

**AN ASSESSMENT OF COMMUNITY AND HOUSEOLD BASED CLIMATE
CHANGE ADAPTATION STRATEGIES ON FOOD ACCESS: A CASE STUDY OF
BINDURA DISTRICT IN MASHONALAND CENTRAL PROVINCE OF ZIMBABWE**

**A dissertation submitted in partial fulfilment of the requirements of the Bachelor of
Agricultural Science Honours Degree in Agricultural Economics and Management.**

Bindura University of Science Education



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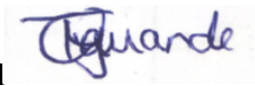
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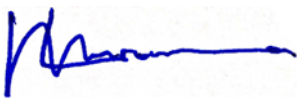


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APPROVAL FORM

The undersigned certified that they have supervised and recommended to Bindura University of Science Education for acceptance of dissertation entitled 'AN ASSESSMENT OF COMMUNITY AND HOUSEOLD BASED CLIMATE CHANGE ADAPTATION STRATEGIES ON FOOD ACCESS: A CASE STUDY OF BINDURA DISTRICT.' Submitted in partial fulfilment of the requirements of a Bachelors of Agriculture Economics and Management at Bindura University.

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DECLARATION

I, Charmaine Tanatswanaishe Nyamande do hereby declare that this dissertation is the result of my own investigation and research, except to the extent indicated in the Acknowledgements, References and by comments included in the body of the report, and that it has not been submitted in part or in full for any other degree to any other university.

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ABSTRACT

The purpose of this study was to evaluate the household and community-based approaches to climate change adaptation that have been put in place in Zimbabwe's Bindura District and how they have affected the availability of food. The study combined quantitative and qualitative data collection approaches in a mixed-methods approach. Purposive and random sampling techniques were combined to choose a sample of sixty households. Field observations, key informant interviews, and household surveys were used to gather data.

The results showed that droughts, crop failures, water scarcity, and altered rainfall patterns were the primary effects of climate change in the study area. As a result, households and communities adopted a variety of adaptation techniques, including energy-saving techniques, crop diversification, agroforestry, climate-resilient agriculture, and water collection. It was discovered that these tactics enhanced household food security, income, and natural resource management to some extent.

Nonetheless, the research also recognized a number of obstacles impeding the successful execution of the adaption tactics, such as restricted availability of monetary funds, technological know-how, and institutional support; inadequate policy frameworks and institutional support; and socio-cultural disparities. In order to increase community resilience to climate change, the study suggests bolstering institutional support, expanding access to extension services and climate knowledge, and encouraging integrated, participatory building methods. All things considered; the results advance our knowledge of how community-based adaptation might improve food security in rural areas with limited resources.

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LIST OF ABBREVIATIONS

IPCC	Intergovernmental Panel on Climate Change
GHGs	Greenhouse Gases
CO ₂	Carbon dioxide
CH ₄	Methane
N ₂ O	Nitrous Oxide
WFP	World Food Program
M&E	Monitoring and Evaluation
CBA	Cost Benefit Analysis
ARDA	Agricultural and Rural Development Authority
AGRITEX	Agricultural Technical and Extension Services
DDF	District Development Fund
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Program
WFP	World Food Program
HFIAS	Household Food Insecurity Access School

CHAPTER ONE

INTRODUCTION

1.0 INTRODUCTION

To understand the effectiveness and outcomes of local initiatives to minimize the consequences of climate change, it is imperative to evaluate community-based solutions for climate change adaptation. In the case of Bindura Rural, where there are significant barriers to enhancing resilience and reducing the adverse effects of changing climate conditions, household and community-based adaptation strategies have been implemented. This introduction highlights the importance of Bindura Rural as a case study, provides an overview of the significance of community-based adaptation to climate change, and outlines the objectives and methodology of the assessment.

1.1 BACKGROUND OF STUDY

Climate change is a global phenomenon that poses significant challenges to societies worldwide. Its implications on economies, ecosystems, and human well-being are substantial. These effects include changing rainfall patterns, rising temperatures, and an increase in the frequency of extreme weather events. Vulnerable areas are disproportionately impacted, particularly those with limited resources and a heavy reliance on climate-sensitive businesses like agriculture. Bindura Rural, in Mashonaland Central, Zimbabwe, is one such vulnerable area. It is negatively impacted by climate change, which causes rising temperatures, irregular rainfall patterns, and frequent droughts. Due to their reliance on rain-fed agriculture, the majority-rural population of Bindura District is especially susceptible to climate-related challenges such as crop failure, food poverty, and water shortages.

Given the urgency of addressing these problems, a number of community-based climate change adaptation strategies have been implemented in the Bindura district. These strategies make use of situation-specific and sustainable actions to boost resilience, improve local communities, and mitigate the adverse effects of climate change. However, there is a dearth of empirical information regarding the effectiveness, outcomes, and implications of various adaptation strategies in the unique context of the Bindura district.

The background of the study is set by the importance of filling up this knowledge vacuum and providing a comprehensive assessment of the community-based climate change adaptation

strategies in the Bindura district. Understanding the impact and effectiveness of these strategies is essential for making well-informed decisions, creating policies, and creating long-term plans. Allocating funding, building on successful projects, and bridging any gaps in the design and implementation of adaptations are all potential benefits for community leaders, development groups, and legislators.

By implementing a comprehensive impact evaluation, this project will generate empirical data on the outcomes of applied methodologies, contribute to the body of knowledge on community-based adaptation, and direct future initiative design and execution. The findings of this research could increase the resilience of marginalized communities in Bindura District and other settings, support the development of evidence-based adaptation plans, and influence policy decisions.

1.2 PROBLEM STATEMENT

The detrimental effects of climate change are becoming more and more alarming for food security in Zimbabwe's rural Bindura districts, where the majority of the population depends on agriculture and natural resources for their subsistence. According to statistics released by the Bindura District Agricultural Office, there has been a 20% decline in agricultural productivity in the last five years due to prolonged droughts and erratic rainfall patterns. Furthermore, 40% of the area's families currently experience moderate to severe food insecurity, per the (ZIMVAC, 2019). Although household and community-based strategies for climate change adaptation are recognized as effective ways to address these problems, there is a dearth of empirical information about the specific challenges and levels of food access faced by participants and non-participants in these strategies in Bindura rural. It is challenging to create targeted interventions and policies that would support communities in adapting to climate change and ensuring equitable access to food resources because of this lack of knowledge. In an effort to close this disparity, this study will compare the challenges and levels of food access experienced by individuals in Bindura rural, Zimbabwe, who participate in family- and community-based climate change adaptation strategies, with those who do not. In order to enhance food security and resilience in the face of climate change in the area, this research attempts to offer evidence-based insights that can direct the design and execution of context-specific interventions. Enough information on the obstacles preventing these tactics from being implemented successfully will be acquired, and the differences in food access between participants and non-participants will be contrasted.

1.3 RESEARCH QUESTIONS

- 1) What community and home-based approaches to addressing climate change are being used in Zimbabwe's rural Bindura area?
- 2) In Bindura rural, Zimbabwe, what obstacles stand in the way of putting into practice community- and household-based climate change strategies?
- 3) In Bindura rural, Zimbabwe, how is family food access compared between those who participate and those who do not in home and community-based climate change adaptation strategies?

1.4 RESEARCH OBJECTIVES

1.4.1 MAIN OBJECTIVE

- To assess household and community-based climate change adaptation solutions' obstacles and food access levels for both participants and non-participants in Chitova Village, Bindura.

1.4.2 SPECIFIC OBJECTIVES

1. To identify the household and community-based climate change strategies
- 2) To examine the challenges in implementing household and community-based climate change strategies in Bindura rural, Zimbabwe.
- 3) To compare household food access of participants and non-participants of household and community-based climate change adaptation strategies in Bindura rural, Zimbabwe?

1.4.3 SIGNIFICANCE OF STUDY

In order to better understand how effective household-based adaptation measures are in strengthening the resilience of vulnerable communities to the consequences of climate change, it is crucial to do research on the topic in Bindura District. Through emphasising the significance of domestic endeavours, the research will contribute to the existing corpus of knowledge concerning resilience enhancement and climate change mitigation. The study's findings will help organizations, practitioners, and policymakers create and implement effective strategies for climate change adaptation that prioritize home and community-led solutions. By providing a localized viewpoint and identifying best practices, the study can enhance policy and decision-making processes linked to climate change adaptation in Zimbabwe. The study's conclusions may be applicable to other regions with comparable socioeconomic contexts and climate change concerns, therefore its potential impact may go

beyond Zimbabwe. The study highlights the importance that communities play in adapting to climate change, which may help communities and households become stronger and more resilient in the face of a fast changing environment. This would promote local sustainable development.

1.4.4. LIMITATIONS AND DELIMITATIONS OF STUDY

- **Scope:** The study's exclusive emphasis on the Bindura district may restrict how broadly the results may be applied to other areas or districts. The District's distinct features, geographic circumstances, economic climate, and other geographical elements could not be typical of other places, which could affect how generalizable the findings are.
- **Time Restrictions:** Data collection and analysis may only be conducted for a certain amount of time during the study's allotted time. Since adapting to climate change is a long-term process, the study's brief length might not have allowed for the full impact of the solutions used in the long run.
- **Data Quality and Availability:** The study's correctness and comprehensiveness may be impacted by the data's quality and availability. Data gaps or incomplete records are examples of data restrictions that could have an impact on the analysis and interpretation of the results. Furthermore, biases or mistakes may be introduced if secondary data or self-reported information from community members are relied upon.
- **Stakeholder Engagement:** There may be wide variations in the degree of stakeholder involvement and engagement in the study. Insufficient involvement or involvement from local groups, pertinent stakeholders, or people of the community may affect how comprehensive the results are and how much community opinions are understood.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

Climate change is one of the most significant problems the world is currently facing, as it has a significant impact on ecosystems and human society. The livelihoods of vulnerable individuals are severely jeopardized, particularly those in emerging countries with limited natural resources (Impacts of Climate Change, 2019). As the effects of climate change become increasingly obvious, immediate action must be taken to implement effective adaptation strategies that can increase the resilience of these communities.

2.1 DEFINITION OF KEY TERMS

2.1.1 CLIMATE CHANGE

(Wallace-Wells, 2019) describes long-term changes to the earth's climate system, including variations in temperature, precipitation, wind, and other factors. Human activity is the main source of it, specifically the release of greenhouse gases (GHGs) into the atmosphere, which include carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). Global temperatures gradually rise as a result of the greenhouse effect, a phenomenon caused by these gases trapping heat from the sun.

2.1.2 COMMUNITY-BASED CLIMATE CHANGE

"Community-based climate change" refers to a model of action that recognizes the importance of empowering and involving local communities in the battle against climate change (Kagan, 2022). It comprises the active participation of individuals, households, local organizations, and institutions in the identification, planning, execution, and assessment of strategies for mitigating and adapting to climate change.

2.1.3 ADAPTATION STRATEGIES

The actions taken to make natural and human systems more resilient to the effects of climate change while simultaneously making them less vulnerable are referred to as adaptation techniques in the context of climate change. (Yazdanpanah, 2023). These techniques aim to mitigate the adverse impacts on several sectors such as infrastructure, agriculture, water

resources, health, and biodiversity, while also supporting communities and ecosystems in their efforts to adjust and cope with the evolving climate.

2.1.4 FOOD SECURITY

Food security is defined by the (FAO, 2023) as having sufficient, healthful food that meets nutritional needs and dietary preferences while also being physically, socially, and economically accessible. This gives accessibility precedence over availability.

The fundamental tenets are:

1. Availability: An adequate quantity of food produced locally, abroad, or with assistance.
2. Access - Individuals has the means and entitlements to obtain the appropriate foods for a well-rounded diet, contingent upon factors such as earnings, purchasing capacity, and market amenities.
3. Use: The proper biological utilization of food, which calls for a diet high in energy and nutrients, as well as access to hygienic settings, clean water, and medical attention.
4. Stability: The capacity to consistently have access to enough food, despite shocks or crises such as natural disasters or downturns in the economy.

This is a critical worldwide issue, and Zimbabwe has had several difficulties in this context. In order to combat hunger and malnutrition, the World Food Programme (WFP), a renowned worldwide organization, has been actively involved in addressing food insecurity in Zimbabwe.

2.2 CLIMATE CHANGE IMPACT IN ZIMBABWE

2.2.1. DROUGHTS AND CROP FAILURES

Serious droughts have recently impacted Zimbabwe severely, particularly in the west and south. These droughts result in crop failures and lower agricultural output. (Chinokwetu, 2023). For instance, a state of emergency was imposed in Zimbabwe during the 2018–2019 crop season due to drought, which is projected to have caused a 50% drop in maize output from the previous year (Dzawanda, 2023). This has had a major effect on livelihoods and food security, particularly in rural areas.

2.2.2. WATER SCACITY AND REDUCED HYDROPOWER GENERATION

Climate change has an effect on Zimbabwe's water supply, which affects hydropower production as well as human, livestock, and wildlife consumption. Less rainfall has caused Lake Kariba, the largest reservoir in the country and a significant source of power, to witness

a drop in water levels. Power outages and load shedding have had a serious negative social and economic impact in Zimbabwe. Socially, it has disrupted daily activities, limited access to essential services, sparked worries about public safety, made it more difficult for students to complete their coursework, and placed a pressure on household budgets. In terms of the economy, it has made things more difficult for enterprises that rely on power, increased costs, discouraged foreign investment, and slowed down the growth of the country's overall economy.

2.2.3. SHIFTING RAINFALL PATTERNS AND FLOODING

Higher rainfall intensities are one consequence of the altered rainfall patterns brought about by climate change. This has raised the possibility of river and flash flooding in some parts of the country. For example, in 2019 Cyclone Idai caused severe flooding in a number of locations, killing people, uprooting communities, destroying infrastructure, and disrupting livelihoods. (Mupepi, 2021).

2.2.4. CHANGING DISEASE PATTERNS

Climate change can affect disease patterns; Zimbabwe has already experienced some of these effects. For instance, changes in temperature and precipitation patterns have contributed to the spread of water-borne diseases like cholera (Semenza, 2024). Climate change can hasten the spread of waterborne illnesses like cholera by promoting the growth and survival of bacteria that cause the disease in water sources, contaminating water supplies with these bacteria, concentrating pathogens in smaller water volumes, and disrupting the sanitation and water treatment infrastructure. Increased exposure to tainted water may arise from this. The 2018 cholera outbreak in Zimbabwe, which resulted in thousands of cases being reported, highlighted how susceptible communities are to health risks linked to climate change (Michael L, 2021).

2.2.5. WILDLIFE AND ECOSYSTEM DISRUPTIONS

Climate change has an impact on Zimbabwe's wildlife and environments. Changes in the patterns of rainfall have an effect on plant growth, which impacts herbivores and their predators. Furthermore, a decline in the availability of water may lead to an increase in conflicts between humans and wildlife as animals search for other sources of water (Rojas, 2023). For example, during dry seasons, elephants have been known to invade agricultural areas in an attempt to locate water, damaging crops and causing conflict with neighboring populations.

2.3 COMMUNITY AND HOUSEHOLD-BASED CLIMATE CHANGE ADAPTATION STRATEGIES IMPLEMENTED BY RESOURCE CONSTRAINT HOUSEHOLDS IN DEVELOPING COUNTRIES

Families with little resources in underdeveloped countries have to cope with scarcity while also adjusting to the consequences of climate change. In reaction to climate change, these households have used the subsequent strategies,

2.3.1 CLIMATE-RESILIENT AGRICULTURE

Resource-constrained families often employ climate-resilient agricultural practices, such as conservation agriculture, agroforestry, and the use of drought-resistant crop varieties, to adapt to the changing environment (Goswami, 2022). For example, to improve soil health, retain water, and boost overall drought resistance, smallholder farmers in several sub-Saharan African countries have implemented conservation agriculture methods, such as crop rotation, limited tillage, and soil cover. (Ram Kishor Fagodiya, 2023).

2.3.2. WATER HARVESTING AND MANAGEMENT

Typically, "water harvesting" refers to the act of collecting runoff from a catchment area during a downpour in order to provide water for use by humans, animals, and agriculture (UVBRAKK M. Venkateshwarlu¹, 2014). Families with limited resources adopt water collecting and management strategies in response to the increasing scarcity of water brought on by climate change. This entails building tiny ponds or dams, putting in drip irrigation, and constructing makeshift rainwater collection systems. For instance, in Ethiopia, farmers in the Tigray region have constructed stone bunds and micro-dams to catch and store rainfall, enabling them to carry on with their farming during periods of drought. (Gebru, 2021)

2.3.3. AGROFORESTRY AND SUSTAINABLE LAND MANAGEMENT

Agroforestry techniques, which combine trees with crops and animals to increase climate resilience, are used by households with limited resources. (Critchley W, 2023) suggested that in addition to improving soil fertility, decreasing soil erosion, and offering shade, trees can also provide income from the sale of their wood or non-timber forest products. Smallholder farmers in Nepal have employed agroforestry practices, such as planting trees in terraced fields, to stop soil erosion, retain moisture, and diversify their revenue streams (Khatri N.D, 2023)

2.3.4. CROP DIVERSIFICATION AND LIVELIHOOD DIVERSIFICATION

Diversification of crops and livelihoods is common among resource-constrained households as a means of mitigating risks associated with climate change. Households can lessen the effects of shifting weather patterns on their food security by growing a range of crops. Diversification into non-farm pursuits like small-business ownership or raising animals can also offer substitute sources of income (Bernzen A S. F., 2023). Farmers in flood-prone parts of Bangladesh have expanded their agricultural techniques to include fish farming in addition to traditional crop agriculture, providing a more stable and varied living.

2.3.5. ENERGY EFFICIENCY AND RENEWABLE ENERGY

Resource-constrained families often use energy-efficient practices and renewable energy sources to manage energy issues and reduce their carbon footprint. For example, they may install solar panels for lighting and charging small electrical devices or use upgraded cookers that reduce interior air pollution (Wang). For example, clean, effective cookstoves have replaced traditional biomass-based cooking methods in rural India, improving indoor air quality and reducing the need for firewood.

2.3.6. CLIMATE INFORMATION AND EARLY WARNING SYSTEMS

Early warning systems and climate information are crucial for households with limited resources to make timely decisions. When conventional knowledge and forecasting approaches are combined with scientific data, early warning systems' accuracy and efficacy are often enhanced. Government and non-governmental organizations, for instance, have partnered in Malawi to provide farmers with climate alerts and information via mobile phone networks, enabling them to make better-informed decisions about when and how to plant and care for their crops (Calvel A, 2020).

2.3.7 SOIL CONSERVATION AND LAND REHABILITATION

Resource-constrained families often use land restoration and conservation techniques to mitigate the effects of climate change on soil erosion and degradation. Techniques like contour plowing, terracing, and the application of organic fertilizers can be utilized to improve soil fertility and structure (Lal R, 2011). Smallholder farmers in the Philippines have adopted contour farming and agroforestry techniques on sloping soils to improve their resilience to

extreme weather events. This has reduced soil erosion and enhanced water penetration (Gupta S.R, 2023).

2.3.8 PARTICIPATORY DECISION-MAKING AND COMMUNITY GOVERNANCE

In order to collaboratively address climate change issues, low-income households actively engage in community governance frameworks and participatory decision-making processes. Local cooperatives, farmers' associations, or community-based organizations that provide farmers a voice in policy discussions and shared access to resources are examples of this (Ford, 2023). Kenyan smallholder farmers have formed community-based organizations to manage water resources, practice climate-smart agriculture, and advocate locally.

2.4 CHALLENGES IN IMPLEMENTING COMMUNITY AND HOUSEHOLD BASED CLIMATE CHANGE ADAPTATION STRATEGIES

The adoption of community- and household-based climate change adaptation strategies faces a number of challenges. These problems may arise from a variety of factors, including a lack of institutional support, a lack of resources, and social and cultural barriers. The following are some common barriers to applying these strategies:

2.4.1 LIMITED ACCESS TO RESOURCES

The financial, technological, and ecological resources needed to implement climate change adaptation plans are typically out of reach for low-income households (Annah E. Piggott-McKellar, 2019). Smallholder farmers in rural sub-Saharan Africa may find it challenging to purchase energy-efficient equipment, climate-adaptable crops, or irrigation systems due to high costs and low financial resources.

2.4.2. LACK OF TECHNICAL KNOWLEDGE AND INFORMATION

Many low-income households lack access to technical knowledge and information on climate change adaptation strategies. This can make it harder for them to select and employ wise strategies (Fahad, 2023). Farmers may find it challenging to make well-informed decisions due to a variety of factors, such as a lack of knowledge about climate-smart agricultural techniques or limited access to weather data and early warning systems.

2.4.3. INSTITUTIONAL SUPPORT AND POLICY FRAMEWORKS

Lack of supportive institutional structures, legislation, and governance frameworks can significantly impede the implementation of community- and household-based adaptation strategies. Weak institutional support can lead to limited access to training and extension services, inadequate funding, and a lack of coordination. This could jeopardize the long-term sustainability and effectiveness of adaptation efforts. One example is the limited capacity and resources of local governments in certain poor countries to provide communities with the support they require in order to prepare for climate change.

2.4.4. SOCIO-CULTURAL BARRIERS

The adoption of adoption techniques may be hampered by sociocultural problems. Traditional conventions, traditions, and gender roles may make it more difficult for some groups, such as women and marginalized populations, to access resources and participate in decision-making processes (Antwi-Agyei, 2015). The adoption of innovative, inclusive solutions can become more challenging as a result. In places where women have less financial and land control, for example, it can be difficult for them to adopt climate-resilient farming practices.

2.4.5. LACK OF AWARENESS AND BEHAVIOURAL CHANGE

Changing deeply rooted habits and behaviors can be challenging, particularly when it comes to adjusting to climate change. Low-income households may be reluctant to adopt new ideas because they don't know about them, are skeptical of them, or simply prefer the traditional ways (Philip Antwi-Agyei, 2014). For example, groups dependent on traditional fishing techniques may be unwilling to adopt sustainable techniques due to declining fish stocks.

2.4.6. CLIMATE-INDUCED MIGRATION AND DISPLACEMENT

The effects of climate change, such as extended droughts, rising sea levels, and extreme weather, may cause migration and population relocation (L, 2018). This might make people more vulnerable and make community-based adaptation efforts more difficult. For instance, communities in Bangladesh's coastal regions are more vulnerable to cyclones and floods, which disrupt community-based adaptation efforts and result in internal displacement (Sarker, 2023)

2.5 FACTORS INFLUENCING COMMUNITY AND HOUSEHOLD CHOICE OF CLIMATE CHANGE ADAPTATION STRATEGIES

The decisions made by households and communities on climate change adaptation are influenced by a multitude of factors. These factors could alter depending on the specific

circumstance, the socioeconomic setting, and the cultural norms of the community. Some significant factors influencing the choice of climate change adaptation plans at the home and community levels are as follows:

2.5.1. CLIMATE CHANGE IMPACTS

The specific impacts of climate change that a community is facing have a big impact on the adaption strategies that are employed. According to (Adger W. N, 2003), communities that have frequently and severely suffered extreme weather events, such as heat waves, floods, and droughts, are more likely to adopt preventative adaptation strategies.. Tompkins and Adger (2004) Also, (Adger W. N A. N., 2005) mentioned how prior disaster experience influences how people adjust.

2.5.2. RESOURCE AVAILABILITY AND ACCESS

The availability and accessibility of resources, including financial, technological, and natural resources, affects the choice of adaption strategies. Encouraging communal cohesion and robust social networks are critical for facilitating collective adaptive techniques, according to (Adger W. N, 2003). In two UK cities, (Nicole J Olynk, 2010) noted the significance of social capital for both individual and collective responses to climate change. Household (Adger W. N, 2003), with limited resources could find it difficult to afford pricey technology, so they would rather focus on low-cost solutions like collecting rainwater or switching to more climate-resilient crop kinds.

2.5.3. SOCIO-ECONOMIC CONDITIONS

Higher socioeconomic status households and communities typically have more alternatives and resources available to them for climate change adaptation (Adger W. N, 2003). Additionally, socioeconomic position is a significant predictor of adaptive capacity, according to (J, 2006). Socioeconomic factors including income, education, and employment status have an impact on adaptation decisions. Awareness and knowledge levels are also significant since more educated families would have better access to information and be more likely to use innovative adaption strategies.

2.5.4. EXISTING KNOWLEDGE AND SKILLS

The knowledge and skills that households and communities possess have an impact on the choice of adaptation strategies. The best adaption strategies are mostly dictated by local expertise, indigenous practices, and traditional knowledge. Long-standing farming

communities, for example, may rely on traditional farming practices that have proven resilient to the local environment. (Deressa T. T, 2009) discovered that in their study of Ethiopian farmers, households with greater levels of formal education were more likely to utilize adaptation strategies, such as changing crop kinds and planting dates. (A, 2009) discovered that farmers' selection of adaption methods was highly influenced by their access to climate information and extension services in South Africa.

2.5.5. INSTITUTIONAL SUPPORT AND PHYDICAL ENVIRONMENT

The selection of adaptation techniques is significantly influenced by the existence of organisations and policy frameworks that assist. (T.G. Measham, 2011) also showed that institutional constraints and challenges can impede local adaptation planning; (Agrawal, 2010) observed that family and community adaptation can be facilitated by the presence of enabling policies, programs, and governance structures at the local and national levels. Policies that promote and encourage adaptation, including tax breaks or subsidies for the deployment of climate-resilient technologies, can also have an impact on decisions.

2.5.6. SOCIAL AND CULTURAL FACTORS

Community dynamics, cultural values, and social conventions can all have an impact on adaption decisions. Social networks and a feeling of community can promote the sharing of knowledge and resources, creating chances for group adaptation. Gender roles and dynamics might influence decisions since different genders may have different roles and responsibilities in reducing climate hazards. In an Arctic community in Canada. (D, 2001) demonstrated how indigenous knowledge and cultural practices might influence preferences for particular adaption techniques.

2.5.7 RISK PERCEPTION AND AWARENESS

According to (Patts, 2005) , if households and communities believe that climate change poses a serious threat, they are more likely to put adaptation measures into place. Additionally, it was confirmed that risk perception has a significant role in shaping how Sri Lankan paddy farmers adjust. (Truelove, 2015)

2.6 ASSESSMENT TOOLS FOR EFFECTIVENESS OF THE ADAPTATION STRATEGIES

Evaluating the success of adaptation measures is essential to understanding their consequences and making informed decisions for future planning. Numerous tools and procedures can be used to evaluate the effectiveness of adaption strategies. These are some commonly used instruments.

2.6.1 VULNERABILITY ASSESSMENTS

A vulnerability assessment establishes a system's susceptibility to the adverse effects of climate change. It includes analyzing exposure, sensitivity, and adaptability. Its comprehensive understanding of risks and challenges, which aids in adaptation plans, is one of its advantages. Its data-intensive structure and difficulty in determining vulnerability are a couple of its disadvantages. Two such are national governments and the IPCC. Both quantitative and qualitative methods, like participatory approaches, interviews, and surveys, are commonly used in these evaluations (Roy P, 2023).

2.6.2 CLIMATE RISK ASSESSMENTS

Climate risk assessments establish the efficacy of adaption strategies in reducing possible dangers linked to the aftermath of climate change. These assessments look at the probability, seriousness, and potential impacts of climate threats on socioeconomic systems (J A. , 2023). They also consider the effectiveness of current adaptation measures in reducing risk and enhancing resilience. the advantages of a system-level approach to understanding climate change risks, identifying components that are vulnerable, and putting adaptation strategies into practice at various scales, but it also highlights some of its disadvantages, such as its data-intensiveness, context-specificity, and difficulty in quantifying and comparing risks.

2.6.3. MONITORING AND EVALUATION (M&E) FRAMEWORKS

M&E frameworks use systematic data collection, analysis, and reporting to assess the effectiveness and performance of adaptation strategies. These frameworks offer performance indicators, data collection methods, and assessment criteria to track progress and evaluate the outcomes and effects of adaptation efforts (Garces A, 2023). M&E frameworks typically incorporate data from a range of quantitative and qualitative data sources, such as surveys, interviews, case studies, and data from remote sensing. The use and effects of the adaptation method are assessed through the provision of real-time feedback, emphasizing successes and

challenges, and encouraging ongoing learning. However, it requires rigorous indications and complex interpretation.

2.6.4 COST BENEFIT ANALYSIS (CBA)

By balancing the benefits of increased resilience or prevented damages against the costs of implementing adaptation measures, CBA assesses the financial feasibility of adaptation strategies (Pais-Barbosa J, 2023). Decision-makers can use it to prioritize investments and analyze the cost-effectiveness of different adaptation strategies. A few examples of the non-financial benefits and costs that CBA considers are ecosystem services, health consequences, and social co-benefits. Numerous studies, such as the Stern Review on the Economics of Climate Change and the adaptation strategies of various governments and organizations, have made use of CBA.

2.6.5 PARTICIPATORY APPROACHES

Participatory approaches include local people, relevant actors, and stakeholders in the evaluation process. Participatory methods give communities the ability to assess the effectiveness of adaptation plans in light of their own knowledge and experiences, such as focus groups, seminars, and community forums (van der Jagt A.P, 2023). Participatory methods ensure that the assessment process is thorough, includes a variety of perspectives, and encourages local initiative ownership for adaptation. The adaptation strategy builds stakeholder confidence, is relevant, and gathers local knowledge. However, it can be time-consuming, challenging to balance interests, and difficult to combine with scientific data. These factors may affect how long-term sustainable adaptation attempts turn out to be.

2.6.6. CASE STUDIES AND BEST PRACTICES

Case studies and best practice assessments are utilized to assess the effectiveness of specific adaption initiatives or programs. These assessments provide in-depth understanding of the outcomes, lessons learned, and process of implementation. In case studies, qualitative research methods such as site visits, interviews, and document analysis are commonly employed to evaluate the challenges, success factors, and feasibility of replicating adaptation procedures (Torresan S, 2012). The text identifies the limitations of case studies, such as their limited generalizability, subjective selection, and resource- and time-intensive nature, in addition to stressing their advantages, which include their capacity to offer in-depth knowledge of adaptation processes, identify success or failure factors, and offer guidance for future research.

2.7 SUMMARY

The urgent issue of climate change and its profound effects on ecosystems and human civilization, particularly for populations in poorer nations that are more vulnerable. It provides a summary of Zimbabwe's issues and defines key words related to community-based adaptation plans, food security, and climate change. The chapter looks on the strategies of resource-constrained households in underdeveloped nations for adaptation. Using climate-resilient agricultural practices, such as conservation agriculture and agroforestry, can enhance soil health and drought resilience. Acknowledging the advantages of having local populations actively participate in the selection, development, and use of adaptation tactics, it is critical to empower and include them in the fight against climate change. Enhancing these vulnerable groups' resilience and ensuring their ability to adapt requires a community-based approach.

CHAPTER THREE

METHODOLOGIES

3.0 INTRODUCTION

(Lincoln, 2015), also states that the nature of the research question and the problem being investigated determines the research approach or strategy, so it is best to think of the study style as a tool for answering the research questions. This chapter will cover the following topics: study design, research philosophy, targeted population, sample size, sampling technique, research tools, data collection process, data analysis, and presentation. All research, according to (Lincoln, 2015), depends on certain underlying philosophical assumptions about what "legitimate" study is and what research methods—or methods—are appropriate for expanding knowledge in a particular discipline. Thus, doing and evaluating any research requires an understanding of these presumptions.

3.1 RESEARCH DESIGN

The overall strategy or framework that directs the course of a research study is known as a research design. It outlines the specific steps, strategies, and procedures that will be used to address the research questions and objectives. The research design guarantees that the study is conducted in a methodical and organized way by outlining a plan for data collection, analysis, and interpretation. This study will employ a mixed-method design, which will allow the researcher to gather contextual data (such as farmer viewpoints and socioeconomic factors) in addition to numerical data (such as crop yields and input costs). A more thorough examination of locals' perceptions of climate change, as well as their attitudes and actions toward the community, was made possible by the qualitative study approach solutions for adapting to climate change at the household level. Using a quantitative research approach, closed-ended questionnaires were used to gather quantitative data. Data for the study were gathered with the assistance of a questionnaire and direct observations, both of which are major sources of information.

3.2 DISCRIPTION OF THE STUDY AREA

The district of Bindura is situated in Zimbabwe's northeastern Mashonaland Central region. It serves as Mashonaland Central Province's administrative center. There are 21 administrative wards in the district (Artwell Kanda, 2013) and of these nine are communal wards (Helliker, 2018). Bindura is located in the Mazowe Valley about 89 km northeast of the capital city,

Harare (Helliker, 2018). The districts of Shamva, Mazowe, and Mount Darwin are bordering the district. Farming and mining are the main economic activity in the Bindura district. The district's principal minerals that are mined include cobalt, nickel, and gold. Over the past ten years, there has been an incredible increase in alluvial gold mining due to the amount of gold. Major crops grown in the district include maize and cotton due to the favourable weather, which includes mean annual rainfall of between 750 mm and 1000 mm and The district's estimated population was 46,274 according to the results of the most recent population census, which was conducted in 2012. Generally speaking, Bindura people engage in a variety of entrepreneurial endeavours depending on where they live, including cross-border trade, retail, mining, agriculture, and construction a maximum mean temperature of between 26 and 28 degrees Celsius (Artwell Kanda, 2013), (Muchenura, 2012-2013).

3.3 POPULATION AND SAMPLE SIZE

The researcher's population is the group from whom he or she wants to conclude (Baker, 2008). A population is an entire group of people from whose samples are taken (Saunders, 2009). The population includes all individuals about whom the researcher is interested in learning more and drawing conclusions. The study location and participants were selected using the purposive sampling technique. By employing a non-probability sampling method known as "purposeful sampling," the researcher deliberately selected the study units based on certain characteristics or requirements that are relevant to the investigation's objectives. This approach is widely used when a researcher has a certain objective in mind and wants to concentrate on a particular group of individuals or locations that can provide the most relevant and useful data for the study. The participants and non-participants in community and household-based climate change initiatives were the goal in this instance.

Cochran's formula was used to calculate the sample size

The formula is expressed as:

$$n = Z^2 * p(1-p) / e^2$$

Where:

- n = the sample size
- Z = the z-score corresponding to the desired confidence level
- p = the expected proportion or prevalence of the characteristic of interest

- e = the desired margin of error

Given:

- Targeted population size (N) = 74
- Confidence level: 95% (z-score = 1.96)
- Expected proportion (p) = 0.5 (assuming maximum variation)
- Desired margin of error (e) = 0.05 (5%)

Using Cochran's formula:

$$n = Z^2 \times p(1-p) / e^2$$

$$n = (1.96)^2 \times 0.5(1-0.5) / (0.05)^2$$

$$n = 3.8416 \times 0.25 / 0.0025$$

$$n = 0.9604 / 0.0025$$

$$n = 384.16$$

adjusting the sample size using the finite population correction factor:

$$\text{Adjusted sample size} = n / (1 + n/N)$$

$$\text{Adjusted sample size} = 384.16 / (1 + 384.16/74)$$

$$\text{Adjusted sample size} = 384.16 / (1 + 5.12)$$

$$\text{Adjusted sample size} = 384.16 / 6.19$$

$$\text{Adjusted sample size} = 62.06$$

Rounding up to the nearest whole number, the final sample size is 62. Therefore, if the targeted population size was 74 consisting of 50 participants and 24 non participants. The appropriate sample size calculated using Cochran's formula would be 62.

3.4. DATA COLLECTION METHODS

Research techniques are the instruments and processes used in performing research, (Williman, 2011). These are the methods or approaches used when conducting research, (Avison, 2005). Primary sources were employed by the researcher to collect data for the study. The researcher may gather primary data using focus groups, questionnaires, direct observations, interviews, gas testing, and other methods (Ajayi, 2017). In the field, semi-structured interviews and questionnaires were employed to gather primary data.

3.4.1 SECONDARY DATA COLLECTION

Secondary data collection is the practice of gathering information from pre-existing sources that has already been obtained by someone else for a different purpose. Rather than obtaining data directly from the source, researchers get and analyse pre-existing data that has been obtained by individuals, groups, or institutions. The secondary data for this study will come from national and international databases (such as the UNDP and the Framework Convention on Climate Change), government publications and reports, government agencies like ARDA, AGRITEX, and DDF, reports from non-governmental organizations, and earlier studies and assessments. Furthermore, reviewed were theses, dissertations, and project papers pertaining to research undertaken in Bindura District or a similar area. Some of the main sources of secondary data included university libraries, institutional repositories, and websites of academic institutions.

3.4.2 PRIMARY DATA COLLECTION

Primary data are previously unrecognized data that are directly obtained through research for a certain subject. According to (Braund, 2005) primary sources are original sources of information. When gathering primary data for this kind of study, Bindura District Ward 13 is the best place to go since it is reliable, accurate, and constantly provides the most recent information. The study's subjects are under the researcher's authority as well. For this project, direct observations and interviews will be undertaken to get primary data.

3.4.3 DEVELOPMENT OF DATA COLLECTION TOOLS

3.4.4 QUESTIONNAIRE

A questionnaire is a text made up of questions and other things that are used to gather information for study or analysis (Babbie, 2013). The major sections of the researcher's questionnaire included:

1. Demographics: Data on age, gender, and greatest level of education were gathered for this part.
2. Sources of Income: Both agricultural and non-agricultural sources of income for the respondents were examined in this section.
3. Agricultural Activities: The researcher collected information on the particular agricultural techniques and activities that the participants were involved in, such as raising crops and cattle.

4. Adaptation Strategies: This section examined the methods being used by individuals, households, and communities to adapt to climate change.

5. Challenges: The researcher used open-ended questions to identify the main obstacles to climate change adaptation that the community's participants and non-participants encountered.

6. Household Food Insecurity Access Scale (HFIAS): This standardized scale was used in the last part to evaluate the degree of food insecurity that the households were experiencing.

It was crucial to include both closed-ended and open-ended questions in these sections. The closed-ended questions yielded quantitative data on subjects including demographics, income sources, and adaptation techniques. Because the questions were open-ended, respondents were able to offer more nuanced perspectives on the challenges they face and the strategies they have employed.

This mixed-methods approach has given the researcher a thorough understanding of the community's efforts to adapt to climate change and its current condition of food security. Though the quantitative data might be subjected to a scientific examination, the qualitative insights offered further context and depth for the interpretation of the results.

3.4.5 ADVANTAGES OF A QUESTIONNAIRE

- Capacity to use a variety of data points to create a comprehensive picture of the community
- Possibility of finding novel themes and perspectives through open-ended responses
- Possibility of making links between resilience and various facets of domestic tasks

3.4.6 DISADVANTAGES

- The questionnaire's length may cause respondents to become weary.
- There are difficulties in doing a methodical analysis of the open-ended qualitative data.
- Dependence on self-reported data, which may create biases

3.4.7 OBSERVATION

A useful method for gathering qualitative data is observation, which is methodically seeing and documenting study participants' interactions, behaviours, and activities in their natural environments (Kawulich, 2005). This method can provide rich, firsthand insights that complement other data sources.

Instead of depending just on oblique reports or surveys, the researcher was allowed to actively participate in the research situation. By taking thorough notes, descriptions, and records of what they saw, the researcher was able to capture the subtleties of interactions and behaviours.

Important background information about the social, cultural, and physical environments that influence participants' behaviours is provided by observation. Observation might reveal implicit or unconscious habits that people might be unable to identify for themselves. Depending on the goals of the study and new information, observations might be modified and altered. Nonetheless, observations could lead to skewed study.

3.5 PLOT STUDY

According to (Hulley, 2007), before a more in-depth investigation, pilot research acts as an exploratory examination. This version is simplified in order to help you grasp things like time, cost, problems, and expected outcomes. The number of participants needed for the main study cannot be determined without this data.

To test their questionnaire, the researchers selected ten participants from the target population. Taking into consideration their age, gender, occupation, and farming practices, these people were chosen at random to represent the many groups in the community.

The pilot study set out to do the following:

1. Examine the questions' comprehensibility and clarity.
2. Evaluate the questionnaire's overall length and flow.
3. Determine any possible problems or areas of misunderstanding.
4. Verify the content's relevance and appropriateness.

Throughout the pilot, the researcher closely observed the participants as they completed the questionnaire, noting any challenging questions or frustrating passages. She also asked for detailed feedback on the language, structure, and overall user experience. The researcher made

multiple changes to the questionnaire in light of the pilot's observations, including: -
Simplifying the wording of some of the questions

- Rearranging several sections to make them make more sense.

- Adding extra prompts and examples to give greater context; - Removing or changing questions that were unnecessary or unclear

Importantly, participants in the pilot study were subsequently excluded from the main survey. This was done to prevent respondents who had already seen the questionnaire and provided feedback from influencing the data collected for the final analysis. The pilot study was an essential first step in refining and validating the questionnaire. It helped the researcher to identify and address any issues prior to utilizing the finished instrument, which increased the precision and dependability of the data collected.

3.6 DATA ANALYSIS

To improve one's comprehension and share it with others, data analysis involves locating and arranging field notes, data, and other items obtained from the field (Orodho, 2023). According to (Newman, 2003), In research, data analysis is the organization and summary of raw empirical materials created into a manageable form, indicating the crucial elements required to act as evidence to answer research questions. It is also the search for patterns in data that assist interpretation.

Identifying community and household-based climate change strategies is the first objective.

It is appropriate to use qualitative approaches to investigate and catalog the many home and community-based climate change initiatives that the participants have adopted.

Goal 2: Analyze the difficulties in putting into practice community- and household-based climate change solutions.

while examining in-depth the difficulties and obstacles that households and communities have while putting climate change solutions into practice, qualitative methodologies are appropriate.

Prioritization and ranking techniques aid in comprehending the participants' viewpoint on the relative severity and importance of the issues that have been identified.

Goal 3: To assess how households using household and community-based climate change adaptation measures for food access differ from those who do not.

In order to comprehend the possible effects of initiatives for adapting to climate change on food security, measuring household food availability is essential.

Comparative Evaluation

Evaluating the effectiveness of climate change measures in enhancing family food security involves comparing the food access of participants and non-participants. To find out if there were statistically significant differences in the HFIAS scores between the two groups (participants and non-participants), statistical tests like t-tests were utilized. This made it possible for the researcher to evaluate the effects of climate change on household food access.

3.7 REALIABILITY AND VALIDITY

In order to maintain reliability, pilot research employing direct methods was carried out on 13 respondents from the Bindura District ward. The accuracy with which the results of data analysis represent the phenomenon being studied is known as validity. The researcher's efforts, such as speaking with specialists, contribute to the research instrument's increased validity. Validity can be determined through content, construct, and criterion-related validity, which assesses whether the instrument measures what it is intended to measure accurately (Mugenda, 1999).

3.8 ETHICAL CONSIDERATIONS

Research ethics, according to (Gomm, 2005) are guidelines for moral and appropriate behaviour for researchers. It is important to conduct research with principled consideration for the rights of others. Ethics, according to (Onwuegbuzie, 2005), is significant because it protects research participants' moral and cultural values, as well as their thoughts about religion and philosophy, as well as their physical and mental dependence. The study highlighted the following research values: respecting the right of participants to privacy and confidentiality; voluntary participation; preventing harm to participants; informed consent; and successful admission.

3.9 CHAPTER SUMMARY

This chapter describes the techniques the researcher employed to carry out her investigation. She employed a study design and mostly used questionnaires and in-person observations to gather data. Data collection procedures and ethical issues were also discussed. The relevance of research techniques in particular, data gathering techniques in ensuring the validity and reliability of the study was also underlined in this chapter. The data presentation, analysis, and conclusions are covered in the upcoming chapter.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

1.0 INTRODUCTION

This chapter presents the study's data and analysis. The study utilized a mixed method research design to identify patterns and trends in the data, and an analysis of the implications of the findings was carried out with a primary focus on connecting the data to the objectives of the study. The results obtained from the various instruments utilized in this investigation are presented and analysed and their implications are discussed.

	Questionnaire Administered	Questionnaire Received back	Response Rate (%)
Chitova Village	62	53	85

Table 1 Overall Response Rate

The sample size for the study was 62, consist of 46 participants and 16 non-participants of household and community-based climate change adaptation strategies. The research yielded an 85% response rate.

4.1 DEMOGRAPHIC STRUCTURE OF RESPONDENTS

Out of the total of 62 questionnaires distributed to the male and females, the response rate for females 95% and that for males was 63% and the overall response rate was 85%.

Category	Questionnaires	Responses	Response Rate
Females	43	41	95%
Males	19	12	63
Overall	62	53	85%

Table 2 Demography of Respondents

The researcher made concerted efforts to follow up the outstanding questionnaires but to no avail and had to contend with what was at hand to interpret the data and draw meanings from the data.

4.1.1 AGE RANGE OF PARTICIPANTS

Age Group	Frequency	Mean	Median Age
Under 18 years	2	16.0	16
18-30 years	17	24.3	25
31-45 years	22	38.2	38
46-60 years	10	52.8	53
Above 60 years	2	64.5	65
Total	53	37.2	37

Table 3 Age Range of Participants

The 31-45 years age group has the highest frequency, with 22 participants (42% of the total). This indicates that this age group was the largest represented segment in this research. The mean and median ages are highest for the above 60 years group at 64.5. this suggest that the respondents in this age group were on the old end of the spectrum. 18-30 years group has a mean age of 24.3 years and a median of 25 years. The close alignment between the mean and median indicates a relatively symmetric distribution of ages within this group. The overall mean age was 37.2 years and the overall median age was 37 years. These summary statistics provide a high-level view of the central tendency of the age variable across the entire respondent's sample.

4.1.2 EDUCATIONAL LEVEL OF PARTICIPANTS

Education Level	Frequency	Percentage
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No formal education	13	25
Primary education (up to grade 7)	14	26
Secondary education (up to form 4)	15	28
Vocational training	7	13
University degree or higher	4	8
Total	53	100

Table 4 Educational Level of Participants

The most common education level is secondary education (up to form 4), accounting for 28% of the sample. Primary education (up to grade 7) is the second most common, making up 26% of the sample. No formal education is the third most common, at 25% of the sample. Vocational training accounts for 13% of the sample. University degree or higher is the least common, representing only 8% of the sample.

4.1.3 HOUSEHOLD AND COMMUNITY-BASED CLIMATE CHANGE STRATEGIES IMPLEMENTED IN CHITOVA VILLAGE.

STRATEGY	FREQUENCY	PERCENTAGE (%)
Water Harvesting	23	60
Agroforestry	24	45
Crop Diversification	37	70
Livestock Management	19	35
Renewable Energy	13	25
Integrated Pest Management	34	64
windbreaks around agricultural fields	12	23
Ecosystem Restoration	13	24
Disaster Risk Reduction	17	32

Table 5 Strategies adapted

4.1.4 WATER HARVESTING

Water harvesting techniques were reported by 60% of respondents. To gather and store water during the rainy season, the researcher saw that locals in Chitova Village had constructed ground ponds, water storage tanks, and rainwater collecting devices. The effects of drought and water shortages are subsequently lessened by using this water for domestic use and small-

scale irrigation during the dry seasons. Not only do 60% of the respondents collect rainwater, but some families have constructed small-scale irrigation systems to divert water from nearby rivers and streams for use in farming. According to one of the responders,

"The small irrigation system we created has been a game changer for our family. Previously, we were completely reliant on uncertain rainfall, and our crops would frequently suffer during dry spells. But today, we can water our fields consistently and secure a stable supply of water for our crops. This has enabled us to diversify our agricultural operations and cultivate a broader range of vegetables and fruits, improving our food security while also providing us with an extra source of revenue. The nicest thing is that we don't have to be as concerned about shifting weather patterns because we have more control over our water supply. It has provided us with a sense of security and stability that we previously lacked."

The respondent's testimonial shows how the lives and livelihoods of the people living in Chitova Village have been changed by small-scale irrigation systems. These households have lessened their vulnerability to the consequences of climate change, like erratic rainfall and long droughts, by using water supplies from nearby streams and rivers. They have been able to raise their food security, diversify their farming practices, and generate more income as a result, all of which are essential for building resilience and adjusting to the challenges posed by climate change. (Verburg, 2015) found that combining these techniques with rainwater collection can increase cereal production by up to 35%. In the semi-arid and dry regions of Kenya, (Oguge, 2018) emphasized how rainwater collection can be used for small-scale, off-season irrigation, enhancing the income and food security of smallholder farmers. The importance of small-scale irrigation systems in agricultural production is highlighted by these research.

4.1.5 AGROFORESTRY

Agroforestry techniques were reported to be implemented by 45% of respondents. Farmers in Chitova Village have included planting trees and shrubs into their agricultural production activities. This agroforestry technique improves soil fertility, lowers soil erosion, and gives the community additional food, fuel, and income. One of the respondents confirmed as much.

"However, the benefits of agroforestry go beyond soil health and crop yield. The trees and bushes we've planted also offer us with a variety of items to complement our income. Many of the species we've planted have delicious fruits, nuts, or leaves that we can harvest to supplement our diets and create extra revenue. Others provide significant supplies of fuel,

construction materials, and even natural medicine, all of which contribute to the diversification of our home economies and minimize our dependency on external resources.”

This is also consistent with the findings of (Jambulingam, 2005) of India and Sisay of Kenya (2013), who discovered that the agroforestry method has been demonstrated to significantly increase yields and is utilized all over the world, especially in Tamil Nadu State in India (Jambulingam, 2005), Ethiopia (Sisay, 2013), and West and Central Africa. (Tchoundjeu, 2010) further stated that the strategy has been shown to improve rural life, increase revenue, and empower smallholder farmers.

4.1.6 CROP DIVERSIFICATION

70% of respondents said they had diversified their crop production. In addition to traditional maize cultivation, residents of Chitova village have begun to grow a wider range of drought-resistant and robust crop species such as sorghum, millet, and cassava. This method contributes to reducing the risk of crop failure and ensuring food security in the face of climate variability.

"A few staple crops, like maize, were our main source of food in the past. But as weather patterns became more erratic due to climate change, we faced significant challenges. We would lose our whole corn crop to droughts. We had to fight every day to feed our families. But everything changed when we began to diversify our crop portfolio. We started introducing a wider variety of crops, such as robust tuber vegetables, drought-tolerant millets, and even some novel cash crops like peppermint and moringa. By doing this, we were able to distribute the risk and take advantage of the various microclimates that exist in our farming areas."

Several studies have shown that crop diversification increases crop productivity and resilience in rural smallholder farming systems (Makate, 2016). This is particularly important in light of the fact that climate change can result in more extreme weather events and increased temperature variability, both of which lower agricultural productivity. Reducing the likelihood of a complete crop failure and increasing food security are two benefits of diversifying food crops, which includes using improved crop varieties. This tactic is expected to lessen crop failure and guarantee food security in the face of climate variability in Chitova village, where residents have diversified their agricultural output to include drought-resistant and robust crop species.

4.1.7 LIVESTOCK MANAGEMENT

To guarantee feed availability during the dry season, 35% of respondents said they had enhanced their livestock management techniques and have begun implementing fodder banks and silage production. In order to reduce their need on chemical treatments, some farmers have also implemented integrated pest management tactics to control illnesses and pests impacting their cattle. created barns to shield cattle from inclement weather and ushered in more resilient livestock breeds.

4.1.8 RENEWABLE ENERGY

Renewable energy technology adoption was noted by 25% of respondents. A few people in Chitova Village have installed solar panels to provide electricity for running small appliances, charging devices, and lighting. In times of system instability or power outages, in particular, this renewable energy source offers a more dependable and sustainable energy supply, reducing reliance on fossil fuels.

4.1.9 INTERGRATED PEST MANAGEMENT

To avoid diseases and pests that could affect their crops and livestock, 64% of farmers in Chitova Village practice integrated pest management, or IPM. In order to promote sustainable agricultural practices and increase climate resilience, farmers have stated that they want to transition away from synthetic pesticides and herbicides. Many farmers observed that to reduce the likelihood of pests and illnesses spreading, cultural techniques like crop rotation, intercropping, and resistant crop types are used. A participant brought attention to the fact that;

“Additionally, we started keeping a careful eye on our fields, using basic monitoring equipment and conventional ecological knowledge to identify pest infestations and disease outbreaks early. For instance, an abundance of the weed "Amaranthus" usually means that we need to monitor our crops more carefully for any possible aphid infestations. Since the amaranthus plant is known to draw aphids, its proliferation indicates an increase in the number of aphids in the area. This allowed us to act quickly and efficiently, often using physical removal techniques or organic materials before things got worse.”

4.1.10 WINDBREAKS AROUND AGRICULTURAL FIELDS

Of those surveyed, 23% mentioned using windbreaks. A review of the literature found that planting shrubs or trees around agricultural fields can help lessen the impact of strong winds. They handle soil erosion, microclimate adjustment, animal shelter, and biodiversity

conservation, among other tasks, in Chitova Village. Windbreaks serve as barriers that lessen wind and retain soil particles to stop erosion and preserve soil fertility, as one of the respondents pointed out. Along with shielding agricultural areas from strong winds and lessening the effects of drought and extreme heat, they also modify the microclimate surrounding these areas. Furthermore offering cows cover and shade, windbreaks lower stress levels and improve health. The farming approach is long-term sustainable because windbreaks contribute to the stability and balance of the environment.

Additional research has demonstrated that windbreak strips are very useful in lowering agriculture particulate matter emissions and wind erosion (Chang X. S., 2021). However, the efficiency of windbreaks in lowering PM concentrations varies depending on wind conditions and tree species (Chang, 2019).

4.2 CHALLENGES FACED IN IMPLEMENTING HOUSEHOLD AND COMMUNITY BASED CLIMATE CHANGE STRATEGIES IN CHITOVA VILLAGE.

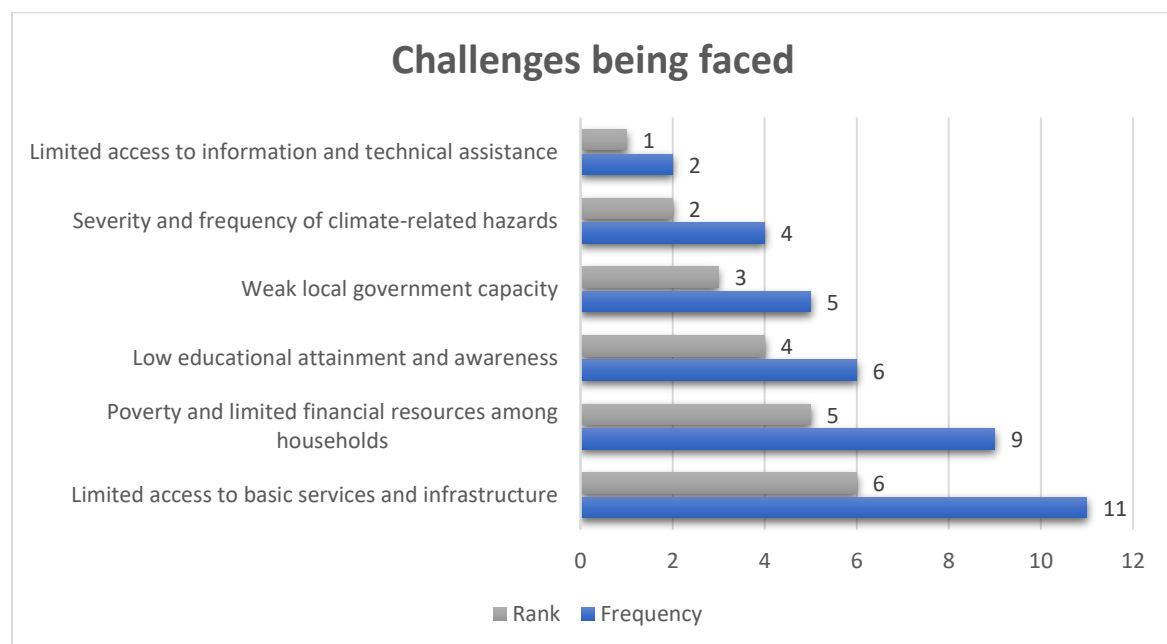


Figure 1 *Challenges being faced*

With a sample size of 37 respondents who are involved in household and community-based climate change strategies in Chitova Village, the bar graph illustrates the main obstacles to their implementation. With 29.7% of all difficulties being household financial resources, poverty and insufficient funds rank highest. Investing in technology, infrastructure, or adaptation techniques that are climate-resilient is challenging for many village households, as they often have low incomes and inadequate savings. The research results are consistent with

other studies that highlight the challenges that low earnings and little savings present for families trying to invest in climate-resilient infrastructure and adaptation strategies. (Hallegatte, 2022) emphasizes the significance of taking climate risks into account when making investments, but points out that budgetary constraints frequently make this difficult. (Ogallo, 2022) highlight how impoverished households are more vulnerable to the effects of climate change. (Ogallo, 2022) highlighting the inadequacy of present coping and adaptation techniques. (Petty, 2022) examines the intersectional barriers to income diversification and adaptation, especially for women living in the Lake Victoria Basin. These findings demonstrate the urgent need for focused efforts to reduce financial barriers to investments in climate resilience made by vulnerable households. Resolving this issue might call for actions that boost prospects for earning money while simultaneously offering assistance with finances or access to reasonably priced loans.

Poor access to essential services and infrastructure, like power, clean water, transportation, and healthcare, ranks as the second most significant concern, accounting for 24.3% of the total. The ability of households and communities to implement successful climate change solutions may be compromised in the lack of these essential services. (McCarney, 2011) This is particularly true in the poorest cities in Asia, Africa, and Latin America, where informal settlements usually lack these essential utilities, endangering vulnerable populations from the consequences of climate change, according to research findings on climate change and cities. Effective climate change policies are hampered by the inability to address the health effects of climate change due to a lack of funding and infrastructure in public health. These results emphasize that in order to increase the effectiveness of climate change measures, there is a need for increased access to infrastructure and basic services.

One significant barrier identified by 16.2% of respondents who were involved in home and community-based climate change measures in the third ranking was low awareness and educational attainment. This could make people less conscious of climate change and the need for adaptation and mitigation strategies. Several studies (Açıkalın, 2024), underline the value of education in promoting mitigation and adaptation measures and increasing public awareness of climate change. Nonetheless, this field faces significant obstacles. The majority of the time, climate change education is inconsistent and ineffective (Açıkalın, 2024). Additionally, it frequently places a higher priority on private sector initiatives than on governmental sector ones, which are essential for successful mitigation and adaptation (Kranz, 2022). In East Africa,

curriculum are beginning to incorporate climate change education, and there is a need for coordinated strategies to use this instruction for mitigation and adaptation (Apollo, 2021).

13.5% of respondents cited a lack of local government capability as another major obstacle. It's possible that local government organizations lack the tools, know-how, or systems for coordination necessary to effectively support and aid community-based climate change initiatives. One major obstacle to climate change adaptation is the inability of local governments to effectively support and aid community-based efforts due to their lack of competence (Nordgren, 2016). Several institutional barriers, such as limited financial resources, insufficient technical proficiency, and a disconnection between the national, local, and village levels, make this worse (Ampaire, 2017). Additional difficulties faced by local governments include a lack of knowledge about climate change issues, a lack of funding, and the absence of cross-departmental planning processes (Zaman, 2011). Improved connections between governments and actors, a more responsive and integrated landscape of climate adaptation resources, and mainstreaming climate change risk assessment and adaptation planning into local government operations are all necessary to address these issues. (Nordgren, 2016); (Ampaire, 2017) ; (Zaman, 2011). Furthermore, there is an increasing demand for capacity training in effective stakeholder involvement at the community level (Moser, 2015).

The frequency and intensity of climate-related threats, such as floods, droughts, and extremely high temperatures, were noted by 10.8% of respondents. These risks may exceed local communities' ability to respond, which could obstruct the efficacy of home and community-based initiatives. These hazards often exceed local coping skills, undermining the efficacy of home and community-based interventions. Disruptions to local economic operations brought on by physical issues related to climate change exacerbate the problem. Consequently, in order to minimize loss and damage in the anticipated climate change scenarios, there is an urgent need for increased support for local initiatives and investments in boosting adaptive capability. By creating early warning systems, improving catastrophic risk reduction, and implementing climate-resilient infrastructure, this challenge can be overcome.

5.4% of respondents indicated that they had trouble getting expertise and technical support, which is the least prevalent obstacle, according to the report. Strategies for adapting to climate change at the home and community level are hampered by a lack of information and technical assistance (Pandey, 2018); (Antwi-Agyei, 2015); (West, 2010). This is particularly evident in rural areas, where historical climatic data and traditional knowledge are commonly employed.

However, additional information is needed to connect community needs with workable adaptation strategies (Pandey, 2018). This issue can be resolved by making climate-related information more widely available and easily accessible and by providing households and communities with focused technical assistance.

4.2.1 REASONS HINDERING NON PARTICIPANTS FROM PARTICIPATING IN COMMUNITY AND HOUSEHOLD BASED CLIMATE CHANGE STRATEGIES IN CHITOVA VILLAGE

Reasons	Frequency	Percentage
Economic Barriers		
- Low household income and limited financial resources	9	56.25
Knowledge and Awareness Gaps		
- Insufficient understanding of climate change impacts and available strategies	7	43.75
Social and Cultural Factors		
- Existing societal norms and gender dynamics	5	31.25
Accessibility and Logistical Challenges		
- Geographical remoteness and infrastructure limitations	6	37.5
Mistrust or Scepticism		
- Past experiences with development programs	4	25

Table 6 Reasons Hindering Others from Participating

4.2.2 ECONOMIC BARRIER

Low household income and limited financial resources: Due to financial limitations, 56.3% of Chitova Village's non-participating households are unable to make investments in or put the climate change initiatives into action. For these households, the upfront expenses of putting some initiatives into practice—like purchasing more productive agricultural inputs or constructing climate-resilient infrastructure—may be too high.

4.2.3 KNOWLEDGE AND AWARENESS GAPS

Seven of the sixteen homes that did not participate—or 43.75% of the sample—said they did not know enough about the methods available to mitigate the effects of climate change. insufficient understanding of potential mitigation strategies and the consequences of climate

change. According to the findings, households that opt out may not have the necessary knowledge and comprehension of how climate change may affect their means of subsistence and the particular adaption measures. This lack of knowledge could make them less inclined to participate in the program.

4.2.4 SOCIAL AND CULTURAL FACTORS

Social norms in place and gender dynamics: Five of the sixteen non-participating houses (31.25% of the sample) were able to identify gender dynamics and existing cultural norms. The village's gender dynamics and sociocultural norms may influence how many people participate in at-home and neighborhood-based climate change solutions. Certain households may have lower rates of engagement in particular activities because of things like traditional gender roles or the power of women in decision-making.

4.2.5 ACCESSIBILITY AND LOGISTICAL CHALLENGES

Geographic remoteness and limited infrastructure were cited by six of the sixteen residences that did not participate in the study, accounting for 37.50% of the sample. Distance from other places and limitations with infrastructure: Thanks to Chitova Village's convenient location and easy access to transportation and communication resources, certain non-participating residences can encounter logistical difficulties. The program's training locations are far away, and their transportation may not be dependable, making it difficult for them to regularly attend and participate in the program.

4.2.6 MISTRUST OR SCEPTISM

25% of the sample, or four out of sixteen non-participating houses, mentioned prior involvement with development programs. prior encounters with development programs: If a household has had a bad experience with a previous development program or village intervention, they may be more hesitant or dubious to engage with the present climate change efforts. This can make it more difficult for them to participate.

4.3 HOUSEHOLD FOOD ACCESS OF PARTICIPANTS AND NON-PARTICIPANTS OF HOUSEHOLD AND COMMUNITY BASED CLIMATE CHANGE ADAPTATION STRATEGIES

	Participants	Non-Participants

HFIAS Occurrence Questions (ask all):		
1. In the past four weeks, did you worry that your household would not have enough food?	Rarely (1)	Often (3)
2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	Sometimes (2)	Often (3)
3. In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	Sometimes (2)	Often (3)
4. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	Rarely (1)	Sometimes (2)
5. In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	Sometimes (2)	Often (3)
6. In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?	Rarely (1)	Sometimes (2)
7. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	Never (0)	Rarely (1)
HFIAS Score Calculation:		
HFIAS Score Range	0 to 27	0 to 27
Mean HFIAS Score	9	20
Standard Deviation	5	6
HFIAS Categorical Indicator:		
Food Secure	12 (32.4%)	3 (18.8%)
Mildly Food Insecure	8 (21.6%)	2 (12.5%)
Moderately Food Insecure	10 (27.0%)	5 (31.3%)
Severely Food Insecure	7 (18.9%)	6 (37.5%)

Table 7 HFIAS of Participants and Non Participants

Key:

- 0 = Never
- 1 = Rarely (once or twice in the past four weeks)
- 2 = Sometimes (three to ten times in the past four weeks)
- 3 = Often (more than ten times in the past four weeks)

4.3.1 HFIAS OCCURRENCE QUESTIONS

The HFIAS occurrence questions assess the degree of food insecurity experienced by the households over the past 4 weeks. Each question is scored on a scale of 0-3, with higher scores indicating more severe food insecurity.

For the participating households:

The majority of participants experienced moderate levels of food insecurity, with many reporting that they sometimes had to eat a limited variety of foods (score of 2), eat smaller meals (score of 2), and eat fewer meals per day (score of 1) due to lack of resources. A smaller portion of participants experienced mild food insecurity, with some reporting they rarely worried about not having enough food (score of 1) or had to eat less desirable foods (score of 1). A few participants experienced severe food insecurity, with 0 households reporting going a whole day/night without eating.

For the non-participant households:

The majority of non-participants experienced severe food insecurity, with many reporting they often worried about not having enough food (score of 3), were unable to eat preferred foods (score of 3), and had to eat smaller/fewer meals (scores of 3 and 2). A smaller portion experienced moderate food insecurity, with some reporting they sometimes had to eat less desirable foods (score of 2) or fewer meals per day (score of 2). Only a few non-participants experienced mild or no food insecurity.

4.3.2 HFIAS SCORE CALCULATION

The HFIAS scores range from 0 to 27, with higher scores indicating greater food insecurity.

The participant households had a mean HFIAS score of 9, with a standard deviation of 5. This indicates mild to moderate food insecurity on average. The relatively low standard deviation

suggests the participant group experienced more homogeneous levels of food insecurity, with fewer outliers at the extreme ends of the spectrum.

The non-participant households had a much higher mean HFIAS score of 20, with a standard deviation of 6. There was a wider spread, with some non-participants scoring below 14 (food secure) and others above 26 (severely food insecure). The higher standard deviation reflects more heterogeneity in the food insecurity experiences of the non-participant group, with a larger proportion at both the low and high ends of the HFIAS scale. This indicates severe food insecurity on average.

4.3.3 SIGNIFICANCE TEST USING ANOVA

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
HFIASSCORES * PARTICIPANTSorNONPARTICIPANTS	52	98.1%	1	1.9%	53	100.0%

Report

Mean

PARTICIPANTSorNONPARTICIPANTS	HFIASSCORES
PARTICIPANT	8.68
NON	19.80
Total	13.9

ANOVA TABLE

		Sum of Squares	df	Mean Square	F	Sig.
HFIASSCORES * PARTICIPANTSorNONPARTICIPANTS	Between (Combined) Groups	48.168	1	48.165	1.492	.044
	Within Groups	1730.508	50	34.610		
	Total	1778.676	51			

Measures of Association		
	Eta	HiEta Squared
HFIASSCORES * PARTICIPANTSorNONPARTICIPANT S	.165	.027

Figure 2 Significance test using ANOVA

Interpretation

Given that the p-value of 0.044 is below the generally accepted significance level of 0.05, it may be concluded that there is a statistically significant difference in the HFIAS scores between the PARTICIPANT and NON-PARTICIPANT groups. Measuring effect size, the PARTICIPANTSorNONPARTICIPANTS variable explains just 2.7% of the variation in HFIAS scores, according to the Eta Squared value of 0.027. With a p-value of 0.044 below the significance level of 0.05, the ANOVA findings demonstrate a statistically significant difference in HFIAS scores between the PARTICIPANT and NON-PARTICIPANT groups. The findings indicate that the groups that participated and those who did not varied in their HFIAS scores in a highly significant way. When compared to the non-participants group, the participants group's mean HFIAS score is significantly lower, indicating that participation Lower levels of household food insecurity are linked to climate initiatives that are based in the home and community. The PARTICIPANTS and NONPARTICIPANTS variable only accounts for 2.7% of the difference in HFIAS scores, indicating a rather moderate effect size.

CHAPTER FIVE

RESEARCH SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.0 INTRODUCTION

This chapter aims to provide clarity on a number of the study's enclosed issues. The major purpose is to summarise the findings of the study and tie the problem of the research to the collected results so come up with a conclusion and recommendations based on the research results. Recommendations will aid in coming up with problem-solving techniques that will be helpful in the industry and academic future studies.

5.1 SUMMARY

The project's objective was to evaluate how the Bindura District community and household-based climate change adaption methods affected food access. The primary goal was to assess how well these tactics worked to increase food security for households with limited resources. The study gathered information from a sample of the district's homes and communities using a mix of secondary data review, questionnaires, observation, and plot studies. The findings shed light on the adaptation strategies being used, the difficulties encountered, and the variables affecting the strategy selection. The results have the potential to improve food security and climate change resilience at the family and community levels through policy and practice. All things considered; the research advances our knowledge of how underdeveloped nations resource-poor populations are adapting to the effects of climate change.

5.2 RECOMMENDATIONS

1. Strengthen Community-Based Adaptation Strategies: The study has shown how community-based adaptation techniques, like agricultural diversification, agroforestry, and water harvesting, can help Chitova Village become more resilient to climate change. To help more homes, these tactics ought to receive increased funding and implementation.
2. Encourage Gender-Inclusive Approaches: The results of the study show that female participants responded at a higher rate, indicating that they are actively involved in climate change adaptation. Gender-inclusive policies should remain a top priority for policymakers and development organizations to guarantee fair benefits and participation
3. Boost community engagement and awareness campaigns: Collaborate closely with local government agencies, extension agents, and community leaders to plan frequent gatherings, workshops, and outreach initiatives to educate households about the significance of adaptation

strategies and how they can contribute. Reach out to all facets of the community through culturally appropriate channels and formats for communication.

4. Encourage peer-to-peer learning: Identify households that are actively involved and have effectively implemented the strategies; then, arrange for knowledge-sharing and demonstration sessions led by these "model" households. This can help encourage adoption by other households that might be more open to gaining insight from their peers.

5.3 CONCLUSION

The primary community- and household-based approaches to adapting to climate change in Bindura District are agroforestry, crop diversification, climate-resilient agriculture, water harvesting and management, and energy-saving techniques. Resource-constrained households in the region have used these measures to varied degrees in an attempt to increase food security and strengthen their resistance to the effects of climate change.

However, a number of issues, including restricted resource availability, a lack of technical expertise and information, and weak institutional and policy framework support, are making it more difficult for people to take part in these adaptation measures. According to the study, compared to households who did not implement the measures, those that actively participated in the adaption techniques experienced greater food security.

In conclusion, the resource-poor communities in Bindura District are working hard to adapt to climate change, but more work needs to be done to remove the obstacles preventing a wider range of people from adopting these tactics. The effectiveness of the interventions for climate change adaptation can be increased and household participation can be increased by enhancing institutional support, community engagement, and awareness-raising. In order to guarantee the sustainability of these community-driven adaptation initiatives, ongoing monitoring and assessment will be essential.

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