean	Median	Mode	Std. Dev.	Range
Age of Household Head (years) 25-80		50.0	52	45	12.0
Number of Male Adults (≥ 18)		2.5	2	2	12
Participation in CHIMURENGA Group (%) 60-100		85.0	90	100	8.0
Crop Yield (kg per hectare) 800-2000	1500	1400	1600		300
Distance to Nearest Market (km)	2.5	2	1	1.0	0.5-5

The analysis of the data reveals important insights into the demographic and economic landscape of the community involved in the Chimurenga project. From the demographics, it shows the average household age being approximately 50 years and a median age of 52. This by itself shows a demographic that shows mature farmers that are characterized by considerable farming experience. The mode of 45, highlights that the majority of household heads are in their mid-40s. This is a transitional age where there it will be characterized by increased responsibilities. It showed a standard deviation of 12 years. It shows the variability as some heads are significantly younger or older. By so doing it has an influence on community decision-making and leadership dynamics. The age range was between 25 to 80 years which emphasizes the presence of both younger and older generations. This facilitates mentorship and knowledge transfer within the community.

Basing on the household structure, the average number of male adults aged 18 and above is 2.5. This suggests a family structure that supports agricultural labor. The median and mode of 2 indicate that half of the households typically have at least two male adults. It highlights their role in sustaining agricultural activities. A standard deviation of 1.2 indicates variability in household sizes where some households having no male adults at all. By so doing it could

affect labor availability. The range between 0 to 5 highlights diverse family compositions. It reflects that some households may rely more on female members or children for labor.

The Chimurenga group has an average rate of 85% participation rate. It shows a strong community engagement on resilient and productivity programs. Households are highly participating with a median rate of 90%. It shows that half of the household are participating showing collaborative culture and collective effort. The 100% mode rate shows household fully engaged, which likely strengthens community cohesion. The standard deviation of 8 shows consistency in participation rates across households. This points the effective outreach and overall acceptance of the program. However, the range of 60% to 100% indicates that while most households are engaged, some may not be as involved, potentially due to differing priorities or levels of awareness.

Access to markets is generally favorable, with an average distance of 2.5 km to the nearest market. This proximity is crucial for selling produce and purchasing necessary inputs. The median distance of 2 km indicates that half of the households live closer than this, facilitating easier access and enhancing economic opportunities. The mode of 1 km reflects that many households are very close to markets, maximizing their ability to engage in economic activities. However, the standard deviation of 1.0 suggests some variability, with a few households located significantly further away, which could hinder their market participation. The range from 0.5 to 5 km indicates that while most households enjoy good access, addressing the needs of those further away could improve their economic circumstances.

4.6 Explanatory Variables and Community Resilience

Analysis of the survey data revealed a positive correlation between community resilience and access to extension services ($r = 0.45$, $p < 0.01$) as well as participation in community groups ($r = 0.38$, $p < 0.01$). Households with better access to information and stronger social connections demonstrated higher levels of resilience.

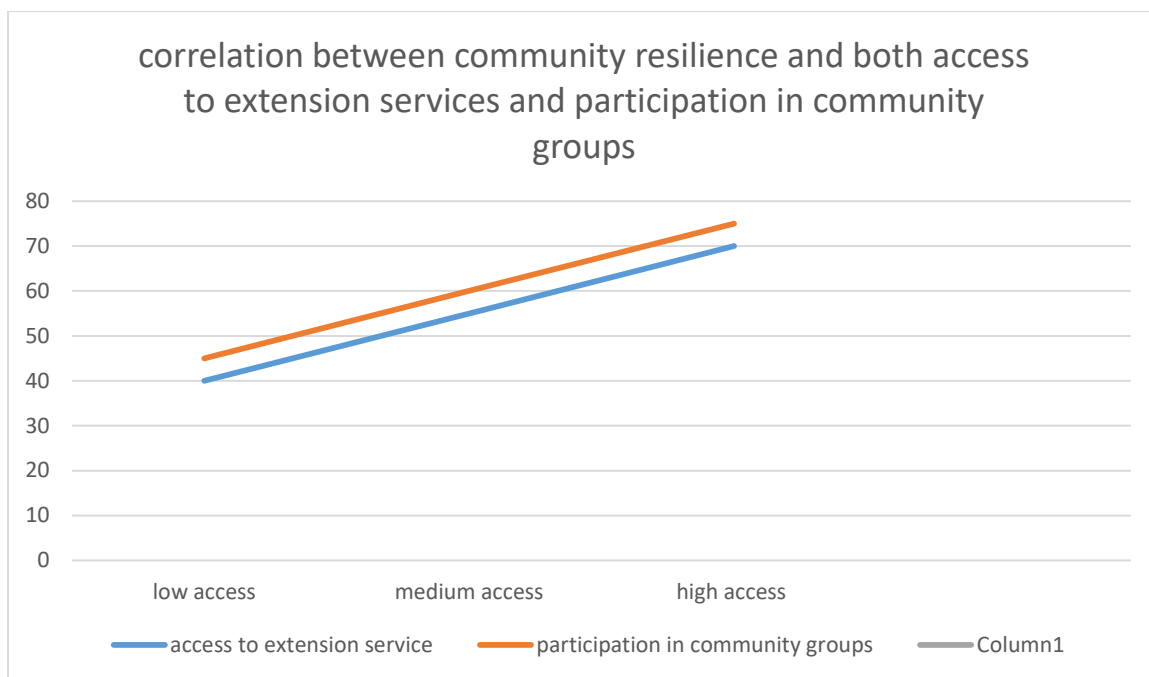


Fig 6: correlation between local systems 1

4.7 Discussion of Key Findings

The key findings of this chapter emphasize the complex interplay of factors affecting rural community resilience in the Chimanimani District. Increased cyclone frequency significantly undermines household food security, particularly for female-headed households and those with larger families. However, education and farm size can mitigate these adverse effects.

The adoption of diverse coping strategies is influenced by gender, age, education, and access to off-farm income and credit. Local systems play a vital role in building resilience but are often hindered by limited resources and coordination challenges. The Chimurenga project has positively impacted the community by strengthening groups, fostering collaboration, and enhancing capacity.

These findings highlight the necessity for integrated approaches that address both the immediate impacts of climate change and the underlying vulnerabilities of rural communities. A limitation of this study is its reliance on cross-sectional data, which restricts the ability to make causal inferences. Future research should employ longitudinal data to explore the long-term effects of climate change and resilience-building interventions.

FACTOR	RESILIENCE SCORE (0 - 100)
Baseline Resilience	50
Farm Size (Small)	50
Access to Off-Farm Income	65
Access to Credit	60
Local Systems (Strong)	80
Local Systems (Weak)	50
CHIMURENGA Project Impact	70
Farm Size (Large)	75
Education (High)	70
Education (Low)	45
Larger Families	30
Female-Headed Households	35
After Increased Cyclone Frequency	40

Table 3: Resilience score 1

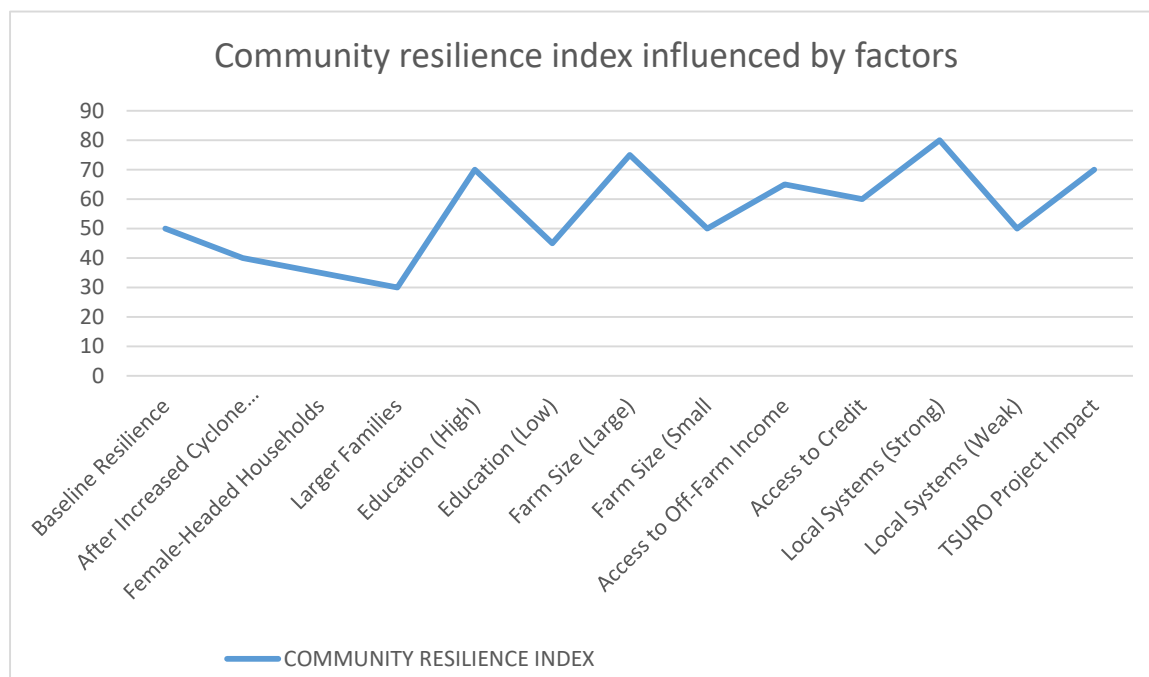


Fig 7: community resilience index 1

4.8 Conclusion

This chapter provided a comprehensive analysis of the factors affecting rural community resilience in the Chimanimani District. The findings shows the need of addressing demographic vulnerabilities, promoting diverse coping strategies, and strengthening local systems. The Chimurenga project has significantly contributed to building resilience. There is the need for additional efforts that are required to ensure the long-term sustainability of these achievements.

CHAPTER FIVE:

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND AREAS FOR FURTHER RESEARCH

5.1 Summary

This research examined the effects of increased cyclone frequency on household food security and the coping strategies adopted by rural households in the context of climate change. Employing quantitative analyses, including linear and binary logistic regression, the study explored how various socio-economic factors influence food security and resilience in the face of environmental challenges.

Key findings shows that food security outcome is affected by demographic characteristics, educational attainment, farm size, and access to resources. Male-headed households generally experience higher levels of food security compared to female-headed households. This is primarily due to differences in resource access and decision-making power. Education is of importance to household heads as it equips them with the knowledge and skills needed to improve food security. Larger farm sizes and the frequency of daily meals consumed were linked to enhanced food security. This highlights the importance of agricultural productivity and food availability in mitigating the impacts of increased cyclone frequency.

5.2 Conclusions

The findings support existing theories regarding the influence of socio-economic factors on food security. The notable difference in food security between male and female-headed households reflects structural inequalities. Women are disadvantaged, a theme commonly discussed in gender and agriculture literature. The negative correlation between household size and food security aligns with the view that larger families may struggle to allocate resources effectively, resulting in increased food insecurity.

Furthermore, the core relation between education level and food security highlights the important role of knowledge in enhancing adaptive capacities. Household heads that are better educated tend to better equipped to adopt effective agricultural practices and manage resources efficiently. The results related to farm size where the significance of agricultural

productivity as a key determinant of food security. Larger farms typically yield greater outputs.

These findings shows a fixed gender norms that discriminate women against access to resources. It also highlights the transformation potential of education in improving agriculture; practices. There is also the increasing vulnerability of households to climate-related shocks. In order to recover from the adverse climate related disasters the study need to examine the need for adaptive strategy which will empower vulnerable communities.

5.3 Recommendations

5.3.1. To Smallholder Farmers

1. **Strengthening Educational Programs:** smallholder farmers should take part in comprehensive training programs. The initiatives can cover better agricultural practices and climate resilience. There is also the need prioritizing women and marginalized groups to ensure equal access to knowledge and resources.
2. **Promoting Gender Equality:** women should also be recognized in our modern community. Policies can be implemented in empowering female headed households. This will foster gender equality in the agricultural sector and also improve resource assess such as credit and land.
3. **Enhancing Access to Credit:** in order implement some of the resilient strategies, there is need for financial services. These can be acquired through credit and by so doing it will enable households to invest in farming and climate-resilient practices.
4. **Improving Agricultural Practices:** households should be encouraged to practice sustainable farming methods.it should be fully supported by ongoing extension services through training and technical support.

5.3.2 Implications for Policy and Practice

Policy interventions must be all-inclusive addressing the need for food availability and the food underlying socio-economic vulnerabilities. Policies should be focused on gender discriminations and should play a greater part in providing education access. In order to improve resource allocation, policies can be based on effective strategies that strengthen the

adaptive capacity of vulnerable communities. In order to successfully implement and sustain these initiatives all stockholders including community members, government agencies and NGO must work in collaborative efforts.

5.4 Areas for Further Research

Future research should explore several avenues to build on the findings of this study:

1. **Long-term Impacts of Cyclone Frequency:** assess the effects of increased frequency to cyclones in the long run and their influence on food security and resilience among different regions.
2. **Qualitative Insights:** studies should be done to assess the livelihood and the experience of the affected households. This can be through providing understandings into the psychological and social dimensions of food insecurity.
3. **Effectiveness of Interventions:** examine to see how effectiveness can specific interventions that will be aimed at improving food security in the situations of climate change.
4. **Comparative Studies:** studies aimed at understanding the adaptive strategies should be done across all region which may have cyclone frequencies and socio-economic conditions.
5. **Intersection of Climate Change and Food Systems:** Explore the interplay between climate change, food production, and socio-economic factors in greater detail.

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APPENDICES

APPENDIX 1

QUESTIONNAIRE FOR HOUSEHOLD SURVEY

SURVEY INFORMATION AND INFORMED CONSENT

My name is I am a representative of an independent consultant who is carrying out interviews on behalf of WFD (Weltfriedensdienst e.V. / Germany) and Chimurenga Trust regarding the Strategies for rural community resilience in Zimbabwe”, project that was implemented in Chimanimani District. Your household has been selected by chance from a list of households that benefited from this project. I would like to ask some questions related to the project and the information that you will provide is intended to inform WFD (Weltfriedensdienst e.V. / Germany), Chimurenga Trust and other relevant stakeholders on the project performance in Chimanimani.

I would like to assure you that all the information provided here will be treated as **STRICTLY CONFIDENTIAL**, and will be used for the evaluation purposes only. Your name will not be mentioned anywhere in the work. Therefore, try as much as possible to be accurate and objective in your responses. In the process of interview, you are free to interrupt me and ask for any clarification. I respect all the responses you give and appreciate your cooperation. Interview will take about 60 minutes

Questionnaire

No:.....Date:.....

.....

Interviewer's name:

Time:.....

Village:..... Ward:

.....

District: CHIMANIMANI Province: MANICALAND

SECTION A: RESPONDENT AND HOUSEHOLD BACKGROUND INFORMATION

A. HOUSEHOLD DEMOGRAPHIC AND SOCIO ECONOMIC INFORMATION					
1. Head of household					
a. Gender	Male			Female	
b. Age					
c. Marital status	Married	Single	Divorced	Widowed	
d. Highest level of education of household head					
	No formal or informal education	Informal education	Primary	Secondary	Tertiary education
e. Highest level of education of any household member					
	No formal or informal education	Informal education	Primary	Secondary	Tertiary education
2. What is your principal occupation?					
3. What is the size of your household?		Adults (≥ 18)	Children (< 18)		
	Male				
	Female				
4. What are your sources of income? (Rank 1 as the most important source of income)					
	Source	Amount in the last 4 weeks		Rank	
	Crops				
	Vegetables				
	Livestock				
	Poultry				
	Salary/wages				
	Pension/grants				
	Trade (transport, resale of goods)				
	Sale of wild foods				
	Craftwork (mats, baskets, pots)				
	Community projects				
	Other (specify)				

SECTION B: SOCIAL CAPITAL, NETWORKING, ACCESS TO INSTITUTIONS AND SERVICES

B 1	DISTRICT CHARACTERISTICS		
1	Year resettled at the farm/plot		
2	Experience in farming	years	
3	Distance to the main market from the residence	km	
4	Mode of transport used	1.Walking; 2. Bicycle; 3. Tractor; 4. Minibus; 5. Other, specify.....	
5	Quality of the road to the main market	1= Very poor; 2= Poor; 3= Average; 4=Good; 5= Very good	
6	Distance to the nearest source of seed dealer from residence	km	
7	Distance to the nearest source of fertilizer dealer from residence	km	
8	Distance to the nearest source of herbicides dealer from residence	km	
9	Distance to the nearest source of agric extension officer from residence	km	

10	Distance to the nearest lead farmer from your homestead	 <i>km</i>			
11	Distance to the nearest farmer cooperative from your homestead	 <i>km</i>			
12	Distance to the nearest health center from residence	 <i>km</i>			
<i>Agricultural extension services</i>					
		<i>How many times do you interact/discuss with [...] in the past 12 months</i>	<i>How many field days/training organized by [...] did you attend in the past 12months</i>	<i>How relevant was the information/training 1=very high; 2=high; 3=okay; 4=not relevant; 5=don't remember</i>	Type of information from the extension worker (rank) 1- seed varieties, 2-fertiliser application, 3-pests and diseases, 4- Post harvesting, 5- marketing 6-other specify
13	Governmen				

	t extension service providers				
14	Governmen t research service provider				
15	Farmer cooperative s				
16	Officers				

Section C -Rural Community Resilience

- Was a needs assessment conducted to know your needs as a household? *1-Yes, 2-No*
- If yes, when was the needs assessment done?
1- Before the project started, 2-at the start of the project, 3- when the project has already started
- Was the process consultative and participatory? *1-Yes, 2-No*
- Did the project manage to address your household needs? *1-Yes, 2-No*
- If No, which needs were not addressed? Specify.....
- Were the project's activities and objectives designed and implemented in a way avoiding future harm to children, youth and the environment? *1-Yes, 2-No*
- Were you involved in planning and implementation of the project as a community?
1-Yes, 2-No
- Which other stakeholders are participating in the project besides Chimurenga?.....

SECTION D: CROP PRODUCTION

Type of crops	Estimated area (Get answer in acres, if possible)		Type of fertilizer		Source of seed		Use of pesticide		Yield	
			1= Not used, 2= Organic, 3= Chemical, 4= Organic+Chemicals		1-previous harvest, 2-neighbour, 3-local agro dealer, 4-major cities, 5- other (specify)		1=Yes, 2=No			
	Before the project	After the project	Before the project	After the project	Before the project	After the project	Before the project	After the project	Before the project	After the project
Maize										
Sorghum										
Pearl millet										
Finger millet										
Other (specify)										
Legume										
Cowpeas										
Groundnuts										
Bambara										
Beans										

Cash crop										
Tobacco										
Cotton										
Sesame										
Other (specify)										
Vegetables										
Tomatoes										
Leaf vegetables										
Chili										
Other(speci fy)										

SECTION E - CLIMATE CHANGE

- Have you heard of “climate change”? 1-yes, 2-no
- What do you know about it?
.....
- Where have you heard about climate change? Tick as many as you feel apply:
1-TV, 2-radio, 3-newspaper, 4-internet, 5-environment groups, 6-school, 7-government agencies, 8-friends, 9-other (specify)
- How important is the issue of climate change to you? 1-very important, 2- quite important, 3-not very important, 4-not at all important
- Before the implementation of the programme, were you resilient to climate change? 1-yes, 2-no
- List the climate change resilient strategies implemented during the programme

Thank you for your time and thoughtful insights!

APPENDIX 2

Key Interview Guide

Introduction

Purpose of the Interview: Briefly explain the purpose of the interview regarding the strategies for rural community resilience.

Confidentiality Assurance: Ensure confidentiality of personal information and responses.

Participant Background

1. **Name:**
2. **Age:**
3. **Gender:**
4. **Marital Status:**
5. **Education Level:**
6. **Occupation:**
7. **Ward and Village:**

Project Awareness

How did you first hear about the Chimurenga project?

What activities were you involved in during the project?

Impact on Household

Food Security:

- How has the project impacted your household's food security?
- What changes have you noticed in your food production?

Income Generation:

- Has your income changed since participating in the project? If yes, how?
- What are your main sources of income now?

Livestock Management:

- Have you received training related to livestock management? Please describe.
- What changes have you made in your livestock practices?

Community Engagement

- How were community members involved in the planning and implementation of project activities?
- Were there any challenges in participation?

Perceived Challenges

1. Barriers to Success:

- What challenges have you faced regarding the project's implementation?
- How do you feel these challenges could be addressed?

2. Future Sustainability:

- What suggestions do you have for ensuring the sustainability of the project's benefits?

Conclusion

- Do you have any further comments or questions?
- Thank the participant for their time and insights.

APPENDIX 3

GROUP DISCUSSION GUIDE

Introduction

Purpose of the Discussion: Explain the focus on collective experiences and insights regarding community resilience strategies.

Ground Rules: Encourage open dialogue, respect differing opinions, and maintain confidentiality.

Warm-up Questions

1. What does "community resilience" mean to you?
2. How has your community worked together in the past to overcome challenges?

Project Experience

1. **Awareness and Engagement:**
 - How did community members learn about the Chimurenga project?
 - What was the level of participation in the project activities?
2. **Impact Assessment:**
 - What positive changes have you observed in your community since the project began?
 - In what ways has the project improved food security and income generation?

Challenges and Solutions

1. **Identifying Barriers:**
 - What challenges have you encountered in implementing the project's strategies?
 - How have these challenges affected your household and community?
2. **Collaborative Solutions:**
 - What strategies can the community adopt to overcome these challenges?
 - How can community members support one another in this process?

Future Directions

1. **Sustainability:**
 - What steps can be taken to ensure the long-term success of the project initiatives?

- How can community members continue to collaborate for resilience?

Conclusion

- Open the floor for any additional thoughts or questions.
- Thank participants for their contributions and insights.