BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF DISASTER RISK REDUCTION

AN INVESTIGATION ON THE EFFECTIVENESS OF DROUGHT RESILIENCE STRATEGIES EMPLOYED IN RURAL ZIMBABWE.THE CASE OF MUNYARARI WARD, MUTARE DISTRICT.

BY MUCHENA FIDELIS T.

B213142B

SUBMITTED TO THE DEPARTMENT OF DISASTERRISK REDUCTION AS A REQUIREMENT IN PARTIAL FULFILMENT OF THE BACHELOR OF SCIENCE HONOURS DEGREE IN DISASTER MANAGEMENT SCIENCES

SUPERVISOR: DR. P. CHINYANGANYA

JUNE 2025

RELEASE FORM

Name of Student: FIDELIS TENDAI MUCHENA

Registration Number: **B213142B**

Dissertation title:

INVESTIGATION ON THE EFECTIVENESS OF DROUGHT RESILIENCE STRATEGIES EMPLOYED IN RURAL ZIMBABWE.THE CASE OF MUNYARARI WARD, MUTARE DISTRICT.

Year granted: 2025

Permission is granted to the Bindura University of Science Education Library and the department of Disaster Risk Reduction to produce copies of this Dissertation for academic use only.

Signature of author: ....

Date signed: **19/06/2025**

APPROVAL FORM

The undersigned certify that they have read and recommend to the Bindura University of Science Education for acceptance, research project titled:

INVESTIGATION ON THE EFECTIVENESS OF THE DROUGHT RESILIENCE STRATEGIES EMPLOYED IN RURAL ZIMBABWE. THE CASE OF MUNYARARI WARD, MUTARE DISTRICT.

Submitted in partial fulfillment of the requirements of a Bachelor of Science (Honours) degree in Disaster Management.

Submitted by **FIDELIS TENDAI MUCHENA,** Registration Number **B213142B** in partial fulfillment of the requirements of the Bachelor of Science Honours Degree in Disaster Management

FIDELIS TENDAI MUCHENA **19/ 06/2025**

Name of Student *Signature* *Date*

20/10/2025

Name of Supervisor *Signature Date*

DEPARTMENT CHAIRPERSON

Signature… Date ……21/10/25……

Prof Emmanuel Mavhura

DECLARATION

I declare that this research project is my original work and has not been copied or extracted from previous sources without due acknowledgement of the source.

FIDELIS TENDAI MUCHENA  **19/06/2025**

Name of Student *Signature* *Date*

DEDICATION

I dedicate this study to my loving parents (Edward Muchena and Fungai Zirume), my uncle (Joseph Muchena), my brothers (Richard Muchena and Panashe Muchena) and the rest of my family. This work is a reflection of your strength, sacrifice and unconditional love.

ASTRACT

Droughts are one of the worst disasters from which most rural people experience immense anguish. It still remains a National Policy agenda and a problem in most developing countries like Zimbabwe. Due to climate change, the impacts of droughts are expected to deepen where the capacity to adapt is low. Though it remains a challenge in communities, local people have devised different coping mechanisms based on the resources that are locally available but the effectiveness of these mechanisms are questionable. Therefore, using both qualitative and quantitative research methods this study aims at identifying and analyzing the effectiveness of the drought resilience strategies that are employed by households in Munyarari Ward 20 in Mutare District, examining the challenges faced during attempts to implement them and the socio-economic and cultural factors that influence the adoption and success of these DRSs. Findings revealed that a wide range of DRSs which include crop diversification, cultivation of drought resilient crops, conservation agriculture, irrigation and engaging in off-farm income generating activities are employed in Munyarari Ward. The findings also highlighted that the strategies that are employed are not fully effective in enhancing resilience of households. More than half of participants 53% highlighted that the DRSs are not effective. Adding on, the results of the Chi-square test of association between application of DRSs and improved resilience showed that there was no significant association between applying DRSs and resilience. The majority of respondents involved in DRSs are not able to produce yields above 500 kg. A number of challenges which include poverty, increasing frequency and periodicity of droughts, lack of resources and techno-science adaptive capacity, lack of markets and the remoteness of the geographical location of the study area, among others, were revealed by the findings of the study as contributors to the ineffectiveness of DRSs strategies. Moreover, the study was also determined to explore the socio-economic and cultural factors that influence the adoption and success of DRSs among households and findings revealed that age of the household head, level of income of household, level of education of household head and gender were some of them. The study recommended the construction of more dams and necessary infrastructure for irrigation, adoption of local knowledge into resilience strategies, improving access to agricultural inputs and enhanced provision of technical assistance to farmers in the study area.

ACKNOWLEDGEMENTS

To begin with, I want to thank the Lord Almighty for leading me in each and every aspect of my life owing to my successful completion of this study. My sincere gratitude goes to my supervisor, Dr. P. Chinyanganya, for the priceless encouragement, contributions and support she provided in this study. Her critique, ideas and comments were highly enlightening and educative. I would also like to thank all the study participants for their contributions to this research. In addition, I would also like to offer immense gratitude to my parents, guardians and the rest of my family for the unyielding and invaluable support they provided during this study.

ACCRONYMS

DRSs	Drought Resilience Strategies
CBOS	Community Based Organisations
ZRCS	Zimbabwe Red Cross Society
CA	Conservation Sgriculture
NGOs	Non-Governmental Organisations
SLF	Sustainable Livelihood Framework
FAO	Food and Agriculture Organisation
IKSs	Indigenous Knowledge Systems

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

CHAPTER 1

BACKGROUND AND ITS SETTING

1.0. Chapter Introduction

Drought is one of the most common disasters which can undermine the livelihoods and well-being of people despite the incessant application of various drought resilience, coping and mitigation strategies (Mugotsi et al, 2012). Droughts are a creeping phenomenon whose effects accumulate over time before they are felt and linger on long after the actual event. The hardships and challenges associated with droughts can have environmental, economic and social detriments. Drought can cause a decline in crop yields resulting in declining income for farmers and rise in market price for agricultural products. Therefore, it is important to ensure that measures are in place to minimize the impacts of drought on human beings and their livelihoods although the assumed and suggested strategies may have limitations or weaknesses.

The impacts of drought cannot be reduced by an individual, but it requires the involvement and participation of collective ideas of authorities, individuals, communities, institutions, volunteer groups and others among these. Therefore, the goal of resilience strategies, mitigation and preparedness is to reduce impacts of drought, reduce vulnerability and foster drought resilient societies (Ncube, 2010). Recurring droughts are an endemic feature for agricultural activities in Zimbabwe, a country whose majority of the population (70%) depends on agriculturally based activities as their livelihoods resource. There are growing concerns that drought might become more unprecedentedly frequent and severe in the region as a result of global warming. In the event that this happens, it will go on to exacerbate problems for the most vulnerable households, communities and economies. The study assesses the effectiveness of the drought resilience strategies that are employed by the rural communities in Zimbabwe, Case of Munyarari Ward 20, in reducing the impacts of droughts. In respect to that, there are also challenges that are normally encountered during implementation and adoption of these strategies and these should be identified, analysed and effectively solved so as to enhance the effectiveness and appropriateness of the resilience strategies. As such, the study seeks to thoroughly assess the effectiveness of the drought resilience strategies in reducing the diverse impacts and challenges that are faced by households as a result of the intense and severe droughts in Munyarari Ward, Mutare District.

1.1. Background of the study

Droughts are one of the disasters that negatively affect most people around the globe, particularly among most developing countries. Droughts are regarded to be among the most common disasters which usually create and bring immense social and economic hardships upon many rural households in the developing world. In order to deal with the adverse effects of droughts, there is urgent need for participatory, contextual and effective formulation of policies enabling the effective enhancement of resilience to the droughts and dry spells. Climate change and climate variability are some of the top factors that are being blamed for promoting and aiding the unprecedented occurrence of drought situations in Zimbabwe. Because of these presumed contributions of climate change and climate variability, the impacts of droughts and sporadic dry spells on the rural populations are projected to worsen and offer more challenges on the most vulnerable people within communities whilst the capacity to implement drought resilience strategies (DRSs) and measures is still very low or absent in communities. Despite the fact that individuals and communities have developed and employed different strategies in a bid to deal with the effects of droughts usually relying on the resources that are locally available, the effectiveness of these mechanisms is still dismal. According to FAO (2008), the frequency, intensity and duration of droughts have been increasing for the past few decades due to a litany of factors, mostly emanating from climate variability, climate change and global warming. At global, regional and local levels, the effects of a changing climate have been mostly and significantly felt through the shifting of planting seasons.

Be that as it may, among the challenges that are usually experienced by rural households in trying to reduce the impacts of droughts in Zimbabwe today there is not only financial resources and skills shortages but climate change and global warming is involved as well (FAO, 2008). These factors have all been responsible for influencing extreme weather and climate events i.e., very heavy rainfall, very little or no rainfall (drought), very cold temperatures, very hot temperatures and they generate serious problems during the employment of diverse drought resilience strategies, due to the fact that they disrupt the normal and common rain patterns, causing more frequent and intense droughts. Regarding such trends, there is need for individuals, households and communities to ensure that the resilience efforts they employ are effective in quenching the impacts of droughts especially in a context whereby climate and weather patterns highlight a more

frequent and intense droughts in Zimbabwe. Climate change and climate variability are factors that have been blamed for weakening the effectiveness of the DRSs and adversely undermining the resilience levels of households and communities as well as manipulating food security. According to World Development Report (2010), it is important to note that the country has been experiencing unprecedented drought challenges for the past quarter of this century and because of those challenging social and economic circumstances, most vulnerable households settling in drought prone areas have been experiencing huge losses in agricultural production resulting in critical food and water shortages. The economic, social, and political constraints, droughts and climate change have all been allegedly responsible for crippling agricultural production and undermining the food security of many rural households in the country. The drought situation in the region has further been worsened by the fact that about 70% of the population in Zimbabwe depends on rain-fed subsistence agriculture and other minor activities and the most challenging effects of these droughts is clearly highlighted by disastrous impacts on food security and the means of survival for the poor. Therefore, effective drought resilience strategies (DRSs) and measures are urgently required as a way of mitigating, adapting and proactively preparing for droughts and dry spells based on well-established policies and institutional capacity as a way of quenching the devastating effects of droughts on the poor. It is vital to note that drought impacts and losses can be fairly dealt with if the regional, national, community and local responsible authorities, individuals, organisations and communities are employing DRSs effectively and are ready to proactively participate and develop their knowledge on how effective drought management may be achieved.

To ensure that the efforts that are made (DRSs) are effective in dealing with the adverse drought situations, there is need to develop an approach to drought resilience enhancement that proactively promote effective resilience, mitigation, adaptation and preparedness to drought. According to Ncube (2010), the approach to drought resilience should be able to fully deal with the risk of droughts, reduce the vulnerability of households and foster societies that are resilient to drought impacts. In the case of Munyarari Ward, Mutare District, small-scale households are currently employing different DRSs yet they still continue to produce very poor yields year in and year out and as a result terrible and consistent food shortages and other effects of droughts continue to pile up. Mostly in Munyarari, rainfall is usually in very low quantities when it is received or it is poorly distributed and falls decently for only a few months during the rainy season each year consequently leading to poor crop yields and livestock production. Even though there are multiple DRSs that

are being applied currently by households, the intensity, frequency and impacts of droughts are being experienced at an unprecedented rate demanding that their effects on the populations be continuously assessed, evaluated and help to promote proper and effective implementation of the DRSs in order to enhance resilience. In addition, a litany of challenges are usually encountered by households during the implementation of DRSs and there is need to identify and suggest solutions for them to ensure effectiveness. As such, the study seeks to weigh on a scale the contribution of the resilience strategies in reducing the impacts of drought and their effects in Munyarari Ward of the Mutare District.

1.2. Statement of the problem

The impacts of climate change are already being experienced in many parts of southern Africa including Zimbabwe as highlighted by the unprecedented occurrence of more frequent and intense droughts, floods, strong winds and heat waves. This will affect the level at which households are capable of producing food in all its dimensions. This is mostly due to the fact that crops and livestock are evidently vulnerable to climate change as higher temperatures are capable of reducing yields and encouraging the growth of weeds and pests. Research indicates that there may be gains in some crops in some other regions of the world despite the fact that the overall impacts of droughts on the vulnerable populations are projected to be negative and threatening global food security. The challenge of recurrent droughts as a disaster in Munyarari Ward in Mutare District in Zimbabwe clearly highlights how urgently a more comprehensive and effective drought resilience approach is needed. Although the government and its ministries, non-governmental organizations (NGOs) and Community-Based Organizations (CBOs) have been prioritizing drought resilience and capacity building in the study area, there is evidence which shows that they overlook the importance of the effectiveness or impact of the resilience strategies that they promote and support. The policy formulators, local and national disaster management practitioners who are responsible for planning the programmes meant for drought resilience enhancement in the country do not consider whether the drought resilience strategies are contextual, appropriate and that they also suit the unique needs of the affected communities. It is of great concern that some of the strategies being employed in the study area might be incompatible with the unique spatial characteristics of Mutare Rural District, hence they may not produce the most effective and desired results. Apart from that, this might also mean that there is no involvement and active participation of the

community members during formulation and planning of the policies and programmes and developmental interventions related to the implementation of DRSs within communities (Mugotsi et al, 2012). The pressing issue of inclusiveness in drought resilience initiatives, efforts and programmes also need to be addressed to ensure that the vulnerable groups in Munyarari Ward enjoy the sustainable contributions of drought risk reduction techniques. The major aim of the study is to thoroughly assess how effective are the drought resilience strategies (DRSs) that are employed in Munyarari by determining whether they are successful in sustainably suppressing the impacts of droughts in the Munyarari area and in promoting community development in the long term. In order to achieve this, there is need for a proposal of a community-based drought resilience framework that neatly suits the drought needs of the Munyarari community.

1.3. Purpose of the study

To investigate the effectiveness of Drought Resilience Strategies (DRSs) that are implemented by households in rural Zimbabwe in enhancing resilience and mitigating the detrimental impacts of droughts.

1.4. Specific objectives

i. To assess how effective are the existing drought resilience strategies relied upon by households in Munyarari Ward.
ii. To explore on the social, economic and cultural factors that influence adoption and effective implementation of drought resilience strategies employed by households in the study area.
iii. To examine the challenges that are faced by households in Munyarari Ward during implementation of DRSs.

1.5.Research questions

i. How effective are the drought resilience strategies (DRSs) that are employed by households in Munyarari?
ii. Which social, economic and cultural factors determine and enable the successful/ effective implementation and adoption of the drought resilience strategies?
iii. Which challenges are encountered by households during implementation of drought resilience strategies?

1.6.Hypotheses

- H_0: There is no association between applying drought resilience strategies and improved resilience to drought
- H_1: There is association between applying drought resilience strategies and improved resilience to drought

1.7.Justification of the study

Carrying out of this research project may be justifiable to a valuable and notable extent as the results of this research project aim to benefit many. This study aims to benefit the academics and researchers (both the students and the facilitators), rural households who depend mostly on subsistence/ small-scale and rain-fed agriculture and also suffer the most from the adverse impacts of droughts, national and international humanitarian organisations, CBOs, donors (*bilateral and multilateral*) and Non-Governmental Organisations (NGOs). This study aims to be a tool that may be relied upon by the national authorities, national policy makers or formulators and consultants to formulate, establish, and implement drought policies that promote effective drought resilience. It also seeks to ensure that drought policies are continuously reviewed, monitored and evaluated as well as revised. It is of great concern that drought policies should promote and support the implementation of drought resilience strategies that are tailor-made to suit the unique vulnerabilities, resources/ capitals and drought needs of at-risk rural communities such as Munyarari. This is vital as it enables the determination of the best courses of action that may be taken in specific communities and societies as far as the alleviation of drought is concerned. The study is also going benefit rural communities in Zimbabwe because it assesses the effectiveness of drought resilience strategies (DRSs) and determine their appropriateness, context and effectiveness when applied and adopted by the at-risk communities and households. This enables households to identify the best resilience strategies that ensure enhanced resilience to drought impacts. More so, it may encourage and motivate the rural households to actively participate in the implementation of the drought resilience efforts and strategies that specifically address their unique drought challenges and that they can trust.

Adding on, households have adopted various drought resilience strategies to deal and cope with the negative effects of droughts and most of that effort has only been put into identifying the possible resilience strategies without conducting thorough and in-depth investigation and assessment of the effectiveness of the strategies. This has led to the continued application of

ineffective resilience innovations by many households. Consequently, it has undermined effective drought resilience enhancement. Besides that, some of these strategies are not fully effective in combating all the unique impacts of droughts in the study area because they might be more effective and successful in other parts of the ward and not in others. It is also vital to consider that resilience strategies that perform well in other parts of the country might not be common in others, hence there is need to identify and recommend them for implementation in the study area in order to enhance resilience of households. As such, this study uncovers the need to promote and advocate for sustainable developmental work towards lobbying for context, effectiveness and appropriateness during the implementation of drought resilience strategies (DRSs).

Moving on, the study may also benefit national disaster and development practitioners, policy formulators, social protection service providers and organisations, national and international humanitarian actors and NGOs. This is so because it intends to raise awareness of these agencies so that they coordinate with communities in planning, implementing and monitoring drought resilience strategies in order to promote effectiveness and sustainability. This is paramount because drought situations in some parts of the country have become too much of a burden to the most affected and at-risk populations and it is no longer possible for many households to effectively deal with the impacts of droughts using their own capacity. Therefore, there is need for urgent and committed local, national, regional, interregional and international cooperation in promoting interventions that improve resilience. The study intends to serve as a tool for attracting different partners to intervene and assist households in alleviating the impacts of droughts. This provides the affected households, communities and at-risk populations with an opportunity to solve and combat their drought challenges, and enjoy the long-term sustainable benefits promoted and guaranteed by the implementation of effective and appropriate resilience strategies. Last but not least, the study also aims to be of significance to disaster management practitioners because it is interested in determining the socio-economic and cultural factors that influence adoption and successful implementation of different drought resilience strategies. If researchers, humanitarian organisations, Non-governmental organisations, government agents, among others, gain deep insight on this issue, it might assist in revealing the root causes of vulnerability and exposure to the risk of droughts. This enables for solutions to be suggested and effectively implemented.

1.8.Delimitations of the study

These may be defined as the intentional restrictions or boundaries that were set by the researcher in order to focus the study and define its scope. They are the conscious decisions made by the researcher to limit the study's coverage, population or variables to ensure a manageable and feasible research project. The researcher had to establish some geographical delimitations in order to indulge in a study that he would be able to complete and also come up with the most reliable findings. As such, the study was limited to the specific community of Munyarari, Ward 20 in Mutare District. This enabled the researcher to carry out a feasible as well as a concise research study that was result-oriented. Also, the researcher also focused the study on the specific group of rural households that supposedly employ different DRSs in the study area. This assisted in focusing the research on the group that is mostly vulnerable to drought. Adding on, the research was interested in determining the effectiveness of DRSs in enhancing the resilience levels of households making the households in the study the basis of this study.

Moving on, in order to streamline the focus of the study, the researcher focused on a few specific factors that influence adoption and effective implementation of DRSs in order to determine the root causes of vulnerability and exposure to drought. The factors that were mainly focused on by the research were social, economic and cultural aspects, that one way or the other, affect drought resilience. These factors were the focus of the study because impacts of droughts and signs of ineffectiveness of the adopted DRSs usually manifest in those aspects. They reveal the shortcomings of the DRSs, drought policies and efforts by revealing the individual and communal social and economic hardships experienced by households due to drought. The researcher also limited the study to few research methods which included questionnaires, interviews and observations as it reduced the time and resources that could have been unnecessarily required and spend during the data collection process.

1.9.Assumptions

A common assumption by researchers when carrying out research studies on the effectiveness of the drought resilience strategies is assuming that all rural communities are homogenous and ignore the differences they have in socio-economic status, culture and accessibility to resources. It is usually common for researchers to assume that rural communities in Zimbabwe face similar challenges and have similar needs when it comes to resilience building. However, it is important

to recognize that different communities may have different vulnerabilities and capacities to cope with impacts of droughts.

Another assumption that usually arises during the assessment of the effectiveness of drought resilience strategies is that there is always a linear relationships between drought resilience strategies and production outcomes (yields and income). D'Haesse et al. (2019), added that, this usually influence researchers to ignore the unique non-linear effects such as, when production outcomes for respondents applying certain drought resilience innovations, for instance, supplementary irrigation and crop yields, does not tally. Another assumption that is usually made by researchers is that rural communities are only passive recipients of the drought resilience efforts that are implemented by external agencies such as non-governmental organizations (NGOs) or government organizations. However, according to D'Haesse and others (2019), it is important to acknowledge the agency and decision-making power of individuals within these communities in shaping their own resilience strategies and innovations. The researcher may also assume that rural communities are implementing drought resilience strategies that are effective in reducing their vulnerability to droughts whilst they are not. Therefore, it is crucial to critically assess the impact and contribution of these resilience strategies to ensure that they are indeed contributing to improved resilience.

1.10. Limitations of the study

The researcher encountered many pitfalls and setbacks during the carrying out of the research study. Among these challenges there was shortages of financial resources that were much needed to facilitate the smooth flow of the study. Money was required by the researcher to facilitate the study in form of bus fares to and from the study area. The researcher also needed money for facilitating accommodation, as sometimes the researcher would be compelled to stay for more than one day in the study area. Other expenses that the researcher incurred include food expenses.

However, in order to quench this challenge, the researcher would take advantage of the trips he used to make with the organisation he was once attached to (The Zimbabwe Red Cross Society (ZRCS), Manicaland Province). During these trips, the researcher would carry out some of the research activities alongside the main agenda of the trips. Also, the researcher got some of the much needed help from family and friends who aided with money to promote the success of the research.

Moving on, the researcher also encountered challenges of proficient communication during the research study. This challenge mainly arose during administering of questionnaire as the instructions were formulated in English while the majority of the respondents did not fully understand the language. Even though the researcher managed to partially solve the challenge by interpreting the questionnaire into Shona, the dialect spoken by the researcher and one vernacular in Munyarari had some significant differences. This posed danger of misinterpretation of important data and alteration of the meaning of data. However, the researcher had to rely on an interpreter whom he had to pay for his services.

Apart from that, accessing remote locations and places in the study area was also another challenge which limited the researcher during the research. Some villages that were very suitable for selection as samples for the study were inaccessible to the researcher due to the absence of convenient transport service to and from those areas. These villages were initially very appropriate for the study because they portrayed the signs of vulnerability to droughts yet there was no easier connection with them. However, the researcher resorted to walking to these remote areas for the purposes of the research and it proved to be beneficial because the researcher would find the opportunity to observe the drought situation in Munyarari and the performance of the DRS. It was a difficult task but worth it. Moreover, the researcher also faced a challenge of some of community members' misperception of the purpose of the research study activities as some of the community members mistook the researcher's efforts as a way of collecting household data for use in social welfare and food aid-related programmes. This might have prompted a tendency of lying by respondents as they assumed that they would receive something in return. In order to solve this, the researcher had to liaise with community elders and village heads so that they would assist in making the community members understand the purpose of research.

1.11. Definition of terms

1.11.1. Drought

There is no one definition of drought that appropriately applies in all situations. According to Wilhite (2000), definitions of drought(s) need to be specific and contextual to region or area and the nature of its impacts. Generally, there are four types of droughts which are: Meteorological droughts, Agricultural drought, Hydrological drought and Socio-economic droughts. However, for sake of this study, the definition of agricultural droughts was adopted by the researcher which is

defined as reduction in soil moisture availability below the optimal level required by a crop at each different growth stage, resulting in impaired growth and reduced yields, shall be resorted to.

1.11.2. Household

According to the ZimStats (2022), a household was defined as people eating from the same pot, while councilors define a household as people staying at the same plot of land. For the sole purpose of the study, the former definition shall be adopted.

1.11.3. Resilience Strategies

According to FAO (2020), resilience strategies are the structural or nonstructural measures that are applied to enable the at-risk communities and individuals to withstand the impacts of a disaster situations.

1.12. Summary of the study

The research project is presented in a gradual content-specific format whereby the first chapter include subcomponents such as the problem statement, background of the study, purpose, goals and research questions. Definitions of important terms, delimitations of the study, assumptions and limitations of the study shall also be outlined. Chapter 2 reviews the pertinent literature on drought resilience strategies (DRSs). Chapter 3 outlines the research techniques and tools that the researcher applied during data collection and analysis. Moreover, in chapter 4, the data findings are presented and analysed while chapter 5 comprises of the researcher's discussion, conclusions and recommendations.

1.13. Chapter summary

The chapter outlined the precise issues which the study seeks to address, it also highlighted the study's primary objectives that include an assessment of how effective and appropriate the drought resilience strategies are in reducing the effects of droughts, determining the socio-economic factors that influence the adoption and success of DRSs and challenges that are encountered during implementation of DRSs. The statement of the problem is also revealed in this chapter. The chapter also justified the need to carry out this study as a way of bridging the study gaps, updating and adding up on the current knowledge of drought resilience.

CHAPTER 2
LITERATURE REVIEW

2.0.Introduction

In a bid to assess the effectiveness of DRSs employed in rural Zimbabwe: Case of Munyarari Ward, Mutare District, multiple and different studies by other academic institutions and scholars were reviewed and assessed. In addition, the research's theoretical framework is based on a theory that offer a comprehensive and thorough grasp of how effectiveness, sustainability and notable enhanced drought resilience may be achieved and guaranteed. This theory is also important because it may be relied upon as a blueprint that guides and influence how drought resilience strategies may be successfully implemented in rural communities by households. Adding on, this framework may also be a special tool that measures and determine the effectiveness of the existing drought resilience strategies common in the study area. This can be achieved through considering whether there is alignment and consistency with the demands and expectations of the theoretical framework. The literature review is also served an important purpose of identifying and revealing the study gaps and important concepts, ideas and discoveries that other scholarly studies made in the area of drought resilience. The literature that was reviewed revealed the application of drought resilience building strategies which include: the adoption of traditional farming practices, selling of livestock, introduction of irrigation schemes and dependence on food aid and food for work programmes, among others, in the study area.

2.2.Theoretical framework

2.2.1. Drought Resilience, Adaptation and Management (DRAM) Framework.

This is a theory which is established stemming from multiple important principles or goals that are meant to enhance the resilience levels of Munyarari people to drought. Wilhite et al. (2000), postulates that the principles of the DRAM framework for drought resilience include reduction of exposure to drought. This is important and necessary to mitigate the potential for loss of human life, livelihoods, ecosystems, resources, important structures and institutions, and economic, social and cultural capitals in communities. The theoretical framework neatly suit the standards and expectations of the Sustainable Livelihood Framework (SLF) approach to drought resilience as it also aims to reduce enhance the resilience of households to droughts by reducing the tendency of communities such as Munyarari from being impacted by detrimental impacts of droughts and dry

spells. It is focused on reducing the underlying factors that promote exposure to drought risk (APDC, 2016). In order to achieve this, effective environmental management, natural resource management, social and economic development practices and other land use planning and technical measures can be implemented. These measures may include activities such as practising conservation agriculture techniques such as mulching, crop rotation, effective water management practices, ecosystem based agriculture, water harvesting and storage practices, among others.

This theoretical approach can guarantee the effective alleviation of drought because it promotes adoption of bottom-up approach to drought resilience. Moreover, it ensures that there would be effective decentralization and active participation of the households in the enhancement of their resilience. Households are encouraged to actively participate in planning, implementation and review of DRSs that are effective in alleviating the dangers posed by drought. This is vital because the impacts of droughts are mostly felt at the local level hence placing the Munyarari community at the frontline of implementation of DRSs is of paramount importance (Wilhite, 2008). It would be a bigger step since in most parts of sub-Saharan Africa such as Zimbabwe, the top down approach to drought resilience and capacity building still persist. Last but not least, Smith et al. (2000), postulates that the DRAM approach to drought resilience building is perfect for communities as it emphasizes that capacity building and knowledge development should be prioritized in order to effectively establish local political and traditional commitment, strengthen competent institutions and create informed communities.

2.3.The conceptual framework

2.3.1. The Sustainable Livelihood Framework

The research study's conceptual framework is primarily based on the Sustainable Livelihood Framework (SLF). This framework suggests that the effectiveness of drought resilience efforts and sustainability can only be realized through effective capacity building and promoting social justice. It also emphasizes on taking a comprehensive perspective towards how rural households survive and make a living in order to empower and promote social and economic welfare of their households. Pandey et al. (2017), posits that a sustainable livelihood approach to drought resilience in Munyarari can be regarded as an appropriate approach involving these factors by drawing from it, hence determining the effectiveness of the drought resilience strategies being adopted by the small-scale farmers. A SLF approach to drought resilience is designed to effectively respond to

various climatic shocks. According to Chambers and Donway (1992), the approach pave a way for retrieving and improving capabilities and assets which enables and ensures sustainable living opportunities to the future generation. Sustainable drought resilience strategies can be used as a factor in integrating development policies, managing sustainable resources and eradicating poverty (Krantz, 2001). As such, determining the availability, achievement of and accessibility to these factors may be vital in the assessment of the level of effectiveness of the drought resilience strategies. In order to achieve sustainable resilience to drought impacts, providing a livelihood approach that promotes resilience enhancement, empowering households through the implementation of proactive DRSs can be essential (Pandey et al., 2018).

2.4. Definition and Categorisation of Drought(s)

Falkenmark and Rockstrom (2009) have classified dry spells and droughts have into two categories whereby they can either be meteorological or agricultural. The researcher as he was also determined to enhance the understanding of these concepts was compelled to share their definitions as outlined below. Agricultural droughts are defined as those that occur more than once in ten years, caused by poor rainfall partitioning and leading to seasonal moisture deficit to produce harvest and also leads to complete crop failure. Meteorological droughts, on the other hand are defined by Falkenmark and Rockstrom (2008), as those that occur once in a decade, caused by seasonal rainfall below the minimum crop water requirement and result in complete crop failure.

Other sources add that meteorological droughts are periods of increased dryness due to rains falling far short of what is expected within a specific region and seasonal timeframe (Pickering & Owen, 1994). Falkenmark and Rockstrom (2009), also identify meteorological dry spells as those that usually occur less than twice in three years, caused by a rain deficit of 2-5 weeks and results in yield reduction. They go on to identify agricultural dry spells as those that occur more than twice in three years, caused by poor rainfall partitioning leading to low plant availability and poor plant water uptake capacity and results in yield reduction or complete crop failure.

Differences between meteorological and agricultural drought(s). Source: Adapted from Falkenmark and Rockstrom (2008).

	DROUGHTS	**DRYSPELLS**
METEREOLOGICAL	**Occurrence** Once in ten years. **Impact** Complete crop failure. **Causes** Seasonal rainfall below minimum seasonal plant water requirement.	**Occurrence** Less than two in three years. **Impact** Yield reduction **Causes** Rainfall shortages during the farming season for a period of two to five weeks.
AGRICULTURAL	**Occurrence** More than once within a period of five to ten years. **Impact**: Yield reduction and sometimes complete crop failure **Cause**s Poor rainfall partitioning Which leads to low plant water availability. Poor plant water uptake capacity	**Occurrence** More than twice a period of three to five years. **Impact** Complete crop failure **Cause**s Poor rainfall partitioning which leads to seasonal soil moisture deficit to produce harvest

2.5. Defining vulnerability and resilience

In order to pay thorough justice to the study, the researcher was also determined to provide clear and contextual definitions of them concepts of vulnerability and resilience. The researcher signified this step considering that appropriate there is usually confusion that arises when the concepts are adopted in different branches of science and also due to the fact that these terms may be new to economics while they may not be new in disaster management and risk reduction sciences. As such, the study included this section as a way of conveying the meanings of the terms of vulnerability as well as explicitly clarifying how they interact with one another.

Many authors have acknowledged that the term "resilience" might have originated from ecology whereby the term for ecosystems is fabricated and explained as "a measure of the ability of these systems to absorb changes and still persist" (Holling, 1973). As time passed on, many authors and scholars were determined to refine and revise Holling's definition for the term resilience. For instance, Blaikie *et al.* (1994), defined resilience to natural hazards as "the ability of an actor to cope with or adapt to the stress of hazards". Adding on, Buckle et al (2001) also pointed out and added value to the work by defining resilience as the capacity of a person, group or system to withstand or recover from loss. These authors affiliate resilience to be a measure of how quickly a system is able to recovers from the negative impacts of disastrous hazards and technological failures. These authors, however, have persistently highlighted that "the concepts of vulnerability and resilience cannot be divorced from each other and so they are linked in a double helix" (Buckle, *et al*. 2001).

Adding more weight to it, authors such as Alinovi *et al.* (2009), have also argued that the ability by an affected household to bounce back from the negative effects of shock is usually determined by its ability to adapt to the risks which it might be exposed to. Whilst, Buckle *et al.* (2001), fervently cites that resilience is a positive attribute of a household, community and/or society and determination of its sustainability does not only imply lack of or reduced vulnerability. It is commonly characterized by attributes such as: resources, proper management skills, accurate and reliable knowledge and information, access to economic and social services, involvement in decision making and planning process, equitable social arrangements, support and supportive capacity, personal coping capacity, shared community values, shared community aspirations and plans and local engagement in social, community and local government capacity.

Still on the same note, Phiri (2010), defined resilience as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and to recover from the effects of a hazard in a timely and efficient manner". According to the United Nations Development Group (UNDG, undated: 38) resilience of a community can also be defined as "the ability of the community, society or even a household to "spring back" from a shock". These authors further argue that "the resilience of a community in respect to potential hazard events is determined by the degree to which the community has necessary resources and is capable in organising itself both prior to and in times of need". This is also in line with arguments from Buckle *et al.* (2001) provided above.

2.6. Effectiveness of drought resilience strategies

2.6.1. Supplementary feeding of livestock

Supplementing the feed of livestock is one of the strategies which are common during droughts, and households that are affected by droughts have employed it to reduce the death rates of their crops and animals. According to Hove et al. (2004), in areas that receive low and seasonal rainfalls, pastures usually get exhausted quickly and livestock tend lose weight or even die if the feed is not supplemented. Due to that reason, households usually employ supplementary feeding of livestock as a way of avoiding loss. As a result, households who stay in drought prone regions view the provision of supplementary feed as a valuable drought and livelihood resilience strategy, although households with low incomes usually find it difficult to purchase the supplementary feed.

2.4.2. Crop diversification

According to Hulme (1984), crop diversification is adopted by the rural households in Western Sudan in an attempt to build resilience to the increasingly frequent and intense droughts. Crop diversification is regarded as a dependable way of avoiding cases of total crop failures, because if one crop fails the others may survive. According to Lliffe (1980), it is important for households to grow different varieties of small grain crops which include millet, rapoko and sorghum. These are recommendable for production in drought prone areas because they are the best chance for the households to enhance their resilience. According to Dupriez (1988), mixing many seed varieties of the same crop can also reduce the risk of crop failure because some varieties mature earlier than others and they react differently to drought.

2.4.3. Conservation Agriculture (CA)/ Traditional farming practices

Traditional farming practices are also common as a drought resilience strategy employed by many rural households in Zimbabwe. Thorough literature research indicates that many communities in the country rely mostly on traditional farming methods such as intercropping, agroforestry, crop rotation, mulching, crop diversification and cultivation of drought resistant crops, among others. These are usually practiced by many rural communities as a way of maximizing yields and minimizing the risk of crop failure due to extreme dry weather conditions. In Zimbabwe, the government and other interested organisations have been involved in assisting households to embrace CA. According to FAO (2013) and Lipper et al. (2014), CA is based on three key principles which are crop rotation, mulching and minimum tillage and it also aims to ensure that households are not entirely powerless when it comes to dealing with drought challenges and increase their resilience. Mujere (2021), added that Conservation Agriculture (CA) is referred to by various names which include no till, zero tillage, conservation tillage, among others, and indigenous names such as *Pfumvudza* in Zimbabwe. Moyo *et al*. (2019), also posits that the CA methods do not only enhance soil fertility but also improve water retention hence making them very crucial for promoting drought resilience. However, Mungai and Nhamo (2021), strongly argue that CA techniques consume a lot of temporal resources to produce the most desired results and they also demand a lot of labour which may not be at the disposal of the already suffering households. Roncoli (2001), also cites that challenges of efficient and qdequate labour sometimes hinder the effectiveness of CA as a DRSs. The different types of some of the most common Conservation Agriculture techniques and practices have been outlined in detail in the paragraphs that follow.

2.4.3.1.Conservation tillage

This is a very common drought resilience strategy which involves the use of crop residue to cover the soil and help to reduce evaporation thus maximising the use of the available water (FAO, 1987). Even though, conservation tillage is sometimes considered to be time consuming and it requires abundant labour resources hence many people perceive it as a resource wasting strategy (Weiss, 1992).

2.4.3.2.Crop rotation

Bennet (2001), describes crop rotation as the process of constantly changing the types of crop grown on a specific plot of land season by season. It enhances the humus level of the soil as it ensures the extraction of minerals from all levels of the soil. According to Mujaya and Mereki (2006), this is chiefly due to the fact that different crop types have different root lengths. UNDP (2009), cites that rotating crops ensures that the soil preserves moisture as it enhances its ability to hold more water due to improved structure. As such, crop rotation can also be regarded as a common DRS which is employed by rural households as a way of reducing the adverse impacts of droughts.

2.4.3.3.Agroforestry

In one of their study, Nair and others (2009), cited that growing tree-based crops and leaving a number of trees situated within farming land can be another way of reducing the impacts of droughts that may adversely affect effective crop production. This is so because trees and bushes are able to cover larger portions of the soil and extract water and nutrients. Tree based plants can offer better soil cover and this can help reduce surface run-off. Moreover, trees can perform better in drought prone areas because they enable high carbon production in the soil. Carbon is important for plant growth due to the fact that it catalyses photosynthesis. Besides that, tree plants are vital during droughts because they are more resilient, as such, they would be important sources of fruits, livestock supplementary feed, firewood and building material.

2.4.4. Income generating activities

Sometimes it is important for rural households settling in drought prone areas to consider off-fam income generating activities. According to Harrison (1997), these activities can assist households to generate extra income, apart from depending continuously on failing rain-fed agriculture only. Harrison (1997), also commented on the income generation activities that have been adopted by rural households in Niger whereby households are involved in other off-farm generating activities such as pottery, knitting, weaving, tailoring, building, boiler-making and fish-farming. NGOs such as the Lutheran World Services are some of the organizations that are assisting households in building and shaping the skills that are related to these activities. Neafjes (2000), also highlighted that many people in rural areas in Southern Niassa have adopted a culture of resorting to piece jobs and many men of within the working age range move to cities and towns to look for work in heavy industries. UNFP (2002), also commented on the Hausa in Northern Nigeria, that they developed

craft skills that they depend on during droughts for extra income generation. Moreover, during the 1982-84 drought, many rural households in the southern part of Zimbabwe generated income by harvesting, shelling and selling wild marula nuts, a species found in several countries in the region (Chenje, 1984).

2.4.5. Cultivation of drought resilient crops

Cultivation of crops resilient to droughts has also been suggested by many academic sources of literature as one of the best chances to reduce the risk of droughts. According to Chazovachii *et al* (2010), sorghum is one of the most common drought resistant crops that is grown by many farmers in rural areas that are under the persistent threat of recurrent droughts. Kaseke (1996), also suggest that it is vital to grow millet in drought prone areas such as regions IV and V because these areas usually experience dry, hot and harsh conditions season after season and do not adequately support the cultivation of other crops due to their natural, geographical and physical characteristics. In order to encourage and support the growth of crops that are resistant to droughts in drought prone areas, the government has made some effort to promote their cultivation as evidence shows that some rural households oftentimes receive drought-resistant crops inputs such as seeds and fertilizer (Bhavnani et al., 2008). However, this strategy has been deemed less effective by many sources of literature because access to drought resistant crops inputs is still very limited among the most vulnerable households (FAO, 2011; Gov. of Zimbabwe, 2020). More so, most of the produce from these crops is mainly exhausted on less important activities such as beer brewing hence they may be deemed popular for other uses than directly enhancing resilience of households. Literature also revealed that sorghum and millet are scarce because of absence resources to purchase chemically treated and approved seeds as not all households get involved in the inputs programmes. (FAO, 2011; Government of Zimbabwe, 2020)

2.4.6. Community irrigation schemes and projects

Intensive community irrigation schemes are one of the drought resilience strategies that many academic researchers have mentioned as being applied in some areas in Zimbabwe and Southern Africa (Kaseke, 1996). Irrigation has been claimed to be paramount as it allows the community members to practice their agricultural activities all year round without depending entirely on rainfall only, which is struggling to sustain households in an environment whereby climatic changes have shifted the normal trends of the rains. However, the irrigation schemes have been

regarded as not beneficial to some households because most of them usually do not get involved in them. The schemes have managed to help only a few households, of which some may fail to fully use their portions because of the absence of adequate faming materials and resources as well as appropriate, up-to-date and modern farming knowledge.

2.4.7. Community food storage banks

According to FAO (1997), the system of community storage banks for food is adopted by many communities in Burkina Faso. Communities are assisted by the government to create banks at community levels and these small banks are managed by households themselves, who gather the food immediately after the harvests, store and sell back to the households at low prices. The Zunde RaMambo in Zimbabwe is based on the same concept.

2.4.8. External Assistance to households' resilience strategies

In Zimbabwe, organisations such as GOAL, CARE and Africa AHEAD, among others, sometimes assist vulnerable households in reducing the impacts of droughts which include food deficit. The type of these assistance programmes and initiatives range from public works programmes, school feeding programmes, food aid and food for work programmes. As far as this is concerned, NGOs and social organisations are a vital source of help during the process of achieving sustainable resilience to droughts.

2.4.8.1. Food Aid

Among the literature that was reviewed, food handouts were identified as a common droughts resilience building strategy. As Munro (2006) postulates, many households in drought prone rural areas receive assistance in the form of food stuffs during droughts when there are food shortages. Food aid is common in most parts of rural areas in Zimbabwe. The vulnerable households are involved in programmes whereby they receive food material such as maize, wheat, oil, beans, among others. NGOs such as GOAL, USAID and Plan International Zim are usually involved in the assistance of households through this way in times of droughts, but only as a coping strategy. Not only in Zimbabwe has been food aid a strong way of alleviating the suffering that is brought by the effects of drought, in countries such as Kenya, food aid id also one of the most common way through which the government assist households by during times of droughts (Nyamangwe, 1995).

According to Munro (2006), many households in rural areas depend on food aid in Zimbabwe and these food aid programmes have been going on for many years in rural areas since the drought of 1991 and 1992. The source focuses on the contribution of the food aid system as a drought resilience strategy which reduces the extent of hunger and starvation. However, Munro (2006), discovered that even though the food aid programmes have been suggested by many scholars to be an effective drought resilience and mitigation strategy, the programmes' effectiveness is hindered by the lack of wide coverage and inclusiveness as some of households that are vulnerable in the community sometimes face challenges in accessing the aid.

2.4.8.2.Food for work

Food for work is also one of the most common drought resilience strategies (DRSs) that is usually depended upon by households settling in drought prone rural Zimbabwe. The effectiveness of this strategy was identified as strong and sustainable in many rural areas. This is chiefly due to the fact that people may participate in other community development activities such as gully reclamation, afforestation and forestation projects in exchange of food and sometimes, cash from the government and non-governmental organisations. The households usually participate in community development projects while ensuring that they have food and also participate in other activities that reduce the negative impacts of droughts. The literature also revealed that food for work programmes are vital since they enable a systematic and sustainable development from a culture of expecting to be handed food for free. Sweet (1998), added that NGOs and the government in Namibia have also introduced the food for work projects. However, Maphosa (1994), argued that the food for work programmes sometimes benefit people who are popular only in the communities and leave out those who need it the most. Besides that, continuously handing food to households may be regarded as a poor way of helping build resilience because it may promote a dependence syndrome.

2.4.9. Gaps in literature

During the perusal of the literature on the research studies carried out on the effectiveness of drought resilience strategies, the researcher discovered that most studies focus on specific regions or communities in Zimbabwe. Handmer and Mehrothra (2012), postulates that this usually leads to limited contextual understanding of the performance of the drought resilience strategies in other areas that would have been left in the research study. O'Brien et al. (2007), states that this results

in the discovery of findings that can only be useful to the communities involved in the research studies and not the ones excluded. As such, this study aims to discover findings that are unique to the community of Munyarari on the effectiveness of the common drought resilience strategies, challenges faced during the implementation as well as the cultural, social and economic factors that affect adoption and effectiveness of these resilience efforts and interventions. The findings on the effectiveness of drought resilience strategies are going to benefit households the most hence allowing them to adjust and improve how they implement the resilience efforts guaranteeing their effectiveness and sustainability.

The researcher also noticed that most of researches being carried out tend to focus more on assessing and investigating short-term drought adaptation measures and not on the long-term drought resilience building strategies. These do not promote long-term and sustainable resilience, rather they only promote short-lived mitigation to the impacts of droughts. This make the studies to be valid for short periods of time and it deters assessment of the long-term effectiveness of drought resilience strategies as the efforts in practice would only be employed for short periods of time, particularly during dry and harsh conditions only (Wamsler, 2009). The researcher realized that it was necessary to conduct this study as a way of determining the long-term effectiveness of drought resilience efforts being employed in rural Zimbabwe and he focused the study on assessing of long-term DRSs only paying particular attention on not to include the short-term adaptation and coping measures. Findings on the effectiveness of the resilience efforts are crucial in enabling rural households to differentiate between long-term drought resilience strategies and short-term drought adaptation strategies.

2.5. Socio-economic and cultural factors influencing adoption and effectiveness of DRSs

2.5.2. Gender

Several studies have mentioned the issue of gender as both an issue and a factor that greatly determines success and effective implementation of drought resilience strategies. It is important to analyse gender of the head of a household as a factor in order determine how to it influences and affects adoption and success of DRSs. Despite the fact that some effort is being put in order to deal with gender blindness during the implementation of DRSs, the roles of women in drought resilience efforts in Zimbabwe are still not considered as important. This is the case regarding the idea that women are not well represented in disaster management oraganisations at all levels i.e.,

locally, nationally and globally. Enarson (1998), highlighted that the engagement and active participation of women in DRSs is only made realistic by top disaster management and humanitarian institutions. However, in order to plan better during the implementation of DRSs in rural Zimbabwe, there is need to assess the political, economic and historical factors that often affect women's active participation in DRSs. In addition, gender of a household head can also determine how a certain population is affected by droughts and respond to it, for example, which gender group is affected the most (risk assessment) and how individuals carry out decisions, for instance during voluntary preparedness and post disaster assistance, as well as communicating after a disaster has occurred (UNISDR and UNDP, 2009).

2.5.3. Age

Age is also another factor that determines and affect the adoption and success of DRSs that are employed by households. According to Abegunde et al. (2020, the age of the head of a household may sometimes affect whether a household take part in the implementation of DRSs and their innovative technologies. This is so because heads of households who are old aged sometimes apply their skills and experience they have gained over the past decades and perform better in reducing the impacts of droughts than heads of households that are younger. On the other hand, sometimes heads of households that are young tend to be more educated and it is highly possible that they might be better informed and knowledgeable in how they apply the DRSs. In addition, household heads that are young are more flexible to try out new and modern innovations related to DRSs. According to Justin et al. (2013), the extent to which older household heads rely to their experience and knowledge on how to reduce the impacts of droughts through the application of DRSs can also be determined by their level of education and their surroundings.

2.5.4. Households' perception of the consequences of drought and effectiveness of DRSs

This study also considered that the perceptions of households pertaining to the advantages of DRSs were also vital in influencing the rate at which rural households adopt different resilience strategies. As Tey and Brindal (2012) posits, if potential adopters do not fully perceive the advantages of implementing DRSs and the feasibility and compatibility of the strategies within their fields, they may not consider them further. This may be true considering that implementation factors such as "relative advantage" and "compatibility" usually affect the rate at which rural households are involved in drought resilience innovation strategies (Tey and Brindal, 2012). As

Dessart et.al (2019) cite, rural households are usually faced with a challenge of conflicting interests whereby they would be willing to participate in resilience efforts at the same time guaranteeing their production output. As such, the DRSs are usually adopted by households who expect the strategies to assist them achieve their economic goals tolerance (Gosling & Williams, 2010). Abegunde et al. (2020), has it that farmers who have a belief that droughts that are caused by climate change are capable of affecting the normal production of their crops are usually highly prepared and anxious to apply DRSs. Ferlie et al. (2001) and Rogers (1995) also support the above notion as they also discovered the prowess of the cited variables.

On the contrary, some authors argued that the implementation of Drought Resilience Strategies can be negatively correlated with specific and strategic economic goals, and also positively correlated with pro-environmental attitudes (Greiner, 2015; Greiner and Gregg, 2011; Kallas et al., 2010). This result is surprising considering that some resilience strategies and practices yield more than commonly applied conventional ones (Dessart et al., 2019). Be that as it may, it is not impossible to assume that during circumstances whereby households have a strong environmental vision, they may be pushed to disregard economic gains. Therefore, adoption may be guided by environmental values in a way that influence the will of households to change their routines to adopt. Siepmann and Nicholas (2018) also added that, these environmental values are usually stronger among organic farmers.

In addition, households who are capable of observing changes in weather patterns, such as increases in temperatures, unpredictable rainfall trends and heavy losses in moisture by soils in their fields, tend to be more prepared and motivated to implement drought resilience strategies than those who do not (Pannell et al., 2006). This is usually because households that can identify, observe, analyse and interpret the different severe weather patterns and shifts in the normalcy of things, among others, are capable of understanding (perceive) what they mean and quickly choose to apply DRSs. As such, they are more likely to be much more resilient to the impacts of droughts than households that are headed by individuals who cannot (Siepmann and Nicholas, 2018). The way households' view the impacts and effects of droughts on their lives sometimes determine whether they have enough knowledge concerning how to respond to it or not and why. Having that knowledge sometimes influence households to take part in the implementation of drought resilience strategies and enhance their resilience.

2.5.5. Farm size and income

Farm size and income may also be crucial in promoting adoption and success of climate change and drought resilience building strategies because of how they can help during the reduction of the impacts of drought. Households that have better financial resources are more likely to be involved in the drought resilience strategies and be more successful because they are able to access the necessary and adequate resources that are required. In addition, having more farming land can also imply that households would be much more concerned of losing a lot of crops and it enables them to apply DRSs on larger portions and they expect better results than those that have less land. Households with large pieces of land that they cultivate are sometimes forced to consider DRSs as a way of avoiding the loss of their crops and lose their market share and they may readily consider and invest in innovations that protect their businesses compared to small farm owners. According to Abegunde et al. (2020), households who own big pieces of land have more potential to adopt more drought resilience strategies and techniques and this indicates that encouraging households to adopt drought resilience strategies is a good thing. Abegunde (2020), also found out that dividing land may sometimes hinder the effectiveness of some drought resilience strategies. Land is an important capital in agricultural activities and households that have more land are able to adopt DRSs and perform better.

2.5.6. Education level of the household head

According to a study by Abegunde *et al.* (2012), education level of the head of household may also be considered as a factor that affect whether households adopt DRSs or not. According to Abegundce et al. (2020), household heads that have better educational qualifications can easily invite the idea of applying new and modern ways of reducing the impacts of droughts. According to Abid et al. (2015), education usually affects positively how households perceive drought resilience. This may be chiefly because the level of education of the head of the household influences how decisions concerning the implementation of DRSs are made within the household. There is a common belief that heads of households with better education status can be trusted to make well informed decisions based on facts and they can quickly suggest ways to deal with their drought challenges.

2.5.7. Gaps in literature

Regardless of how literature review played a very important role in revealing some of the major factors that influence adoption and effective implementation of drought resilient strategies, it tends to pay insufficient consideration of the social, economic and cultural factors like poverty, inequality and access to resources. According to O'Brien et al. (2007), it tends to pay more attention on the environmental factors related to drought such as its impacts to environment and environmental and climatic factors that influence the adoption and success of the drought resilience strategies. Therefore, this study aims to explore the socio-economic and cultural factors that are necessary and conducive for effective and sustainable resilience to droughts. In doing so, the study reveals more on the root causes of vulnerability to drought impacts.

2.6. Challenges faced by households during DRSs.

2.6.2. Poverty

Many households do not have access to the necessary and adequate resources that are required in order to pursue the different DRSs. The dire economic situation that affect almost everyone in rural areas has made it difficult for some households to effectively implement the DRSs effectively. Poverty is one of the major problems that greatly exacerbate the negative impacts of droughts as highlighted by Maphosa (1994). In other rural communities, setbacks such as lack of capital have led to serious inaccessibility to important farming materials such as fertilizer, seeds and other necessary farming equipment, which provide the necessary means to get involved in resilience building activities.

2.6.3. The increasing frequency and periodicity of droughts

According to Mushore (2013), households in Chiredzi reported that the frequency, intensity and periodicity of droughts are increasing and this has made it difficult for other vulnerable households to effectively curb the impacts. Due to that, some households have even found it impossible to effectively implement DRSs. According to UNFCC (1998), it is presumed that the frequency and intensity of droughts might become more severe in the rural parts of the country as a result of global warming. For instance, some parts of Manicaland Province experienced several severe droughts in the past 15 years (Ministry of Agriculture Zimbabwe, 2008, 2009, 2011, 2012, 2013).

2.6.4. Lack of markets

The literature that was reviewed also revealed that there is a serious lack of markets for some of the crops that are produced by households, especially vegetables and drought resilient crops, so the majority of rural households end up focusing on the cultivation of maize mostly for consumption and market value. Chazovachii et al. (2010) cites that it is difficult to access and create market for small grain crops, as households rely on the local market only.

2.6.5. The remoteness and inaccessibility of some rural areas due to their geographic locations

The geographic locations and remoteness of some of the rural areas in the country make them more vulnerable to droughts, especially those that are located in regions IV and V. This is so due to the fact that they may be located far away from marketing places such as shopping points, growth points, towns and cities. According to Roncoli et al. (2001) and Nyamangwe (1995), the terrible transport and communication networks make some areas difficult to contact as the roads may be in severely poor conditions to the extent that organisations and humanitarian actors sometimes are not encouraged and motivated to assist the most vulnerable communities. This remoteness due to the lack of enhanced structures, sometimes affect the decisions that are made by households concerning DRSs during times of great distress, crises and droughts.

2.6.6. Lack of integration, cooperation and coordination by government departments, NGOS and institutions

In one of their studies, Buckland and others (2001), cites that there is serious and incessant absence of coordination and integration among departments and arms of the government, Non-governmental Organisations and other institutions involved in Disaster Management activities in the country. Organisations usually face many setbacks such as interference by political views and preferences, shortage of important resources and materials and lack of cooperation during drought resilience building. According to the World Development Report (2010), only a few households benefit from drought resilience building activities promoted either by the government or NGOs since there is evidence of serious political interference. Moving on, rural households usually do not fully benefit from the services they are offered by different organisations and departments because the help they receive only help them for a short period of time usually just after droughts but there are serious food shortages that are usually experienced in the long run. The selection of beneficiaries who get incorporated into the drought resilience building initiatives and programmes

is usually done by community members that are popular and because of that, nepotism and favouritism enable only very few vulnerable households to enjoy the services from these programmes and initiatives. In the end, the vulnerable households usually end up being helpless and prone to drought risk once they are excluded from drought resilience building programmes and initiatives.

2.6.7. Gaps in literature

Studies on drought resilience strategies are usually carried out without adequate involvement and active participation of the local communities. Wamsler (2009), suggests that, this influences the discovery of results which do not reflect the divergent perspectives of the local community members on the performance of the resilience efforts and interventions. On the other hand, involving the community members leads to the discovery of results that are contextual to the study area, for instance, the social, economic and cultural factors in Munyarari that influence adoption and the success of the drought resilience strategies. Community members are also important because they can reveal challenges they personally encounter during implementation of resilience innovations making it possible to identify the crucial issues and factors that affect drought resilience in the study area. Actively engaging community members enabled that the results are more accurate and reliable. As such, this study intends to add more in the assessment of the effectiveness of the drought resilience strategies by actively involving the community members in exploring what drives the success and failure of resilience interventions. According to Nyamangwe (1995), this promotes and encourages community members to actively participate in planning, application and monitoring of performance of drought resilience strategies hence assisting in achieving sustainability.

2.7. Conclusion

The researcher noted that, there is shortage of adequate knowledge on the long-term effectiveness of DRSs. Therefore, having ample knowledge in that area enables the maintenance of sustainability of benefits of the implemented DRSs which effectively combat and withstand the continuously mounting impacts of climate change. Additionally, the social, economic and cultural factors that determine and enable the successful implementation of the drought resilient strategies, and challenges that are encountered by households during implementation and of the strategies have been ignored by many scholars, hence there is need to understand them so as to apply remedial

actions and measures. As such, the research study aims to address the above mentioned issues by bridging the knowledge gaps.

2.8. Chapter summary

This section of the research study covered on examination of pertinent literature covering on the assessment of effectiveness of drought resilience strategies. The literature review clearly revealed a complex interplay of traditional practices, community engagement, and policy frameworks in enhancing drought resilience in Zimbabwe. While significant strides have been made in that area, there is need for more detailed and thorough research in order to evaluate how effective, sustainable and appropriate are these drought mitigation and resilience strategies. The theoretical and conceptual frameworks are also presented in this chapter

CHAPTER 3

RESEARCH METHODOLOGY

3.0.Introduction

According to Kotari (2004), technique of research is a systematic and comprehensive method to solve a research problem. Because of the fact that this is both a qualitative and quantitative study, this chapter presents its methodology and its main and primary components include the area of study, design of the research, and target population, sampling techniques, data collection tools and the analysis methods applied and the ethical considerations observed by the researcher during the study.

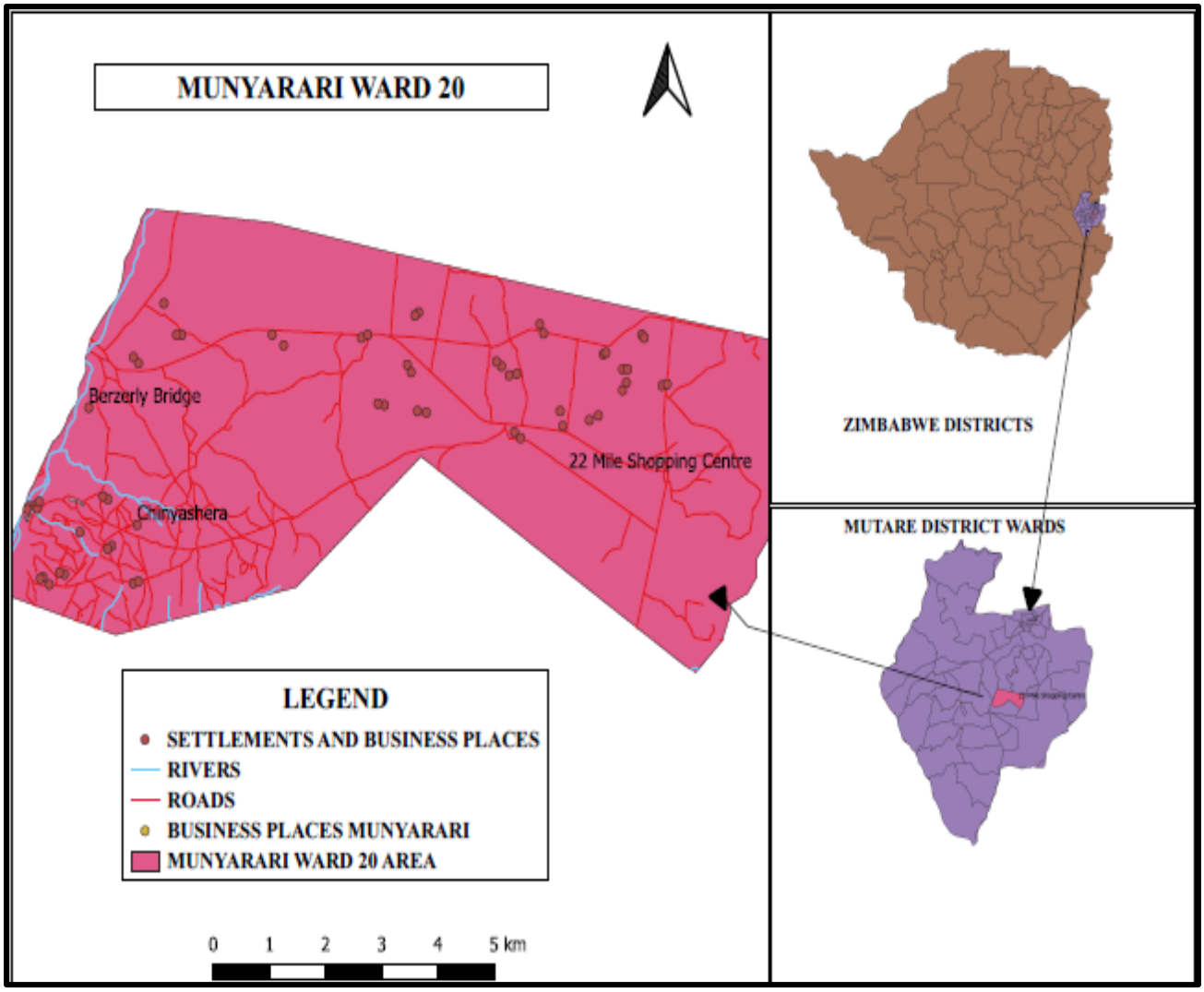
3.1.Description of the study area

The ward of 20 of Munyarari, is found about 35 km south of the city of Mutare in the province of Manicaland. Larger portions of the ward is located in Agro-ecological Region III and other areas are also located in region IV. According to Manatsa et al. (2020), the ward usually receives annual rainfall that ranges from a mere 500mm to 700 mm, and sometimes maximum temperatures can reach as high as 29 °C whilst in areas that are located within region IV, annual rainfall ranges from 450mm to 600 mm. Droughts characterized by high temperatures are commonly experienced in this area and these are mostly blamed on climate change and climate variability affecting most of the region. The growth of crops in Munyarari is primarily based the cultivation of small grain and climate change resilient varieties such as cowpeas, ground nuts, millet and sorghum and also, the rearing of drought resilient cattle and goat breeds. Agricultural activities in Munyarari are usually subsistence and communal because of the sandy soil that is common in many parts of the area. Munyarari Ward is sparsely covered by natural vegetation due to the unprecedented cutting down of trees. The 2022 revealed that the overall population of the area is about 8 146 people and it contains at least 3100 households (ZIMSTATS, 2022). Some of the villages that are found in Munyarari include Revesai, Manyengavana, Musi and Zvoushe, among many others. The ward is divided by Mpudzi dam and Mpudzi River in the East and by Odzi River which is to the West of the area. The researcher selected the study area because it is one of the most vulnerable areas to droughts in Manicaland Province hence it was deemed appropriate for the study.

3.2.Target population.

The target population refers to a set of elements of interest from which information is desired. The researcher selected household heads as study respondents due to the fact that they are the ones who apply the different drought resilience strategies under analysis and they directly affect their resilience to droughts. Their personal experiences revealed the nature of performance of the drought resilience efforts and the level of their effectiveness that were not identifiable by mere observations. Representatives from AGRITEX, Social Welfare department and the Ministry of Agriculture were also included as key informants in order to analyse how they perceive the perfomance of the DRSs that are relied upon in the study area. Representatives from AGRITEX were targeted due to their consistent and direct contact with the households who practise the different resilience approaches, most of which they encourage and support. The researcher also targeted responsible authorities and leadership in the study area who included the councilor and village heads in order to gather important information concerning the performance of the drought resilience strategies that are employed within the areas of their jurisdiction.

Representatives from the Ministry of Agriculture and Climate Change and AGRITEX were also among the target population because their institutions are responsible for supporting and encouraging the promotion of drought resilience in the country. They were of vast importance as they had vital information on effectiveness of the resilience strategies, such as food for work, food aid, public works and Pfumvudza/ Intwasa programmes. In addition, they have ample knowledge on drought resilience strategies that are employed in most rural parts of the country and as such, they contributed during the assessment of their effectiveness.



Map 3.1: The map of Munyarari, Ward 20. Source: Map created by the researcher (Fidelis Muchena).

3.3.Research design

A mixed approach of data collection was used by the researcher in order to collect both quantitative and qualitative data on the effectiveness of the drought resilience strategies employed in the community, the social, economic and cultural factors that determine adoption and success of drought resilience strategies as well the challenges that encountered during implementation these strategies. According to Yin (2004), the design of research is the tool that connects the collected data to the main questions and hypotheses of the research. An exploratory research design was adopted by the research as it was found to be appropriate in exploring and investigating effectiveness of the drought resilience strategies employed in the study area. According to Maree (2007), an exploration plan is the structure or methodology that shifts the basic philosophical

presumptions to deciding which respondents to use, what information gathering techniques to employ and how to complete the information investigation. In order to achieve this, the researcher had to rely on accounts provided by respondents describing what they experience and observe. The qualitative research was vital in the study because it enabled a deeper exploration of the socio and economic context and lived experiences of households. This approach strengthened the weaknesses of the quantitative method by offering rich, detailed insights into the complex factors influencing drought resilience. Data collection methods such as in-depth key informant interviews, questionnaires, observational surveys, among others, were relied upon by to gather first hand data about the performance of drought resilience strategies. Also, a qualitative design was resorted to due to its ability to capture the voices of the marginalized populations, ensuring that vulnerable households' perspectives are heard and considered in the analysis (Tawodzera et al., 2018).

The quantitative approach was also employed by the researcher in this study. It was essential as it enabled the researcher to collect and analyse numerical data types in order to identify patterns and carry out correlations analyses. As such, structured questionnaires, interviews and sources of secondary data were used for the collection of quantitative data. The approach also provided a solid foundation for drawing generalisable conclusions and making data-driven recommendations. Diverse Pearson's coefficient of correlation analyses were employed to determine the relationship between household income and effective implementation of DRSs, relationship between gender and effective implementation of DRSs, relationship between age and effective implementation of a drought resilient strategies as a way of drawing valid and accurate conclusions from the quantitative data. In addition, the Pearson's Chi-square test of association was also applied by the researcher to determine the association between applying DRSs and improved drought resilience. The researcher also reviewed the data that already existed before carrying out the process of data collection from the field. This helped the researcher to study and understand how households in the study area usually deal with their drought challenges during times of hardships. This helped to guide the direction and primary data collection for cross-checking information collected in the field (Holzman and Boudreau, 2008).

3.4. Sampling size and its determination

Lincoln and Guba (2003), posit that qualitative investigation is a consistent approach with a number of beliefs that provide insight into the mechanisms and dynamics of this world. As such,

to determine the impact of the existing drought resilience strategies, the researcher employed the mixed methods to carry out the data collection process and the two-stage sampling technique was used to obtain a representative sample of the households. For the sake of the study, 40 household heads from 5 villages were selected from the study area for participation as respondents. The researcher applied the convenience sampling technique in order to select villages from which the respondents of the study were selected since involving all the 20 villages was not possible. The 5 villages were conveniently selected because they could easily be accessible. Musi, Zvoushe, Munyarari, Manyengavana and Tutsai villages were selected. Due to that, 20% sample size of the 20 villages resulted in the convenience selection of only 5 villages. 8 participants were then randomly selected from each of the conveniently selected villages to come up with 40 respondents. 20% sample size was chosen because it would help improve validity (Crouch, 2001). The study also targeted four key informants for interviews, and these were the Agricultural Extension (AGRITEX) officer, the Councilor of ward 20 and a representative from the Ministry of Agriculture and Climate Change (Agronomist) and 2 traditional leaders (village heads)

3.5. Data collection tools/ instruments

To gather information on how effective are the drought resilient strategies applied in rural Zimbabwe, the researcher depended on both the primary and secondary sources of data. Both quantitative and qualitative research methods were used and as such, the researcher used in-depth interviews, questionnaires and observations to collect data. This made it easier for the researcher to obtain direct feedback from the participants as these tools aided in the creation of reliable data for the study.

3.5.1. Questionnaire

This tool usually comprises of a list of questions followed by their suggested answers (Abawi, 2013). They were designed and distributed to all the 40 household heads who participated in the study. This number was the 20% sample of the target population based on villages. Among this sample, 22 participants who practised any of the existing drought resilience strategies were randomly selected from the 5 villages while all the household heads of the 18 households who did not take part in any of the identified drought resilience strategies were all selected. To them, the questionnaires were administered. Questionnaires were used to collect valuable information on

type of crops that households grow. Also, information regarding the effectiveness of the drought resilience strategies was gathered through this way. The document included close ended questions that demanded that the household heads specify whether there were any differences in the production outcomes between those who practised the drought resilience strategies and those who did not. Information about the production outcomes of the households such as crop yields in kilogrammes, number of livestock and the total incomes was also gathered using questionnaires.

Questionnaires helped to determine the differences in drought resilience levels between the households that practise the drought mitigation efforts and those that do not. Adding on, the valuable information on the socio-economic factors influencing the adoption of the drought resilience strategies was partly collected through this way. Moving on, important quantitative information which include the number of beneficiaries of external aid programmes such as, food aid and food for work programmes, was also gathered through this method. This allowed the researcher to determine the dependability of households on the drought resilience strategies as well as the contribution of external aid programmes as back up. Also, through the questionnaires, the households revealed the drought resilience strategies that they practise, as well as their effectiveness by highlighting whether they were benefitting from them or not.

Questionnaires were resorted to as a data collection tool because they are cost-effective, especially when collecting data from large samples such as whole wards (Dillman, 2014). They were also reliable as they could be administered quickly and the household heads could complete them at their own pace which ensure reliable and fast collection of high volumes of data (Dillman, 2014). The questionnaire also ensured that all the respondents were asked the same questions as the process allowed for standardization of the data collection tool. Groves et al. (2013), has it that it helps to reduce bias and increase reliability. Questionnaires were also favoured by the researcher because they ensured that anonymity was maintained which encouraged the respondents to provide honest and accurate information (Dillman, 2014). However, the reliability of questionnaires may be affected by the household heads' social desirability bias as they might be compelled to provide answers that they think are socially acceptable (Groves et al., 2013).

3.5.2. Interviews

The researcher held about 5 Interviews with key informants. The key informants who took part in these interviews included the ward councilor, the extension officer (ARITEX), 2 village heads and

a representative from the Ministry of Agriculture and Climate Change (Agronomist), all of whom were of significant contribution to the study. Through key informant interviews, important information which include the views and judgments on the performance of DRSs was revealed, for example, the AGRITEX officer revealed on the drought resilience strategies that are applied in the study area and crops that are grown. Valuable information on average yields and income produced by participating households and challenges encountered during the implementation of the DRSs was also collected through this method. The ward councilor also divulged on the effectiveness of the drought tolerant crops and the number of households depending on humanitarian among respondents.

The interview method of data collection from the key informants because it allowed for in-depth information on the actual effectiveness of each and every resilience strategy. Cresswell (2014), cited that interviews ensure that respondents provide their personal perspectives and insights. This enabled the researcher to gain a deeper understanding of the respondents' experiences and opinions about the effectiveness of the drought resilience strategies and the challenges that the households encounter during implementation. More so, interviews were one of the best qualitative data collection tool from the key informants because they enabled the researcher to establish rapport with them, building trust and encouraging them to be honest in their responses. However, interviews were time consuming to conduct because they allowed an in-depth discussion and most of the questions were open ended. Also, conducting interviews was very expensive as they required traveling.

3.5.3. Survey observations

Survey observations were also relied upon by the researcher for gaining deep first-hand knowledge concerning the DRSs that are employed by households. The researcher carried out observations during the farming season so that he could the identify crops that are grown, the times of planting as well as methods of crop and animal management. This data collection criterion was chosen due to its ability to provide firsthand insights into implementation and effectiveness of drought resilience strategies in real-world settings. Without altering or tampering with the surroundings, the researcher observed the quality of the crops in the fields, the quantities of livestock, the general health and well-being of the community members, levels of water in the sources, the quality of the food, number of meals taken by the household members and even the quality of the households'

properties, among others. This was done as a way of presuming the resilience level of the community. This also made it possible to record real-time data pertaining to how effective the implemented resilience strategies are. Adding on, along with actively participating in community programs and activities, the student also observed the attitudes and behaviors of the participants and by developing trust with participants, he was able to understand deeply about the community dynamics and provide more sincere observations (Antonio, 2013). Regular site visits to observe the farming practices, water management systems, and community initiatives were the best ways of acquiring the most accurate and reliable data. Detailed notes and photographs to document conditions and practices were also taken.

Be that as it may, the reliability of the survey observations was limited by many challenges including the fact that the researcher's presence and his expectations or biases could influence the phenomenon being observed. Also, observations were not adequate in capturing the full context of the effectiveness of the DRSs. For instance, they might have been vital in observing the types of resilience measures being employed by the households but they did not reveal anything about the challenges the households experience during implementation. More so, the process of carrying out survey observations was consumes a lot of temporal reso urces and expensive because the researcher had to travel to the study area more often.

3.5.4. Secondary data sources

The researcher also depended upon multiple secondary data sources as a way of gathering all the data and information he could find concerning the climate and demographic characteristics of the study area and also during the review of literature. Important data was collected from traditional leaders, the extension officer and the councilor, which revealed on the types of DRSs adopted by households, number of households in the study area as well as the types of assets owned. Some of the data was also collected from the sources found on the internet.

3.6.Data presentation and analysis methods

Kothari (2004), highlights that statistics is a scientific discipline that involves processing data through ways such as editing, coding, classifying and tabulating it. All these activities are part of analysis of the data that would eventually contribute to the presentation, discussion and conclusion of findings. Both qualitative and quantitative methods of data analysis were used in this research.

Data that collected was critically analysed and comparisons and the researcher generated conclusions about the performance of the drought resilience strategies. Experiences are usually seen from different perspectives hence contrasts and comparisons of different accounts were made by the researcher. Quantitative data was expressed in the form of percentages, analysis of correlation and hypothesis tests of associations. Some of the results were also presented on simple tables, bar graphs and pie charts. The researcher also depended on analytical tools such as Microsoft Excel and Statistical Package of Social Science (IBM SPSS Statistics 2O) when carrying out analyses.

3.7.Validity and reliability of data collection tools

As a way of ensuring relevance of the collected data, more than one method of data collection was used and data collection tools such as questionnaires, observations and interview guides were used. The researcher triangulated these methods in order to validate the research findings. Data on the effectiveness of the drought resilience measures was gathered from individuals with different demographic characteristics including age, gender, socio-economic status, occupations and positions. As such, the researcher targeted the village headmen, the ward councilor, household heads (both males and females), and the agricultural extension officer, among others, as study respondents. This helped to incorporate all the available information on the practical drought experiences and theoretical knowledge in the study area, thus further triangulating of the findings. The results were also compared with empirical studies by earlier researchers to check for consistency. The participants were assured that the research was being carried out only for academic purposes and because of that, information was shared without holding back and this enhanced the reliability of the collected data. The data was also thoroughly checked and verified to ensure that it fully satisfied all the research study objectives. The researcher also pilot tested the data collection tools before collecting the data.

3.8. Chapter summary

The methods for gathering and analysing data are outlined in this chapter. It gives defined approaches for gathering data and guarantees that the research is methodologically sound. The research design, which explains the study's general methodology and design using both the qualitative and quantitative data, is also presented within this section. Also, the tools and instruments used to collect data which include surveys, focus groups, and interviews, are also listed

in this chapter. Additionally, it presents the methodical approach to data collection, presentation and analysis, guaranteeing consistency and dependability. The chapter also covers the ethical concerns surrounding the study, such as participant protection, confidentiality, and informed permission.

CHAPTER 4

PRESENTATION AND ANALYSIS OF RESULTS

4.0. Chapter Introduction

In this chapter the researcher managed to present the results revealed and the discussions that were made on the effectiveness of the drought resilient strategies (DRSs) employed in Munyarari, socio-economic and cultural factors influencing the adoption and success of the strategies and the challenges encountered during implementation of these strategies. Data collection tools such as questionnaires, interviews, observational surveys and secondary data sources were relied upon during the study.

4.1.The effectiveness of drought resilience strategies (DRSs)

Diverse drought resilience strategies (DRSs) were identified to be common in the study area and these include: crop diversification, irrigation, supplementary feeding of livestock, observation of Indigenous Knowledge Systems (IKSs), conservation agriculture (CA), participation in other off-farm income generating activities and cultivation of drought resilient crops.

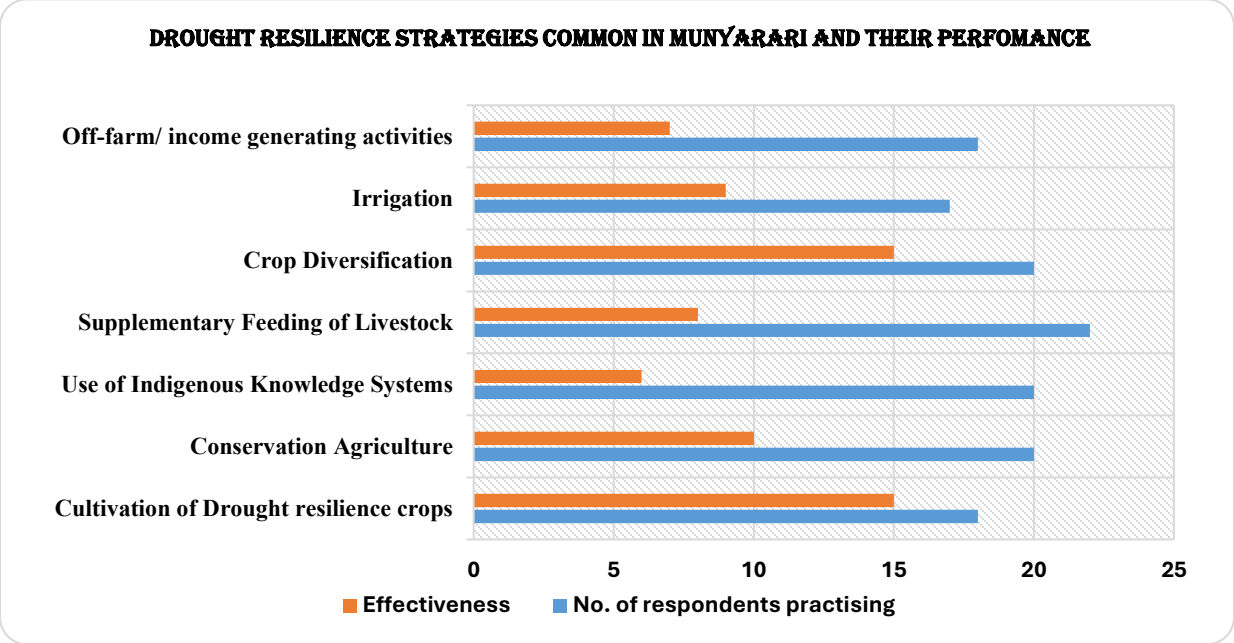


Figure 4.1: The effectiveness of drought resilience strategies based on the perceptions of respondents

The effectiveness of these drought resilience measures was determined by assessing and comparing the production outcomes, particularly average annual crop yields and monthly income

produced and generated by households who are involved in drought resilience activities and those that are not. The researcher was also determined to assess the perceptions of the Munyarari households on effectiveness of the DRSs by considering benefits that are gained through them. Findings on the perceptions of households on effectiveness of DRSs show that the most effective strategies are crop diversification and cultivation of drought tolerant crops which are practiced by 20 and 18 respondents, respectively. About 15 respondents admitted in both the cases that the strategies were effective in improving households' resilience. Conservation agriculture was applied by 20 respondents and only half of them (10) could confirm that it was an effective DRS. The data showed that observation of IKSs, supplementary feeding of livestock, irrigation and income generating activities were the least effective strategies as highlighted by low numbers (all above half of participants) of respondents confirming that they were effective. In addition, 9 respondents claimed that observation of IKSs was effective, 8 claimed that supplementary feeding of livestock was effective and 9 respondents highlighted that irrigation was effective. The data also revealed that the least effective DRS employed in the study area is getting involved in income generating projects and activities with only 7 respondents showing that it was effective. This data was used to determine the extent to which the identified strategies were contributing to the overall resilience of households to droughts. These findings clearly show that the DRSs that are employed in Munyarari are not fully effective in improving the resilience of households to droughts. The results showed quantities less than half of the participants acknowledging that these strategies were effective.

4.1.1. Determining the effectiveness of drought resilience strategies through Pearson's Chi-sqare test of association

In order to determine whether the application of drought resilience strategies contribute to better resilience, the researcher perfomed a mathematical Chi-square test at 0.05 per cent confidence level. This was done as a way of determining whether there is any reltionship between aon the households involved in the implementation of DRSs. This test was based on the hypothesis below:

H_0- There is no significant association between applying drought resilience strategies and improved resilience to drought

H_1- There is significant association between applying drought resilience strategies and improved resilience to drought

If P> 0.05 : Reject H_1 and accept H_0

If P<0.05 : Accept H_1 and reject H_0

	N	Mean	Std. Deviation	Std. Error Mean
YIELDS	22	495.0000	192.17428	40.97169

Table 4.1: Descriptive statistics used during the determination of association between application of DRSs and effective drought resilience

	Test Value = 500					
	T	DF	Sig. (2-tailed)	Mean Difference	.05% Confidence Interval of the Difference	
					Lower	Upper
YIELDS	-.122	21	.904	-5.00000	-5.0260	-4.9740

Table 4.2: Determining association between application of DRSs and effective drought resilience

The analysis presented in the data aims to evaluate the association between the application of drought resilience strategies (DRSs) and effective drought resilience outcomes from a sample of 22 participants involved in DRSs, measured in terms of household yields. Therefore, 0.904 > 0.05, we reject H_1 and accept H_0. In this context, it is clear that there was no association between implementing drought resilience strategies and achieving better resilience to droughts. The t-value of -0.122 indicates that the mean yield (495 kg) is very close to the hypothesized mean yield of 500 kg. The mean is slightly below the minimum mean yields but the difference is minimal. The mean difference of -5.00 kg is not substantial enough to imply a meaningful impact of applying DRSs on yield outcomes of those applying the DRSs. More over, the p-value of 0.904 is significantly greater than the 0.05 threshold. The analysis reveals no significant association between the application of DRSs and effective drought resilience in the study area indicating that the strategies are not fully effective in reducing the impacts of droughts.

4.1.2. Cultivation of drought resilient crops

It was revealed in the study that households in Munyarari grow a variety of drought resilient crops and the number of households cultivating these crops differ depending on the type of crop. These crops include: sorghum, millet, sunflower, rapoko, cowpeas, and they are grown by more than half (55%) of the participants. In order to assess the effectiveness of cultivation of drought resistant crops, the researcher considered and identified differences that exist between the production outcomes of drought resistant crops and other crop species. Figure 4.1 below shows the differences between the total yields of drought resilient crops and other crops grown in the study area, such as maize.

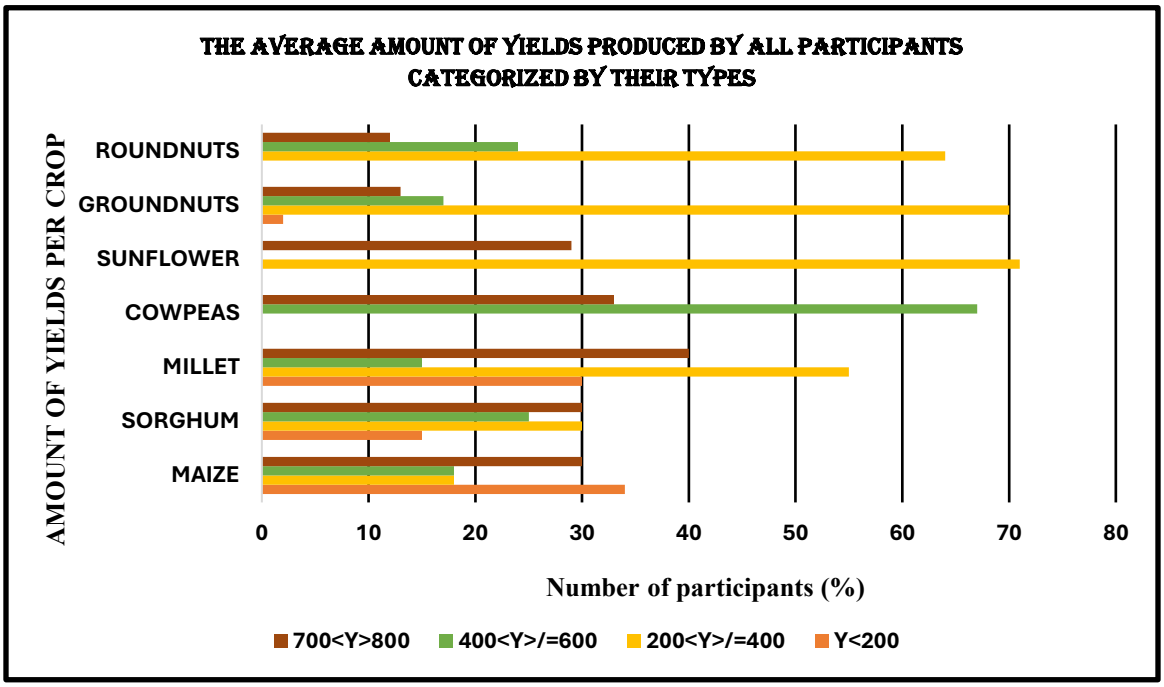


Figure 4.2: Average quantities of produce in kilogrammes generated by participants categorized by crop type

There were clear differences in the amount of surplus that was generated between drought resilient crops and other crops. Questionnaires revealed that surplus that was accumulated in the category of drought resilient crops was high as compared to other categories. About 70 per cent of households that grow drought tolerant crops claimed that they produced yields above 500 kg followed by legumes 68 per cent of the participants producing yields above 500 kg. Maize was the least with only 5 per cent of participants producing yields above 500 kg. 15 respondents among the study sample declared that the strategy was effective in enhancing resilience to droughts.

Households that grow these drought tolerant crops emphasized that it is near to impossible for them to severely suffer from the negative impacts of droughts because they are capable of adapting to warm and dry climate. One of the traditional leaders reported in an interview that some of short seasoned crop varieties that are cultivated in the study area enable effective reduction of the impacts of drought on agricultural activities such as, growing of crops and rearing of livestock production in the area because they delay the development of seeds in times of droughts and dry spells. Therefore, one can safely conclude that growing drought resilient crops is an effective way of alleviating the impacts of droughts and enhance resilience in the study area.

4.1.3. Conservation Agriculture

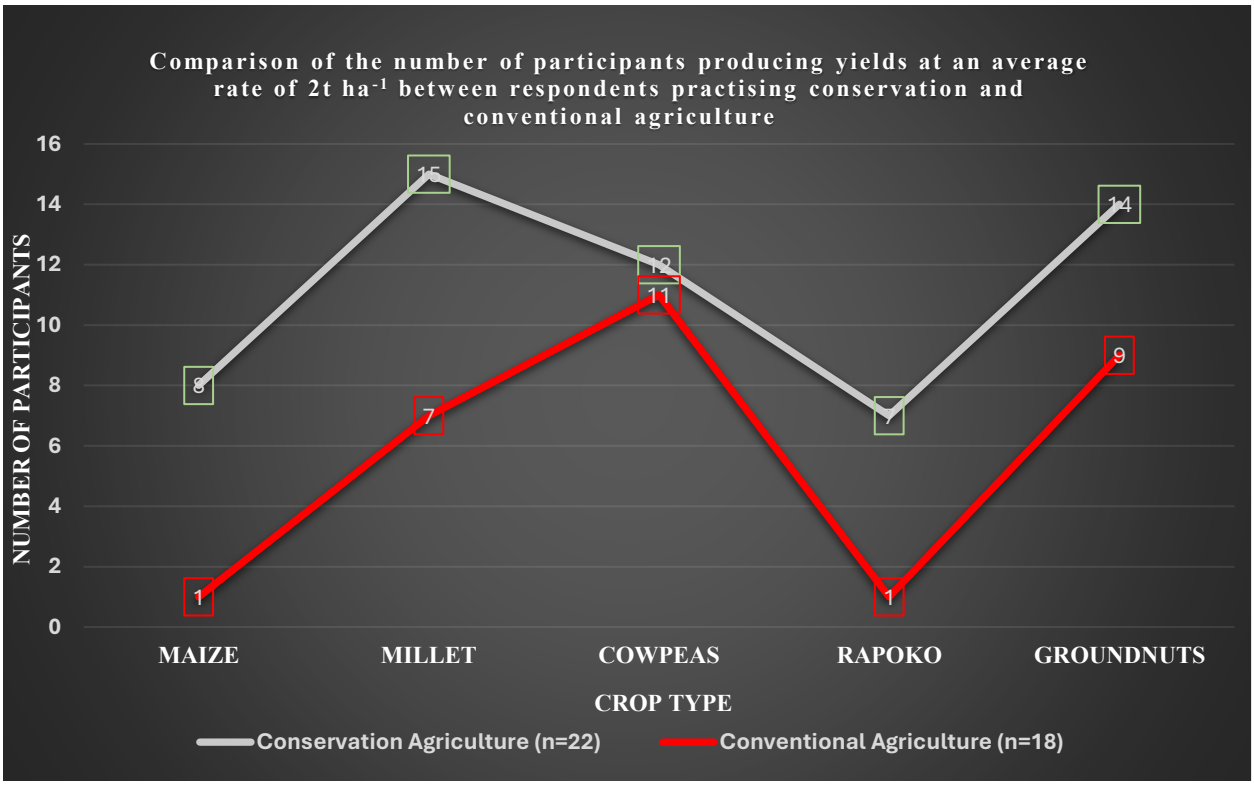


Figure 4.3: Average amount of produce per hectare per crop generated by participants practicing conventional and conservation agriculture

The study also revealed that conservation agriculture involving crop rotation, mulching, zero-tillage, intercropping and agroforestry is common in Munyarari. Among the 40 households that participated, about 55% of them indicated that they participated in either one or more conservation agriculture practices. The 55% of households who apply conservation agriculture rely on various techniques as shown in Table 4.3 below.

Technique	Number of participants
Mulching	18
Crop rotation	20
Intercropping	23
Conservation tillage (zero tillage)	15
Agroforestry	13

Table 4.3: Conservation agriculture techniques commonly applied in Munyarari and the number of respondents practicing them

The findings revealed that about 45% of participants mulched their plots, 15 households practise zero tillage whilst 20 households rotate the crops they grow. The data also revealed that, 12 of the 22 households applying conservation agriculture highlighted that they produced yields above 500 kg compared to only 4 who produced the same amount through conventional agriculture. These findings demonstrate the less effectiveness of implementing conservation agriculture in the study area as highlighted by less than half of the participants managing to produce yields above 500 kg. Only 10 respondents among the study sample claimed that they perceived conservation agriculture as an effective strategy to reduce drought impacts. However, the yields that were produced by respondents practicing conservation agriculture were higher than those produced by respondents resorting to conventional method which shows that there are certain advantages to employing CA as a DRS. An officer from the Ministry of Agriculture confirmed in an interview that conservation agriculture could be an effective drought resilience strategy because it benefits households by providing a balanced diet because it enables households to grow different crops that are sources of various nutritional benefits. Respondents reported that crops such as, water melons, pumpkins, vegetables and fruits, are usually produced as a result of the practise of conservation agriculture and these are vital during dry times as they can be supplemented with cereal crops. About 15% of the participants reported that they did not employ conservation agriculture because it requires a lot of labour, for instance, most households start the process of preparing the land for CA during the months of September, October and November. This shows that the method require a lot of labour resources to effectively deal with the effects of droughts. Others claimed that they did not have the knowledge of its benefits (20%) whilst others claimed that they did not really notice any differences that are made by the strategy (20%).

Giller et al (2009), also suggest that sometimes farmers tend to be knowledgeable about conservation agriculture though there are misconceptions about the method. This research uncovered these misconceptions in the study area, for instance, some respondents strongly believed that crops can only be mulched using crop residue. This discourages households in Munyarari from using this practice because they usually use plant residues such as maize, sorghum and millet stocks as animal feed hence they cannot spare some for mulching. This clearly demonstrates why only a few respondents resort to some conservation agriculture techniques.

4.1.4. Use of Indigenous Knowledge

The study also revealed that there is ample traditional knowledge and indigenous knowledge (IK) that is relied upon by people in Munyarari to deal with the effects of droughts. Some households in the study area reported that they usually apply some of traditional ways and skills of limiting the effects of droughts they have perfected through the experience they have accumulated by repeating some of the techniques over and over again during multiple drought times. About 20 respondents claimed that they adopted one or more indigenous knowledge practices whilst 9 of them regarded the practice as effective in improving resilience of households. The indigenous knowledge practices that are common in the study area are practiced by the respondents as illustrated by Table 4.2 below.

Indigenous Knowledge Technique	Number of respondents observing
Presence of migratory birds	**16**
Presence of migratory butterflies	**14**
Good fruiting of Lannea (tsambatsi or tsombori) species	**8**
Mist/ haze on hilly terrain	**14**
Circular halo around the moon	**20**

Table: 4.4: Indigenous Knowledge common in Munyarari and the number of respondents observing them

The tradition of exploiting the indigenous knowledge was also confirmed by the following excerpt from an interview with one of the key informants:

"....We predict good normal seasons by the following indicators, general wind direction presence of migratory birds, (e.g. swallows, black and white storks), good fruiting of Lannea species,

presence of butterflies flying in from the north in a southerly direction starting October, a characteristic mist/ haze on hilly or mountainous terrain after the winter months, a circular halo around the moon is taken to mean that heavy rains are expected and very high temperatures during the dry months of September/ October/ beginning of November…" (***Key informant 2***)

Respondents also claimed that they meticulously study behavior of plants and animals such as bird species like Dendera and Mafudzamombe as a way of predicting the patterns and trends of weather conditions in order to determine the occurrence of severe droughts and dry spells or low rainfalls. This enables timely and effective preparation in the form of DRSs to be made in advance, usually before the full impact of droughts have struck. It is important to note that households actually depend upon IKSs as a way of shaping their resilience and reducing vulnerability to droughts. This has enabled many households to make informed and engage in DRSs. Ajani et al. (2013), added that there is a lot of IKS which can be used to predict weather and climate conditions and assist rural households in effectively implementing drought resilience efforts.

4.1.5. Supplementary feeding of livestock

Based on the quantitative and qualitative data collected in the study, it was established that households that practise supplementary feeding of livestock usually manage their livestock better during times of shock. The data that has been presented and analysed was aggregated according to the number of households who practise supplementary feeding of livestock (22) and those who do not (18). There were clear and significant differences between the average quantities of livestock owned by those who resort to supplementary feeding as a drought resilient strategy and those who do not. Eight respondents claimed that livestock supplementary feeding was an effective DRSs. The researcher analysed the different trends in quantities of livestock species including goats, cattle, sheep and donkeys. Households relying on livestock supplementary feeding claimed that they owned an average of 6 heads per animal type. Those depending on traditional grazing had an average of 3 heads per animal type with about 11 of them recording the same value. The data also show that 45 percent of the participating households owned at least 5 sheep, 86 percent owned at least 5 cattle, 55 percent also owned 5 goats and above, 86 percent of households have at least 5 donkeys whilst pigs were the least being owned by only 45 percent of the households with at least five beasts.

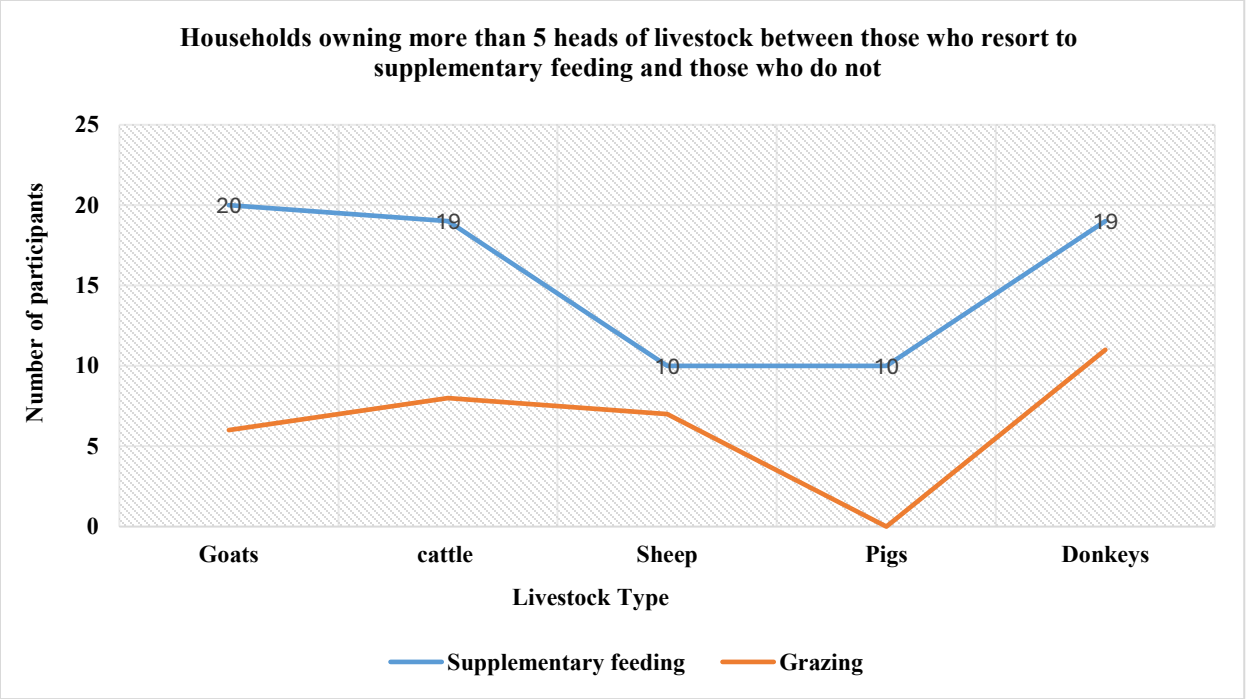


Figure 4.4: A comparison of quantity of livestock (disaggregated by type) owned by participants in the study who apply and who do not apply supplementary feeding of livestock

Findings displayed above show that, despite the few claims by respondents that the strategy was effective, on average, 84 percent (18 households) of the households who apply livestock supplementary feeding own quantities of livestock which range from 5 to 10, which clearly highlight the importance of supplementary feeding of livestock during drought periods. On the contrary, the numbers of livestock owned by those who do not implement livestock supplementary feeding tend to differ with those who practise in most of the categories. Only 44 percent of the households that depend entirely on grazing own livestock heads ranging from 5 to 10 per animal type. Only 35% of the households owned at least 5 goats, 45% owned at least 5 cattle, 40% owned at least 5 sheep and no household that do not employ supplementary feeding owned pigs. This illuminates that livestock production in Munyarari Ward does not reach its full potential without supplementary feeding particularly during drought times hence it is effective.

4.1.6. Crop diversification

The study revealed that respondents cultivate my types of crops in the study area as highlighted by 85% of the households growing maize, 40% growing drought resilient crops/ small grains (Millet, Rapoko and Sorghum) and about 60% cultivating legumes (Groundnuts, Roundnuts and Cowpeas). Although drought resilient crops are encouraged in drought prone areas, data from Munyarari shows that they grow less grains and legumes as compared to maize.

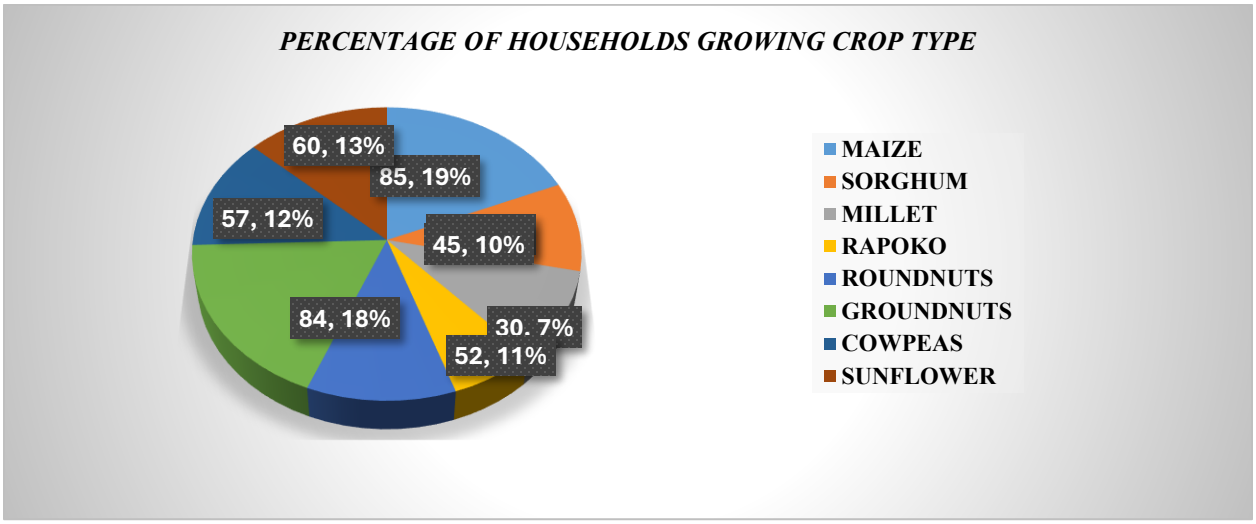


Figure 4.5: Distribution of respondents growing different crop types in the study area

The analysed data showed that depending on maize cultivation alone in Munyarari affects the resilience of households. This was evidenced by differences in amount of surplus (yields above 500 kg) produced by those who depend on maize production and those who cultivate a wide range of crops. About 52 % of households that cultivate maize do not manage to produce 500 kg of produce whilst 53% of respondents cultivating maize and other crops managed to reach yields above 500 kg. About 70% of households cultivating legumes produced yields above 500 kg. Small grains and legumes are promising to be a suitable match for cultivation in the study area with data showing high production of yields than maize. It is apparent that diversifying maize production with other crops is the way that works effectively in Munyarari Ward as highlighted by 15 respondents confirming in the questionnaire that the strategy was effective as a drought resilience measure. This was confirmed by the following excerpt from an interview with one of the key informants;

*"…. Our staple food is Sadza and we used to grow maize and have bumper harvests. We last experienced such harvests in the 80s. Growing maize these days is like gambling due to recurrent heat waves and unpredictability of rainy seasons. Farming itself these days is like gambling. When I say farming is like gambling I mean that if you do not plant with the early rains, like this year, in some years it is possible to start early and the crops wilt and die while those who started late may be able to reap it is unpredictable so we have resorted to growing mapfunde (soghurm mhunga (millet) and rukweza (rapoko) which require less rainfall…" (**Participant 1**)*

This information strongly suggests that dependence on maize production alone exposes households to impacts of droughts. The councilor also reported that butternuts, okra, pumpkins, chilies, cabbage and African spinaches were being cultivated in the study area and they are important for both household food production and for selling.

4.1.7. Irrigation

Supplementary irrigation was identified as one of the least common drought resilience strategies employed in Munyarari. Only 4 participants reported that they had access to the communal irrigation scheme situated at Mpudzi Dam, 13 claimed that they resorted to irrigation of their crops during dry spells using their own resources whilst the other remaining 23 participants highlighted that they lacked access to irrigation facilities and resources. The data show that those who irrigate crops have better average monthly income and annual crop yields than those that depend on rain-fed agriculture. Of the 17 households applying irrigation, 9 of them had income above 200 USD whilst among the 23 households depending on rain-fed agriculture, only 2 households had income above 200 USD. Many households reported that they adopted irrigation on their own capacity.

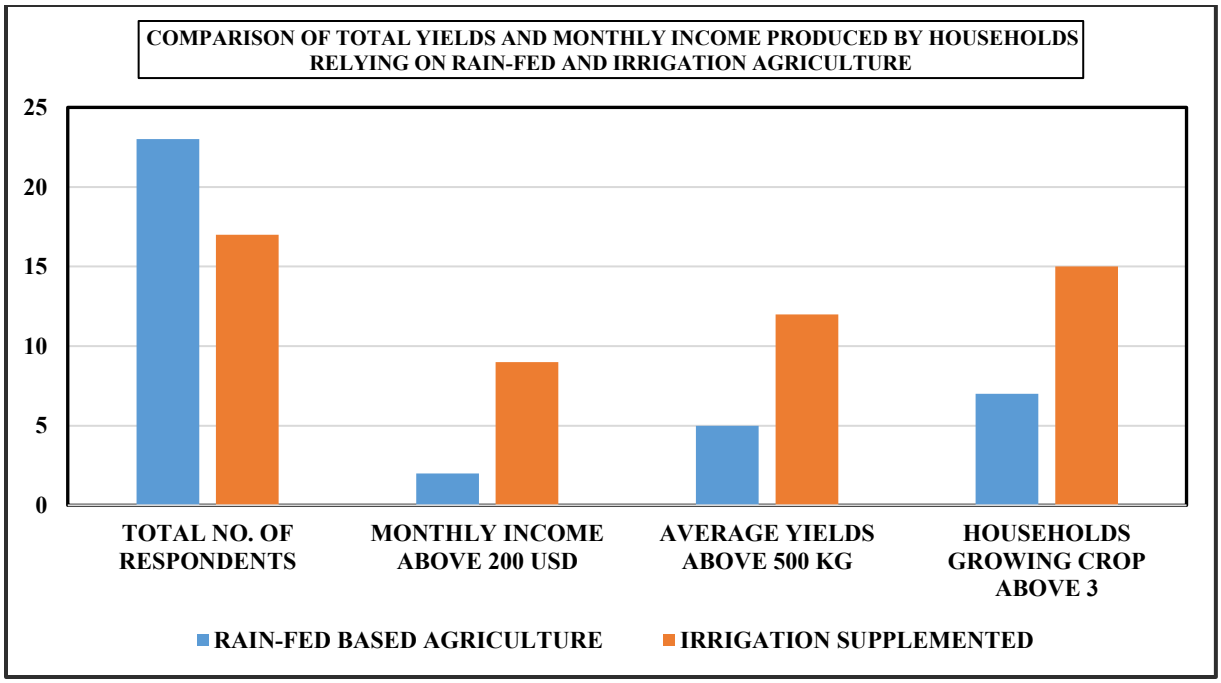


Figure 4.6: Comparison of total yields and monthly income produced by households relying on rain-fed and irrigation agriculture

The data in Figure 4.7 above highlighted that many farmers who practiced irrigation grow different varieties of crops than those who depend on rain-fed agriculture. Almost 15 households who have access to irrigation services in the study area claimed that they grow at least 3 types of crops whilst only 7 of the 23 depending on rain-fed agriculture reported that they could do the same. Regardless of the benefits of irrigation as a science as highlighted by those practicing producing better yields, only a few respondents highlighted that it was effective. Even though respondents claimed that irrigation was associated with many resilience benefits, many of them could not admit that it was an effective strategy in the study area. This was highlighted by only 9 households acknowledging that the strategy was effective. The ward AGRITEX officer reported that irrigation could be an effective way of dealing with drought because it allowed households to practise agricultural activities all year round. However, due to only a few number of respondents applying the strategy, it was regarded as less effective regarding that only a few could benefit from it. Be that as it may, diverse crops and vegetables are grown among these households which improves the nutritional value of food consumed thus enhancing resilience. Carrots, onions, tomatoes, green beans, among others, are some of the crops that households that apply irrigation cultivate. Winter agriculture is also mostly common among households that apply irrigation. The respondents reported that this contributed to their resilience to droughts as it ensures a continuous supply of food. Some of the

vegetables, for instance, tomatoes and cabbages can be sold for money. This research revealed that irrigation is an activity which is associated with high production outcomes in both income and yields as highlighted by many participants that apply it producing more in both categories than those that do not. On the other side of things, this data may also be interpreted as suggesting that only those that have better income can have the access to irrigation services, knowledge and equipment. As such, they end up producing more. In light of this perception, the researcher noticed that irrigation was an activity that only the most economically powerful can perform hence only a few get involved. The researcher observed that there were only a few households who could access the irrigation services and this affects the level at which they depend upon the strategy. Communal irrigation projects and schemes are very few and not many households benefit from them. Even the few households that have access to the irrigation scheme lamented that the plots of land they have are too small to improve their resilience to droughts. The rest of the respondents revealed that they did not have access to irrigation schemes as there is only one major source of irrigation water in Munyarari, which is Mpudzi Dam.

4.1.8. Income generation/ Off-farm activities

As a way of dealing with the effects of drought on the growth of plants, households in Munyarari have developed many off-farm income generating activities. This has enabled households involved to generate income that can be used to purchase foodstuffs during times when crops are failing as a result of the adverse impacts of droughts.

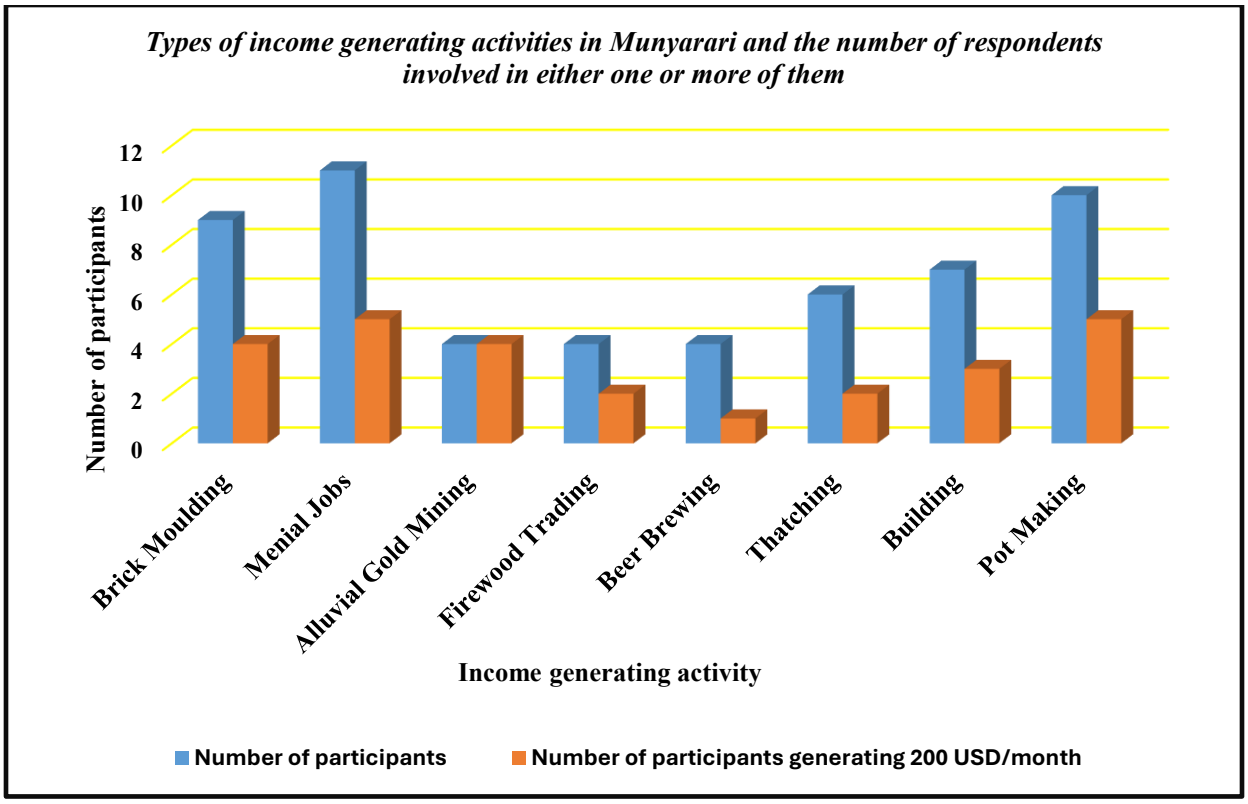


Figure 4.7: Off-farm activities commonly practiced in Munyarari and the income raised within each category

The data shown on the chart above suggest that, due to the persistent recurring droughts that have negatively affected the effective growth of crops, households in the study area depend on many activities that assist in the generation of income. About 18 participants claimed that they partook in one or more of the income generation activities and 7 reported that they perceived it as an effective drought management strategy. These results revealed that income generating activities are not effective in enhancing the resilience levels of households as highlighted by only 11 respondents generating a monthly income above 200 kg. Results from the questionnaire showed income generating activities such as alluvial gold mining, brick moulding, menial jobs, thatching, building, firewood cutting, beer brewing and pot making are very common. Respondents acknowledged that these activities were important due to the fact that they act as adaptation strategies after crops have failed to produce enough due to droughts. Income generating activities are a crucial drought resilience strategy because they ensure that there would be food for consumption bought using the extra income generated. Chazovachii et al. (2012), argued that participating in off-farm activities or income generating is a perfect method of reducing risk of the impacts of droughts and reduce the dangers of future food insecurities in rural areas. However,

some of the activities that are carried out by households to generate income tend to be detrimental to the environment and natural resources which undoubtedly compromise the effectiveness of income generating activities as a DRS. As such one can choose to conclude that some of these activities are not sustainable in solving the challenge of droughts in Munyarari. Some of these activities, for instance, cutting of trees for firewood selling usually leads into deforestation

4.2. Socio-economic and cultural factors influencing the successful and effective implementation of DRSs

4.2.1. Household head age

Household head age may also be considered as important in determining the resilience level of a household to the impacts of droughts because it sometimes affects the decisions that are made by a household regarding adoption and success of DRSs. In relation to that, this study revealed that households in the study area that are headed by medium aged individuals (40-55 years) in the study area are more likely to implement drought resilience strategies (DRSs) effectively and they tend to be resilient than households that are headed by younger or elderly individuals. The data in figure 4.9 below clearly highlights that households that are headed by medium aged individuals achieve better crop yields and income. Four respondents were aged 30 years and below and half of them could not produce yields above 500 kg, whilst there is a positive indication of success among households that are headed by individuals between 30-50 years with 13 respondents producing yields above 500kg.

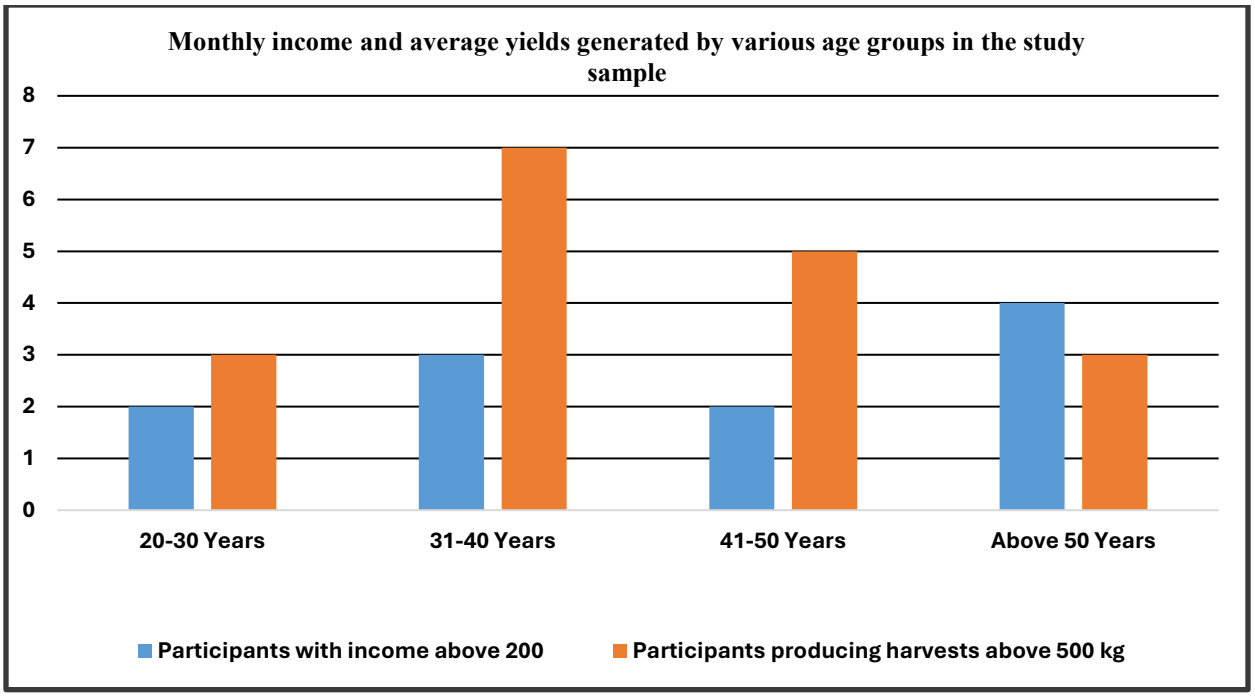


Figure 4.8: Monthly income and average annual yields of household aggregated by age groups of respondents in the study

There was a notable negative relationship between adoption and production outcomes of drought resilience strategies and households headed by individuals above the age of 50 years. This result corroborates with Tesso *et al.* (2012), and Andersen and Cardona (2013), who also agree that age of the household head practicing DRSs is one of the factors that may determine the level of resilience or vulnerability to droughts and short dry spells.

4.2.1.1. Determining the relationship between age and effective implementation of DRSs

To quantitatively determine the contribution of age as a factor that influence adoption and success of drought resilience strategies, Pearson's correlation analysis was carried out between yields produced by households and age of household heads involved in drought resilience strategies.

	Mean	Std. Deviation	N
YIELDS	495.0000	192.17428	22
AGE	47.9545	10.88239	22

Table4.5: Descriptive statistics used during calculation of Pearson's correlation coefficient of household age and effective drought resilience

		YIELDS	AGE
YIELDS	Pearson Correlation	1	.522**
	Sig. (1-tailed)		.006
	N	22	22
AGE	Pearson Correlation	.522**	1
	Sig. (1-tailed)	.006	
	N	22	22

**. Correlation is significant at the 0.01 level (1-tailed).

Table4.6: Determining Pearson's correlation coefficient of household head age and effective drought resilience

A significant correlation coefficient of 0.522 was found which suggest that adopting and succeeding when implementing resilience strategies highly depends on age of a household head. Hence, one can conclude that adoption and success of DRSs hinges on age of the head of the household desiring to reduce the vulnerability to the effects of droughts. Younger heads of households sometimes lack experience and hereditary knowledge of how to effectively enhance resilience through the adoption of resilience strategies whilst older household heads may be actively involved in drought resilience activities because they usually have ample knowledge and proven ideas which directly determine the DRSs they adopt. The data also showed that older household heads have better social capital and networks in the community which enable them to source for assistance from a wider network of friends and relatives in the form of financial, human and material resources required in enforcing DRSs. However, due to old age a person's ability to implement DRSs effectively tends to decrease. This negatively affects a household's accessibility to different sources of income, for instance, from off-farm generating activities. According to the observations made by the researcher, households with younger household heads do not prioritise drought resilience measures because of their family sizes that are small and they do not require them to produce much.

4.2.2. Gender of household head

Household head gender may also considered as crucial in influencing the choices that are made by households in adopting and practicing diverse DRSs. This might due to the fact that gender

sometimes affects opportunities to possession of valuable capital resources such as land and income. However, Andersen and Cardona (2013), posit that household head gender may be insignificant but their results showed that male headed households were slightly likely to be less vulnerable as compared to female headed households.

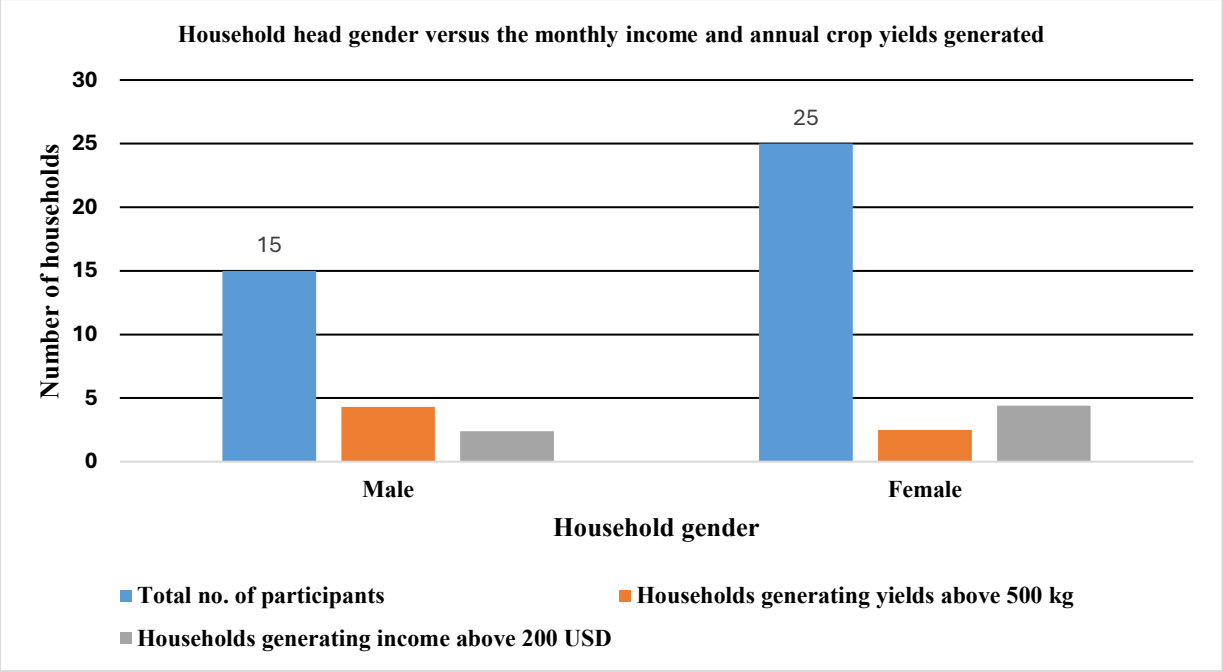


Figure 4.9: Comparison of income levels and total yields between female and male headed households participating in the study

Findings from the study displayed in Figure 4.9 above suggest that, despite the fact that the study hypothesized that households headed by males would be more involved and successful in adopting DRSs as compared to households headed by females, there were no clear differences in adoption, performance and success of drought resilience strategies employed by female and/ or male headed households. About 24 households were headed by women and only 12 respondents were managing to produce harvests above 500 kg whilst male household heads that highlighted that they produced same amount were 6. This might be because in Zimbabwe, male headed households have better accessibility to productive resources such as land and credit as compared to households that are headed females.

4.2.2.1. Determining the relationship between gender and effective implementation of DRSs

Pearson's correlation analysis was also carried out to determine how gender can influence the adoption and success of drought resilience strategies.

	Mean	Std. Deviation	N
YIELDS	495.0000	192.17428	22
GENDER	.41	.503	22

Table 4.7: Descriptive statistics used during calculation of Pearson's correlation coefficient of household head gender and effective drought resilience

		YIELDS	GENDER
YIELDS	Pearson Correlation	1	.293
	Sig. (1-tailed)		.093
	N	22	22
GENDER	Pearson Correlation	.293	1
	Sig. (1-tailed)	.093	
	N	22	22

Table 4.8: Determining Pearson's correlation coefficient of household head gender and effective drought resilience

The gender variable of 0.41 indicates a predominance of the female gender among the respondents. A weak correlation coefficient of 0.293 was produced which suggested that there was low relationship between household gender and effective drought resilience. This suggest that as the gender variable increases, indicating a shift from male to female, there is a slight tendency for household yields to increase. However, the correlation is weak and the significance level (p=0.093) is above the conventional threshold of 0.05 which suggest that the relationship is not that significant. This weak correlation may imply that gender, in isolation, is not a strong determinant of positive and effective implementation of drought resilience strategies. While there is a slight positive relationship, it does not provide sufficient evidence to conclude that gender alone plays a decisive role in influencing effective drought resilience. This shows that gender of the head of a household head does not significantly affect the adoption and success of DRSs in the study area.

4.2.3. Level of Education of the head of household

The education level of the head of household may also be considered as a factor that may determine whether a household participate in DRSs effectively because it affects how decisions are made within households. The researcher discovered that households in Munyarari that are headed by

better educated individuals have better accessibility to better economic and career opportunities especially those that enables earning from off-farm income generating activities as they can be a crucial factor in affecting the DRSs choices and performance. Number of years spent in secondary education were considered in this study since secondary education was the most attended level by most of the study respondents.

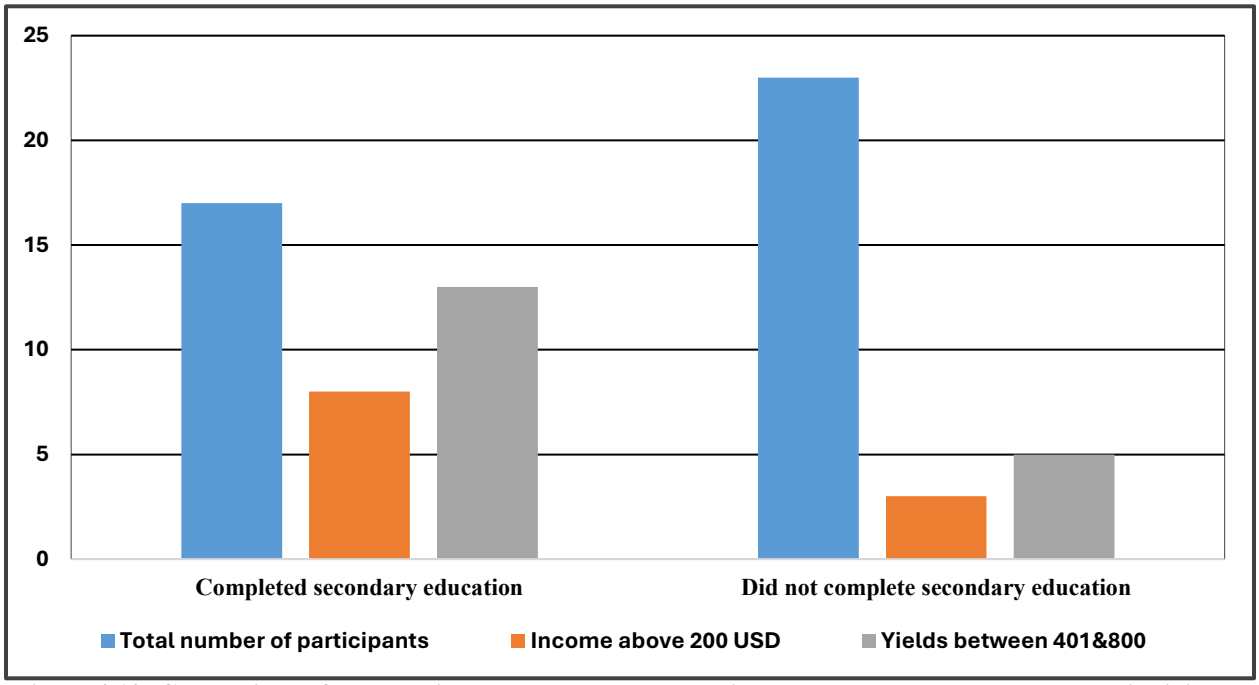


Figure 4.10: Comparison of monthly income and total annual yields among households headed by individuals who completed secondary education and those who did not

Findings in Figure 4.10 above show that only 40 per cent of the participants in the study managed to at least attend secondary education. The number of years spent in school were considered as a factor by the researcher to measure and determine the ability of households to adopt DRSs that could enhance their resilience to drought when adopted. The researcher hypothesized that education level of the head of household could positively determine and affect the choices made as far as adopting DRSs is concerned. This was further supported by the collected data which revealed that better education among Munyarari households contribute to better resilience choices and success. This was further highlighted by 13 of the 17 household heads with secondary education managing to produce harvests above 500 kg. The opposite was also proved to be correct by the data which showed that of the 23 without formal secondary education, only 5 of them were managing to produce harvests above 500 kg.

4.2.4. Size of a household

Size of a household that practices DRSs may also be considered as a crucial factor influences the adoption and success of the drought resilience strategies. This might be because it can affect the household labour pool. In the study area, households that have elderly applying DRSs are more likely to have less challenges in having labour that is capable and willing to implement efforts against drought impacts than a smaller household. Among the study sample, 23 households had at the least 5 members living in their homes, of which 14 of them managed to produce yields above 500 kg. On the other hand, only 4 households with less than 5 members permanently residing in their home highlighted that they had generated yields above 500kg in the previous farming season. The researcher found out that the average size of a farming household in Munyarari is 3.6 persons per household and it is clearly below the national average of about 5.1 persons per household as of the 2022 census. This may be used to explain the reason why households in the study area tend to be reluctant to participate in drought resilience strategies as well as why many households do not produce minimum yields 500kg within a single farming season. Keil *et al.* (2006), also found out that household size has a positive and a significant effect on how households respond to the impacts of droughts and dry spells hence affecting their resilience levels. This implies that households with more members are more likely to have enough labour capacity to work in the fields and hence would produce more output contributing to better drought resilience. The other argument for this observation could be that large households are more likely to have diversified sources of incomes that may be used to facilitate implementation of drought resilience efforts, and hence be more drought resilient as compared to smaller households.

4.2.5. Relatives living outside the household

Having relatives that live outside the household is another important factor that may influence whether a household take part in drought resilience strategies or not. Respondents reported that the remittances that are received by households from relatives living outside the family are important because they enhance the level of income generated by the receiving households. Adding on, these members living outside the household can also provide financial and material assistance that may benefit the households with resources such as farming inputs and other important material resources. The study presumed that there is a positive correlation between

receiving remittances from relatives and effectively implementing drought resilience strategies.

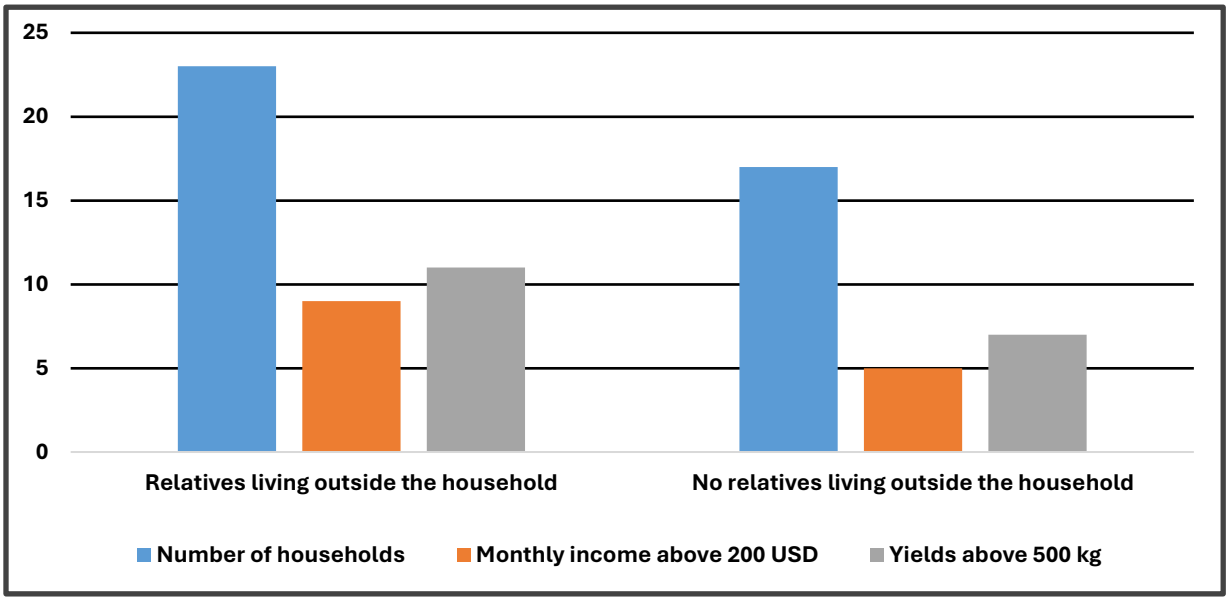


Figure 4.11: Comparison of production outcomes (Monthly income and average total yields) between households that have relatives living outside the household and those that do not

The ward AGRITEX officer mentioned that having relatives living outside the household is also important during the marketing phase of the produce as households with relatives living outside usually find it easy to visit the market through their relatives living in urban areas, for instance, in Mutare. According to Andersen et al. (2013), the money that is received as remittances or transfers from relatives can be vital in assisting households to implement measures and get involved in drought resilience through DRSs in Bolivia. The study revealed that some households depend on remittances and cash transfers from members who work in cities and other countries such as South Africa, Zambia and Botswana.

4.2.6. Household Income

4.2.6.1. Determining the relationship between household income level and effective implementation of DRSs

The researcher presumed that household income could influence the effective implementation and success of DRSs. A Pearson's test to determine the correlation coefficient of household income and effective drought resilience among households involved in DRSs was carried out as illustrated in Tables 4.9 and 4.10 below.

	Mean	Std. Deviation	N
YIELDS	495.0000	192.17428	22
INCOME	136.3636	74.29321	22

Table 4.9: Descriptive Statistics used in the Pearson's correlation analysis between Income level and effective drought resilience

		YIELDS	INCOME
YIELDS	Pearson Correlation	1	.779**
	Sig. (2-tailed)		.000
	N	22	22
INCOME	Pearson Correlation	.779**	1
	Sig. (2-tailed)	.000	
	N	22	22

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.10: Pearson's Correlation analysis of significance of Income level and effective drought resilience

A strong Pearson correlation coefficient of 0.779 suggests that there is positive correlation between income levels and household yields as well as enhanced resilience among the study sample. This explains that households with higher incomes are more likely to be involved in DRSs, especially those that require financing such as, irrigation and supplementary feeding of livestock, and be successful than those with lower income in the study area. This might be because income helps insulate the effects of drought which include poor rainfall and yields.

4.3. Challenges faced by households during implementation of DRSs

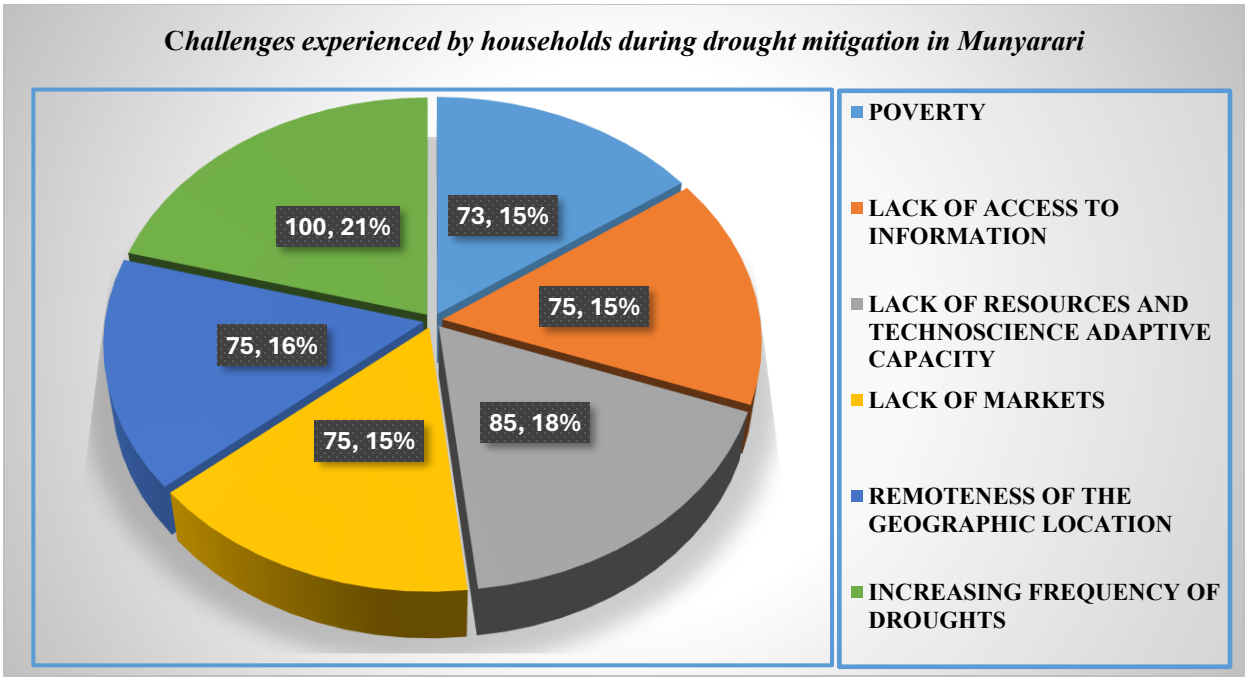


Figure 4.12: Challenges experienced in Munyarari during drought resilience improvement and their frequency among the study sample

Households in Munyarari are facing a lot of challenges as far as eradicating the challenges of drought is concerned. During the research study, households reported that they were experiencing many challenges in trying to enhance their resilience to the impacts of droughts and these challenges have made it difficult for many households to implement DRSs effectively. Challenges such as poverty, lack of access to information, lack of techno-science adaptive capacity, increased frequency of droughts and remoteness of the Munyarari geographic area were pointed out as the major setbacks that are usually faced in trying to implement the DRSs hence enhancing resilience to the adverse impacts of droughts in the area.

4.3.1. Increasing frequency of droughts

Households emphasized through questionnaires and interviews that the frequency and periodicity of droughts is increasing in their area and they lamented that this was a problem that hindered the efforts that are made to reduce the impacts of droughts. According to UNFCC (1988), it is projected that severe droughts might increase in both frequency and periodicity in the area as a result of global warming and climate change. For instance, some parts of Manicaland Province experienced severe droughts in the most recent seasons (Ministry of Agriculture Zimbabwe, 2015, 2016, 2018, 2019, 2020, 2023 and 2024). This is evidenced by the collected data whereby many respondents

highlighted in the questionnaire that droughts were occurring at a rate of at least 1 severe drought after 3 farming seasons and 2 moderate droughts within 3 farming seasons. This was further supported by one of the traditional leaders who claimed that;

"….we used to spend as much as up to 4 or 5 years without experiencing severe droughts during the farming seasons. These days we can hardly spend even 2 full farming seasons without experiencing serious dry spells. Sometimes this area can now suffer from as much as 4 serious dry spells within a single farming season." (**Key informant 2)**.

Frischen *et al.* (2020), cites that Mutare District has a relatively high average drought years within the period 1989-2019 by decoding the data from seasonal vegetation health index (VHI) composites. It was found that the district had an average of 4.24-5.64 drought events from the period 1989 to 2019, which clearly show that Munyarari ward is not spared from the persistently growing drought risk in Mutare District. This has added more burden to households that are already struggling to make the ends meet through the application of DRSs. Many households do not have accessibility to resources and materials that are required to effectively apply DRSs and become successful in reducing the impacts of droughts. The situation is further worsened by the poor economic climate prevalent in the country which has clearly made it difficult for the people to cope and adapt to the effects depending on their capacities.

4.3.2. Poverty

According to Maphosa (1994), poverty is also one of the problems that can disturb effective implementation of DRSs. Due to lack of financial resources and access to credit, respondents find it difficult to purchase important inputs such as fertilizer, seeds and tools. Many households in Munyarari showed that they generated very low incomes with only 6 households among the respondents claiming that they could generate an average monthly income above 200 dollars (USD). It is the poor who usually suffer the most during the implementation of efforts to reduce the impacts of droughts as they do not have adequate and necessary resources to combat the impacts through application of appropriate strategies. Some respondents claimed that efforts that are meant to reduce drought impacts usually require and demand a lot of resources in the form of financial, material and temporal resources, of which are not at the disposal of many rural small scale farmers in Munyarari. For instance, it is difficult for the rural community of Munyarari to invest in drought-resistant technologies such as improved irrigation systems or drought tolerant

crops. This limits the potential and ability of households to resist the negative effects of droughts. Also, poverty has forced many households in Munyarari to depend mostly on rain-fed agricultural activities and this has inevitably placed them under vulnerability to the impacts of droughts. Without alternative livelihoods, their resilience to drought is severely compromised.

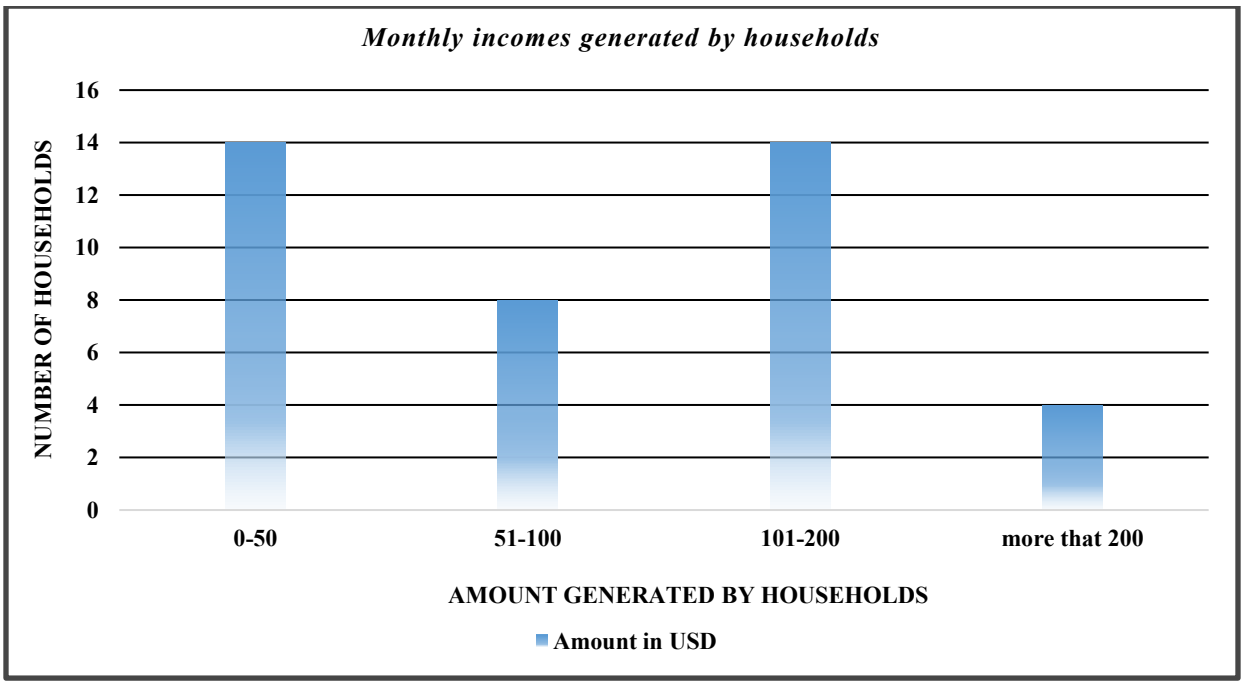


Figure 4.13: The average amount of income generated by households participating in the study

More so, many poor and marginalized groups in rural areas often face additional barriers in accessing support and resources for resilience building and that also seems to be the case in Munyarari. One key informant highlighted in an interview that there are inequalities in land ownership, gender roles and social status in Munyarari which are further exacerbating vulnerability to droughts as well as compromising the ability to reduce their impacts. Brooks and Loevinson (2011), posit that in order to assist households enhance resilience to the impacts of droughts there is urgent need to address the poverty that has hindered their efforts in the form of DRSs. The formulation of effective legislation and policies is also another way that can be exploited to ensure that households' resilience activities are prioritized among the most vulnerable in communities in order to foster economic growth for everyone. According to Ndaki (2014), one of the prominent setbacks usually experienced during implementation of DRSs in many rural areas is the lack of adequate financial resources and it has remained a major challenge for many developing countries who have weak economic situations and livelihoods that are so vulnerable to droughts.

4.3.3. Lack of resources and techno science adaptive methods

One of the chief problems hindering the effective implementation of DRSs in the study area is the absence modern and technologically advanced structures, resources, knowledge and assets such as of boreholes, dams, supplementary feed and reliable food aid which play very crucial contribution in resilience enhancement. Mpudzi Dam benefits only a few villages in the ward which include Musabayana and Mukwindidza which depend on it for irrigation. The capacity of water which the dam can hold has decreased because the dam is drying up because of the ongoing heat waves.

Households heavily depends on agricultural activities which are dominantly supported by seasonal rainfalls. The amount of rainfall has continued to become less and less to the extent that it is no longer possible to produce sustainable and adequate food. According to Dube and Phiri (2013), there is urgent need to promote and support drought resilience activities by helping households with accessibility to appropriate modern scientific methods, such as, remote sensing services, local weather forecasting, crops that are tolerant to droughts, early warning and information dissemination systems and modern systems of irrigation (for example, solar powered irrigation systems) in rural communities.

One respondent highlighted that the community lacks the necessary capacity to facilitate techno science development in the form of solar powered irrigation systems, modernized water harvesting techniques such as safe reservoirs, reliable climate and weather monitoring equipment and genetically modified and improved seeds. Apart from that, the little techno science adaptive capacity that is available is usually affected by low skills on how to effectively utilize it. Also, one key informant revealed that the little development that is made in the community usually fell victim to vandalism and mouth-gaping mismanagement. For some villages, water to drink and other domestic uses is a serious problem in the area with some villages amounting to about 200 households per borehole. This helps to determine how vulnerable households are before considering the need for water outside of the domestic use domain. Community members lamented that there was need to ensure the availability of irrigation water through the construction of small dams, deep wells and boreholes. (IPCC) (2007), cites that it is important to expand rainwater harvesting structures such as dams and reservoirs in order to ensure irrigation competence and the efficient use of water available.

4.3.4. Lack of Markets

Households also lamented that finding markets for some of the crops they grow as part of DRSs implementation is a difficult task. It was reported that there are no lucrative markets for some vegetables and crops like millet, sorghum and rapoko and as such, many households cultivate them only for their consumption and other less important uses. Almost half of the respondents (17) lamented that they experienced market challenges for their produce, which makes it difficult for them to generate income for other purposes besides consumption. Chazovachii et al (2010), also added that there are no reliable markets for small grain crops. This becomes worse as people dominantly rely on the local market as the transportation of produce to far markets may be difficult. Despite that, the AGRITEX officer also mentioned that produce by households is usually sold and purchased at very low prices due to unfair market prices. More so, one informant purported that, millet, rapoko and sorghum crops do not mature at the same time and this force households not to harvest crops at the same which generates a challenge of storing produce and visiting market places more than one time, which is expensive.

4.3.5. The geographic location of Munyarari

The geographic location of Munyarari ward which is remote makes it more vulnerable to droughts because it is isolated from market centers and growth points such as 22 Miles Shopping centre and Bazerley Bridge as well as Mutare City. The poor road networks and communication networks make some parts of the area inaccessible as the roads are very poor such that the donors and investors shun away from the ward. This also makes it difficult for households to transport their produce to markets as roads from some of the villages to Bazaley Bridge Shopping centre and the Grain Marketing Board (GMB) are in bad shape. The access to information by the Munyarari community members may also be another challenge that is promoted by the remoteness of Munyarari as vulnerable populations may not have access to timely and relevant information about drought. This isolation due to lack of infrastructure may limit choices and copying strategies during times of stress and drought risks and management practices.

4.3.6. Lack of information about drought resilience strategies and the capacities to adapt to droughts

Participants claimed that lack of information about resilience and capacity to implement DRSs was also another challenge they experienced during implementation of DRSs. However, officials from the AGRITEX office, and other traditional leaders asserted that they try as best as they can to

spread knowledge about droughts resilience strategies, but most of the workshops that they convene face poor attendances. About 63 % of respondents highlighted in the questionnaire that, they were impressed by the roles that NGOs have been playing in trying to assist households in effectively implementing DRSs and reduce vulnerability from the adverse impacts of droughts. Organizations such as Zimbabwe Red Cross Society (ZRCS), CARE and Africa Ahead were mostly highlighted as the most active NGOs in the study area. However, many respondents claimed that they had not learnt about the effectiveness of the drought resilience methods they were encouraged to employ. About 60 % participants reported that they did not have any knowledge of DRSs prior to the study whilst 20 % lamented that they had partially heard about them. On the other side, the ward councilor maintained that they in some instances try to educate the community about drought resilience It was further suggested that that the community has developed a high level of dependency syndrome whereby each time a community meeting is organized by officials from NGOs and the government people would be expecting to receive material things not just information. As has been mentioned before, the community in unconsciously making ends meet in terms of employing a number of mechanisms to reduce the impacts of droughts.

This finding is supported by Ndaki (2014), who suggests that the knowledge level regarding drought resilience is some areas still very low. The role of information and skills in explaining adaptive capacity cannot be overemphasized. For a population to take initiatives to adapt to drought, it has to be aware of the risks posed and perceive that something is not right and that there is need for change so as to adapt. For this to happen, people must have access to information. Access to information can help people assess the magnitude of the drought challenge, possible options and those feasible within the relevant context (Toi, 2009). It is the researcher's view that the level of access of information with regard to drought and best resilience measures needs to be heightened in Munyarari community to raise awareness that will in turn make adaptation to drought easy.

4.4. Chapter summary

The chapter outlines the results that were found by the researcher from the study and the analyses made on the effectiveness of DRSs, the socio-economic and cultural factors influencing the successful adoption and effective implementation of the DRSs as well as the challenges that are experienced during implementation. Pearson's Chi-square test of association was conducted to

statistically determine the association between applying DRSs and effective drought resilience. Multiple Pearson's correlation analyses were also carried out to determine the relationships between socio-economic and cultural factors and effective drought resilience. Results from these analyses were made and conclusions drawn.

CHAPTER 5
RECOMMENDATIONS AND CONCLUSIONS

5.1. Introduction

Findings revealed that a wide range of DRSs are employed in Munyarari Ward. The findings also highlighted that the strategies that are employed are not fully effective in enhancing resilience of households. Many households argued that they are not sustainably benefitting from the strategies and that persistent and adverse food shortages are usually experienced during and post drought and dry spells. The study revealed that most of the strategies are not sustainable as they require financial resources that are usually not available for the majority of rural households. A litany of challenges including poverty, increasing frequency and periodicity of droughts, lack of resources and techno-science adaptive capacity, lack of markets and the remoteness of the geographical location of the study area, among others, have clearly contributed to the effectiveness of these strategies. The study also managed to determine some of the many socio-economic factors that influence the adoption and success of DRSs.

5.2. Conclusions

After carrying out thorough analyses on the findings from the study, the following conclusions have been made. It is revealed in the study that the Drought Resilience Strategies (DRSs) that are employed by the households are not effective in improving the resilience of households practicing them. Findings on the perspectives of households pertaining to the effectiveness of strategies show that some of the strategies were effective and some were not. Crop diversification and cultivation of drought resilience crops were the two strategies that were identified as the most sustainable ways of ensuring resilience of households to droughts in the study area. Both the strategies were confirmed to be effective by 15 respondents apiece. The other strategies which include observation of IKSs, Conservation Agriculture (CA), supplementary feeding of livestock, irrigation and income generating activities were identified as least effective as highlighted by all of them being regarded as effective by respondents less than half of the total participants involved. From a qualitative point of view, it can be concluded that the DRSs that are employed in Munyarari are not effective in combating drought impacts regarding the overall assessment of the households' perspectives on the strategies they consider as effective.

Adding on, after carrying out a statistical Pearson's Chi-square hypothesis test aiming at determining whether there was association between application of DRSs and enhanced resilience to droughts, a conclusion that there was no significant relationship between getting involved in drought resilience strategies and improved drought resilience of households was made. This is because the mean difference of -5.00 kg is not substantial enough to imply a meaningful impact of applying DRSs on yield outcomes of those applying the DRSs. More over, the p-value of 0.904 is significantly greater than the 0.05 threshold. This analysis reveals no significant association between the application of DRSs and effective drought resilience in the study area indicating that the strategies are not fully effective in reducing the impacts of droughts. These findings corroborate well with the qualitative findings from the perspectives of households on the effectiveness of the DRSs which also suggest the same.

The study also influenced the conclusions that household head age, household size, income level of the household and the number of immediate family relatives living outside the household were among the significant factors that influence the adoption and successful implementation DRSs. Results highlighted that households headed by medium aged individuals were more likely to participate in DRSs and become successful than their younger or elderly conterparts. This might be because of the well established social networks, better farming experience by older household heads as compared to households headed by younger individuals. These results suggested that diverse socio-economic and cultural factors related to households can affect adoption and effective implementation of DRSs.

Adding on, the findings from the study pointed out some of the setbacks that are encountered by households during the implementation of DRSs. Challenges which include the increasing frequency and intesnsity of droughts, lack of markets for selling produce, lack of techno-science adaptive capacity, remoteness of the geographical locations of rural areas and poverty were identified as prevalent in the study area. The increasing frequency and intensity of droughts was identified as the most prevalent challenge as highlighted by all the repondents admitting of its seriousness. Poverty and remoteness of the geographic

location of the study area were the least challenges managing to register 75% of respondents claiming that they had experienced them.

5.3. Recommendations

- **Enhancement of early warning systems (EWSs) and improvement of the timing and quality of drought information**

Climate change is increasingly making it difficult to predict the amount and timing of rainfalls in the study area and under such conditions, there is need to enhance and mordenise early warning systems and improve the quality and efficiency of climate information, all of which may assist the households to engage in appropriate activities in a timely manner through observing and aligning with the expected weather conditions (UNDP, 2009). For example, drought resilient crop varieties that mature early can be planted when the rains are expected to start late. It is also encouraged that commercial livestock feed can also be stockpiled in advance when severe droughts are expected. The facilitation and dissemination of drought information to all rural households should also be prioritised and measures taken to improve the process so that even those without access to the common mass media such as newspapers, televisions and radios, and social media platforms will access the information and engage in proactive drought resilient strategies in a timely manner.

- **Enhance the techno-science adaptive capacity through the construction of more dams, greenhouses and solar powered boreholes, among others.**

Findings from the study revealed that there is serious lack of techno-science adaptive capacity in the study area. Evidence shows that there is also a serious lack of drought techno-science capacity such as dams, greenhouses, solar powered boreholes, weather stations and early warning systems in the study area. Dams are in short supply in Munyarari ward 20 of Mutare District and the existing one is heavily silted to the extent that its capacity has reduced and it can no longer hold adequate water to use during times of droughts when supplementary irrigation might be required. As such, community individuals, households and various stakeholders involved and interested in drought resilience improvement should assist in the mobilization of resources and support the construction of new and large dams and also reduce siltation of the existing ones. By doing this, it would be possible to maximize the capacity of rainwater harvested and stored and minimize the challenge of water scarcity. The growth of crops through irrigation may then be facilitated and

pressure on boreholes can be reduced. Currently there is only one dam in the study area which is Mpudzi Dam and it is not enough to address the drought problems of the communities that depend on it to for water harvesting for irrigation purposes. By constructing more large dams and reduce the siltation of the existing dam may be a long term and sustainable way of reduce households' vulnerability and improve their resilience to drought impacts such as food insecurity. Mujaya and Mereki (2006), suggested that enhancement of techno-science capacity such as solar powered bores and dams can influence the introduction of large irrigation schemes and projects that can enable households to produce crops such as maize, wheat, sorghum and millet on a large scale thereby improving the quality of their lives. This can assist in making a positive direction towards households' desire to improve their resilience to droughts. This may also be crucial in reducing the dependence of households on rain-fed agriculture which often leads poor crop yields, crop failures and the risks of hunger and famine (UNDP, 2009). Overall annual crop yields and monthly income of households may also increase as most of them would have the opportunity to apply irrigation services. Furthermore, in a water stressed period, high temperatures and low and erratic rainfall being experienced, irrigation can be more helpful as it supplies moisture when rainfall is inadequate to facilitate the production of crops and rearing of livestock during drought times and extend rainy seasons when are shortened. This is likely to increase the effectiveness of the drought resilient strategies and improve crop and animal production and in turn reduce households' vulnerability to droughts.

- **Intensification of on-farm activities and introduction of income generating activities**

Encouraging households settling in drought prone areas to grow a wide variety of crops and to fully indulge in other income generating activities that can help to generate income is also another strategy that can be adopted in order to promote implementation of DRSs and help enhance the people's resilience. This is important as it would help the farming households to rely on off-farm sources of income in times of droughts and dry spells. In addition, encouraging households to rear diverse drought resilient breeds of livestock would also help to minimize the negative impacts of droughts on the households. Also, due to the low agricultural potential of the area because of the adverse impacts of climate change and climate variability, crop yields and livestock production are expected to be affected by up to 50% if the systems of agricultural production are not changed. As such, there is urgent need to adopt intensification of on-farm production as a prerequisite for increased resilience for both people and livestock. There is also need for a shift of people's attitude

towards off-farm income generating activities. These must stop being viewed as activities that only serve as supplement crop yields and give them equal value to the farming activities. This can help increase households' income from off-farm production activities and in turn improve the effectiveness of the drought resilience strategies.

- **Prioritise targeting of external drought resilient capital/inputs and relief assistance on the most vulnerable or the least resilient households in communities**

In order to promote the effectiveness of the drought resilient strategies it is crucial for governmental Departments and Non-Governmental Organisations (NGOs) who operate in the study area to ensure that the drought resilience inputs and material such as genetically modified seeds, hybrid seeds, drought resilient crop varieties seeds and information, and relief/ external assistance items that are received by households were targeted basing on the age of the household heads, size of the family farms, land holding size and number of family members working in cities or in other countries. By targeting relief items based on age implies that NGOs and other humanitarian institutions should include households that are headed by young heads (25 -39 years) and those headed by the elderly (60+ years) in the programmes and activities that assist in improving their resilience to droughts. This is because findings revealed that households that are in the economically active age group are capable of effectively implementing the DRSs and enhance their resilience. Though the contribution of gender of household head is not significant, results show that households headed by female heads usually apply DRSs ineffectively and are less resilient compared to their male counter-parts. Therefore, it is also crucial to target female headed households with the drought resilience inputs and relief items.

Also basing on size of the household, it was recommended that interventions to enhance drought resilience must be targeted to households that have very few members and those that have very large sizes. This is because in most cases, households that had few members were mostly composed of older people who could not apply the drought resilience strategies on their farms due to the lack of financial, material, informational and labour resources. Targeting these households could also lead to the effectiveness of the DRSs and short term relief food items usually offered by organisations working in the area such as World Vision International in Zimbabwe, Africa Ahead and Department of Social Welfare.

In addition, the distribution of inputs and relief to households should be based on the number of immediate family members living outside the household whereby priority attention and focus should be placed on those households that do not have immediate family members living outside the household. This is because during the implementation of DRSs, households that have relatives would be in a better position to implement effective drought resilience efforts and initiatives because they get assistance from their relatives who work in cities or abroad in the form of remittances while households that do not have relations have no source of external support. However, in order to encourage households that do not have access to remittances, it would be beneficial to encourage diversification of livelihoods apart from agriculture mostly. The needful support and assistance from the government and non-governmental actors (NGOs) should be uniquely tailored to increase resilience to drought so that the welfare of at-risk households is enhanced.

- **Integrating IKSs into the local, national and regional drought resilience frameworks**

It is also important that policy formulators, disaster management practitioners and organisations should involve the local traditional drought resilience knowledge (IKSs) and practices as this could provide the basis for development and implementation of more effective strategies.

- **Providing households with technical assistance**

Households should be supported and assisted with technical assistance and other modern farming technologies and methods to enhance the effectiveness of drought resilience efforts they apply hence improving agricultural yields. Organisations such as AGRITEX, the Ministry of Agriculture and Climate Change and NGOs, amongst others, are encouraged assist and support households with the needful help they need during the implementation of DRSs.

5.4. Summary

The chapter comprise of the important conclusions that were drawn from the findings of research study on the effectiveness of the DRSs employed by households. Conclusions were also made on the revealed factors that influence the adoption and success of DRSs as well as on the challenges that are experienced during the implementation of these DRSs. Recommendations on what can be

done to ensure the effectiveness of the DRSs in the study area and to address the challenges that are experienced in resilience building have also been outlined in this chapter.

CHAPTER 6

References

1. Abawi, K. (2013). *Data Collection Instruments (Questionnaire & Interview)*. Geneva: Geneva Foundation for Medica Education and Research.
2. Abegunde, V. O., Sibanda, M., & Obi, A. (2020). *Determinants of the adoption of climate-smart agricultural practices by small-scalefarming households in King Cetshwayo district municipality, South Africa. Sustainability*, *12*(1), 195. https://doi.org/10.3390/SU12010195.
3. Abid, M., Scheffran, J., Schneider, U. A. & Ashfaq, M. J. E. S.D. (2015). *Farmers' perceptions of and adaptation strategies to climate change and their determinants: The case of Punjab province, Pakistan. Earth System Dynamics*, *6*(1), 225–243.org/10.1191/1464993403ps060oa.
4. Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005*). Successful adaptation to climate change across scales*. Global Environmental Change, 15(2), 77–86. https://doi.org/10.1016/j.
5. Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). *Adaptation to climate change in the developing world*. Progress in Development Studies, 3(3), 179–195. https://doi.
6. Adger, W.N., Huq, S., Brown, K., Conway, D. and Hulme, M. (2003). *Adaptation to climate change in the developing world. Progress in Development Studies*, 3(3):179-195.
7. Andersen. E. and Cardona, M. (2013). *Building resilience against adverse shocks: What are the determinants of vulnerability and resilience?* Institute for Development Studies: Laz Paz, Bolivia. Available at: www.inesad.edu.bo/bcde2013/papers/BCDE2013-12.
8. Bhavnani, R., Vordzoghe, S., Owur, M., & Bousquet, F. (2008). *Report on the status of disasters and Risk reduction in the Sub Saharan African Region.*
9. Buckland, R., Eele, G., & Mugwara, R. (2000). *Humanitarian Crisis and natural disasters, A SADC perspective, Food and Humanitarian security.* Frank Cass Production. London.
10. Chambers, R. and Conway, G. (1992). *Sustainable rural livelihoods: Practical concepts for the 21st century: IDs discussion paper 296*. Brighton. Institute of Development Studies.

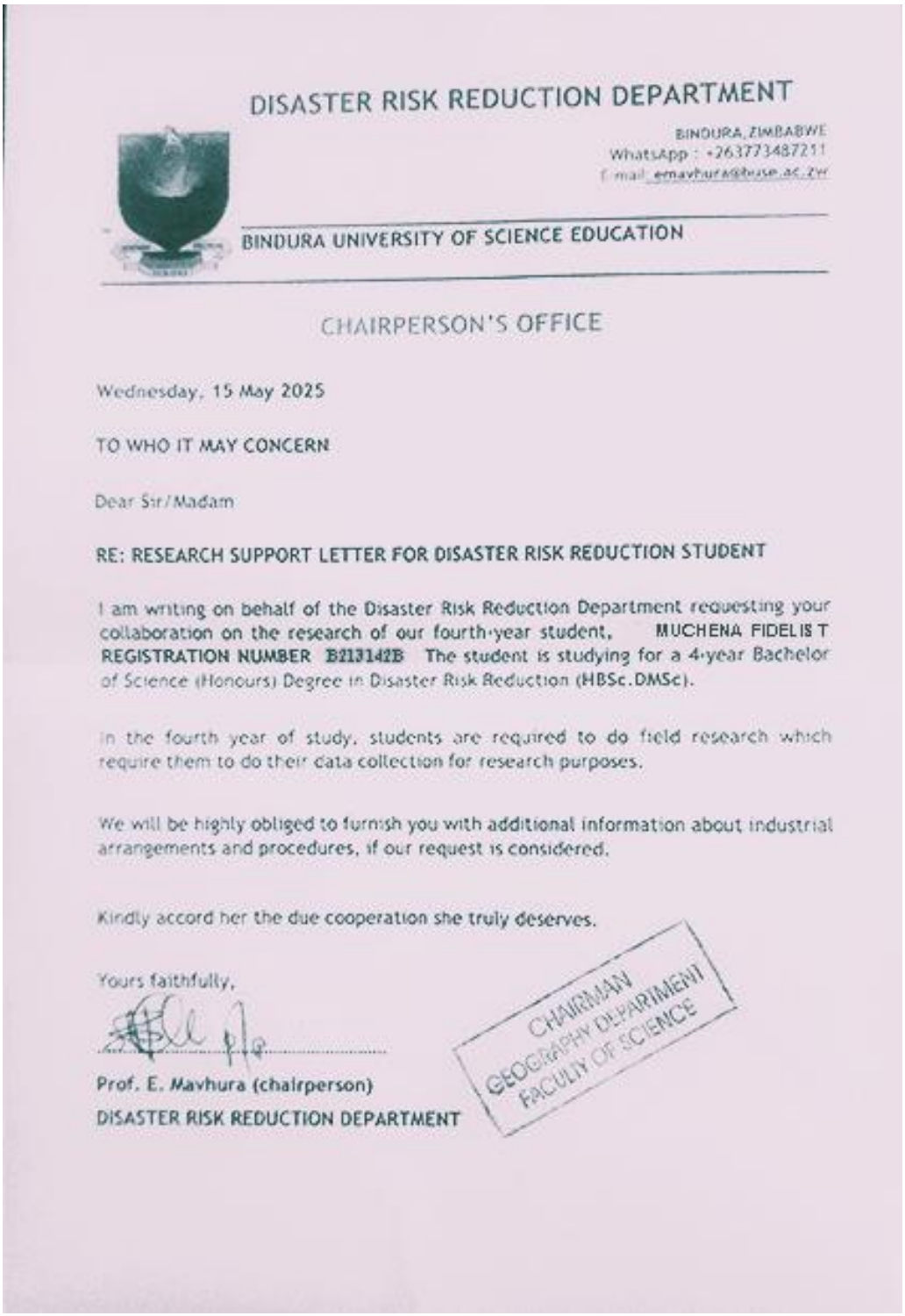
11. Chazovachii, B., Chigwenyu, A., & Mushuku, A. (2010). *Adaptation of Climate Resilient Rural Livelihoods through Growing of Small Grains in Munyadzi Communal Area. Gutu District*. African Journal of Agricultural Research, 8, 1335-1345.
12. Chibi, T., Kandori, C., & Makone, B. F. (2005). *Mzingwane catchment outline plan*. Bulawayo: Zimbabwe National Water Authority.
13. Chitongo, L. (2017). *The efficacy of smallholder Tobacco farmers on rural development in Zimbabwe*. PhD thesis, University of the Free State, South Africa. Environmental Research Journal, http://www.medwell journals.com/fulltesxt/?doi=erj.2011.156.162.
14. FAO. (1987). *Soil and water conservation in semi-arid areas. Soil resources, management and conservation service division*. Rome: Author.
15. FAO. (2007). *Animal feed impact on food security*. Rome: FAO.
16. FAO. (2008). *Zimbabwe 2008/07 Agricultural Season Update*. [Accessed on 26/05/2025].
17. Hove, L., Chakoma, C., & Nyathi, P. (2004). *The potential of the tree legume leaves as supplements in diets for ruminants in Zimbabwe*. Harare: Department of Research and Specialist Services.
18. Kaseke, E. (1996). *Social Security Systems in Rural Zimbabwe*. Weaver press, Harare.
19. Keil, A, Zeller, M, Wida, M, Sanim, B and Birner, R (2006). *Determinants of farmers' resilience to ENSO related drought: Evidence from Central Sulawesi, Indonesia*. Paper prepared for presentation at the International Association of Agricultural Economists conference in Gold Coast, Australia, August 12-18, 2006. DOI: 10.1007/s10584-007-9326-4.
20. Maphosa, B., (1994). *Lessons from the 1992 Drought in Zimbabwe: The Quest for Alternative Food Policies*. Nodic Journal of Africa Studies, 3(1), 53-58.
21. Ministry of Agriculture Zimbabwe. (2023). *Second Round Crop and Livestock Assessment Report.*
22. Ministry of Agriculture Zimbabwe. (2024). *First Round Crop and Livestock Assessment Report.*
23. Ministry of Agriculture Zimbabwe. (2024). *Second Round Crop and Livestock Assessment Report.*
24. Mogotsi, K., Nyangito, M. M., & Nyariki, D. M. (2011). *Drought management strategies among agro-pastoral communities in non-equilibrium Kalahari ecosystem*.

25. Mogotsi, K., Nyangito, M. M., & Nyariki, D. M. (2012). *The Role of Drought among Agro-Pastoral Communities in Semi-Arid Environment. The Case of Botswana*. Journal of Arid Environments, 91, 38-44.
26. Mujaya, I. M., & Mereki, B. (2006). *Agriculture today. General agriculture, crop husbandry and decorative horticulture*. Harare: ZPH Publishers.
27. Munro, L. T., (2006). (2006). *Zimbabwe's Drought Relief Program in the 1990s. A re-Assessment using the National Household Survey Data*. Journal of Contingencies and Crisis Management, 14(3), 125-141.
28. Mushore, T. D. (2013). *Climatic Changes, Erratic Rains and the Necessity of Constructing Water Infrastructure: Post 2000 Land Reform in Zimbabwe*. International Journal of Scientific & Technology Research.
29. Nyamangwe, N. (1995*). Famine Mitigation in Kenya: Same practices, impact lessons*. Journal of the Middle State Geographer, 28, 37-44.
30. Roncoli, C., Ingram, K., & Kirshen, P. (2001). *The Costs and Risks of Coping with Drought Livelihood Impacts and Farmers Responses in Burkina Faso*. Climate Research, Volume, 19 (119-132).
31. Sweet, J. (1998). *Livestock coping with drought: Namibia a case study.* Nerma Livestock Development Project, Tsuneb.
32. UNDP. (2004, February). *User's guidebook for the adaptation policy framework. United Nations Development Programme (p. 33)*. UK: Cambridge University Press.gloenvcha.2004.12.005.
33. UNDP. (2009). *Climate change in the African dry lands: Options and opportunities for adaptation and mitigation*. Nairobi.
34. UNDP. (2014). *Sustaining human progress: Reducing vulnerabilities and building resilience (Human Development Report 2014)*. New York: United Nations Development Program.)
35. UNFCC. (1998). *Expected Impacts of Climate Change Vulnerability and Adaptation Assessments in Zimbabwe*.
36. Unganai, L. S. (1996). *Historic and future climatic change in Zimbabwe.* Climate Research, 6, 37-145.
37. Vincent, B., & Thomas, T. (1961). *The land husbandry act of Southern Rhodesia*. London: Oxford University Press.

38. Weiss, P. (1992). *Focus on geography: The human and economic environment of Southern Africa*. Harare: College Press.
39. Whingwiri, E. E., Mashingaidze, K., & Rukuni, M. (1992). *Small-Scale Agriculture in Zimbabwe*. Harare: Rockwood Publishers.
40. World Development Report. (2010). *Vulnerability Preparedness and Mitigation. Natural and Anthropogenic Disasters*. Springer, New Delhi.

APPENDICES

APPENDIX A: APPROVAL LETTER FROM BUSE



DISASTER RISK REDUCTION DEPARTMENT

BINDURA, ZIMBABWE
WhatsApp : +263773487211
E-mail: emavhura@buse.ac.zw

BINDURA UNIVERSITY OF SCIENCE EDUCATION

CHAIRPERSON'S OFFICE

Wednesday, 15 May 2025

TO WHO IT MAY CONCERN

Dear Sir/Madam

RE: RESEARCH SUPPORT LETTER FOR DISASTER RISK REDUCTION STUDENT

I am writing on behalf of the Disaster Risk Reduction Department requesting your collaboration on the research of our fourth-year student, MUCHENA FIDELIS T REGISTRATION NUMBER B213142B The student is studying for a 4-year Bachelor of Science (Honours) Degree in Disaster Risk Reduction (HBSc.DMSc).

In the fourth year of study, students are required to do field research which require them to do their data collection for research purposes.

We will be highly obliged to furnish you with additional information about industrial arrangements and procedures, if our request is considered.

Kindly accord her the due cooperation she truly deserves.

Yours faithfully,

Prof. E. Mavhura (chairperson)
DISASTER RISK REDUCTION DEPARTMENT

CHAIRMAN
GEOGRAPHY DEPARTMENT
FACULTY OF SCIENCE

APPENDIX B: THE HOUSEHOLD SURVEY QUESTIONNAIRE

My name is Fidelis Tendai Muchena, a student at the Bindura University of Science Education and I am currently carrying out a research study with a goal to assess the effectiveness of the drought

resilience strategies that are employed by the Munyarari households. For the purposes of this study only, may you please assist by completing this questionnaire and providing your views? The information you will provide is confidential and it will be used for academic purposes only.

SECTION B: DEMOGRAPHIC/ SOCIO-ECONOMIC INFORMATION

1. What is the gender of the household head?

☐ Male

☐ Female

☐ Other (Specify……)

2. What is the age group of the household head?

☐ Below 20 years

☐ 20-30 years

☐ 31-40 years

☐ 41-50 years

☐ Above 50 years

3. What is the marital status of the household head?

☐ Single

☐ Married

☐ Widowed

☐ Divorced/ separated

4. What is this household's highest level of education?

☐ No formal education

☐ Primary education

☐ Secondary Education

☐ Tertiary education (college/ university)

☐ Vocational training

5. What is the size of the household?

   ☐ 1-3 members

   ☐ 4-6 members

   ☐ More than 6 members

6. What is the household's primary source of income?

☐ Crop farming

☐ Livestock rearing

☐ Formal employment

☐ Informal business

☐ Remittances from relatives/ friends

☐ Other (specify……)

7. What is the estimated monthly income of your household?

☐ Below the value of 50USD

☐ Between 50-100USD

☐ Between 101-200USD

☐ Above the value of 200USD

SECTION B: THE EFFECTIVENESS OF DROUGHT RESILIENCE STRATEGIES

1. Have you adopted any drought resilience strategies?

(a) If yes, what drought resilience strategies have you adopted as a household?

☐ Crop diversification

☐ Livestock management practices

☐ Water harvesting techniques

☐ Irrigation farming

☐ Conservation agriculture

☐ Cultivation of drought resistant crop varieties

☐ Other (Specify…….)

2. How did you learn about these drought resilience strategies?

☐ Government agricultural extension officers

☐ NGOs and donor organisations

☐ Farmer cooperatives

☐ Media (newspapers, television or radio)

☐ Community meetings

☐ Traditional leaders

☐ Other (specify……...)

3. For how long have you been implementing these strategies?

☐ less than a year

☐ 1-3 years

☐ 4-6 years

☐ More than 6 years

4. How effective have these strategies been in improving your agricultural productivity?

☐ Very effective

☐ Moderately effective

☐ Not effective

5. How have these strategies affected you household's income?

☐ Increased the income significantly

☐ Slightly increased the income

☐ There is no change in the income

☐ The income has decreased

6. Have the resilience strategies helped you reduce crop and livestock losses during drought period?

☐ Yes, significantly

☐ Yes, slightly

☐ No, not at all

7. Which strategy do you find most effective for dealing with drought?

☐ Crop diversification

☐ Water harvesting techniques

☐ Conservation agriculture

☐ Irrigation agriculture

☐ Livestock rearing and management practices

☐ Cultivation of the rough resilient crops

☐ Other (specify……)

SECTION C: THE CHALLENGES ENCOUNTERED DURING THE IMPLEMENTATION OF DROUGHT RESILIENCE STRATEGIES.

1. Which challenges do you face as a household during the implementation of drought resilience strategies?

☐ Lack of extension and training

☐ Lack of inputs

☐ Lack of markets

☐ The remoteness of Munyarari

☐ Lack of formal education

☐ The increasing frequency of drought

☐ Lack of adequate support from the government, its departments and the Non-Governmental Organisations

2. What would help to improve the adoption of the drought resilience strategies in your community?

☐ Increased financial

☐ More agricultural training and education

☐ Improved access to water and irrigation facilities

☐ Strengthening local cooperatives and community based organisations (CBOs)

☐ Other (Specify…….)

SECTION D: THE SOCIAL AND ECONOMIC FACTORS AFFECTING THE ADOPTION AND SUCCESS OF DROUGHT RESILIENCE EFFORTS

1. Do you have access to credit or financial support for farming activities?

☐ Yes

☐ No

2. If yes, what is your main source of financial support?

☐ government programmes

☐ Non-Governmental Organisations

☐ Banks or micro-finance institutions

☐ Cooperatives

☐ Relatives/ friends

☐ Other (Specify)

3. How does your income level affect your household's ability to adopt drought resilience strategies?

☐ Can afford to implement most of the strategies

☐ Can afford a few strategies

☐ Cannot afford any strategies

4. Regarding your household's income level, what type of farming do you practise?

☐ Subsistence farming

☐ Commercial farming

☐ Mixed farming (both crops and livestock)

5. What crops do you mainly grow?

☐ Maize

☐ Sorghum

☐ Millet

☐ Groundnuts

☐ Cowpeas

☐ Rapoko

☐ Sunflower

☐ Soybeans

☐ Other (specify……..)

6. What livestock do you keep?

☐ Cattle

☐ Goats

☐ Sheep

☐ Poultry

☐ Other (specify……)

7. Do you receive agricultural extension services or training on drought resilience?

☐ Yes

☐ No

8. If yes, who provides these services

☐ Government Agricultural Extension Services

☐ NGOs

☐ Farmer cooperatives

☐ Other (specify……)

9. How frequently do you receive agricultural training?

☐ Regularly (More than 3 times a year)

☐ Occasionally (1-2 times per year)

☐ Never

10. How accessible is the information on drought resilience strategies?

☐ Very accessible

☐ Somewhat accessible

☐ Not accessible at all

11. Do local institutions (government, NGOs, community based farmer groups, etc.) provide support for drought resilience improvement/

12. Yes

13. No

☐ If yes, what type of support is provided?

☐ Training and education

☐ Financial aid or subsidies

☐ Provision of farming inputs (seed, fertilizer, equipment)

☐ Market access support

☐ Other (Specify…….)

15. Do the cultural beliefs or traditional practices influence the adoption of drought resilience strategies?

☐ Yes

☐ No

16. If yes, how do cultural beliefs or traditional practices affect the adoption of these strategies?

☐ Encourage adoption

☐ Discourage adoption

End of questionnaire. Thank you for your time!

APPENDIX C: INTERVIEW GUIDE FOR THE AGRITEX OFFICER

1) Can you briefly describe your role and responsibilities as an agricultural extension officer in Munyarari?
2) For how long have you been working in this area, and what experience do you have with drought resilience efforts and activities in Munyarari?
3) When was the last time this area was affected by a drought or a dry spell?
4) What drought resilience measures are employed by the community members in dealing with drought?
5) In your own opinion, are these measures effective in alleviating the impacts drought in the area?
6) For how long does it usually take for a drought to affect the ward or region?
7) What are the common impacts of droughts on the households of Munyarari?
8) Are there any households that do not practise these measures? If yes, what may be the reasons for not employing these measures?
9) In your own opinion, to what extend have these measures been able to deal with the impacts of droughts?
10) What are the challenges that are encountered by the households when implementing drought resilience efforts?
11) What efforts have been made by your office in order to deal with these problems?
12) Are there any training programmes or systems that have been put in place to encourage the households to implement better drought resilience strategies? If yes, what impact has these training programmes been able to make on the households?
13) As a way of averting the impacts of droughts, what common crops are grown by the households?
14) On average, how many 50 kg bags of produce are produced by:
    (a) A household practicing the resilience measures in Munyarari after a successful growing season?
    (b) A household not practicing?
15) In your own words, what are the factors that contribute to effective drought resilience improvement?

APPENDIX D: INTERVIEW GUIDE FOR THE WARD 20 COUNCILOR

1. Can you describe your role and responsibilities as the councilor of this area?
2. For how long have you been serving as the councilor of this area?
3. When was the last time this area was affected by a serious drought?
4. What measures are adopted by the community members in dealing with the impact of drought?
5. Are these strategies effective in reducing the impacts of droughts?
6. What may be credited for the success or failure of the existing drought resilience strategies in Munyarari
7. What has the government, it partners and agencies; and the non-Governmental Organisations been doing as a way of improving resilience to droughts by the households settling in Munyarari?
8. Have these measures been successful in realizing their goal?
9. Are there any training programmes that are in place to educate the community members on the significance of the conservation agriculture principles? If yes, how has this made an impact on the resilience levels of the households?
10. In your own opinion, what are the social, cultural and economic factors that enable the adoption and success of the drought resilience strategies? Does the status quo and income level of a household significantly affect effectiveness of the drought resilience? If yes, how?
11. Which differences exist between the production outcomes of those who practise resilience strategies and those who do not?
12. Elaborate on the differences by comparing the average total amount of produce in kilogrammes between the two groups of households.
13. Are there any national organisations, non-Governental Organisations (NGOs) government departments and agencies that offer external assistance to the drought stricken households of Munyarari? If yes, to what extend does the community depend on these programmes?
14. What nature of assistance does the community receive from these organisations?
15. What do you think are the challenges that are likely to be encountered during the implementation of the different drought resilience strategies?

APPENDIX E: INTERVIEW GUIDE FOR VILLAGE HEADS

1. Can you describe your role and responsibilities as a village head?
2. How long have you been serving as a village head?
3. How long does it usually take for the next drought to strike in this ward of Munyarari?
4. When was the last time Munyarari was affected by a major drought?
5. May you please comment on the level of resilience to drought of the households?
6. How long does it usually last before the dry spells/ droughts are over?
7. What drought resilience measures that are commonly employed by the households in your area?
8. Among these measures, are there any that are cultural and indigenous to Munyarari? If yes, to what extend has the community members been relying upon these indigenous measures?
9. Do you think that indigenous knowledge-based practices have contributed to improved drought resilience or not? If yes, how has these measures contributed to improved drought resilience in Munyarari?
10. To what extend do the community members practise these methods and with what outcomes?
11. (a) What are the common crops that are grown by the households in your village?
    (b) Which indigenous/ traditional crop varieties are grown in Munyarari?
    (c) Which crops perform better than others in Munyarari?
    (d) Comparing between the households that practise either one of the drought resilience strategies and those that do not, how much is usually produced in kilogrammes after a successful growing season?
    (d) Are there any significant production outcome differences between the practising and the non-practising households? If yes, specify the major differences.
12. What usually influence the adoption of a drought resilience measure or approach by a household?
13. In your own perspective, what are the common challenges that are likely to be experienced by the households during the implementation of the drought resilience strategies?
14. How has the households been able to deal with these challenges and how has the challenges been responsible for the current low resilience level in Munyarari?

APPENDIX F: OBSERVATION GUIDE.

ASPECT	**OBSEVATION**	**COMMENT**
The farming field/ plots	❖ The colour of plant leaves ❖ The height of the plants ❖ The flowering and fruition of the plants ❖ The health and quantities of livestock per each household.	
The social and economic aspect	❖ The socio-economic characteristics of households ❖ The number of meals taken per day ❖ The assets owned by a household ❖ The quality of the homesteads ❖ The gender, age and educational aspects of the household heads	
The drought resilience strategies	❖ The drought resilience strategies employed ❖ The crops grown by households	

	❖ Animal species owned by households	