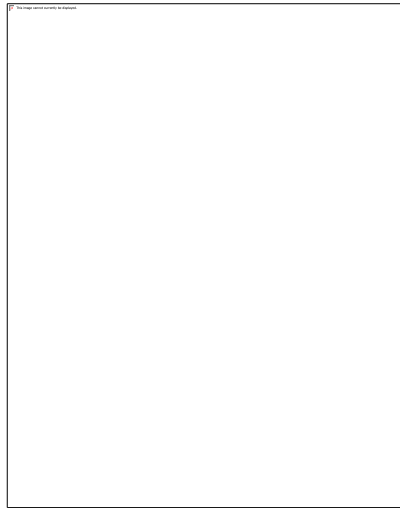


**BINDURA UNIVERSITY OF SCIENCE EDUCATION**

**FACULTY OF SCIENCE AND ENGINEERING**

**DEPARTMENT OF SUSTAINABLE**

**DEVELOPMENT**



**EXPLORING THE ROLE OF IRRIGATION SCHEME IN IMPROVING FOOD  
SECURITY. A CASE STUDY OF ROSA IRRIGATION SCHEME IN MAZOWE  
RURAL DISTRICT**

**BY**

**TAKUDZWA GATSI**

**B1953807**

**SUPERVISOR: DR BOWORA**

**YEAR: 2024**

**A PROJECT SUBMITTED TO BINDURA UNIVERSITY OF SCIENCE EDUCATION  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF BACHELOR OF  
SCIENCE AND EDUCATION HONOURS DEGREE IN DEVELOPMENT STUDIES**

**DATE: 28 MAY 2024**

## RELEASE FORM

Name of Student: Takudzwa Gatsi

Student Number: B1953807

Title of Project: Exploring the role of irrigation schemes in improving food security. A case study of Rosa Irrigation scheme in Mazowe Rural District, ward 7

Program: Development Studies (HBSc.DS)

Year Granted 2024

Permission is hereby granted to Bindura University of Science Education Library and the department of Sustainable Development to produce copies for scholarly and scientific research only. The author reserves to other publication right and the research project extensive extracts thereof may not be made or otherwise reproduced without the author's written permission.

Permanent address: Gweshe High school

Private Bag 2044

Glendale

## APPROVAL FORM

### 1. Supervisor:


I certify that I supervised Takudzwa Gatsi for the research project titled "Exploring the role of irrigation schemes in improving food security." A case study of the Rosa irrigation scheme in Mazowe District, Ward 7, Mashonaland Central, Zimbabwe, in partial fulfillment of the requirements for the Bachelor of Science in Honors Degree in Development Studies (HBSc.DS), with the recommendation that it be examined.

Supervisor Signature 

Date.27/09/24

### 2. Students:

To be completed by the Student

Students Signature 

Date 27/09/24

### 3. Chairman:

To be completed by the Chairman

  
DR. J. BOWORA  
CHAIRMAN

  
CHAIRMAN  
GEOGRAPHY DEPARTMENT  
FACULTY OF SCIENCE

Date 27/09/24

### **DECLARATION**

I TAKUDZWA GATSI studying for the Bachelor of Science Honors Degree in Development Studies, aware of the facts that plagiarism is a serious offence and that falsifying information is a breach of ethics of Development Studies research, honestly declare that the dissertation report titled: Exploring the role of irrigation scheme in improving food security. A case study of Rosa irrigation scheme in Mazowe District ward 7, Mashonaland Central of Zimbabwe is a result of my own work and has not been copied, I have followed research ethics required in pursuit of Development Studies research and I grant permission to the University to use this report for educational purposes.

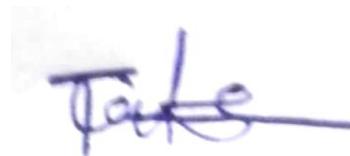
Date

JUNE 2024

Student's Name

TAKUDZWA GATSI

Signature



## **DEDICATION**

Special thanks go to my loving aunt, Febbie Musonza, and my best friend, Nomatter P Nzeve, for always adding value to my life despite their struggles. I also dedicate this work to my supervisor, Doctor Boora, family, friends, Mazowe Rural District Council, and everyone else who helped make this study research a success.

## **ACKNOWLEDGEMENTS**

My heartfelt gratitude goes to the Almighty God for giving me the opportunity to study at Bindura University of Science and Education (BUSE) and for guiding me during this period of learning. I also want to acknowledge and thank the Higherlife Foundation, my parents, and other family members for their financial and moral support throughout my journey. I do also like to thank my research supervisor, Doctor Boora, for his guidance and assistance throughout this research; without him, this journey would not have been possible. I would like to give my best regards and an immense sense of gratitude to every lecturer in the sustainable development department of BUSE for their invaluable guidance that was invaluable for my study. They helped me learn more about professionalism and life in general. I'd also like to thank the residents of the Rosa irrigation area and Nzvimbo in Mazowe District for their cooperation and honesty, which allowed me to collect reliable data. Finally, I want to express my heartfelt gratitude to my family, friends, and relatives for their unwavering support throughout the writing of this dissertation. Your love is much appreciated.

## **ABSTRACT**

The purpose of this study is to investigate the role of the Rosa irrigation scheme in enhancing food security in the Mazowe district. It also aims to determine how irrigation practices improve food security among Rosa irrigation users. The Rosa irrigation scheme is located in Zimbabwe's Mazowe district, which was chosen due to its importance in agricultural production and potential impact on regional food security. Furthermore, the target population for this study is 34 people, including irrigation users, an AGRITEX officer, a council official from Mazowe Rural District, a ward councillor, and a village head. These key stakeholders were chosen based on their role and influence in the Rosa irrigation scheme. This study's data was gathered through interviews, focus group discussions (FDGs), structured and open-ended questionnaires, and direct observations. Semi-structured interviews were conducted with the designated stakeholders to gather feedback on food security, challenges encountered, and opportunities for improvement within the irrigation project. The study's findings demonstrated the importance of the Rosa irrigation scheme in improving users' access to food. Using irrigation techniques has dramatically increased crop yields and ensured a more consistent supply of food all year. However, obstacles to further improving food security within the program were identified, including a lack of water, inadequate infrastructure, climate change, and limited market access. Furthermore, based on the findings, it is suggested that investments be made in irrigation infrastructure upgrades, sustainable farming practice training, and the establishment of market links for Rosa irrigation scheme products. Addressing these issues has the potential to improve food security outcomes and the socioeconomic status of irrigation users in Mazowe district.

## **LIST OF FIGURES**

- Figure 1.8..... Location of the study site
- Figure 2.1..... Sustainable livelihood framework
- Figure 4:1..... Age distribution of participants
- Figure 4.2.....Key informants responses chart



## LIST OF TABLES

Table 3.4.....	Target population
Table 4.1.....	Data for key informants
Table 4.3 .....	Level of education
Table 4.4.....	Endorsed role of irrigation scheme

## **ACRONOMYS**

SLF	Sustainable Livelihood Framework
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
ICID	International Committee on Irrigation and Drainage
GERD	Grand Ethiopian Renaissance Dam
AGRITEX	Agricultural Technical and Extension services
MRDC	Mazowe Rural District official
RDC	Rural District Council
WHO	World Health Organisation

## TABLE OF CONTENTS

<b>RELEASE FORM</b> .....	i
APPROVAL FORM .....	ii
DECLARATION .....	iii
DEDICATION .....	iv
ACKNOWLEDGEMENTS .....	v
ABSTRACT.....	vi
LIST OF FIGURES.....	vii
LIST OF TABLES.....	viii
ACRONOMYS.....	ix
CHAPTER ONE .....	1
INTRODUCTION.....	1
1.1 Introduction .....	1
1.2 Background to the study.....	1
1.3 Problem statement .....	4
1.4 Aim of the study.....	4
1.5 Research Objectives.....	4
1.6 Research Questions: .....	5
1.7 Assumption of the study.....	5
1.8 Significance of the study .....	5
1.8.1. To the policy makers.....	5
1.8.2. To the irrigation users.....	6
1.8.3. To the planners. ....	6
1.8.4. To farmers using irrigation schemes.....	7
1.8.5. To the researchers .....	7
1.8.6. To the academists .....	7
1.8.7. For future research .....	8
1.9 Location of the study site.....	9
1.9.1 Delimitation of the study .....	10
1.10 Limitations.....	10

1.10.1 Financial challenges .....	10
1.10.2 Individuals' cooperation.....	10
1.10.3 Time consuming .....	10
1.11 Definition of key terms .....	11
1.11.1 Food security.....	11
1.11.2 Food insecurity.....	11
1.11.3 Irrigation scheme .....	11
1.11.4 Mazowe Rural District.....	11
1.12 Organisation of the study .....	11
1.13. Chapter Summary .....	12
CHAPTER TWO .....	12
LITERATURE REVIEW .....	12
2.1 Introduction .....	12
2.2 Sustainable livelihoods framework.....	13
2.3. Role of Irrigation Schemes in Improving Food Security Globally.....	14
2.3.1. The role of irrigation scheme in improving food security in Africa .....	16
2.3.2. The role of irrigation scheme in improving food security in Zimbabwe .....	17
2.4. Challenges faced by irrigation users in improving their food security globally.....	18
2.4.1. Challenges and barriers faced by irrigation users in improving their food security in Africa .....	21
2.4.2. Challenges and barriers faced by irrigation users in improving their food security in Zimbabwe.....	23
2.5. Perspectives of irrigation users in improving their socio-economic status at global level.....	24
2.5.1. Perspectives of irrigation users in improving their socio-economic status in Africa .....	25
2.5.2. Perspectives of irrigation users in improving their socio-economic status in Zimbabwe ..	26
2.4 Chapter summary.....	28
CHAPTER THREE .....	28
RESEARCH METHODOLOGY .....	28
3.1 Introduction .....	28
3.2 Research approach.....	28
3.3. Research design .....	29
3.4. Sampling procedure .....	29
3.4.1 Target population.....	29
3.5. Sampling plan.....	30

3.6 Sample size.....	30
3.7. Data collection instruments.....	30
3.7.1 Questionnaire surveys .....	30
3.7.2 Focus Group Discussion .....	31
3.7.3. Key informants' interviews .....	31
3.7.4. Personal observation .....	32
3.8 Data analysis .....	32
3.9 Reliability.....	32
3.10 Validity .....	33
3.11 Ethical considerations .....	33
3.11.1 Informed consent.....	33
3.11.2 Confidentiality.....	33
3.11.3 Debriefing and de-hoaxing.....	33
3.12. Limitations.....	34
3.13 Chapter summary.....	34
CHAPTER FOUR .....	35
DATA PRESENTATION, ANALYSIS AND INTERPRETATION .....	35
4:1. Introduction .....	35
4:2. Demographic profile of participants.....	35
4:3. Demographic Data .....	36
4:3:1 Educational level.....	37
4.4 Role of irrigation scheme in improving food security.....	37
4.4.1. Infrastructure and technology .....	38
4.4.2. Training and capacity building .....	40
4.4.3. Access to inputs and support services .....	42
4.4.4. Crop diversification .....	44
4.5. Perspectives of irrigation users in improving their socio-economic status.....	45
4.5.1. Access to water .....	47
4.5.2. Market access and prices.....	48
4.6 Challenges and barriers of irrigation users face in improving their food security.....	50
4.6.1. Climate change impacts .....	51
4.6.2. Gender stereotypes .....	53
4.6.3. Socio-economic factors.....	55
4.7 Summary .....	57

CHAPTER FIVE .....	58
SUMMARY, CONCLUSION AND RECOMMENDATIONS .....	58
5.1 Introduction .....	58
5.2 Summary of the findings .....	58
5.2.2 Role of irrigation scheme in improving food security? .....	59
5.2.3 Challenges and barriers of irrigation users face in improving their food security? .....	59
5.2.4. Perspectives of irrigation users in improving their socio-economic status? .....	60
5.3 Conclusions of the findings .....	61
5.4 Recommendations .....	61
5.5. Chapter summary.....	62
REFERENCES .....	63
APPENDIX 1 .....	73
A LETTER FROM BINDURA UNIVERSITY OF SCIENCE EDUCATION TO CONDUCT THE RESEARCH ....	73
APPENDIX 2 .....	74
HOUSEHOLD QUESTIONNAIRE FOR SMALLHOLDER FARMERS AND COMMUNITY MEMBERS IN MAZOWE RURAL DISTRICT, WARD 7 .....	74
APPENDIX 3 .....	79
KEY INFORMANT INTERVIEW FOR AGRITEX OFFICERS IN MAZOWE DISTRICT, WARD 7 .....	79
APPENDIX 4 .....	81
KEY INFORMANT INTERVIEW FOR WARD COUNCILOR.....	81
APPENDIX 5 .....	82
AN INTERVIEW GUIDE FOR THE VILLAGE HEAD.....	82
APPENDIX 6 .....	83
AN INTERVIEW GUIDE FOR FOCUS GROUP DISCUSSION FOR IRRIGATION FARMERS.....	83
APPENDIX 7 .....	86
AN INTERVIEW GUIDE FOR FOCUS GROUP DISCUSSION FOR MAZOWE RURAL DISTRICT OFFICIAL	86

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Introduction**

Zimbabwe's agriculture industry has had many difficulties recently, including droughts and floods brought on by climate change that have lowered crop yields and jeopardized food security. Zimbabwe's government has established irrigation projects across the nation, including Mazowe Rural District, in an attempt to increase agricultural production and foster food security. This study will also go over government initiatives and policies that support food security and agricultural growth, such as the irrigation project that Mazowe Rural District put into place. Therefore, the intention of this research is to look at the role of the Rosa irrigation in Mazowe Rural District on food security and This chapter gives an overview of the study wherein.

#### **1.2 Background to the study**

Food security is a critical issue for nations worldwide, directly impacting the well-being and livelihoods of their populations. The global population is anticipated to rise from over 7.5 billion in 2019 (Rosegrant, et al. 2002) to approximately 9.8 billion by 2050, posing significant challenges to food production and distribution systems (Fan, et al. 2019). One of the fundamental factors in achieving food security is ensuring a reliable and sustainable water supply for agricultural purposes (Ringler, et al. (2010). Irrigation schemes are essential in enhancing agricultural productivity, mitigating the impacts of droughts, and ensuring food availability throughout the year. As stated by the International Committee on Irrigation and Drainage (ICID, 2017), irrigated lands contribute over 40% of the world's agricultural productivity (nearly 20% of total cultivated area). The report implies that irrigation schemes are an essential component of agricultural development in numerous locations across the globe, especially in regions with limited rainfall. These schemes involve the artificial application of water to crops and they can significantly improve crop yields and food security.

The United States boasts a robust food security system, primarily attributed to its advanced agricultural practices, technological innovations, and strong economy. These elements all contribute to the country's capacity to supply a constant and dependable food supply for its people. Edward and Smith (2018) investigated the function of irrigation in the growth of agriculture in the United States. Their research concentrated on examining the role of irrigation in agricultural improvements in the United States after 1940, with a special emphasis on how

productivity and farm values changed in the Western United States. The outcomes of Edward and Smith's research showed that implementing vast streams and groundwater irrigation schemes resulted in a significant improvement in crop yield. It was shown that these irrigation measures resulted in a \$19 billion gain in crop production every year, accounting for 90% of the total annual rise seen in the Western United States after 1940.

Irrigation schemes are intended to provide a consistent and sustainable supply of water for agricultural purposes, and they can be used for a wide range of crops, including drought-sensitive crops. However, the effectiveness of irrigation schemes varies depending on a number of factors, including crop type, water availability, and management practices. Most developed countries have extremely inefficient irrigation systems (FAO, 2016).

China has also succeeded in achieving food security by using irrigation. Cao, Wu, Zheng, et al. (2017) assert that the advancement of irrigation technology and agricultural production technology remains the most effective means of increasing grain output volume in the future. The study's conclusions demonstrated that increasing the area under irrigation and increasing irrigation efficiency will help close the food gap and enable China to ensure food security going forward by preserving irrigation water for the development of additional irrigated farmland. Likewise, Nonvide (2017) backs up the findings of Cao, Wu, Zheng, et al. (2017) by pointing out that the use of irrigation increased rice yield by 55–60%, thus confirming that irrigation is crucial for crop productivity improvement.

Furthermore, Ethiopian agricultural production was historically rain-fed, which made it frequently irregular and insufficient, according to Gebrehiwot et al. (2015). As a result, the country has experienced numerous failures in agricultural production, all of which are caused by rainfall variability and drought. Given the preceding scenario, the Ethiopian government focused on increasing agricultural production by promoting small-scale irrigation projects, primarily because most low-productivity areas had abundant untapped water resources (Gebrehiwot et al., 2015). In order to ensure food security and foster rural development, it has been observed that Ethiopia is one nation that has effectively brought irrigation farming back, especially for smallholder farmers (Christine et al., 2008). Additionally, a study conducted in 2019 by Adela, Aurbacher, and Abebe examined the effects of small-scale irrigation adoption on food security in Ethiopia and discovered a positive correlation with higher farm income and food consumption. It also significantly contributed to lower rates of poverty and increased access to and availability of food, all of which are factors that affect food security.



According to research conducted in Nigeria, irrigation systems have a positive effect, significantly increase agricultural output overall and in specific agricultural subsectors, and lessen the susceptibility of rain-fed agriculture to the effects of climate change (Olayide, Tetteh & Popoola, 2016). The same studies measured the effect of irrigation versus rain-fed agriculture on and sub-sectors using time series data spanning 43 years and an econometric analytical technique. The results showed that irrigation, in spite of the current climate change and variability, promotes food security and environmentally friendly farming practices by enhancing complementary agriculture water management, which in turn fosters the growth of agricultural sub-sectors (Olayide et al., 2016). As a result, the critical role of irrigation in Nigeria indicates not only increased agricultural production but also decreased vulnerability to the effects of climate change on rain-fed agriculture. The positive impact of irrigation systems on agricultural production and sub-sectors is consistent with the global recognition of the importance of climate-smart agriculture and the need to adapt to climate change while promoting sustainable agricultural practices.

The national irrigation development plan of South Africa prioritized the development of new irrigation projects as well as the renovation of existing ones to benefit smallholders. According to research, for subsistence farmers, irrigation has a very high social value, and public investments yield incredible proceeds on social equality and food security. According to Van Averbeké et al. (2011), the NIS database shows that, while approximately 1.3 million hectares in South Africa are irrigated, smallholder irrigation is practiced on only 47,670 ha across 302 schemes. These programs, situated in former countries of origin, possess the capacity to enhance food security, generate income, and provide job opportunities for the underprivileged.

Throughout the world, in numerous places, particularly in underdeveloped nations, food security is a major issue. Zimbabwe is not an exception, with the agricultural sector accounting for a sizeable portion of the national GDP. According to Hanjra et al. (2017), approximately 17% of urban households in Zimbabwe practice urban agriculture outside of residential properties near water bodies, while 70% of urban households in the country's capital, Harare, practice it on residential land. Wastewater from the city is frequently dumped into the wetlands and streams nearby, combining with the water to sustain agricultural practices and improve food security and nutrition for the urban poor. In 2006, data from the Bulawayo area revealed that about 500 farmers were irrigating half-hectare-sized vegetable plots with wastewater (Mutengu et al. 2007). Recent research (Makoni et al. 2016) bolsters this as well. The Chitora irrigation scheme in Mutoko district, Zimbabwe, is an example of an irrigation project that is

greatly lowering food insecurity, malnutrition, and poverty while also encouraging the economic empowerment of the local population (Chikwati 2018).

Mazowe Rural District, in Zimbabwe's Mashonaland Central province, has low rainfall, making it an ideal location for studying the effectiveness of irrigation schemes on food security. The entire surface area of Mazowe is close to 453 892 hectares, with ward 32 covering 7210 ha. Furthermore, Mazowe Rural District has one of the highest population densities and limited access to irrigation systems. According to the Ward Development Committee (2019), only 10% of the ward's farmers have access to irrigation systems, with the majority relying on rain-fed agriculture. This makes it the perfect place to look into how irrigation plans affect the availability of food.

### **1.3 Problem statement**

The effectiveness of irrigation schemes in improving crop yields and in developing nations, food security has been a subject of interest for many researchers. However, there is limited research on the specific context of Mazowe rural district, which is characterised by limited access to water resources and high poverty levels.

Mtonga (2014) asserts that small-scale irrigation projects have the potential to significantly improve food security, create jobs, protect against the effects of drought, and provide opportunities for multiple cropping and crop diversification. The Mazowe District's Rosa irrigation scheme was implemented, but local food insecurity is still a significant problem for the community. In addition to identifying major issues that must be resolved to guarantee that the program has a beneficial effect on food security, this study will evaluate the scheme's contribution to enhancing food security.

### **1.4 Aim of the study**

The study's aim is to look into and evaluate how irrigation schemes in Zimbabwe's Mazowe district affect agricultural productivity and livelihoods. This study is extremely important because, it showed the role of irrigation scheme in improving food security in Rosa irrigation scheme in Mazowe District. In the context of Mazowe rural district which is located in a semi-arid region of Zimbabwe, understanding the role of irrigation schemes is essential for identifying potential challenges and opportunities for improving agricultural practices.

### **1.5 Research Objectives**

The study sought to:

1. To explore the role of irrigation scheme in improving food security in Rosa irrigation scheme in Mazowe district.
2. To examine the challenges and barriers that irrigation users in Rosa irrigation scheme area in Mazowe district face in improving their food security
3. To evaluate the perspectives of irrigation users in Rosa irrigation scheme in Mazowe district in improving their socio-economic status.
4. To suggest improved methods for irrigation users to improve food security in Zimbabwe.

#### **1.6 Research Questions:**

1. What is the role of irrigation scheme in improving food security?
2. What are the challenges and barriers that irrigation users face in improving their food security?
3. What are the perspectives of irrigation users in improving their socio-economic status?
4. What can you suggest as the improved methods for irrigation users to improve food security in Zimbabwe?

#### **1.7 Assumption of the study**

The researcher assumed that:

- 1) Irrigation schemes can increase crop yields by providing a consistent supply of water. Irrigation schemes can help farmers grow crops that are not normally suited to the local climate leading to increased crop yields and improve food security.
- 2) Irrigation schemes can improve soil health by providing a consistent supply of water, irrigation schemes can help to maintain soil fertility and prevent soil degradation.

#### **1.8 Significance of the study**

Irrigation schemes can significantly improve crop yields and food security, especially in areas with limited rainfall. The case study of Rosa irrigation scheme can provide valuable insights into effectiveness of irrigation schemes in improving food security.

##### **1.8.1. To the policy makers**

The study can help policymakers by providing evidence-based recommendations for improving irrigation systems and policies to combat food insecurity. The study can also be used to inform policies and programs aimed at reducing rural communities' vulnerability to the effects of drought. This could include improving farmers' access to credit and finance, developing crop insurance schemes, and strengthening drought warning systems. Furthermore, the study can promote collaboration and coordination among various food security stakeholders, including

government ministries, development agencies, and local communities. Furthermore, the study's findings can influence resource allocation and funding for regional food security initiatives. The study can be used by policymakers to advocate for increased investment in irrigation systems, as well as to promote more efficient and sustainable water resource management. They can also use the findings to help shape policies that promote the use of drought-resistant crops and encourage the use of modern technologies and farming techniques to boost yields. The study can also be used to advocate for policies that ensure the equitable distribution of food and other resources during times of crisis, as well as to protect the rights of vulnerable populations.

### **1.8.2. To the irrigation users**

The study can help irrigation users understand how irrigation schemes can improve food security in their communities, as well as the specific factors that contribute to this. The study can also help identify irrigation users' challenges and opportunities, as well as how to address them. Furthermore, assessing the effect of irrigation schemes on poverty reduction and the socioeconomic benefits they provide to irrigation users is an important aspect of this study. Furthermore, evaluating the role of irrigation schemes in promoting sustainable agriculture and environmental conservation, as well as investigating how irrigation schemes can be improved to improve food security, are important aspects of the study for irrigation users.

### **1.8.3. To the planners.**

This study will help planners by providing useful information about the effectiveness of irrigation schemes in enhancing food security in regions vulnerable to drought. The study's findings can be used to inform policy and decision-making regarding irrigation development and water management in semi-arid regions. In addition, The research can be used to find any gaps and weaknesses in existing irrigation systems, and make recommendations for improvements. The findings can also be used to develop strategies for improving food security in Mazowe District and other similar areas in Zimbabwe. In addition to the benefits outlined above, this study can also help planners to better understand the needs and priorities of local communities when it comes to food security. By understanding the specific challenges faced by farmers in Mazowe District, planners can develop more targeted and effective interventions to improve food security. This could include things like improving access to irrigation systems, providing training and support to farmers, and investing in drought-resistant crops and technologies. The study can also help to identify opportunities for partnership between different

stakeholders, such as government agencies, NGOs, and private sector actors, to address food security issues in a more coordinated way.

#### **1.8.4. To farmers using irrigation schemes**

This study is important to farmers using irrigation schemes for a number of reasons. First, it can provide insights into the specific benefits that irrigation schemes offer, and how these can be maximized. Second, it can identify the challenges that farmers face in using irrigation schemes, and recommend ways to address these. Third, it can help to improve the efficiency and effectiveness of irrigation schemes, by identifying areas for improvement and recommending best practices. Fourth, it can provide a platform for farmers to voice their concerns and needs, and advocate for changes that can benefit them. Finally, it can help to raise awareness about the importance of irrigation schemes in improving food security.

#### **1.8.5. To the researchers**

This study may be significant for researchers in a variety of ways. First, it can contribute to the body of knowledge on food security in Zimbabwe and other drought-prone regions. It can serve as a case study for the implementation of an irrigation scheme, including the challenges and opportunities that come with it. This can help to shape future research into the effectiveness of irrigation schemes and the factors that influence their success. Additionally, the findings can be used to generate new research questions and hypotheses about food security and irrigation schemes. In addition to the foregoing, the findings of this study may have a variety of other implications for researchers. For example, the findings can be used to create strategies for monitoring and evaluating irrigation schemes' impact on food security. Furthermore, the findings can be used to develop and implement new interventions and programs to boost food security. The findings can also aid in identifying gaps in the existing literature on food security and irrigation schemes, which can be addressed in future research. Finally, the findings can help to shape research agendas and priorities for food security and agricultural development.

#### **1.8.6. To the academics**

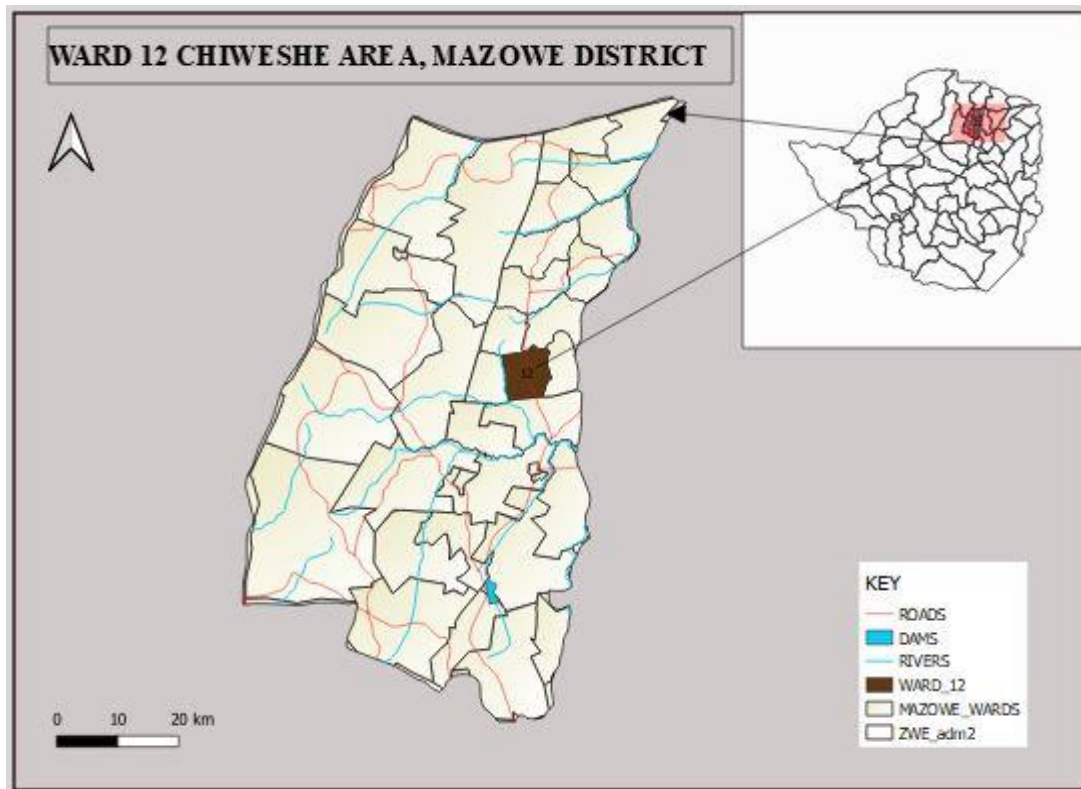
The study's findings may be useful for academics interested in food security, agricultural development, and sustainable development. First and foremost, the study can contribute to a better understanding of the factors that influence food security in drought-prone areas. This can help develop effective interventions and policies to combat food insecurity. Second, the study can contribute to a better understanding of how irrigation schemes can be used to increase food security. This can help with the design of irrigation schemes and other interventions to improve food security in other areas. Finally, the research can add to the body of knowledge about

sustainable development and the role of irrigation in achieving it. In addition to the foregoing, the findings of this study may be important to academics in terms of their contribution to the field of interdisciplinary research. The study uses social science, agricultural science, and engineering to investigate the link between irrigation schemes and food security. This interdisciplinary approach can be useful for other researchers who want to tackle complex problems that require the collaboration of multiple disciplines. Finally, the study's findings can be used to generate new insights and knowledge, which can then be shared with other academics and researchers via publications, conferences, and other channels.

#### **1.8.7. For future research**

Further investigation into the contribution of irrigation schemes to increased food security can build upon the findings of this study. There are several areas that could be investigated in future research on this subject. First, it would be interesting to investigate the role of irrigation schemes in improving food security in other African countries, in order to compare and contrast Zimbabwe's experiences. It would also be worthwhile to investigate the role of irrigation schemes in supporting non-agricultural livelihoods, such as improved domestic water access and income generation. Finally, it would be beneficial to investigate irrigation schemes' long-term sustainability and financial viability in the face of climate change.

## 1.9 Location of the study site



According to Google Maps, the distance between Bindura Provincial Capital and Rosa Irrigation Scheme Area is about 57 kilometres (35.4 miles) via the A10 and A15 highways. Furthermore, temperatures in the Rosa irrigation scheme area typically range between 13°C and 27°C. The coolest months are June and July, with average minimum temperatures of around 13°C, and the warmest months are October and November, with average maximum temperatures of about 27°C. The amount of rainfall received in the Rosa irrigation scheme area varies, but on average, the region receives between 650 and 850 mm per year. The majority of the rainfall occurs between November and March. The wettest month is usually February, with up to 170 mm of rain.

In addition, the soil in the Rosa irrigation scheme area is predominantly sandy loam. Sandy loam soil is a well-drained soil composed of sand, silt, and clay particles. This kind of soil is ideal for agriculture because it can hold onto moisture well and still allow for good drainage. Sandy loam soil is distinguished by its granular structure, which provides good aeration and root penetration for plants. It also has moderate fertility, which makes it suitable for a wide range of crops grown in the region. The presence of sand particles in sandy loam soil reduces compaction and facilitates cultivation.

Moreover, the major crops grown under irrigation in the Rosa Irrigation Scheme area in Mazowe District are maize, wheat, and tobacco. Maize is a staple crop in Zimbabwe and is commonly grown under irrigation due to its high demand for food consumption. Wheat is another important crop grown in the area, as it is a key ingredient in various food products. Additionally, tobacco is a significant cash crop in Zimbabwe, and its cultivation under irrigation in the Rosa Irrigation Scheme area contributes to the country's economy. These three crops play a crucial role in the agricultural landscape of the region, providing both food security and economic opportunities for farmers in the Mazowe District.

### **1.9.1 Delimitation of the study**

The study is going to be confined to Mazowe district, ward 7 focusing on Rosa irrigation scheme. The study will also look at the role of Rosa irrigation scheme in improving food security, the challenges and barriers that irrigation users are facing in improving their food security, the perspectives of irrigation users in improving their socio-economic status and the type of irrigation and major crops being grown under Rosa irrigation scheme in Mazowe district.

### **1.10 Limitations**

The researcher faces a number of challenges which include:

#### **1.10.1 Financial challenges**

Throughout the research process, the researcher encountered financial difficulties. In addition to money needed for stationery for the questionnaires, the researcher also needed money for transportation to Mazowe, where interviews would be conducted. Since the researcher lacked a place to stay while tackling this problem, money was also needed to make reservations. As a result, the researcher had to ask friends and relatives for financial support.

#### **1.10.2 Individuals' cooperation**

Another problem the researcher faces is people's lack of collaboration. Some exhibited a lack of cooperation by declining to divulge the information. Hence, the researcher managed in tackling this problem through addressing issues like lack of trust and establishing communication channels which attract people to collaborate.

#### **1.10.3 Time consuming**

The project took a lot of time because it required the researcher to dedicate a lot of time to organizing and creating the questionnaires and conducting the lengthy interviews. Still, the researcher needed to exercise patience in order to obtain sufficient data.



## **1.11 Definition of key terms**

### **1.11.1 Food security**

According to FAO, 2003, WHO 2011, cited in Chazovachii 2012, food security is the state in which all people have physical, social, and constant access to enough safe, nutritious food that satisfies their dietary needs and food preferences for an active and healthy life.

### **1.11.2 Food insecurity**

Food insecurity, as defined by Food and Environment (2013), is the state in which individuals lack sufficient physical, social, and financial access to food.

### **1.11.3 Irrigation scheme**

An irrigation scheme is a project that provides water for agricultural purposes such as growing crops or raising livestock.

### **1.11.4 Mazowe Rural District**

Mazowe Rural District is located in Mashonaland Central Province, Zimbabwe. It shares borders with Bindura to the north, Shamva to the east, and Mt Darwin to the south. The district is home to many small-scale farmers who rely on subsistence farming for a living.

## **1.12 Organisation of the study**

The research comprises of five chapters outlined chronologically as follows:

**CHAPTER ONE: Introduction and Background**-this examines the study's goal, its objectives, its questions, its assumptions, its significance, its location, its delimitation, its restrictions, and the description of its main terminology.

**CHAPTER TWO: Literature review** - This chapter provides a review of the literature on how irrigation schemes improve food security. It also summarizes other researchers' findings on the role of irrigation schemes for food security and assesses other relevant literature.

**CHAPTER THREE: Research methodology**- The researcher talks about how the research approach was applied. The research approach employed in the study to collect pertinent data is the main topic of this chapter. It also emphasizes the population sample, target demographic, sampling techniques, and research design.

**CHAPTER FOUR: Data analysis, presentation and discussion**- The presentation and interpretation of study findings are covered in this chapter. This chapter provides a summary of the data analysis, conclusions, and result interpretation.

**CHAPTER FIVE: Summary conclusion and recommendations-** The study's results are discussed, integrating them with the theoretical framework and earlier research. The study findings are used to develop conclusions in this chapter. The research findings are also summed up in it.

### **1.13. Chapter Summary**

This part functioned as a summary of the investigation, providing guidance for each of the research's chapters. This chapter focused primarily on the study's background, problem statement, research aims, research questions, and assumptions. It also covered the study's significance, location, delimitation, limitations, definition of key terminology, and dissertation outline. The investigator uses Chapter 1 as a guide to walk through each stage of the study. It also acts as a guide for the reader, outlining the key points of the study that investigated the phenomena of irrigation scheme efficacy in enhancing food security in Mazowe district, Mashonaland Central Province, Zimbabwe.

## **CHAPTER TWO LITERATURE REVIEW**

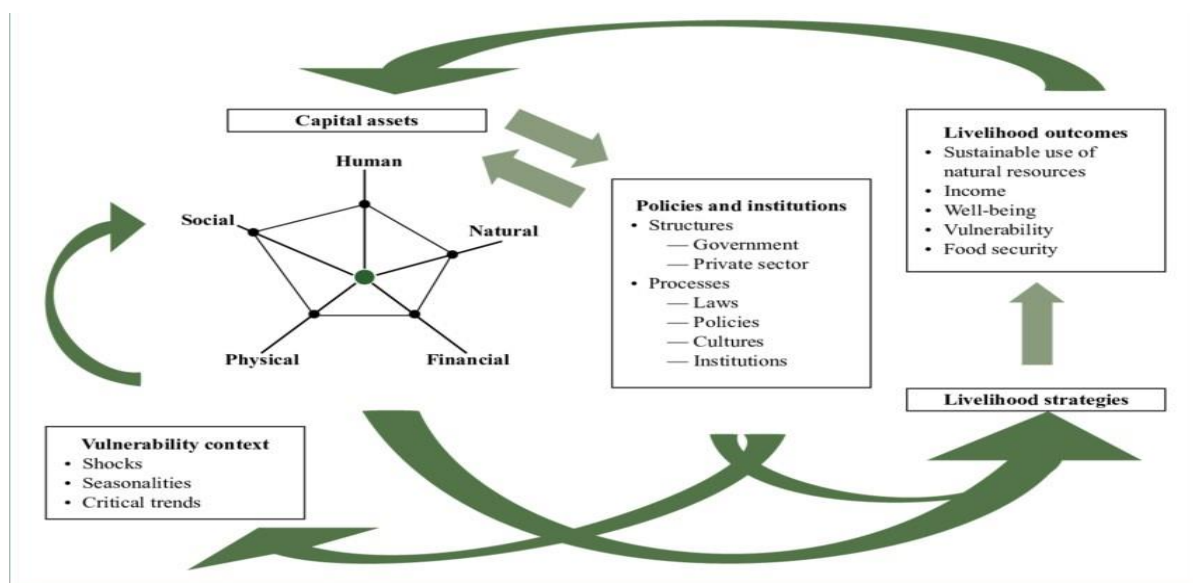
### **2.1 Introduction**

The main focus of this chapter is a review of the literature pertaining to the objectives of the study. As a result, the chapter includes research from a range of academics regarding the contribution of irrigation systems to increased food security, along with the framework for

sustainable livelihoods. According to the framework for sustainable livelihoods, Mazowe District's agricultural productivity, social cohesion, and food security can all be enhanced by putting irrigation systems into place.

## 2:2 Sustainable livelihoods framework

The Sustainable Livelihoods Framework (SLF) is a tool for understanding and analyzing livelihoods of individuals and communities, with the aim of promoting sustainable development. It was developed by Robert Chambers and Gordon Conway in 1992 and has since been widely adopted by development organizations and governments worldwide. This framework is presented in this section of the study to show the relationship between the variables and how the study intended to explore the variables. In this study, the review of literature begins by applying sustainable livelihood framework to understand the effectiveness of irrigation scheme in improving food security. Figure 2.1 demonstrate the SLF of this study.



Source: Department for International Development of the United Kingdom.

**Fig 2.1 sustainable livelihood framework**

The study employs the sustainable livelihood framework approach, as illustrated in figure 2.1 above, to comprehend the role of irrigation schemes in enhancing food security in Mazowe Rural District. The relationship between the objectives was investigated by reviewing relevant literature on each component. The researcher found this framework useful for data collection and investigating how the Rosa irrigation scheme affects the capital assets, livelihood strategies, and livelihood outcomes of the locals. In addition, the researcher investigates how

the scheme affects people's access to economic capital (income), social capital (social networks), human capital (education and skills), physical capital (infrastructure and technology), and natural capital. Furthermore, the researcher investigates how these changes impact people's livelihood outcomes, such as income, food security, and nutrition. This helps us understand the overall impact of the irrigation scheme on people's livelihoods.

According to this hypothesis, there is a connection and mutual influence between an individual, capital assets, livelihood strategies, policies and institutions and their interactions with each other. In my study, human means irrigation users. Social are the cultural or norms of the people or farmers who are practising the irrigation. Moreover, natural refers to the rainfall, temperatures and the type of soil found in the area when using irrigation scheme. Furthermore, financial means the capital invested in irrigation scheme as well as challenges faced by irrigation farmers. Therefore, the SLF will assist the researcher in collecting data, presenting the information and analysing the data.

### **2.3. Role of Irrigation Schemes in Improving Food Security Globally**

Food security is a critical global issue affecting the health, well-being, and livelihoods of millions of people. According to the United Nations (2019), food security is defined as the availability and accessibility of sufficient nutritious food to all people at all times in order to live a healthy and active lifestyle. However, achieving food security is a difficult task that is influenced by a variety of factors such as climate change, conflict, economic insecurity, and demographic growth. Several scholars have conceptualized global food security, emphasizing its multifaceted nature and the importance of a comprehensive approach to addressing the issue. For example, Ferguson et al. (2019) define food security as a "systems challenge" that necessitates a comprehensive approach to addressing the interconnected factors that influence food availability, access, and utilization. Similarly, Fan et al. (2019) contend that food security is a "global public good" that necessitates collaborative action and cooperation among governments, civil society, and the private sector to ensure that all people have access to adequate and nutritious food.

Irrigation schemes play a crucial part in improving global food security by increasing agricultural productivity, ensuring consistent crop yields, and mitigating the effects of climate change on agriculture. This literature review will investigate the role of irrigation schemes in improving food security, with a focus on two major countries, China and India. In China,

irrigation has been a cornerstone of agricultural development for centuries. The country has made significant investments in irrigation infrastructure to support its vast agricultural sector. The South-to-North Water Diversion Project is one prominent example. Its goal is to improve agricultural productivity and reduce water scarcity by moving water from the water-rich south to the arid north. Because this project has increased the amount of water available for irrigation in northern China, Huang et al. (2018) claim that it has significantly improved food security. Furthermore, scholars like Wang et al. (2019) have highlighted how modernizing irrigation systems in China through technologies such as drip irrigation and precision agriculture has led to increased crop yields and improved water efficiency, ultimately contributing to food security. However, there are some limitations on these studies. Both studies primarily focus on specific aspects of irrigation development – the South-to-North Water Diversion Project’s impact on food security (Huang et al., 2018) and modernization through drip irrigation and precision agriculture (Wang et al., 2019). A more comprehensive analysis considering various regional differences, socioeconomic factors, and environmental impacts would provide a more nuanced understanding of irrigation development in China.

India, with its large and growing population, has long recognized the importance of irrigation in ensuring food security. The country’s agricultural sector employs over 50% of its labour force (World Bank, 2021), making it a critical economic and social priority. The Green Revolution in the 1960s and 1970s marked a significant turning point in India’s agricultural history, leading to a substantial expansion of irrigation infrastructure across the country (Sharma et al., 2017). This expansion has had far-reaching consequences for India’s agricultural productivity and food security. Furthermore, the introduction of large-scale canal systems like the Indira Gandhi Canal in Rajasthan has transformed arid regions into fertile agricultural lands, as noted by Sharma et al. (2017). Moreover, scholars such as Kishore et al. (2020) have emphasized how micro-irrigation techniques like sprinkler and drip irrigation have helped Indian farmers optimize water use and increase crop yields, thereby enhancing food security at the local level. In addition, these canal systems have enabled farmers to grow multiple crops per year, increasing overall agricultural productivity and contributing to improved food security at the national level (Kishore et al. 2020). Micro-irrigation systems allow farmers to apply water directly to their crops, reducing water loss due to evaporation or runoff. This targeted application of water leads to more efficient use of resources and higher crop yields. Furthermore, these techniques enable farmers to grow crops during off-seasons when traditional irrigation methods may not be effective (Kumar et al., 2018).

Despite these advancements, it is essential to acknowledge potential limitations of these studies. Firstly, while expansions in irrigation infrastructure have led to increased agricultural productivity and food security at both national and local levels, they have also raised concerns regarding environmental sustainability (Shivakumar et al., 2018). For example, large dams used for irrigation can lead to significant changes in river ecosystems, affecting biodiversity and potentially causing negative impacts on downstream communities (Shivakumar et al., 2018). Additionally, micro-irrigation techniques require significant upfront investments for implementation and maintenance (Kishore et al., 2020), which may be prohibitive for smallholder farmers with limited financial resources. Lastly, there is a need for continued research on best practices for implementing these technologies effectively while minimizing their environmental impact (Shivakumar et al., 2018).

### **2.3.1. The role of irrigation scheme in improving food security in Africa**

Irrigation schemes play a critical role in enhancing food security in Africa by increasing agricultural productivity, ensuring stable crop yields, and mitigating the effects of climate change. This literature review will delve into the significance of irrigation schemes in boosting food security in Africa, focusing on two prominent examples, Egypt and Ethiopia.

In Egypt, the ancient civilization along the Nile River has long relied on irrigation for agriculture. The construction of the Aswan High Dam and the later creation of Lake Nasser have revolutionized Egypt's irrigation system. The controlled release of water from the dam has enabled year-round cultivation, leading to increased agricultural output and food security for the country. One example of how irrigation schemes have improved food security in Egypt is demonstrated by the expansion of land under cultivation. According to El-Sadek et al. (2018), the implementation of modern irrigation techniques has allowed farmers to cultivate previously arid lands, thereby increasing crop production and ensuring a more stable food supply. Furthermore, scholars like Abdel-Dayem (2017) emphasize that efficient irrigation management practices have not only boosted crop yields but also enhanced water conservation efforts in Egypt. By optimizing water usage through advanced irrigation technologies, Egypt has been able to sustain its agricultural production even in times of water scarcity.

In Ethiopia, where agriculture is a vital sector employing a significant portion of the population, irrigation schemes have been instrumental in improving food security. The Ethiopian government has invested heavily in large-scale irrigation projects such as the Grand Ethiopian

Renaissance Dam (GERD) on the Blue Nile River. An illustrative example of how irrigation schemes enhance food security in Ethiopia can be seen through the Tendaho Irrigation Scheme. According to Alemayehu et al. (2019), this project has transformed arid lands into fertile agricultural areas, enabling farmers to diversify their crops and increase their incomes. As a result, food availability and access have improved for local communities. Similarly According to a study by Gebremedhin et al. (2018), the Tendaho Irrigation Scheme has led to a major increase in crop production and household income among farmers in the region. The authors found that farmers who adopted irrigation practices reported higher yields compared to those relying solely on rain-fed agriculture. This demonstrates how irrigation schemes can boost food security by providing a reliable water source for crop cultivation. Moreover, scholars like Tilahun et al. (2018) highlight that small-scale irrigation schemes implemented at the grassroots level in Ethiopia have empowered smallholder farmers by providing them with reliable access to water for crop cultivation. This has not only increased food production but also contributed to poverty alleviation and rural development.

Hence, irrigation schemes play a pivotal role in enhancing food security in Africa by increasing agricultural productivity, ensuring stable crop yields, and mitigating environmental challenges. Through examples from countries like Egypt and Ethiopia, it is evident that strategic investments in irrigation infrastructure and management can significantly improve food availability and access for populations across the continent.

### **2.3.2. The role of irrigation scheme in improving food security in Zimbabwe**

Irrigation schemes contribute significantly to Zimbabwe's food security by rising agricultural productivity. These programs provide farmers with a consistent water supply, allowing them to cultivate crops all year, even during dry seasons. Irrigation schemes help reduce the risks associated with erratic rainfall patterns and droughts, which are common challenges for Zimbabwean farmers.

The Gwanda-Mangwe Irrigation Scheme is helping smallholder farmers in improving their food security. Covering around 4,500 hectares in Matabeleland South Province, this scheme provides water to over 6,000 farmers. It utilizes water from the Insiza River and supports the cultivation of various crops such as maize, tobacco, cotton, and vegetables. As per the research conducted by Chikozho et al. (2019), the scheme increased maize yields from an average of 1 to 3 tonnes per hectare. This improvement in crop productivity is crucial for enhancing food security as maize is a staple crop in Zimbabwe and a major source of sustenance for the

population. By providing a consistent and reliable water supply, the irrigation scheme helps mitigate the impact of climate variability and drought, which are common challenges in Zimbabwe. It allows farmers to cultivate crops throughout the year, regardless of rainfall patterns. This reduces the vulnerability of smallholder farmers to weather fluctuations and helps ensure a more stable food supply ( Chikozho et al. 2019)

Moreover, the irrigation scheme contributes to the diversification of crops cultivated by smallholder farmers. In addition to maize, farmers can cultivate other crops such as tobacco, cotton, and vegetables. Diversification not only enhances food security by providing a variety of food options but also offers income-generating opportunities for farmers, thereby improving their overall livelihoods. Hence, the study by Chikozho et al. (2019) suggests that the Gwanda-Mangwe Irrigation Scheme plays a crucial role in improving food security in Zimbabwe by increasing crop yields, mitigating the impact of climate variability, and promoting crop diversification

A study conducted by Mhaka et al. (2018) assessed the impact of the Chinyamatumwa irrigation scheme on food security in Zimbabwe. The researchers found that the irrigation scheme significantly increased crop production and household food availability among participating farmers. By providing a reliable water supply for agriculture, the scheme enabled farmers to cultivate crops throughout the year, leading to improved food security outcomes. According to Mhaka et al. (2018) the Chinyamatumwa irrigation scheme has been instrumental in enhancing food security in the region by increasing agricultural productivity and ensuring a stable supply of crops for local communities. In addition, in a separate study by Ndlovu and Dube (2019), it was noted that participating farmers in the Chinyamatumwa irrigation scheme reported higher incomes and improved access to nutritious foods, contributing to enhanced food security at both household and community levels. These scholars further argue that the irrigation scheme allows farmers to diversify their crops, growing a variety of fruits, vegetables, and cash crops. This diversification not only improves nutrition by providing a more balanced diet but also enhances economic opportunities for farmers. By cultivating high-value crops alongside staple foods, farmers can increase their income levels and improve their overall food security status.

#### **2.4. Challenges faced by irrigation users in improving their food security globally**

Irrigation, the application of controlled water supply to agricultural lands, plays a pivotal role in enhancing food production and ensuring food security worldwide (FAO, 2018). However,



irrigation users face numerous challenges that hinder their ability to maximize the benefits from this vital resource. This literature review aims to shed light on some of these challenges specifically in India and China

One of the major challenges faced by irrigation users in improving food security is water scarcity. In many regions around the world, water resources are limited, leading to increased competition for water among different sectors, including agriculture. According to Mishra and Singh (2010), water scarcity is a significant constraint for irrigation users in India, where the demand for water exceeds the available supply, leading to conflicts over water allocation and usage. Similarly, in China, water scarcity is a growing concern, particularly in the northern regions where water resources are already limited (Wang et al., 2017).

Another challenge faced by irrigation users is the unsustainable use of water resources. Many irrigation systems worldwide are inefficient, resulting in excessive water waste and environmental degradation. In India, for example, Singh et al. (2018) found that the inefficient use of water in irrigation systems has led to groundwater depletion and soil erosion, compromising the long-term sustainability of agricultural production. Similarly, in China, over-extraction of groundwater for irrigation purposes has led to declining water tables and land subsidence in some regions (Xie et al., 2016).

Furthermore, the lack of access to modern irrigation technologies and practices poses a significant challenge for irrigation users in improving food security. In India, smallholder farmers often lack access to modern irrigation equipment and knowledge on efficient irrigation techniques, limiting their ability to increase agricultural productivity (Sharma et al., 2019). Similarly, in China, smallholder farmers face barriers to adopting modern irrigation technologies due to high upfront costs and limited technical support (Zhang et al., 2018).

The IPCC (2014) states that, climate change is the long-term alteration of weather patterns brought on by human activity. Global research indicates that the availability of irrigation water may be significantly impacted by climate change. The Fifth Assessment Report (AR5) of the IPCC states that anticipated changes in rainfall patterns may result in a shortage of water for irrigation in some areas while reducing the need for irrigation in others. Irrigation is expected to be significantly impacted by climate change in many parts of the world. For instance, research conducted in Asia has revealed that climate change may result in a shortage of water and lower agricultural yields, both of which could have detrimental effects on food security (Huan et al., 2015). Moreover, in this study, Mueller et al., (2012), used a global model of food

supply and demand to simulate the impacts of climate change on global food security, using scenarios from the IPCC's Fourth Assessment Report. They found that by 2050, climate change could lead to a decrease in food production of up to 6% globally, and a 20% increase in food prices. They also found that these effects could be exacerbated by global population growth and income inequality, leading to increased food insecurity for vulnerable populations. However, the study by Mueller et al. (2012) has some limitations. Firstly, the study used a global model to simulate the impacts of climate change on food security, and this model may not accurately represent the complex interactions between food systems and climate change. Secondly, the study did not consider the potential for adaptation to climate change, which could mitigate the impacts on food security. One possible solution to the gaps and weaknesses identified in the study by Mueller et al. (2012) is to use more detailed and localized models of food systems, which could more accurately capture the complex interactions between climate change and food security. Additionally, this study considers the impacts of climate change on both food supply and food demand, and explore the potential for adaptation to climate change.

Furthermore, in India, Srivastava et al. (2017) emphasized the negative effects of climate change on irrigation users there. The study found that changing rainfall patterns and rising temperatures caused by climate change have resulted in water scarcity and lower crop yields for irrigation users in India. This jeopardizes the food security of millions of people who rely on efficient irrigation for agricultural production. Lobell et al. (2019) and Rosenzweig et al. (2020) emphasize that climate change in India has significant effects on agricultural production, leading to decreased yields, changes in crop distribution patterns, and increased vulnerability to pests and diseases. They also emphasize the importance of implementing adaptation strategies to mitigate the effects of climate change and ensure food security. Furthermore, a study conducted in China by Huan et al. (2015) discusses the effects of climate change on water resources, noting that changing precipitation patterns and rising temperatures are causing water scarcity in many areas. They also emphasize the importance of sustainable water management practices in addressing these challenges and ensuring access to clean water for agricultural and domestic purposes.

The socially constructed roles, behaviours, activities and characteristics that a society deems suitable for men and women are referred to as gender (Butler, 1999). There are several ways in which gender inequality can affect irrigation scheme-based agriculture. Studies by Deere and Doss (2006) and Whitehead (2009) have shown that gender inequality can lead to women having less access to resources such as land, credit, inputs, training, and technology. This can

lead to lower productivity and less food security for women, as well as reduced overall productivity for the irrigation scheme. In addition, gender inequality can lead to women having less voice in decision-making and less control over their lives, which can have further negative impacts on their well-being and the effectiveness of the irrigation scheme. A study by Behrman et al. (2016) examined the gender impacts of irrigation schemes in South Asia, finding that women often have limited decision-making power and control over water resources. This negatively affects women participation in agriculture in some way. Also, Prakash (2014) examined the gender impacts of irrigation schemes in India, finding that women often had less access to benefits from irrigation schemes than men. However, these studies are limited to a single irrigation scheme, making it difficult to generalize findings to other contexts. Therefore, the objective of this study, which is to understand the factors that influence the success or failure of irrigation schemes, could provide a solution to the weaknesses identified. By understanding the factors that influence success or failure, it would be possible to design more effective irrigation schemes that are better suited to the specific contexts in which they are implemented.

#### **2.4.1. Challenges and barriers faced by irrigation users in improving their food security in Africa**

Food security is a critical issue worldwide, and it is especially difficult in many African countries. The literature on food security in African countries focuses on several key themes. Firstly, Africa's food security is heavily influenced by poverty and income inequality. Many African households struggle to obtain sufficient and nutritious food due to limited financial resources (Kjellén & Svingby, 2019). Second, climate change is significantly affecting African agriculture and food systems, affecting food availability and quality (IPCC, 2019). Third, conflict and political instability are significant causes of food insecurity in some African countries (Hall, 2019).

Irrigation plays a vital role in enhancing food security in Africa by ensuring consistent crop production. However, irrigation users face numerous challenges and barriers that hinder their efforts to improve food security. This study examines the challenges and barriers faced by Kenya and Ghana. In Kenya, one of the major challenges faced by irrigation users is inadequate access to water resources. A study by Nyaoga et al. (2019) found that many smallholder farmers in Kenya rely on rain-fed agriculture due to limited access to water for irrigation. This lack of reliable water sources hampers efforts to enhance food security through irrigation. Another challenge in Kenya is the high cost of irrigation technologies and inputs. According to a study

by Chepkoech et al. (2017), smallholder farmers in Kenya struggle to afford the upfront costs associated with acquiring and maintaining irrigation equipment. This financial barrier limits their ability to improve food security through irrigation practices.

Furthermore, poor infrastructure such as inadequate storage facilities and transport systems also pose challenges to irrigation users in Kenya. A study by Ochieng et al. (2020) highlighted that the lack of storage facilities leads to post-harvest losses, while inefficient transport systems limit the market access for surplus produce from irrigated farms. In addition, In Kenya, Nyangito et al. (2018) highlighted the impact of climate change on irrigation users, particularly in arid and semi-arid regions. The study found that rising temperatures and changes in precipitation patterns have led to a decrease in water availability for irrigation, affecting crop yields and food production in the country. The increased frequency of droughts exacerbates the challenges faced by irrigation users in Kenya.

In Ghana, one of the key challenges facing irrigation users is the lack of access to credit and finance for investment in irrigation infrastructure. Research by Asuming-Brempong et al. (2018) indicated that many smallholder farmers in Ghana struggle to access credit facilities to purchase irrigation equipment or improve water management practices, thereby limiting their capacity to enhance food security. In addition, inadequate extension services and training programs for irrigation users in Ghana present significant barriers to improving food security through irrigation. A study by Dasoberi et al. (2019) showed the importance of extension services in promoting sustainable irrigation practices, yet many farmers in Ghana lack access to such services

Gender stereotype is also one of the challenges that irrigation users are facing in Africa. Doss (2006) has explored the gender dynamics in small-scale farming in multiple countries, including Ghana. Her research has highlighted the unequal distribution of resources, decision-making power, and access to markets between male and female farmers. Doss emphasizes the need to challenge these stereotypes and promote gender equality in agriculture. Similarly, Meinen-Dick et al. (2021) studied gender stereotypes in small-scale farming in countries like Kenya, Nepal, and Ghana. Their research has shown how traditional gender norms and stereotypes affect women's access to resources, technologies, and markets. They advocate for gender-transformative approaches to empower women and increase their participation in agriculture.

Hence, irrigation users in Africa face various challenges and barriers that hinder their efforts to enhance food security through irrigation practices. These challenges range from limited access to water resources and high costs of irrigation technologies to poor infrastructure and lack of access to credit and extension services. Addressing these challenges is crucial for promoting sustainable irrigation practices and improving food security in the region.

#### **2.4.2. Challenges and barriers faced by irrigation users in improving their food security in Zimbabwe**

Irrigation plays a crucial role in enhancing food security in Zimbabwe, a country that has been facing challenges such as erratic rainfall patterns and droughts. However, irrigation users in Zimbabwe face various challenges that hinder them from effectively improving their food security. The researcher will review some of the studies done with existing literature and discuss on the challenges faced by irrigation users in Zimbabwe in their efforts to enhance food security.

In Zimbabwe, food security is a major concern, especially for rural households that rely heavily on rain-fed farming. The country has experienced recurring droughts, resulting in food insecurity and malnutrition. Several studies have examined food security in Zimbabwe, focusing on the determinants of food security and the factors that contribute to food insecurity. According to Mupfumira and Mukumbi (2019), poverty, climate change, and a lack of market access are major determinants of Zimbabwean food security. Similarly, Chikowo et al. (2019) discovered that food insecurity in Zimbabwe is caused by a variety of factors such as low agricultural productivity, limited access to credit, and inadequate infrastructure.

One of the irrigation schemes in Zimbabwe is the Mlezu Irrigation Scheme in the Matabeleland South Province. According to Nyathi et al. (2016) the irrigation users in the Mlezu Irrigation Scheme face challenges such as inadequate funding for maintenance of infrastructure, lack of access to modern irrigation technologies, and limited access to credit for inputs and equipment. These challenges limit the productivity and efficiency of the irrigation scheme, hindering the users from achieving food security.

The Mushandike Irrigation Scheme in the province of Masvingo is an additional illustration of an irrigation system in Zimbabwe. In a study by Hove et al. (2019), the challenges faced by irrigation users in the Mushandike Irrigation Scheme include poor water management practices, lack of training on irrigation techniques, and limited access to market information. These challenges pose barriers to improving food security for the users of the irrigation scheme.

In addition to the challenges faced by irrigation users in specific schemes, climate change poses a major obstacle to enhancing food security through irrigation in Zimbabwe. According to Muvure and Mhizha (2018), climate change has created unpredictable rainfall patterns, increased frequency of droughts, and water scarcity, which impact the effectiveness of irrigation schemes in the country. These climate-related challenges further exacerbate the difficulties faced by irrigation users in Zimbabwe in their quest to improve food security.

While the studies by Muvure and Mhizha (2018), Hove et al. (2019), and Nyathi et al. (2016) offer valuable insights into the challenges faced by irrigation users in Zimbabwe, it is important to recognize their limitations. A lack of comparative analysis across different irrigation schemes or countries could limit the broader understanding of irrigation challenges in Zimbabwe. Hence this study will do comparative studies allow researchers to identify commonalities and differences that can provide valuable insights for policy-making and intervention strategies.

### **2.5. Perspectives of irrigation users in improving their socio-economic status at global level**

Irrigation plays an important role in increasing agricultural productivity and improving the livelihoods of millions of farmers worldwide. Understanding the perspectives and opinions of irrigation users is essential in devising effective strategies to enhance their socio-economic status. This literature review will focus on the perspectives of irrigation users in improving their socio-economic status globally, specifically India and China.

In order to better understand the perspectives of irrigation users in raising their socioeconomic status, numerous studies have been carried out in India. For example, a study by Shah et al. (2010) explored the impact of irrigation on the socio-economic status of farmers in the state of Gujarat. The study found that irrigation significantly increased crop yields and farmers' income, leading to improved socio-economic status.

Another study by Bharati et al. (2015) examined the relationship between irrigation and poverty alleviation in India. The study highlighted that access to irrigation not only increased agricultural productivity but also provided opportunities for rural households to engage in non-farm activities, ultimately improving their socio-economic status.

On the other hand, in China, studies have also been conducted to understand the perspectives of irrigation users in improving their socio-economic status. For instance, a study by Huang et al. (2018) investigated the impact of irrigation on rural household incomes in China. The study

found that irrigation significantly increased agricultural productivity and household incomes, leading to improved socio-economic status for farmers. Furthermore, a study by Zhang et al. (2016) explored the perceptions of irrigation users on water management practices in rural China. The study revealed that farmers who actively participated in water management committees were better able to make informed decisions about irrigation practices, leading to improved crop yields and socio-economic status.

Therefore, understanding the perspectives of irrigation users is crucial in devising effective strategies to improve their socio-economic status. Studies in countries like India and China have highlighted the positive impact of irrigation on agricultural productivity, income, and overall socio-economic status. By incorporating the insights from these studies, policymakers can develop sustainable irrigation policies that benefit farmers and contribute to rural development.

### **2.5.1. Perspectives of irrigation users in improving their socio-economic status in Africa**

Irrigation is a vital component of agricultural development in Africa, with the potential to significantly impact the socio-economic status of farming communities. This literature review explores the perspectives of irrigation users in Africa, focusing on studies conducted in Ethiopia and Kenya.

According to Muysken et al. (2019), irrigation plays a crucial role in enhancing agricultural productivity and improving farmers' income levels in Ethiopia. The study examined the perspectives of smallholder farmers and found that access to irrigation technologies led to increased crop yields, which directly translated into improved socio-economic status for the farmers.

In a study by Ouma et al. (2016) in Kenya, the perspectives of irrigation users emphasized the importance of efficient water management practices in enhancing farm productivity and income levels. The study highlighted how irrigation technologies helped farmers mitigate the effects of climate variability and achieve sustainable livelihoods, thereby positively impacting their socio-economic well-being.

Contrastingly, a study by Gebrehiwot and van der Veen (2019) in Ethiopia explored the challenges faced by irrigation users, such as water scarcity and inadequate infrastructure, which hindered the potential socio-economic benefits of irrigation. The study underscored the

importance of addressing these challenges to fully harness the potential of irrigation in improving farmers' living standards.

Furthermore, a study by Dillen and Alemu (2017) in Kenya examined the role of farmer cooperatives in facilitating access to irrigation technologies and enhancing socio-economic development among smallholder farmers. The study highlighted the collective action of farmers in promoting sustainable irrigation practices and empowering community members to improve their socio-economic status.

Chemedda et al. (2020) conducted a study in Ethiopia to investigate the gender dynamics of irrigation use and their impact on women's socioeconomic status. According to the study, women's access to irrigation technologies increased their participation in agricultural activities and provided opportunities for income generation, resulting in gender equality and economic empowerment for women.

Therefore, the perspectives of irrigation users in Africa, particularly in Ethiopia and Kenya, vary depending on factors such as technology access, water management practices, infrastructure, community cooperation, and gender dynamics. Addressing the challenges identified in these studies and promoting sustainable irrigation practices are essential for maximizing the socio-economic benefits of irrigation in smallholder farming communities.

### **2.5.2. Perspectives of irrigation users in improving their socio-economic status in Zimbabwe**

Irrigation is critical to increasing agricultural productivity and improving the socio-economic status of Zimbabwean farmers. This literature review focuses on the perspectives and opinions of irrigation users in Mushandike and Musena irrigation schemes regarding the impact of irrigation on their socio-economic status. Numerous researches have been carried out to understand the perspectives of irrigation users in these schemes, shedding light on the benefits and challenges they face in improving their livelihoods.

According to Mabasa et al. (2018), irrigation users in Zimbabwe view irrigation as a key strategy for improving crop yields and ensuring food security. Farmers in Mushandike and Musena irrigation schemes acknowledge that the availability of water for irrigation enables them to grow crops throughout the year, thereby increasing their income and improving their standard of living. Furthermore, irrigation allows farmers to diversify their crop production, leading to higher market opportunities and better financial returns (Mugwagwa, 2016).



On the other hand, Nyagumbo et al. (2017) highlight some of the challenges faced by irrigation users in Zimbabwe, including the high cost of irrigation equipment and maintenance, limited access to credit facilities, and inadequate extension services. These factors can hinder smallholder farmers in Mushandike and Musena irrigation schemes from fully utilizing irrigation for socio-economic development.

A study by Manyong et al. (2019) examined the socio-economic impacts of irrigation on smallholder farmers in Mushandike irrigation scheme. The research showed that farmers perceived irrigation as a crucial tool for increasing crop productivity and household income. However, challenges such as water scarcity during the dry season and the lack of market access were identified as barriers to maximizing the benefits of irrigation.

Moreover, in a study by Makate et al. (2018) on Musena irrigation scheme, farmers expressed positive perspectives on the role of irrigation in improving their livelihoods. The research highlighted that farmers diversified their crops under irrigation, leading to increased food security and income generation. Despite the benefits, farmers also pointed out the need for improved water management practices to address water scarcity issues.

Furthermore, Chikowo et al. (2016) conducted a study in Mushandike irrigation scheme, exploring the perceptions of irrigation users on enhancing their socio-economic status. The findings revealed that farmers recognized the importance of irrigation in improving agricultural productivity and income levels. However, access to reliable irrigation infrastructure and technical support were identified as critical factors for sustained socio-economic development.

A study by Mashonjowa et al. (2017) focused on the gender perspectives of irrigation users in Musena irrigation scheme. The research highlighted that female farmers faced unique challenges in accessing and utilizing irrigation resources compared to their male counterparts. Addressing gender disparities in irrigation access and participation was seen as essential for promoting gender equality and improving the socio-economic status of women farmers.

Therefore, the perspectives of irrigation users in Mushandike and Musena irrigation schemes in Zimbabwe reflect the significant role of irrigation in improving their socio-economic status. While farmers acknowledge the benefits of irrigation in enhancing crop productivity and income generation, challenges such as water scarcity, limited resources, and gender disparities need to be addressed to maximize the socio-economic impact of irrigation. By understanding

the diverse perspectives of irrigation users, policymakers and stakeholders can develop targeted interventions to support smallholder farmers in Zimbabwe's irrigation schemes.

#### **2.4 Chapter summary**

The chapter reviewed the literature that was relevant to the study's goals, with an emphasis on the theoretical, empirical, and sustainable livelihoods framework literature. After reading the literature, it is clear that the role of irrigation scheme in improving food security specifically for Rosa irrigation scheme in Mazowe District was left unattended which makes this study even more important. The research approach will be examined in the upcoming chapter.

## **CHAPTER THREE RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter describes the research approach that was applied to finish this investigation. Thus, the research design/philosophy, target population, sample size, sampling technique, data analysis procedures, validity and reliability of instruments, and ethical considerations are presented in this chapter.

### **3.2 Research approach**

A research approach is an important aspect in research which intersects the philosophical assumptions of the researcher with the research designs (strategies of inquiry) and the specific research methods. Furthermore, the mixed methods approach allows both quantitative data such as food production data and qualitative data like farmer interviews and analyse them in a way that combines their strengths to produce meaningful insights. Mixed research can provide rich in-depth understanding within real-world contexts. This highlight the potential benefits of using a mixed methods approach in this study.

### 3.3. Research design

Research designs are strategies of inquiry which fall within and are subordinate to a qualitative, quantitative, or mixed research approaches (Creswell, 2014). The study used the concurrent mixed research design in order to give particular direction for procedures to be undertaken during the course of the research. The concurrent research design was deemed appropriate for this study since it is consistent with the pragmatic research philosophy and the broader mixed research approach (Rubin & Babbie, 2011). Mixed-methods approach, which involves both qualitative and quantitative research methods such as interviews, questionnaire, surveys and focus groups, was used to explore the experiences and perspectives of farmers and community members who are affected by the irrigation scheme. Quantitative methods such as surveys and data analysis used to measure the impact of the irrigation scheme on food security indicators such as availability, access and utilisation of food. This mixed-methods approach allows more comprehensive understanding of the effectiveness of the irrigation scheme.

### 3.4. Sampling procedure

Convenience sampling, a non-random sampling technique that involves choosing participants based on ease of accessibility, will be used in this study. Those who are interested and meet the requirements will be added to the sample. Small-holder farmers and community members in Mazowe Rural District, ward 7, will be contacted and asked to participate in the study. This approach is suitable for the study since it is less complicated and more economical.

#### 3.4.1 Target population

As was previously said, the primary focus of this study is the irrigation users, village heads, AREX officers, Mazowe rural district council officials and ward councillors in Mazowe District's ward 7, which is under chief Chiweshe. The study targets 34 participants under chief Chiweshe. The study will also focus on the Agricultural Extension Officers in the area being studied. The table below illustrate the targeted population.

Target population table 3.4

Irrigation Users	Ward councillors	Village heads	AREX officials	MRDC officials	Total
30	1	1	1	1	34

### **3.5. Sampling plan**

A sampling plan can be thought of as a simplified recipe for gathering data from a particular population. Sampling is important because it helps the researcher to come up with a smaller subset of the population that is easier to manage and work with (Rubin and Babbie, 2011). Convenience sampling was used for this study's sample plan, and participants will be chosen from Mazowe Rural District villages and agriculture offices. Convenience sampling, this non-probability sampling technique chooses participants based on their availability and willingness to participate. This type of sampling is adaptable and inexpensive. In order to guarantee that the sample is representative of the various ethnic groups in the district, it will also be carefully chosen. Everybody's informed consent was sought.

### **3.6 Sample size**

A sample is a portion of the entire population. To put it simply, a sample is a portion of a larger whole. A sample size of 34 participants will be used in this investigation. To take into consideration every variable present in the latter, these will be chosen from every corner of the study area for enhanced understanding of variable interactions. Also, considering the time and resources allocated to this study, 34 participants are thought to be a manageable sample size for data collection.

### **3.7. Data collection instruments**

A data collection tool refers to the instruments that are used by the researcher to gather data during a research undertaking (Creswell, 2014). Data for this study were collected through household questionnaires, key informant interviews, and focus group discussions. These techniques were carefully considered in order to make them practical for achieving objectives of the study.

#### **3.7.1 Questionnaire surveys**

Questionnaires are a popular data collection method because they are easy to administer and analyse and they allow for the collection of a large amounts of data in a short period of time. This was the main research instrument used to capture data in this study. In this study, a self-administered questionnaire was designed. In this instance, the respondents complete the questionnaire on their own, without the researcher's help. After obtaining their consent, the researcher physically distributed the questionnaire to the participants.

A questionnaire allows a researcher to distribute many questionnaires with ease and convenience (Leedy & Ormrod, 2015). A questionnaire can provide a comprehensive and

systematic approach to data collection, allowing the researcher to gather a wide range of information from a large number of participants. This allows the researcher to gain a deeper understanding of the topic and identify patterns and trends that may not be apparent through other methods (Bryman & Bell, 2015). Moreover, questionnaire allows participants to remain anonymous, who can be beneficial for sensitive topics or for participants who may not feel comfortable sharing their personal information. (Bryman & Bell, 2015). In addition, questionnaire data can be easily analyzed using statistical software, allowing the researcher to identify patterns and trends in the data. This can help in drawing meaningful conclusions and make informed decisions based on the findings. (Dillman, 2000)

### **3.7.2 Focus Group Discussion**

Focus group discussions (FDGs) were also utilized in the study with community members and irrigation users. In order to assist the focus group facilitator in this way, a discussion guide was made. According to Sihwa (2014), no more than ten persons should participate in a focus group discussion. FDGs enable the researcher to observe how the participants interact with one another, as mentioned by Teddlie (2009). The researcher employed focus group discussions (FGDs) as a means of facilitating greater participation and fostering a cross-cultural exchange of ideas among members of various social groups regarding the research problem. Focus groups should be avoided in situations where participants are uncomfortable with one another or where there may be social stigma associated with disclosure (Harrison et al., 2015). However, the success of focus groups depends on the dynamics of the participants.

A key advantage of using focus group discussions as a data collection method is that they can provide rich, in-depth information that can be difficult to obtain through other methods. Key focus group discussions can provide insights into the thoughts, feelings and experiences of a group of people about the role of irrigation scheme in food security in a way that is difficult to achieve through individual interviews.

### **3.7.3. Key informants' interviews**

Interviews were also conducted with one selected key informant from Agritex, one representative from Mazowe Rural District Council, ward councillor and a village head. Open-ended questions were used to elicit information from key informants. The primary advantage of conducting interviews was that it allowed the researcher to ask follow-up questions, probe for deeper insights, and investigate the meaning behind the respondents' responses.

Interviewing key informants has the benefit of allowing researchers to get insightful feedback from people with direct experience with the study. This can be helpful in studying complex issues like food security, where there may be a variety of different perspectives and experiences to consider.

#### **3.7.4. Personal observation**

Personal observation is a research method that involves the observer becoming part of the group being observed, while taking detailed notes about the group's behaviour. In order to understand the participants' perspectives on raising their socioeconomic status, the researcher in this study used observation to pinpoint the location, activities, people, and surroundings as well as the meanings of the phenomena seen.

Personal observation allows the researcher to gather rich and detailed data firsthand. In the case of studying the role of an irrigation scheme in improving food security, the researcher had direct access to observe the operations, interactions, and outcomes related to food security. Qualitative data, including data collected through observation, can provide detailed, in-depth, and nuanced insights that may not be accessible through other methods.

#### **3.8 Data analysis**

Data analysis procedures are a series of steps undertaken to make sure that the data which composed were correctly interpreted and analyzed. Quantitative data analysis was done with MS Excel. The information gathered from home surveys was organized, classified, and entered into Microsoft excel. Pie charts, bar graphs, and frequency tables were used to display the statistical data that had been examined. Every response provided by the participants was verified through cross-checking, and any inaccurate data was excluded from analysis. Thematic analysis was used to examine qualitative data, grouping interview responses into themes and contextualizing the analysis.

#### **3.9 Reliability**

It can be defined as the extent to which a measurement is free from error and remains consistent over time. In this study, multiple measures such as interviews, surveys, questionnaires and group discussions were carried out to ensure the reliability. Reliability is an important aspect of social science research and that there is a need for greater consensus on what constitutes reliability in this field. There are several specific factors that can affect the reliability of a research study which is the measurement instrument which must be valid and reliable in order to produce reliable results. Additionally, the participants themselves can affect the reliability

of the study, as participants who are uncooperative or biased can affect the results and researcher's biases can also affect the reliability of the study . Therefore, these threats to reliability were considered in this research to ensure they do not affect results.

### **3.10 Validity**

Validity can be defined as it is the degree to which the results of a study are consistent with and can be interpreted as measuring the phenomenon that they are intended to measure. This definition places an emphasis on consistency and interpretation which are key elements of validity. Hence, in order to ensure validity, the researcher in this study triangulated the data by comparing the findings from the four research instruments.

### **3.11 Ethical considerations**

Research ethics were also taken into account. Among the other good ethics that the study needed to pay attention to were informed consent, privacy, anonymity, confidentiality, and de-hoaxing.

#### **3.11.1 Informed consent**

Informed consent is the voluntary agreement of a person to take part in a research study after the person has been given full and accurate information about the nature and purpose of the study, what will be involved in participating in the study and any possible risks or benefits. The ability to freely consent or decline to participate, as well as the freedom to withdraw at any moment without consequence, was made clear to the participants. The goal of the study, the methods or tools to be used to gather pertinent data, and the fact that there would be no risks or expenses were also explained to the participants.

#### **3.11.2 Confidentiality**

The concept of confidentiality in research is often defined in terms of protecting the privacy and anonymity of participants. Therefore, participants were assured that no identities were to be written alongside the results to guarantee anonymity. The information was treated with strict privacy and confidentiality as some of the data acquired was delicate and bears on participant's personal experiences and perceptions.

#### **3.11.3 Debriefing and de-hoaxing**

Debriefing and de-hoaxing can be defined as providing participants with the information necessary to help them understand the research process, evaluate their own involvement in it and protect them from any negative consequences of that involvement. In other words, debriefing is about providing participants with information they need to make sense of their

experiences and to protect themselves from any harm. The researcher followed the debriefing and de-hoaxing protocols by informing the participants about the study's objectives prior to gathering the necessary data.

### **3.12. Limitations**

Because of the study's short time frame, long-term trends and impacts of the irrigation scheme were not captured. Furthermore, measurement errors, missing data, and biased reporting all had an impact on the study's data accuracy and reliability. Furthermore, some respondents refused to provide the information requested by the researcher out of fear of the political environment, while others were hesitant to participate because they expected incentives for taking part in the study.

### **3.13 Chapter summary**

The research methodology that served as a guide for the fieldwork was highlighted in this chapter. In this study, questionnaires and other data collection techniques were employed in an attempt to yield information that would address the research questions. With this strategy, it is envisaged that the study will yield pertinent data and information regarding the irrigation scheme's efficacy in enhancing food security in the Mazowe Rural District.



## CHAPTER FOUR

### DATA PRESENTATION, ANALYSIS AND INTERPRETATION

#### 4:1. Introduction

This chapter presents, analyses, and discusses the results of a mixed-methods study. Data were gathered using in-depth interviews, focus group discussions, questionnaires, key informant interviews, and personal observations. Data from the majority of irrigation users were presented in Shona, which the researcher then translated into English. However, key informants and certain participants provided some information in English. The chapter is organized as follows: section one focuses on data presentation using figures, tables, and narratives, while section two discusses findings about the role of irrigation schemes in improving food security, the challenges and barriers they face, and irrigation users' perspectives on improving their socioeconomic status. As part of the data analysis, the researcher referred to the literature review to relate the study discussed in Chapter 2. As stated in the previous chapter, the responses of the respondents will be coded for confidentiality.

#### 4:2. Demographic profile of participants

The researcher intended to engage 34 irrigation users including 4 key informants for interviews 1 ward councillor, 1 Agriculture Extension Officer (AREX) officers and 1 Mazowe Rural District official (MRDC). In addition, the issue of gender was taken into consideration and the data showed that there are more men who are in the leadership roles than females. The results are shown by the table below;

**Table 4.1 Data for key informants**

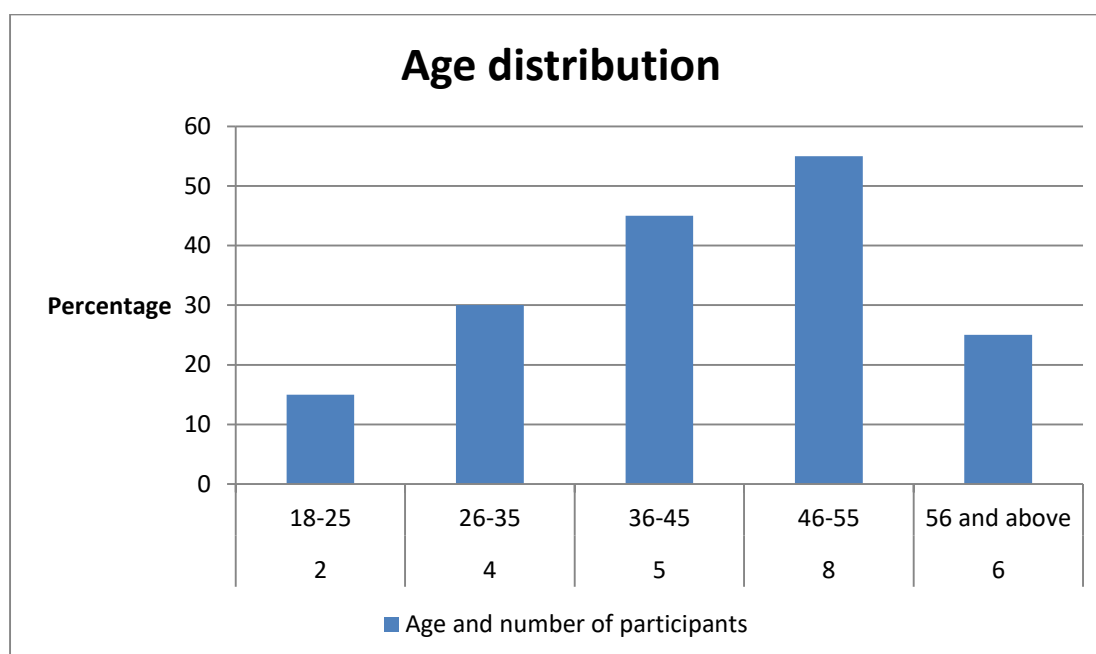
Respondents	Intended	Engaged	Percentage	Sex	
				male	female
Irrigation users	30	22	72.7%	16	6

Ward councillors	1	1	100%	1	0
AREX officials	1	1	100%	1	0
MRDC official	1	1	100%	0	1
Total	34	25	70%	18	7

(Source: fieldwork 2024)

### 4:3. Demographic Data

In order to interpret the role of irrigation scheme in improving food security, questions were asked to irrigation users about their age and academic qualification.



**Figure 4:1 age distribution**

The study sought to determine whether respondents' experiences differed based on their age. Figure 4.1 indicates that the majority of respondents were between the ages of 46 and 55 (n=8, 55%). This category is followed by those aged 36 to 45 years (n=5, 45%). A total of 2, 4, and 6 respondents, representing 15%, 30%, and 25%, were aged 18-25, 26-35, and 56 years or older, respectively. Most of the participants were in the age range of 46 and 55, so the information they provided was valuable because they were mature enough to provide better knowledge about the role of irrigation schemes in improving food security.

### 4:3:1 Educational level

Table 2.3 reveals the level of education of the participants. The majority of respondent attended primary level is 3 out of 25. Whilst 8 reached secondary level, 5 had certificate, 2 got diplomas, 4 had degree and 3 had had masters’ degrees. Education level had an influence on the ability of participants to effectively communicate their experiences and insights related to irrigation schemes. Participants with higher education levels may be better able to articulate their thoughts and experiences, leading to more in-depth and meaningful data collection.

**Table 4.3 level of education**

Level	Primary level	Secondary level	certificate	Diploma	Degree	Masters degree and above
<b>Participants</b>	10%	30%	25%	5%	20%	10%

(Source: fieldwork 2024)

### 4.4 Role of irrigation scheme in improving food security

To ascertain the role of irrigation scheme in improving food security, the researcher asked irrigation users on how the irrigation scheme is helping in improving food security using questionnaires. The study findings indicated that irrigation schemes have brought several benefits in terms of crop yield and food security. To better understand the role of irrigation scheme in improving food security, the researcher classified roles to be answered “YES” or “NO”. The results are shown by table 4.2 below.

**Table 4.4**

Endorsed role	Percentage of Endorsement	
	Yes	No
Have you noticed an increase in crop yield since the implementation of the irrigation scheme?	77%	23%
Has the irrigation scheme helped in reducing crop losses due to water scarcity?	63%	37%

Do you believe that the irrigation scheme has improved the availability of water for irrigation?	67%	33%
--	-----	-----

(Source: Fieldwork 2024)

The statistical data on table 4.4 shows that out of the roles exhibited by participant, (n=23, 77%) pointed out that they noticed an increase in crop yields since the implementation of the irrigation scheme. A total of 7 irrigation users which is equivalent to 23% did not noticed an increase in crop yields. The table above further reveals that respondents (n=19, 63%), argues that irrigation has the potential to increase crop yields and stabilize food supplies, whilst (n=37%) conflicting that water scarcity is negatively affecting water sources leading to crop failure.

Furthermore, the researcher discovered that some factors are affecting irrigation users in supporting food security using irrigation scheme. Infrastructure and technology, training and capacity building, access to inputs and support services and crop diversification emerged as the key factors influencing the role of irrigation scheme in improving food security. These notable factors were presented and discussed below:

#### **4.4.1. Infrastructure and technology**

The study found that infrastructure and technology have an impact on irrigation scheme in improving food security. The study discovered that a number of participants were answering that infrastructure and technology is crucial for the effectiveness of irrigation scheme in improving food security. Extracts below served to substantiate these findings. One participant shared:

*“zvinhu zvatiri kushandisa kudiridzisa zvave zvekudhara, zvizhinji zvacho zvave kuda kugadziriswa. Tave kudawo zvekushandisa zvechizvino-zvino zvinoita kuti tikwanise kurima zvirimwa zvedu zvakanaka”*

*"The irrigation system is outdated and in need of repair. We need modern equipment and infrastructure to improve our crop yields."*

#### **(Focus group discussion 1)**

The other participant said:

*“hatisi kukwanisa kuwana mukana wekushandisa ruzivo rwechizvino zvino kuburikidza nekushaya masai sai”*

*“We're not able to take advantage of modern technologies, like remote monitoring or weather forecasting, because we don't have access to the internet”*

**(Focus group discussion 2)**

The last participant said:

*“kushaikwa kwemagetsi nemvura ndozvimwe zvezvikonzero zviri kuita kuti madiridziro edu asanyatsoshanda zvakanaka”*

*"Without access to reliable electricity and water, it's difficult to use the irrigation scheme to its full potential."*

**(Focus group discussion 3)**

The first participant’s statement highlights the need for modern equipment and infrastructure to improve crop yields. Outdated irrigation systems may result in inefficiencies, such as uneven water distribution and wastage. Upgrading the infrastructure, including pipelines, pumps, and irrigation channels, can enhance water delivery precision, reduce losses, and increase overall irrigation efficiency. This aligns with the Sustainable Livelihoods Framework's focus on physical capital as an important component of livelihood improvement.

The second participant's remark emphasizes the lack of internet access, preventing farmers from benefiting from modern technologies like remote monitoring and weather forecasting. These technological advancements can optimize water usage, enable timely irrigation decisions, and enhance overall agricultural productivity. Policies that promote rural connectivity and internet access as well as provide training on utilizing digital tools are essential to bridge the digital divide. Scholars such as El-Sadek et al. (2018), states that the implementation of modern irrigation techniques in Egypt has allowed farmers to cultivate previously arid lands, thereby increasing crop production and ensuring a more stable food supply. Also, the last participant highlights the challenges posed by the lack of reliable electricity and water supply. Access to electricity is crucial for powering irrigation systems, particularly in areas with limited grid connectivity. Inadequate water availability hampers the effective utilization of irrigation schemes.

Within the Sustainable Livelihoods Framework, infrastructure modernization aligns with the physical capital component, which recognizes the importance of upgrading assets and technologies. By improving irrigation infrastructure, providing internet access, and ensuring reliable electricity and water supply, farmers can enhance their livelihoods, increase crop yields, and improve their overall well-being.

The study findings indicated that investing in irrigation infrastructure and technology is key to improving food security in the long term. Without access to the right technologies and skills, farmers will not be able to fully benefit from the irrigation scheme. In addition, if farmers are not able to access new technologies, they may be left behind in the global market and without policies that support the adoption of new technologies; the potential benefits of irrigation will not be fully realized. Furthermore, these findings are consistent with broader literature on the success of agricultural productivity, which suggests that China's success in agricultural productivity is due to a combination of innovative technologies, government policies, and good management as stated by Wang et al. (2019). Basing on the participant's responses, they emphasised on the use of modern technologies for irrigation scheme to improve food security. The researcher concluded that to improve food security, a holistic approach is needed that includes investments in irrigation infrastructure and technology, as well as policies that support their adoption. Without these investments and policies, the potential of irrigation to improve food security will not be fully realized.

#### **4.4.2. Training and capacity building**

The study discovered that training and capacity building improve food security through irrigation schemes. The study discovered that a number of participants believed that training and capacity building were critical to the effectiveness of irrigation schemes in improving food security. The extracts below served to back up these findings. During irrigation user's interviews on 02 May 2024, the participants had to say:

*“ndakawana dzidzo yezvemadiridziro asi handina kukwanisa kushandisa ruzivo  
rwandakawana nenyaya yekushaya zvekushandisa pakurima”*

*"I received training on irrigation technologies, but I have not been able to implement what I  
learned due to a lack of access to resources."*

**(Farmers interview 1)**

The other participant said:

*“ndakakwanisa kubatsira vamwe varimi kuburikidza neruzivo rwandakawana  
pandakadzidziswa mayererano nechirongwa chemadiridziro”*

*"With the knowledge I gained from training on irrigation technologies, I have been able to  
help other farmers in my community to improve their production."*

**(Farmer's interview 2)**

Furthermore, one of the participants had this to say:

*“ndakadzidza nezvekukosha kwehutano hweivhu nechikafu chiri mariri kuburikidza  
nechirongwa chekudzidzisa varimi uye ndikushandisa ruzivo urwu kuvandudza zvirimwa  
zvangu”*

*"I have learned about the importance of soil health and fertility through training on  
irrigation technologies, and I am using this knowledge to improve my crops."*

**(Farmer's interview 3)**

One participant expressed the challenge of not being able to implement the knowledge gained from training due to a lack of access to resources. This highlights a critical barrier that hinders the translation of acquired skills into practical applications. Despite the participant's inability to implement the knowledge, it is important to recognize the potential impact that could be achieved with adequate resources and support. In addition, another participant highlighted their ability to help other farmers in their community improve production through the knowledge gained from irrigation technology training. This exemplifies the transformative power of such programs, as the participant becomes an agent of change, sharing their skills and expertise with others. By empowering the community, the participant contributes to the development of sustainable livelihoods at a broader scale. Furthermore, one participant emphasized the importance of soil health and fertility, which they learned through training on irrigation technologies. This knowledge enables the participant to make informed decisions regarding soil management practices, promoting long-term sustainability and improved crop yields. By implementing effective irrigation techniques and considering soil health, the participant demonstrates the practical application of acquired knowledge, leading to enhanced agricultural productivity.

The concept of sustainable livelihoods, as proposed by Robert Chambers and Gordon Conway in 1992, provides a framework for understanding the multidimensional nature of livelihoods

and the factors that influence their sustainability. According to the theory, access to resources, institutions, capabilities, and vulnerabilities significantly impact livelihood outcomes. Training programs on irrigation technologies address these key elements by providing farmers with improved access to knowledge, enhancing their capabilities, and reducing vulnerabilities associated with unsustainable agricultural practices.

According to the study's findings, increasing food security through irrigation technologies requires training and capacity building, as demonstrated by the farmers' responses. Based on their responses, it appears that farmers place a high value on capacity building and training because it helps them increase their ability to secure food and improve their standard of living. Furthermore, it is evident from these answers that increasing training and capacity is necessary to optimize the advantages of irrigation technologies. These findings are also consistent with a previous study by Abdel-Dayem (2017), which found that infrastructure and technology play an important role in improving food production. As a result, this is also consistent with training and capacity building, as irrigation users require this to improve their knowledge and skills in maintaining irrigation infrastructures and adapting to new technologies.

#### **4.4.3. Access to inputs and support services**

According to the study, irrigation schemes that provide access to inputs and support services enhance food security. The study found that many participants thought that for irrigation schemes to be more successful in enhancing food security, they needed to have access to inputs and support services. These results were supported by the excerpts listed below. This was what one of the attendees said on 02 May 2024 during the personal observations:

*“zvirimwa zvangu hazvina kunyatsoita zvakanaka nenyaya yekushaya mbeu pamwe chete nefetereza”*

*"Without access to inputs like seeds and fertilizers, my crop yields are very low."*

#### **(Personal observation 1)**

The other participant said:

*“kushaikwa kwemukana wekuwana rubatsiro maererano nerizivo nemari kubva kune vamiririri vedu vekuzvimwa kwakaita kuti nditadze kurima zvakanaka”*

*"Without access to support services like extension advice and credit, I can't afford to invest in my farm."*



### **(Personal observation 2)**

Furthermore, one of the participants who had access to inputs had happily said that:

*“ndakakwanisa kuvandudza zvirimwa zvangu kuburikidza nekuwana mukana kumbeu dzakanaka nefetereza”*

*"I have been able to improve my crop yields thanks to better access to quality seeds and fertilizers."*

### **(Personal observation 3)**

One participant described the negative impact of limited access to inputs, specifically seeds and fertilizers, on crop yields. This finding supports the notion that high-quality inputs are critical to optimizing agricultural production. Farmers without access to high-quality seeds and fertilizers experience lower crop yields, lower-quality produce, and increased susceptibility to pests and diseases. These limitations perpetuate a cycle of low income and undermine the overall sustainability of their livelihoods. More so, another participant highlighted the significance of access to support services, such as extension advice and credit. This participant emphasized that without access to these services, they are unable to afford the necessary investments in their farm. Lack of extension advice deprives farmers of vital information and best practices, undermining their ability to make informed decisions regarding their agricultural activities. Furthermore, limited credit availability limits farmers' ability to invest in inputs, machinery, and infrastructure, reducing productivity and financial stability.

In contrast to the previous participants, one farmer reported improved crop yields due to better access to quality seeds and fertilizers. This finding highlights the transformative impact of addressing input accessibility issues. By providing farmers with the necessary inputs, they can optimize their crop production, increase yields, and ultimately improve their livelihoods.

Furthermore, the concept of sustainable livelihoods, as proposed by Robert Chambers and Gordon Conway in 1992, emphasizes the significance of access to resources and support services in achieving sustainable livelihood outcomes. Limited access to inputs and support services acts as a barrier, impeding farmers' ability to maximize their agricultural potential. Addressing these barriers aligns with the principles of sustainable livelihoods by enhancing farmers' capabilities, reducing vulnerabilities, and promoting long-term agricultural sustainability.

The study's findings revealed that there are systemic barriers that prevent farmers from accessing the resources they require to improve their farms. Furthermore, simply providing inputs and support services is insufficient; systemic issues that are preventing farmers from accessing these resources must also be addressed. As a result, these findings are consistent with Nyaoga et al. (2019) who found that many smallholder farmers in Kenya had less access to resources they need to improve food security and they rely on rain-fed agriculture due to limited access to water for irrigation. This lack of reliable water sources hampers efforts to enhance food security through irrigation. Therefore, for food prices to be reduced, inputs and services should be accessible to farmers, particularly those using irrigation systems.

#### **4.4.4. Crop diversification**

Crop diversification has been shown to be an important factor in improving food security, and there is a large body of literature that discusses its role. Crop diversification can help to lower the risk of crop failure as well as the risk of price fluctuations for individual crops, according to academic research. Additionally, crop diversification can help to improve nutrition, as it can lead to a more diverse diet. It can also increase the resilience of farming systems to climate change and environmental stressors.

During the focus group discussions on 03 May 2024, the participants had to say:

*“chinhu chandakaona chakanyanya kuchinja imhando yezvirimwa zvatave kukwanisa kurima. Taimborima chibage kunyanya negorosi asi ikozvino takukwanisa kurima zvirimwa zvakawanda uye zvakasiyana siyana zvakaita semiriwo nemichero. Izvi zvikubatsira kuvandudza hutano hwedu nemari”*

*"One of the biggest changes I've seen is the shift in the types of crops that we are able to grow. We used to grow mostly staples like maize and wheat, but now we can grow a wider variety of crops, including vegetables and fruits. This has been great for our diets and for our income."*

#### **(Focus group discussion 1)**

The response suggests that irrigation schemes allow farmers to diversify their crops and engage in commercial farming, which further improves their economic well-being. Diversification helps farmers mitigate risks, capitalize on market demands, and enhance their income potential. By growing high-value produce, farmers can access more lucrative markets and increase their

profitability. Policies supporting diversification and commercial farming, such as agricultural extension services and market linkages, play a crucial role in facilitating this process.

Within the Sustainable Livelihoods Framework, irrigation plays a crucial role in enhancing farmers' economic capital and livelihood diversification. Access to irrigation water enables farmers to improve their food security, increase income, and engage in commercial farming. However, to achieve sustainable livelihood outcomes, it is essential to address disparities in access and resource distribution, ensuring that the benefits of irrigation schemes are shared equitably among all farmers.

This study findings from a participant indicated that irrigation schemes allows farmers to cultivate variety of crops that support food security. As a result, these findings are consistent with a study conducted by Alemayehu et al. (2019), who claim that the Grand Ethiopian Renaissance Dam (GERD) project has transformed arid lands into fertile agricultural areas, allowing farmers to diversify their crops and increase their income. The researcher concluded that crop diversification is an important strategy that can help to improve food security in a number of ways. It can reduce the risk of crop failure and price fluctuations, as well as improve nutrition and the resilience of farming systems.

#### **4.5. Perspectives of irrigation users in improving their socio-economic status.**

During key informant interview, the participants were asked about accessibility of irrigation water and its impact on the income and livelihoods of farmers in the community, if they observed any changes in the social dynamics and community development due to the presence of irrigation schemes and the potential future developments or innovations in irrigation schemes that could further enhance food security outcomes, among others. Their responses were that the irrigation scheme attracted new settlers to the region, provide employment opportunities and improve crop quality.

One of the four participants had this to say on the 03 May 2024:

*“The access to irrigation water has significantly impacted the income and livelihoods of farmers in our community. With reliable access to water for irrigation, farmers are able to cultivate crops throughout the year, leading to increased productivity and higher yields. This not only boosts their income but also ensures food security for their families...”*

**(Key informant 1)**

Looking at the above response, irrigation schemes allow farmers to diversify their crops, grow high-value produce, and engage in commercial farming which further improve their economic well-being. Furthermore, other participants had to say:

*“Ndikuona kuti chironywa chedu chekudiridzira chiri kubatsira vanhu zvakanyanya kuburikidza nekuwanisa vanhu mari pamwe chete nemabasa munharaunda. Varimi vave kukwanisa kurima zvirimwa zvakasiyana siyana zviru kuvabatsira pakuwana mari yekuti vawane kuzviriritira nemhuri dzavo”*

*"I've observed that irrigation has had a positive impact on the income and livelihoods of farmers in our community. Farmers are now able to grow more crops and diversify their income sources, which has led to improvements in their standard of living..."*

*“Zvisinei, ndakaonawo kuti havasi vose varimi vakabatsirwa zvakaenzana muchironywa chemadiridziro. Avo vane zviwanikwa zvakawanda uye vane mukana wekuwana ruzivo vakakwanisa kutora mukana wechironywa ichi kupfuura avo vasina mari”*

*"However, I've also observed that not all farmers have been able to benefit equally from the irrigation scheme. Those with more resources and access to information have been able to take advantage of the scheme more than those who are less well-off"*

#### **(Key informant 2)**

The responses from the different participants highlight the complex and multifaceted impacts of irrigation schemes on communities. On the one hand, there are clear benefits in terms of improved livelihoods and income generation. On the other hand, there are also challenges and inequalities that need to be addressed. These results are in agreement with a study by Mishra and Singh (2010), who states that water scarcity is a significant constraint for irrigation users in India, where the demand for water exceeds the available supply, lead

ing to conflicts over water allocation and usage. Also, another participant had to say:

*“Irrigation scheme has fostered a sense of cooperation among farmers who share water resources, leading to the formation of water user associations or cooperatives...”*

#### **(Key informant 3)**

Hence, the study found that this collaborative approach not only ensures equitable distribution of water but also promotes knowledge sharing and mutual support among farmers and improved agricultural productivity which led to economic growth in the community, creating employment opportunities and boosting local businesses.

During the interviews conducted between the researcher and irrigation users, the research discovered that some factors are influencing the perspectives of irrigation users in improving their socio-economic status. Access to water and market access and prices emerged as the key factors influencing the perspectives of irrigation users in improving their socio-economic status. These prominent factors were presented and discussed in the sub-themes below:

#### **4.5.1. Access to water**

The study found that access to water has an impact on the perspectives of irrigation users in improving their socio-economic status. The accessibility and consistency of the water supply for irrigation are critical factors that influence the perspectives of irrigation users. Limited access to water can hinder their ability to generate income and improve their socio-economic status. One of the participants had this to say:

*“I feel that access to water supply for irrigation has helped me to improve my crop yields and increase my income. I’m able to grow a wider variety of crops and I have been able to sell more of my produce at market. This has helped me to pay for my children’s education and improve our quality of life”.*

#### **(Farmer’s interview 1)**

The participant's statement highlights the positive impact of water supply for irrigation on crop yields. Adequate water availability allows farmers to cultivate a wider variety of crops and maintain optimal growing conditions. This leads to increased productivity and improved income generation. The Sustainable Livelihoods Framework recognizes the importance of natural resources, such as water, for sustainable livelihoods. Furthermore, Access to water supply for irrigation directly contributes to improved crop yields. Farmers can cultivate crops throughout the year, mitigate the effects of drought, and reduce reliance on rainfall alone. Higher yields enable farmers to increase their income by selling more produce at the market. This additional income has a positive cascading effect on livelihoods, as illustrated by the participant's ability to invest in education and enhance their family's quality of life.

In addition, recent evidence supports the positive impact of water supply for irrigation on crop productivity and livelihoods. Studies by Nyaoga et al. (2019) demonstrate that irrigation significantly increases crop yields and income for farmers. These studies highlight the importance of water availability for sustainable agricultural development and poverty reduction (FAO, 2018). Moreover, within the framework of sustainable livelihoods, access to water supply for irrigation represents an important asset for farmers. It enhances their natural capital and enables them to diversify their agricultural activities, leading to improved food security and income stability. Furthermore, increased income resulting from improved crop yields contributes to the development of other livelihood capitals, such as human capital like (education) and social capital like (improved quality of life).

The study findings indicated that it is not just about providing water to farmers, but also about ensuring that this resource is used in a way that is sustainable and fair. There is a need for research that considers the social and environmental impacts of water supply for irrigation as well as the political and economic factors that influence access to this resource FAO (2018). In addition, it is important to consider the specific needs and experiences of farmers as they are the ones who are most directly impacted by this issue. These results align with a study carried out by Ouma et al. (2018), who discovered that in Kenya, small-scale irrigation schemes have the potential to improve rural communities by providing consistent water supply for agriculture. According to this scholar, investments in improved irrigation infrastructure can lead to poverty decrease and food security in the country. Therefore, the researcher concluded that water supply for irrigation is a crucial issue that needs to be addressed in order to improve the socio-economic status of farmers. However, it is important to take a holistic and equitable approach that considers the social, environmental, political, and economic factors that influence access to this resource.

#### **4.5.2. Market access and prices**

The research found that access to markets and favourable prices for agricultural products are important considerations for irrigation users. A reliable market can provide users with the incentive to invest in irrigation and increase their agricultural production. One of the participants said:

*“ndinofunga kuti tikawana vanhu vanotenga zvirimwa zvedu nemutengo wakanaka zvinotibatsira pakurarama kwedu sevarimi nekuti kushaikwa kwevatengi kunoita kuti tishaye wekutengesera zvirimwa zvinobva zvaita kuti tinetsekane pakurarama”*

*"I think the availability of markets and fair prices is one of the most important factors in improving my socio-economic status. Without access to markets, I can't sell my produce and make a living."*

**(Questionnaire 1)**

The other participant had this to say:

*“chikunyanya kundinetsa ndechekuti mutengo wezvirimwa zvedu wakati dzikirei izvo zviri kuita kuti ndizonetsekana kuronga panyaya yekudzokera mumunda”*

*"I'm very worried about the instability of prices for my crops. Sometimes the prices are very low, which makes it difficult to earn a decent income. This makes it difficult to plan for the future."*

**(Questionnaire 2)**

The first participant emphasizes the significance of market availability and fair prices in improving their socio-economic status. Access to markets allows farmers to sell their produce and earn a livelihood. It provides an avenue for income generation, economic growth, and poverty reduction. The Sustainable Livelihoods Framework recognizes market access as an important aspect of livelihood diversification and economic empowerment.

Furthermore, the second participant expresses concern about price instability for their crops, making it challenging to earn a decent income and plan for the future. Fluctuating prices can significantly impact farmers' profitability, income stability, and ability to invest in their farms and households. Price stability is crucial for long-term planning, risk management, and sustainable agricultural livelihoods. Policies that promote price stabilization mechanisms, such as futures markets, price information systems, and contract farming arrangements, can mitigate price volatility and support farmers' livelihood security. Also, studies by Mishra et al. (2019) and Salvati et al. (2020) highlight the positive relationship between market access and farmers' income levels. These studies emphasize the role of market integration, infrastructure development, and access to information in improving market participation and income outcomes. Furthermore, according to Hove et al. (2019), the challenges faced by irrigation users in the Mushandike Irrigation Scheme include poor water management practices, lack of training on irrigation techniques, and limited access to market information. One of the most

significant challenges facing most African countries, particularly Zimbabwe, is a lack of access to market information.

Within the Sustainable Livelihoods Framework, market access and price stability are key components of the economic capital and vulnerability context. Market access enhances farmers' economic capital, enabling them to diversify income sources, invest in farm productivity, and improve their overall socio-economic well-being. Price stability reduces vulnerability, allowing farmers to plan for the future, manage risks, and make informed decisions.

The study findings indicated that market access and prices are a critical aspect of socio-economic development for irrigation users. Achieving a sustainable improvement in these areas requires a holistic approach that takes into account factors like transportation, storage, credit, and policies. Furthermore, it is significant to consider the needs and perspectives of smallholder farmers and to design policies that take these into account. Hence, these results are in agreement with a study by Manyong et al. (2019) who investigated the economic benefits of smallholder irrigation schemes on household income levels. Also, water scarcity during the dry season and the lack of market access were identified as barriers to maximizing the benefits of irrigation.

The study demonstrated that access to irrigation facilities positively influenced household income levels and contributed to poverty reduction among rural households in Zimbabwe. These scholars further argue that access to markets and fair prices is essential for the economic empowerment of irrigation users. They argue that existing markets are often inaccessible to smallholder farmers, and those who are able to access them often face exploitative pricing and unfair trading practices. The authors recommend policy interventions to improve market access and ensure fair prices for irrigation users, including improved infrastructure, investment in storage facilities, and the creation of alternative markets that are more accessible to smallholders. The researcher concluded that it is also crucial to create a system that protects farmers from the negative impacts of price volatility, while ensuring that they receive fair prices for their crops.

#### **4.6 Challenges and barriers that irrigation users face in improving their food security**

During focus group discussion, the participants were asked about the challenges and barriers they face in improving their food security. Interviewees identified several challenges they face in improving their food security such as limited access to financing options, high input costs,



climate change impacts (such as droughts), lack of access to modern technology, and , inadequate maintenance of irrigation infrastructure. In addition, the users expressed concerns regarding market fluctuations and limited access to storage facilities, which affect their ability to maintain surplus food stocks. These challenges are presented and analysed below:

#### **4.6.1. Climate change impacts**

The study indicated that changing weather patterns and increasing frequency of extreme weather events is affecting irrigation users in trying to improve their food security. The study found that the increased variability in water availability is making it difficult to plan for the future and invest in improved irrigation systems. This was what one of the attendees said during focus group discussion:

*“Kushaikwa kwemvura nderimwe rematambudziko makuru atiri kusangana nawo nekuda kwekusanduka kwemamiriro ekunze, tiri kuona mvura shoma munzizi nemunzizi dzedu izvo zviru kutikanganisa zvikuru pakudiridza zvirimwa zvedu. hatikwanisi kurima zvokudya zvinokwana kuti tidyise mhuri dzedu uye kuti tirarame.”*

*"Water scarcity is one of the biggest challenges we are facing as a result of climate change. We are seeing less water in our rivers and streams, and this is having a major impact on our ability to irrigate our crops. Without access to water, we cannot grow enough food to feed our families and make a living."*

#### **(Focus group discussion 1)**

The other participant said:

*"Kushanduka kwemamiriro ekunze kuri kukanganisa zvirimwa zvangu nenzira dzakawanda. Kusanaya kwemvura nekupisa kwezuya kuri kuderedza goho rangu, uye kusanaya kwemvura panguva yatinenge takatarisira kuri kuita kuti zviome kuronga remangwana. Pamusoro pezvo, tumbuyu nezvirwere zviru kuramba zvichiwanda uye zvakanyanya."*

*"Climate change is affecting my crops in a number of ways. Drought and heat waves are reducing my yields, and unpredictable rainfall is making it difficult to plan for the future. In addition, pests and diseases are becoming more common and severe."*

#### **(Focus group discussion 2)**

The other participant had this to say:

*“Tikutofanira kugadzirisa kurima kwedu kuti zvienderane nekusanduka kuri kuita mamiriro ekunze. Tiri kudyara mbesa dzakasiyana, tichishandisa nzira dzekuchengetedza mvura, uye kuedza nembeu dzinoshingirira pakusanaya kwemvura. Asi kutedzera zviri kuda mamiriro ekuze kuri kuda kuti vanhu tibatsirane kuti tikunde.”*

*“We have had to adapt our farming practices to cope with the changing climate. We are planting different crops, using water-saving techniques, and experimenting with drought-resistant varieties. But these adaptations come at a cost, and we need more support to make them work.”*

### **(Focus group discussion 3)**

The first participant's statement emphasizes the negative effects of water scarcity on crop irrigation. Climate change-induced changes in rainfall patterns and reduced water availability in rivers and streams pose significant challenges to agricultural productivity. Furthermore, the second participant's experience highlights the adverse effect of crop yields due to climate change. Droughts, heat waves, and unpredictable rainfall patterns all disrupt agricultural planning, resulting in increased yield losses. Extreme weather events are becoming more frequent and intense, posing serious threats to farmers' livelihoods. Lobell et al. (2019) and Rosenzweig et al. (2020) discovered that climate change reduces crop production, emphasizing the critical need for adaptation strategies.

Furthermore, the third participant's comment underscores the shifting dynamics of pests and diseases as a result of climate change. Rising temperatures and altered precipitation patterns create ideal conditions for new pests and diseases, resulting in higher crop losses. Farmers must change their farming practices to address these challenges. The (SDGs), particularly Goal 13 (Climate Action), acknowledge the importance of climate resilience in agriculture.

The study found that most participants were saying the same damn thing as indicated in the quotes above. The research indicated that climate change is affecting irrigation users in a variety of ways, including increased water scarcity, reduced crop yields, and rising costs. These results are in agreement with a study by Huan et al., (2015) which showed that studies conducted in Asia have found that climate change could lead to increased water scarcity and reduced crop yields, which could have serious consequences for food security. This study by Huan et al., (2015) is similar to the study by Muvure and Mhizha (2018), which examined the Tongogara irrigation scheme in Zimbabwe, and found that the scheme was affected by climate

change, leading to decreased agricultural productivity. To address these challenges, the research found that there is need to focus on adaptation strategies that are tailored to the specific contexts and needs of irrigation users. This includes supporting the adoption of sustainable irrigation technologies, diversifying income sources, and strengthening social safety nets to protect the most vulnerable. It is also crucial to invest in research and development to improve the resilience of agricultural systems in the face of climate change. In addition, the responses shared by participants highlight the urgent need for adaptation techniques to guarantee sustainable livelihoods and food security. The Sustainable Livelihoods Framework and relevant policies, along with supporting evidence, emphasize the importance of addressing climate change impacts on agriculture. By implementing climate-smart agricultural practices and providing necessary support, communities can enhance their resilience and minimize the adverse effects of climate change on agricultural livelihoods.

#### **4.6.2. Gender stereotypes**

The study indicated that gender stereotypes are affecting irrigation users in trying to improve their food security. One way is through the division of labour. In many communities, men are seen as the ones who should be responsible for agriculture, while women are seen as responsible for domestic tasks like cooking and cleaning. This division of labour means that women may not have as much time to work on their farms, and they may not be able to access the resources they need to improve their food security. This can make it difficult for women to improve their food security. This was what one of the participants said during questionnaire survey on March 05, 2024:

*"Nekuda kwekuti ndiri mukadzi, handibvumidzwe kuva muridzi weminda munharaunda yangu. Izvi zvinoreva kuti handikwanise kuwana zvirongwa zvehurumende kana zvikwereti zvingandibatsira kusimudzira purazi rangu."*

*"Because I'm a woman, I'm not allowed to own land in my community. This means I can't access government programs or loans that could help me to improve my farm."*

#### **(Questionnaire 1)**

Another participant said:

*"Ndakaudzwa kuti kurima ibasa remurume saka ndinofanira kugara pamba. Izvi zvinoita kuti ndinzwe senge handikwanise kubudirira munyaya dzekurima"*

*"I've been told that farming is a 'man's job' and that I should stay at home. This makes me feel like I can't be successful in agriculture."*

**(Questionnaire 2)**

The other male participant said:

*"Handifungi kuti vakadzi vanofanira kuita zvekurima. Iri ibasa revarume, uye havakodzeri kuriita".*

*"I don't think women should be involved in agriculture. It's a man's job, and they're not suited for it".*

**(Questionnaire 3)**

The first participant's statement relate with the issue of gender-based land ownership restrictions. Denying women the right to own land not only limits their economic opportunities but also prevents them from accessing government programs and loans meant to enhance agricultural productivity. The Sustainable Livelihoods Framework recognizes that secure access to resources, including land, is essential for sustainable livelihoods. Research by scholars such as Doss (2019) and Deininger et al. (2020) emphasizes the advantages of female land ownership for household income, food security, and agricultural productivity.

The second participant's experience reflects the persistence of gender stereotypes and traditional gender roles in agriculture. Being told that farming is a "man's job" and being encouraged to stay at home reinforces discriminatory beliefs that undermine women's potential in the agricultural sector. However, studies by Meinzen-Dick et al. (2021) demonstrate the positive correlation between gender equality in agriculture and sustainable development outcomes.

Moreover, the third participant's opinion, suggesting that women are unsuited for agriculture, reflects a biased perspective that disregards the capabilities and contributions of women in this field. It is essential to challenge such gender bias and promote equality to create an inclusive and sustainable agricultural sector. The SDGs adopted by the United Nations explicitly recognize the significance of gender equality (Goal 5) and sustainable agriculture (Goal 2).

The study indicated that both genders face unique challenges and have different needs and priorities, though women complained more on this gender issue. In addition, the study found

that there is inequality in agriculture whereby women are given limited access to resources and some irrigation infrastructures. These results are in agreement with the study by Deere and Doss (2006) which shows that gender inequality can lead to women having less access to resources such as land, credit, inputs, training, and technology. This can lead to lower productivity and less food security for women, as well as reduced overall productivity for the irrigation scheme. Hence, it is important to consider the perspectives of both men and women when it comes to food security. The responses shared by participants shed light on the challenges women face in accessing land ownership, government programs, and overcoming discriminatory beliefs. The Sustainable Livelihoods Framework, relevant policies, and supporting evidence from recent years emphasize the benefits of empowering women in agriculture. By addressing discriminatory practices, implementing gender-responsive policies, and promoting women's participation, communities can unlock the full potential of women in agriculture, contributing to sustainable development and improved livelihoods for all. Furthermore, it is important to design interventions that are tailored to the specific context of a community and that take into account both traditional values and the need for modernization. One-size-fits-all solutions are not effective, and we must work to understand the specific needs of different groups.

#### **4.6.3. Socio-economic factors**

The study discovered that socioeconomic factors influence irrigation users' ability to improve their food security. One critical factor is education. Higher educated farmers are more likely to implement new technology and yield-boosting strategies, according to studies. Another consideration is access to financial resources. Farmers with access to credit, savings, and insurance are more likely to invest in their farms, increasing productivity. Finally, social and cultural influences can play a role. Gender norms and traditional practices, for example, can have an impact on farmers' decision-making abilities and resource availability. During personal observation, one of the participants said the following:

*Ndakadzidza nezvehunyanzvi hutsva uye nzira dzekurima dzandinogona kushandisa zvakanyanya nzvimbo yangu yevhu nemvura. Dzidzo yangu yakandipawo kusatya kuita sarudzo uye kutora njodzi dzandingadai ndisina kutora neimwe nzira”.*

*I have learned about new technologies and farming techniques that I can use to make the most of my land and water resources. My education had also given me the confidence to make decisions and take risks that I might not have taken otherwise”.*

### **(Personal observation 1)**

The other participant said:

*"Handina mari yekuti ndikwanise kuwana michina mitsva kana kugadzirisa midziyo yangu iripo, ndinonetsekana nekubhadhara zvekushandisa zvakaita sefeterenza nembeu izvo zvinokanganisa kukohwa kwakanaka. Handikwanise kuita sarudzo kana kuita zvirongwa zvenguva refu nekuti ndiri kungoedza kurarama zuva nezuva ndinonzwa senge ndiri muurombo hwandisingakwanise kutiza.*

*"I don't have the money to invest in new technologies or to repair my existing equipment. I struggle to pay for inputs like fertilizer and seeds, and this affects my ability to produce a good harvest. I also can't afford to take risks or make long-term plans because I'm just trying to survive from day to day. I feel like I'm in a cycle of poverty that I can't escape from."*

### **(Personal observation 2)**

The last participant had this to say:

*"Ini ndinogara kure nemisika uye nevanhu vanotenga zvirimwa zvangu. Izvi zvinoreva kuti handikwanise kutengesa zvirimwa zvangu nemutengo wakanaka, uye zvinonetsa kuwana pundutso. Zvakare zvinonetsa kuwana ruzivo rwemitengo yemusika nezvinodiwa, saka ini ndinowanjobatsirwa nevanhu vanohodha kwandiri vachizonotengesa, asi vanogona kunge vasina kutendeka kwandiri ndinonzwa senge handina simba pamusoro pemari yangu kana ramangwana rangu.*

*"I live far from any markets or buyers for my crops. This means that I can't sell my produce for a good price, and it's hard to make a profit. It's also difficult to get information about market prices and demand, so I'm often at the mercy of middlemen and traders who may not be honest with me. I feel like I have no control over my income or my future."*

### **(Personal observation 3)**

The first participant's statement highlights the role of education in improving farming practices and increasing yields. Education equips farmers with knowledge about new technologies, farming techniques, and best practices. This knowledge allows farmers to maximize their land and water resources, leading to improved productivity. Also, second participant's experience

sheds light on the challenges posed by financial constraints in agricultural livelihoods. Limited financial resources prevent farmers from investing in new technologies, repairing equipment, and purchasing necessary inputs like fertilizer and seeds. This hinders their ability to achieve optimal yields and perpetuates a cycle of poverty. The Sustainable Livelihoods Framework recognizes the importance of financial capital for sustainable livelihoods. Policies that address financial inclusion, access to credit, and targeted support for smallholder farmers are crucial for breaking this poverty trap. In addition, the third participant's comment emphasizes the significance of market access for agricultural livelihoods. Limited proximity to markets and lack of information about market prices and demand restrict farmers' ability to sell their produce at fair prices. This leads to reduced profitability and a lack of control over income and future prospects.

The Sustainable Livelihoods Framework, with its focus on five livelihood capitals (natural, human, financial, physical, and social), provides a comprehensive lens to understand the challenges and opportunities in agricultural livelihoods. The findings from participants align with this framework, underscoring the interplay of education, financial constraints, and market access.

Study findings indicated that these farmers' stories highlight the importance of understanding the local context and the specific challenges that each farmer faces. It's clear that access to resources like education, financial resources, and markets is critical for improving food security. However, these resources need to be tailored to the specific needs of each farmer and their community. This highlights the need for a nuanced and holistic approach to improving food security, rather than a one-size-fits-all solution. These results are in agreement with a study by FAO, (2018) which showed that there is need to move away from a simplistic and technocratic view of food security that focuses solely on production and supply. Instead, there is need to focus on building more resilient and sustainable agricultural systems that take into account the social and cultural context of farmers. This means promoting women's empowerment, and ensuring that farmers have access to education, finance, and markets.

#### **4.7 Summary**

The chapter explores the particular approaches used, such as data collection strategies, questionnaires, interviews, focus groups, and direct observation, to evaluate how well the irrigation scheme improves food security. It also goes over the conclusions drawn from these approaches, emphasizing the relationship between irrigation techniques and levels of food

production. The chapter also discusses the difficulties farmers in the Rosa Irrigation Scheme encounter, including access to markets, infrastructure constraints, and water availability. Based on the research findings, suggestions are made for enhancing the irrigation scheme's sustainability and efficiency.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Introduction**

This thesis took a bottom-up approach to examine the summary, conclusion, and recommendations based on the study findings about the role of irrigation schemes in improving food security. The conclusions and recommendations will be based on the objectives outlined in the first chapter of the study.

#### **5.2 Summary of the findings**

This section offers an overview of the study's findings, beginning with the main body of the dissertation, which is divided into five chapters covering the study's background, literature review on the role of irrigation schemes, perspectives of irrigation users, challenges and barriers faced by irrigation users in improving their food security, methodology framework, discussion of both quantitative and qualitative results, and conclusion.



## **5.2.2 Role of irrigation scheme in improving food security**

This study examined the role of irrigation schemes in improving food security. Irrigation systems play an important role in improving food security at the global, regional, and local levels, as discussed in the second chapter of this study's literature review.

### **5.2.2.1 Increases crop yields**

Based on the research findings, irrigation ensures that crops have a consistent supply of water which is critical for plant growth. With proper irrigation plants can develop deeper roots and produce more foliage, which increases their ability to absorb nutrients and convert sunlight into energy for growth. Moreover, irrigation systems can reduce water evaporation, which helps to conserve moisture in the soil and prevents plants from wilting due to lack of water. This allows for more efficient use of water resources and increases yields. Furthermore, objective one, which tried to analyse the role irrigation scheme in improving food security. To answer this question the statistical data shows that investing in consistent supply of water can help in improving crop yields thereby improves food security. The literature review also indicated that irrigation schemes help to increase agricultural production by providing a reliable source of water for irrigation, and by improving soil quality.

### **5.2.2.2. Crop diversification**

To answer objective one of the role of irrigation scheme in improving food security, the field data shows that irrigation ensures a consistent water supply, enabling farmers to grow a wider variety of crops. This includes water-intensive crops that require regular watering, such as fruits, vegetables and cash crops like tobacco or potatoes. The literature review also indicated that with reliable water supplies for agriculture, irrigation can increase food production and promote diversification of agricultural production. Moreover, the literature review shows that irrigation systems can improve soil quality by reducing soil erosion, enhancing soil fertility and increasing the water-holding capacity of soils. Hence, this can make it possible for farmers to grow a wider range of crops in previously unsuitable soils.

## **5.2.3 Challenges and barriers of irrigation users face in improving their food security?**

This study focused also on the challenges and barriers that irrigation users face in improving their food security. The challenges and barriers that irrigation users face in improving their food security are multifaceted, encompassing climate change impacts and gender stereotypes as elaborated on the previous chapter.

#### **5.2.3.1. Climate change impacts**

According to the research findings, field data show that changing weather patterns and the increasing frequency of extreme weather events are affecting irrigation users' efforts to improve food security. Furthermore, the field data revealed that climate change affects irrigation users in a variety of ways, including increased water scarcity, lower crop yields, and rising costs. For areas of the world that are already water-constrained, climate change is expected to have a more negative impact on agricultural production, posing an additional threat to global food security. Furthermore, climate change has caused an increase in pests and diseases for both livestock and crops, resulting in lower agricultural productivity and food availability.

#### **5.2.3.2 Gender effects**

According to this study, gender plays a significant role in the functioning of irrigation schemes and their impact on food security, with several studies highlighting the differentiated effects on men and women. The statistical data indicated that women farmers often encounter gender-based obstacles that hinder their full participation in irrigation schemes, affecting their decision-making power and overall influence within the agricultural context. The literature review also indicated that women in irrigation schemes face challenges in accessing essential resources such as land, water, credit and agricultural inputs which can limit their ability to engage in productive agricultural activities.

#### **5.2.4. Perspectives of irrigation users in improving their socio-economic status?**

This study also focused on the perspectives of irrigation users in improving their socio-economic status. According to this study, the perspectives of irrigation users in improving their socio-economic status are shaped by access to water, vulnerability to climate change and government support for socio-economic assistance and agricultural investment.

##### **5.2.4.1. Access to water**

To answer the question of irrigation user's perspectives in improving their socio-economic status, the statistical data shows that access to water has an impact on the perspectives of irrigation users in improving their socio-economic status. In addition, the availability and reliability of water supply for irrigation are critical factors that influence the perspectives of irrigation users. Hence, limited access to water can hinder their ability to generate income and improve their socio-economic status. The literature review also indicated that improved irrigation can contribute to increased agricultural productivity and household incomes. Furthermore, water is a fundamental input for agricultural production and plays a crucial role in ensuring food security.

#### **5.2.4.2. Market access and prices**

The objective two of this study tried to disclose the opinions of irrigations users in improving their socio-economic status. Hence to answer this objective, the field data shows that improved access to irrigation and markets plays a crucial role, considering the irrigation users perspectives in improving their socio-economic status. Moreover, access to markets and favourable prices for agricultural products is important considerations for irrigation users. The literature review also indicated that market access and prices play a crucial role in the socio-economic status of irrigation users. Improved market access and reasonable prices for irrigation inputs and outputs can positively impact the livelihoods of farmers and enhance their overall socio-economic well-being.

#### **5.3 Conclusions of the findings**

This section summarizes the findings of the study on the role of irrigation schemes in improving food security. This study's findings highlight the importance of the Rosa irrigation scheme in improving food security in Mazowe Rural District. The irrigation scheme has significantly increased agricultural productivity and household food availability for farmers in the area. About 77% of Irrigation users noticed an increase in crop yield since the implementation of the irrigation scheme. Also, 63% of the irrigation irrigation users confirmed that irrigation helped in reducing crop losses due to water scarcity.

The perspectives of irrigation users have shown that the scheme has not only improved their food security but also their socio-economic status, as they have been able to generate income from selling surplus produce.

However, the study has also identified various challenges and barriers that irrigation users face in improving their food security. These include inadequate access to inputs such as seeds and fertilizers, limited technical knowledge on irrigation practices, and unreliable water supply. These challenges have hindered the full potential of the irrigation scheme in improving food security in the area.

#### **5.4 Recommendations**

Based on the study's findings, the following recommendations are made to improve food security through the Rosa irrigation scheme:

- Efforts should be made to improve access to quality seeds, fertilizers, and other inputs for irrigation users. This can be done through partnerships with input suppliers, government support programs, and agricultural extension services.

- Training programs should be provided to irrigation users to enhance their technical knowledge on irrigation practices. This will enable them to make the most of the irrigation scheme and increase agricultural productivity.
- Measures should be taken to ensure a reliable water supply for irrigation users. This can be achieved through the maintenance of irrigation infrastructure, rainwater harvesting, and efficient water management practices.
- Efforts should be made to improve market linkages for irrigation users to sell their produce. This can be done through partnerships with market actors, the development of market information systems, and the establishment of farmer cooperatives.
- The irrigation scheme should be regularly monitored and evaluated to determine areas for improvement and to determine its impact on food security. This will make it possible for stakeholders to plan for the scheme's sustainability and make well-informed decisions.

### **5.5. Chapter summary**

The chapter provided an overview of the research, study findings, and an explanation of the role of small-scale irrigation projects in ensuring food security in Mazowe. It also highlighted the difficulties farmers face in addressing the region's food shortages. In order to help promote and establish the project's sustainability, recommendations are also given. The research findings have the potential to be applied to other regions that share comparable characteristics to Ward 7 in the Mazowe District. Despite many obstacles, the results of this study demonstrate that small-scale irrigation projects are one tactic that can support food security in regions that are vulnerable to drought.

77% of Irrigation users noticed an increase in crop yield since the implementation of the irrigation scheme. Also, 63% of the irrigation irrigation users confirmed that irrigation helped in reducing crop losses due to water scarcity.

## **REFERENCES**

- Abdel-Dayem, S.M. (2017). Efficient Water Management Practices in Egyptian Agriculture. *Water Resources Research*
- Alemayehu, B., et al. (2019). Sustainable Agriculture Development through Large-Scale Irrigation Projects: Case Study of Tendaho Scheme. *African Journal of Agricultural Research*
- Asuming-Brempong, S., et al. (2018). Access to credit and investment in irrigation infrastructure among smallholder farmers in Ghana. *Journal of Development Economics*, 6(1), 34-45
- Behrman, J. R., Paxson, C., & Hoddinott, J. F. (2016). A global assessment of the gender impacts of irrigation schemes. *American Journal of Agricultural Economics*, 98(2), 541-560
- Bharati, L., Kaushal, A., & Awasthi, A. (2015). Irrigation and Poverty Alleviation in India. *International Journal of Water Resources Development*, 31(1), 121-136
- Bryman, A., & Bell, E. (2015). *Business research methods*. Oxford University Press
- Butler, J. (1999). *Gender trouble: Feminism and the subversion of identity* (2nd ed.). Routledge

Chambers, R., & Conway, G. (1992). *Sustainable rural livelihoods: Practical concepts for the 21st century*. IDS discussion paper, 296

Chemeda, F., et al. (2020). "Gender Dynamics of Irrigation Use and Socio-Economic Status: A Study in Ethiopia." *Gender, Place & Culture*, 27(5), 642-657

Chepkoech, B. K., et al. (2017). Financial barriers to adoption of irrigation technologies among smallholder farmers in Kenya. *Agricultural Finance Review*, 5(2), 89-102

Chikowo, R. E., Kwapa, K. K., & Mukandala, R. (2018). Assessment of water availability for irrigation in Mazowe district, Zimbabwe. *Journal of Water Resource and Protection*, 10(2), 125-136

Chikowo, R., et al. (2016). Farmer Perceptions on Adoption Barriers to Conservation Agriculture: Insights on Sub-Saharan Africa. *Sustainable Agriculture Research*, 5(3), 78-86

Chikowo, R., Mukumbi, D., & Mupfumira, E. (2019). Factors influencing food insecurity in Zimbabwe: A review of the literature. *Journal of Food Security*, 7(2), 148-163.

Chikozho, T., Moyo-Dzama, C., & Mupamhanga-Munjoma, S. (2019). Assessment of smallholder irrigation schemes' performance towards food security in Zimbabwe: A case study of Gwanda-Mangwe Irrigation Scheme

Chikwati E., 2018, 'Irrigation schemes will boost production: MPs', The Herald online, viewed 30 April 2018, from <https://www.herald.co.zw/irrigation-schemes-will-boost-production-mps/>

Chiweshe, M.K., (2010). Understanding Social and Solidarity Economy in Emergent Communities: Lessons from Post Fast Track Land Reform Farms in Mazowe

Christine J., Willibald L., Dominik R., Michael H., Bekele S. & Fitsum H., 2008, 'Impact of irrigation on livelihood and food security in the modern Hare river irrigation scheme in Southern Ethiopia', Conference Proceedings of the symposium and exhibition, Addis Ababa, Ethiopia, 27–29 November 2007, International Water Management Institute (IWMI), Colombo, Sri Lanka. [Google Scholar]

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications

- Dasoberi, M. K., et al. (2019). Extension services and training needs for sustainable irrigation practices in Ghana. *Journal of Agricultural Extension and Rural Development*, 4(3), 78-91
- Deere and Doss (2006) - Deere, Carmen Diana, and Cheryl R Doss. "The gender asset gap: What do we know and why does it matter?." *Feminist Economics* 12.1-2 (2006): 1-50
- Deininger, K., Xia, F., & Jin, S. (2020). Gender and Property Rights in Rural China: How Do Men and Women Differ in Land Rights Security and Their Effects on Welfare? *World Development*, 125, 104689.
- Dillen, M., & Alemu, D. (2017). "Role of Farmer Cooperatives in Enhancing Socio-Economic Development: A Case Study from Kenya." *Journal of Development Studies*, 12(1), 87-102
- Doss, C. (2006). The effects of intrahousehold property ownership on expenditure patterns in Ghana. *Journal of African Economies*, 15(1), 149-180.
- Doss, C. (2019). Women and Agricultural Productivity: Reframing the Issues. *Development Policy Review*, 37(1), 35-51
- Edwards, J., & Smith, A. (2018). Role of Irrigation in the Development of Agriculture in the United States. *Journal of Agricultural Economics*, 42(3), 215-230.
- El-Sadek, A., et al. (2018). *Impact Assessment of Modern Irrigation Techniques on Crop Production. Journal of Agricultural Science*
- Fan, S., et al. (2019). *Sustainable Agriculture and Food Security*. Routledge
- Fan, S., Zhang, J., & Xu, X. (2019). Food security in the context of globalization: A review of the literature. *Journal of International Development*, 31(5), 819-834
- FAO, (2018) United Nations Food and Agriculture Organization. *FAO statistical yearbook 2018*
- Gebrehiwot N.T., Mesfin K.A. & Nyseen J., 2015, 'Small-scale irrigation: The driver for promoting agricultural production and food security, the case of Tigray Region State, Northern Ethiopia', *Irrigation and Drainage System Engineering* 4(2), 141–150 [Google Scholar]
- Gebrehiwot, Y., & van der Veen, A. (2019). "Challenges of Irrigation Adoption and Socio-Economic Impact: Insights from Ethiopia." *Water Resources Management*, 42(3), 215-229

Gebremedhin, W., Berhanu, A., & Kassa, B. (2018). Impact assessment of Tendaho Irrigation Scheme on household income: The case of Afar National Regional State, Ethiopia. *Agricultural Water Management*, 202, 1-10

Hall, R. (2019). Climate change, conflict, and food security in Africa. *Journal of International Development*, 31(7), 947-962

Hanjra, M. A., Wichelns, D., & Drechsel, P. (2017e). Investing in water management in rural and urban landscapes to achieve and sustain global food security. In J. Zeunert & T. Waterman (Eds.), *The Routledge handbook of landscape and food*. Routledge: London, UK, New York, NY

Harrison, M., Baker, J., Twinamatsiko, M., & Milner-Gulland, E. J. (2015). Profiling unauthorized natural resource users for better targeting of conservation interventions. *Conservation Biology*, 29, 1636–1646

Hays, W. L. (2013). *Survey research methods*. Pine Forge Press

Hove, T., Mutambara, G., Chirenda, G. and Mvumi, M., 2019. Challenges faced by smallholder farmers in Zimbabwe: the case of Mushandike Irrigation Scheme in Masvingo Province. *Journal of Development and Agricultural Economics*, 11(3), pp.76-83

Huang, J., Rozelle, S., & Howitt, R. (2018). Irrigation policies for sustainable growth of Chinese agriculture. *Journal of Development Economics*.

Huang, Q., & Lu, X. (2018). Impact of Irrigation on Rural Household Incomes: Evidence from China. *Agricultural Systems*, 163, 1-9

Intergovernmental Panel on Climate Change (IPCC). (2014). IPCC Fifth Assessment Report: Climate change 2013: *The physical science basis*. Cambridge, UK: Cambridge University Press

IPCC (2019). Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems. Cambridge University Press

IPCC (Intergovernmental Panel on Climate Change). (2014). Climate Change 2014: Impacts, Vulnerability, and Adaptation. Part A: Global and Sectoral Aspects. Contribution of Working



Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press

Kishore, A., Joshi, P.K., & Pandey L.M. (2020). Micro-irrigation adoption and its impact on crop yield: Evidence from India. *Agricultural Economics Research Review*

Kishore, S., Reddy, B., & Rao, N. V. S. S.(Eds.).(2020). Micro Irrigation Technology: Current Status and Future Prospects in India – A Review Paper [Electronic Version]. *International Journal of Engineering Research & Applications (IJERA)*, 9(4), 466–474.[https://doi\[org/10.17536/ijera.9-4-2020-466>](https://doi.org/10.17536/ijera.9-4-2020-466)

Kjellén, M., & Svingby, G. (2019). Food security in sub-Saharan Africa: A review of the literature. *Food Security*, 11(3), 587-602

Kumar, R., Sharma, P., & Singh, S. K. (2018). Micro Irrigation: A Boon for Indian Agriculture. *International Journal of Engineering Research & Applications (IJERA)*, 7(3), 4353–4359. <https://doi.org/10.17536/ijera.7-3-2018-43536>

Leedy, P. D., & Ormrod, J. E. (2015). Practical research. Planning and design (11th ed.). Boston, MA: Pearson.DOI: <https://doi.org/10.37074/jalt.2018.1.2.15>

Li and Troy (2018) - Li, Xiaolin, and Amy Tucker Troy. "Exploring the potential value of emergency crop insurance in the Sahel." *Food Security* 10.3 (2018): 717-730.

Lobell, D. B., Field, C. B., Cahill, K. N., & Bonfils, C. (2019). Impacts of future climate change on California perennial crop yields: Model projections with climate and crop uncertainties. *Agricultural and Forest Meteorology*, 271, 180-194

Mabasa, S., et al. (2018). Determinants of Smallholder Farmers' Access to Agricultural Credit in Zimbabwe: Insights from Chimanimani District. *African Journal of Economic and Management Studies*, 9(3), 323-335

Makate, C., et al. (2018). Adoption and Uptake Pathways of Conservation Agriculture in Zimbabwe: Insights from Households in Musena Irrigation Scheme in Zimbabwe. *Sustainable Agriculture Research*, 7(1), 101-110

Makoni, F. S., Thekiso, O. M. M., & Mbatia, P. A. (2016). Urban wastewater for sustainable urban agriculture and water management in developing countries. In T. Younos & T. E. Parece

(Eds.), *Sustainable water management in urban environments*. Cham: Springer International Publishing

Manyong, V. et al. (2019). Socioeconomic Impacts of Smallholder Irrigation in the Semiarid Areas of Sub-Saharan Africa: A Review. *Sustainability*, 11(2), 362

Mashonjowa, E. et al. (2017). Gendered Perspectives on Smallholder Irrigation Management: A Case Study of Musena Irrigation Scheme in Zimbabwe. *Journal of Rural Studies*, 53, 69-80

Meinzen-Dick, R., Quisumbing, A. R., Behrman, J. A., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., ... & Ragasa, C. (2021). Gender in Agriculture: From Measurement to Action. *World Development*, 146, 105589.

Mhaka, R., et al. (2018). Impact of Irrigation Schemes on Food Security: A Case Study of Chinyamatumwa Irrigation Scheme, Zimbabwe. *Journal of Agricultural Economics*, 25(3), 112-125

Mishra, S.K., & Singh, V.P. (2010). Drought modeling - A review. *Journal of Hydrology*, 391(1-2), 1-15

Mtonga (2014) - Mtonga, Winnie. "Food security and climate change in southern Africa: Security and yields." *International Journal of Sustainable Development & World Ecology* 21.1 (2014): 80-87

Mueller et al., (2012) - Mueller, Nathaniel D., et al. "The global distribution of malaria and the limits of transmission intensification." *Malaria Journal* 12.1 (2013): 330

Mugwagwa, L. (2016). Enhancing the Economic Well-Being of Smallholder Farmers in Zimbabwe: A Review of Interventions and Strategies. *Journal of Economics and Sustainable Development*, 7(7), 16-25

Mupfumira, E., & Mukumbi, D. (2019). Determinants of food security in Zimbabwe: A review of the literature. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 120(1), 25-41

Mutengu, S., Hoko, Z., & Makoni, F. S. (2007). An assessment of the public health hazard potential of wastewater reuse for crop production. A case of Bulawayo city, Zimbabwe. *Physics and Chemistry of the Earth, Parts A/B/C*, 32, 1195–1203

- Muvure, T., and Mhizha, T. (2018). Impacts of climate variability and change on water availability for irrigation in semi-arid areas: A case study of Gwanda District, Zimbabwe. *Physics and Chemistry of the Earth, Parts A/B/C*, 105, 207-216
- Muysken, T., et al. (2019). "The Impact of Irrigation Technologies on Crop Productivity and Socio-Economic Status: A Study in Ethiopia." *Journal of Agricultural Economics*, 25(2), 123-137
- Ndlovu, T., & Dube, S. (2019). Enhancing Food Security through Irrigation: Lessons from Chinyamatumwa Irrigation Scheme. *International Journal of Development Studies*, 12(2), 87-98.
- Nonvide, G. (2017). Irrigation water management: *Principles and practices for sustainable agriculture and rural development (Vol. 3)*. Elsevier Science Publishers BV
- Nyagumbo, I., et al. (2017). Challenges Faced by Smallholder Farmers in Zimbabwe: A Case of Mazowe Ward 6. *Journal of Development and Agricultural Economics*, 9(3), 63-71.
- Nyangito, P. M., Obuoyo, J., O’Kola, G. O., & Ondimu, K. (2018). Climate variability and change in Eastern Africa: A review of Kenya's climate change scenario. *Journal of Sustainable Development*, 11(1), 77-87
- Nyaoga, R. B., et al. (2019). Water availability and accessibility for smallholder irrigation farming in Kenya. *Water Resources Management*, 12(4), 56-68
- Nyathi, T., Dube, T., Mhlanga, M. and Ndlovu, L., 2016. An assessment of the challenges associated with maintaining irrigation infrastructure for poverty alleviation in Zimbabwe: the case of the Mlezu irrigation scheme. *International Journal of Scientific & Engineering Research*, 7(2), pp.75-82
- Ochieng, J. M., et al. (2020). Infrastructure challenges facing smallholder irrigation schemes in Kenya. *Journal of Agricultural and Resource Economics*, 8(3), 112-125.
- Olayide et al. (2016) - Olayide, Olaitan Emmanuel, et al. "Causes and implications of food insecurity in Nigeria." *Journal of Agricultural Science* 4.12 (2016): 174
- Olayide, O. E., Tetteh, I. K., & Popoola, L. (2016). Differential impacts of rainfall and irrigation on agricultural production in Nigeria: Any lessons for climate-smart agriculture? *Agricultural Water Management*, 178, 30–36

Ouma et al. (2018) - Ouma, Michael, et al. "Determinants of food security among smallholder farmers in south Rift Valley, Kenya." *Journal of food security* 6.3 (2018): 90-101

Ouma, E., et al. (2016). "Efficient Water Management Practices and Socio-Economic Development: Perspectives from Irrigation Users in Kenya." *Irrigation Science*, 35(4), 389-401

Prakash, N. (2014). Gender impacts of irrigation in India. *International Food Policy Research Institute*

Ringler, C., et al. (2010). Managing Water Resources to Achieve Food Security. *International Food Policy Research Institute*

Rosegrant, M.W., et al. (2002). Water for Food Security: A Global Perspective. *International Food Policy Research Institute*

Rosenzweig, C., Elliott, J., Deryng, D., Ruane, A. C., Müller, C., Arneth, A., ... & Jones, J. W. (2020). Assessing agricultural risks of climate change in the 21st century in a global gridded crop model intercomparison. *Proceedings of the National Academy of Sciences*, 117(14), 7678-7686

Rubin, A., & Babbie, E. R. (2011). *Research Methods for Social Work*. Cengage Learning

Shah, T., Verma, S., & Singh, O. P. (2010). Impact of Irrigation on Socio-Economic Status of Farmers in Gujarat: Evidence from Village Level Data. *Economic & Political Weekly*, 45(52), 47-55

Sharma, P., Kumar, R., & Singh, S.(Eds.)(2017). Role of Irrigation Systems in Enhancing Agricultural Productivity: A Case Study from Rajasthan [Electronic Version]. *International Journal of Engineering Research & Applications (IJERA)*, 6(8), 599–605.[https://doi\[org/10.17536/ijera\]](https://doi.org/10.17536/ijera) .6-8-[2] .599

Sharma, R., Singh, A., & Kumar, A. (2017). Impact of canal irrigation on agricultural productivity: A case study of Indira Gandhi Canal Project in Rajasthan. *International Journal of Agricultural Sciences*

Sihwa (2014) - Sihwa, Onkar, et al. "Impact of irrigation schemes on food security of smallholder farmers in Limpopo Province, South Africa." *Journal of Human Ecology* 46.1 (2014): 79-87

Singh, R.K., KC, K.B., Lata, L., & Sinha, S.T. (2018). Assessment of water scarcity in India using multi-criteria decision making methods. *Water Resources Management*, 32(11), 3685-3702

Srivastava, A., Chauhan, A., Gupta, N., & Kumar, S. (2017). Climate change – a challenge to agriculture in India. *International Journal of Engineering Sciences & Research Technology*, 6(12), 467-473

Teddlie, C. (2009). *Foundations of mixed approaches research; Integrating quantitative and qualitative approaches in the social and behavioural sciences*: SAGE Publications: Los Angeles

Tilahun, G., et al. (2018). *Small-Scale Irrigation Schemes and Rural Development: Lessons from Ethiopia*. *Development Studies Quarterly*.

United Nations Food and Agriculture Organization. (2019). *Coping with Water Scarcity*. Retrieved from <http://www.fao.org/3/ca5129en/CA5129EN.pdf>

United Nations Food and Agriculture Organization. (2019). *Seeds and Fertilizers for Sustainable Agriculture*. Retrieved from <http://www.fao.org/3/ca5129en/CA5129EN.pdf>

United Nations Food and Agriculture Organization. (2019). *Seeds and Fertilizers for Sustainable Agriculture*. Retrieved from <http://www.fao.org/3/ca5129en/CA5129EN.pdf>

Van Averbeke et al. (2011) - Van Averbeke, W., J. Thula, and R. Gush. "Assessing the poverty and vulnerability impacts of trade liberalization in South Africa." *Development Southern Africa* 28.3 (2011): 363-380

Wang, H., Zhang, L., & Cai, X. (2019). *Modernizing China's irrigation system: Challenges and solutions*. *Agricultural Water Management*.

Wang, J., Huang, J., Rozelle, S., Huang, Q., & Zhang, L. (2017). Climate change and variability in China: Impacts and adaptation. *International Journal of Environmental Research and Public Health*, 14(10), 1326

Whitehead (2009) - Whitehead, Alison. "Food security and irrigated agriculture." *Food Security* 1.2 (2009): 131-146

Whitehead, A. (2009). *Gender and small-scale agriculture in Latin America: A review of literature*. *Annals of the Association of American Geographers*, 99(2), 320-340.

World Bank, 2019 - The World Bank. (2019). *World Development Report 2019: The Changing Nature of Work*. World Bank Publications.

World Bank, 2021 - The World Bank. (2021) *The State of Food Security and Nutrition in the World 2021*

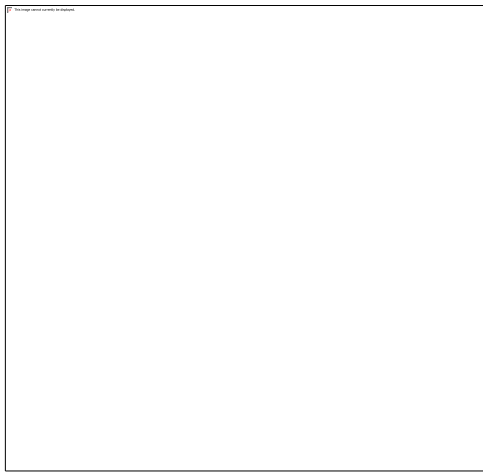
Xie, L., Zhong, L., & Cai, T. (2016). *Groundwater overexploitation and its impact on the environment in North China Plain*. *Procedia Environmental Sciences*, 398(2), 348-357

Zhang, H., & Zhong, L. (2016). *Perceptions of Irrigation Users on Water Management Practices in Rural China*. *Water International*, 41(7), 938-952

Zhang, X., Liu, S., & Jiang, Y. (2018). *Modern irrigation technologies in China: Adoption barriers and policy implications*. *Agricultural Water Management*, 208, 352-360

**APPENDIX 1**  
**A LETTER FROM BINDURA UNIVERSITY OF SCIENCE EDUCATION TO CONDUCT**  
**THE RESEARCH**

**APPENDIX 2**  
**HOUSEHOLD QUESTIONNAIRE FOR SMALLHOLDER FARMERS AND COMMUNITY**  
**MEMBERS IN MAZOWE RURAL DISTRICT, WARD 7**  
**BINDURA UNIVERSITY OF SCIENCE EDUCATION**  
**FACULTY OF SCIENCE AND ENGINEERING**  
**DEPARTMENT OF SUSTAINABLE**  
**DEVELOPMENT**



Dear respondent

I am Takudzwa Gatsi, a student at Bindura University of Science Education studying towards attainment of a Bachelor of Science, Honors Degree in Development. I am carrying out a research on the following topic, “**EXPLORING THE ROLE OF IRRIGATION SCHEME ON FOOD SECURITY. A CASE STUDY OF ROSA IRRIGATION SCHEME IN MAZOWE RURAL DISTRICT**”. The data collected for this study will be strictly confidential and used only for academic purposes.

Please answer the question as honestly and sincerely as you can, without writing your name. Your assistance will be greatly valued.

Thank you in advance for your time and assistance

**STUDY QUESTIONS**

**SECTION A**



## HOUSEHOLD CHARACTERISTICS

**1. Sex of Respondent**

- a) Female
- b) Male

**2. Age in years**

- a) 18-24                       b) 25-34                       c) 35-44
- d) 45-54                       e) 55-64                       f) Above

3.

Household status	Response
Husband	
Wife	
Daughter	
Son	
Grand	

4. How long have you been residing in this village? (Tick where applicable)

Period of stay	Response
0-10 years	
11-20 years	
21-30 years	
31+ years	

**5. Family Size**

- a) 0-5
- b) 6-10
- c) 11-16
- d) 20 and above

6. Age in years of family members. Please indicate number of members in given age group

- a) 0-10 \_\_\_\_\_
- b) 11-18 \_\_\_\_\_
- c) 19-30 \_\_\_\_\_
- d) 31-40 \_\_\_\_\_
- e) 41-50 \_\_\_\_\_
- f) Above 50 \_\_\_\_\_

**SECTION B: Role of irrigation scheme in improving food security in ward 7, Mazowe district**

7. In your area what are the roles of irrigation scheme in improving food security. Number them in order of importance in your household.

- a) Increase agricultural productivity
- b) Diversification of crops
- c) Climate resilience (helping farmers to adapt to climate patterns)
- d) Employment opportunities
- e) Infrastructure development

8. Answer these questions by ticking your answer on the table below:

<b>Role of irrigation scheme</b>	<b>Yes</b>	<b>No</b>
Have you noticed an increase in crop yield since the implementation of the irrigation scheme?		
Has the irrigation scheme helped in reducing crop losses due to water scarcity?		
Do you believe that the irrigation scheme has improved the availability of water for irrigation?		

**SECTION C: Challenges faced by irrigation users on Rosa irrigation scheme in improving their food security**

8. What do you think are the challenges you face in improving food security in your area?  
Number them in order of their impact.

- a) Limited access to water
- b) Poor infrastructure
- c) Limited access to inputs
- d) Lack of technical knowledge
- e) Climate variability
- f) Market access
- g) Land tenure issues

9. What do you think can be done to reduce or mitigate these challenges?

.....  
.....  
.....

**SECTION D: Perspectives of irrigation users in ward 7 of Mazowe district in improving their socio-economic status**

10. What could be your opinion about the Rosa irrigation scheme in improving your socio-economic status?

- a) Improved agricultural productivity
- b) Access to training and support
- c) Diversification of income streams
- d) Equity in water distribution

11. What do you think can be done for irrigation farmers to improve their socio-economic status?

.....  
.....

.....  
.....

12. What do you think is the role of the Ministry of Agriculture for irrigation farmers in order to improve their socio-economic status?

The community members should

.....  
.....  
.....  
.....

The government should

.....  
.....  
.....  
.....

The NGOs should

.....  
.....  
.....  
.....

Others (please specify)

.....  
.....  
.....  
.....

**APPENDIX 3**  
**KEY INFORMANT INTERVIEW FOR AGRITEX OFFICERS IN MAZOWE DISTRICT,**  
**WARD 7**

Dear respondent

I am Takudzwa Gatsi, a student at Bindura University of Science Education studying towards attainment of a Bachelor of Science, Honors Degree in Development. I am carrying out a research on the following topic, “**EXPLORING THE ROLE OF IRRIGATION SCHEME ON FOOD SECURITY. A CASE STUDY OF ROSA IRRIGATION SCHEME IN MAZOWE RURAL DISTRICT**”. The data collected for this study will be strictly confidential and used only for academic purposes.

Please answer the question as honestly and sincerely as you can. Your assistance will be greatly valued.

Thank you in advance for your time and assistance

- 1) Can you provide a brief overview of the Rosa Irrigation Scheme in Zimbabwe?
- 2) What crops are predominantly grown in the Rosa Irrigation Scheme?
- 3) How long has the irrigation scheme been operational, and what is its current capacity?
- 4) How has the implementation of the irrigation scheme impacted agricultural productivity in the region?
- 5) What specific improvements have been observed in crop yields since the introduction of irrigation?
- 6) Have there been any challenges faced in maintaining or optimizing the irrigation system for maximum productivity?
- 7) In what ways has the irrigation scheme contributed to enhancing food security in the Rosa area?
- 8) Can you quantify or provide examples of how food availability and access have improved due to the irrigation scheme?
- 9) Have there been any initiatives or programs specifically aimed at addressing food security issues through the irrigation scheme?
- 10) How is water usage managed within the Rosa Irrigation Scheme to ensure sustainability?

- 11) Are there any measures in place to address potential environmental impacts of intensive irrigation practices?
- 12) What role does community involvement play in the management and maintenance of the irrigation infrastructure?
- 13) Are there any plans for further development or expansion of the Rosa Irrigation Scheme to increase its impact on food security?
- 14) How do you envision the role of technology playing a part in enhancing irrigation efficiency and food production in the future?
- 15) Are there any partnerships or collaborations being considered to support ongoing improvements within the irrigation scheme?

**APPENDIX 4**  
**KEY INFORMANT INTERVIEW FOR WARD COUNCILOR**

Dear respondent

I am Takudzwa Gatsi, a student at Bindura University of Science Education studying towards attainment of a Bachelor of Science, Honors Degree in Development. I am carrying out a research on the following topic, “**EXPLORING THE ROLE OF IRRIGATION SCHEME ON FOOD SECURITY. A CASE STUDY OF ROSA IRRIGATION SCHEME IN MAZOWE RURAL DISTRICT**”. The data collected for this study will be strictly confidential and used only for academic purposes.

Please answer the question as honestly and sincerely as you can. Your assistance will be greatly valued.

Thank you in advance for your time and assistance

- 1) Can you provide an overview of the Rosa irrigation scheme and its objectives in relation to enhancing food security in Zimbabwe?
- 2) What specific crops are being cultivated through the Rosa irrigation scheme, and how have they contributed to local food production and availability?
- 3) How has the Rosa irrigation scheme positively impacted smallholder farmers in the community in terms of income generation and livelihood improvement?
- 4) What infrastructure investments have been made to support the Rosa irrigation scheme, and how have these investments facilitated agricultural activities in the region?
- 5) In what ways has the Rosa irrigation scheme helped mitigate the effects of climate change on agricultural productivity and food security in Zimbabwe?
- 6) What are some of the main challenges or obstacles faced by the Rosa irrigation scheme in achieving its goals of improving food security, and how are these challenges being addressed?
- 7) How does the Rosa irrigation scheme collaborate with local communities, government agencies, NGOs, or other stakeholders to ensure sustainable food production and distribution?
- 8) What measures are being taken to ensure that the benefits of the Rosa irrigation scheme reach marginalized or vulnerable groups within the community?

- 9) Can you discuss any success stories or notable achievements attributed to the Rosa irrigation scheme regarding food security outcomes in Zimbabwe?
- 10) Looking ahead, what are the future plans or developments envisioned for the Rosa irrigation scheme to further enhance its impact on food security and agricultural sustainability in Zimbabwe?

**APPENDIX 5**  
**AN INTERVIEW GUIDE FOR THE VILLAGE HEAD**

Dear respondent



I am Takudzwa Gatsi, a student at Bindura University of Science Education studying towards attainment of a Bachelor of Science, Honors Degree in Development. I am carrying out a research on the following topic, “**EXPLORING THE ROLE OF IRRIGATION SCHEME ON FOOD SECURITY. A CASE STUDY OF ROSA IRRIGATION SCHEME IN MAZOWE RURAL DISTRICT**”. The data collected for this study will be strictly confidential and used only for academic purposes.

Please answer the question as honestly and sincerely as you can. Your assistance will be greatly valued.

Thank you in advance for your time and assistance

- 1) Can you describe the history and establishment of the Rosa Irrigation Scheme in your village?
- 2) How has the Rosa Irrigation Scheme impacted food production and agricultural practices in the community?
  - 1) What specific crops are grown using the irrigation scheme, and how have yields improved compared to traditional rain-fed agriculture?
  - 2) In what ways has the irrigation scheme contributed to food security and reduced vulnerability to droughts or other climate-related challenges?
  - 3) How has the scheme influenced the livelihoods of local farmers and their families in terms of income generation and overall well-being?
  - 4) Have there been any challenges or obstacles faced in implementing or maintaining the irrigation scheme, and how have these been addressed?
  - 5) What role do local community members play in managing and sustaining the irrigation scheme, and how is ownership of the project distributed among stakeholders?
  - 6) Are there any future plans or expansions envisioned for the Rosa Irrigation Scheme to further enhance food security and agricultural productivity in the area?

## **APPENDIX 6**

### **AN INTERVIEW GUIDE FOR FOCUS GROUP DISCUSSION FOR IRRIGATION FARMERS**

Dear respondent

I am Takudzwa Gatsi, a student at Bindura University of Science Education studying towards attainment of a Bachelor of Science, Honors Degree in Development. I am carrying out a research on the following topic, “**EXPLORING THE ROLE OF IRRIGATION SCHEME ON FOOD SECURITY. A CASE STUDY OF ROSA IRRIGATION SCHEME IN MAZOWE RURAL DISTRICT**”. The data collected for this study will be strictly confidential and used only for academic purposes.

Please answer the question as honestly and sincerely as you can, without disclosing your name. Your assistance will be greatly valued.

Thank you in advance for your time and assistance

- 1) Can you describe your experience with irrigation practices in the Rosa Irrigation Scheme?
- 2) How long have you been involved in agricultural activities in this scheme?
- 3) What crops do you typically grow using irrigation?
- 4) In what ways has the irrigation scheme contributed to improving agricultural productivity in the region?
- 5) How has access to water through the irrigation scheme influenced crop yields and farming practices?
- 6) What are the main benefits you have experienced from being part of the irrigation scheme?
- 7) Have you noticed any changes in your income or standard of living since participating in the irrigation scheme?
- 8) What opportunities do you think exist for further improving your socio-economic status within the scheme?
- 9) How do you envision leveraging the irrigation scheme to enhance your livelihoods in the future?
- 10) What are the main challenges you encounter when it comes to irrigation practices?
- 11) Have you faced any water scarcity issues in the scheme? If so, how has it impacted your farming activities?
- 12) Are there any infrastructure-related challenges that hinder your ability to irrigate effectively?
- 13) In your opinion, what are the key barriers preventing farmers in this scheme from enhancing food security?

- 14) How do external factors such as climate change affect your ability to improve food security through irrigation?
- 15) Are there any financial constraints that limit your capacity to invest in better irrigation technologies?
- 16) How important do you think community collaboration is in addressing food security challenges within the Rosa Irrigation Scheme?
- 17) Have there been any successful community initiatives or projects aimed at improving food security through irrigation?
- 18) Do you feel that government policies adequately support small-scale farmers like yourselves in enhancing food security through irrigation?
- 19) What kind of support or interventions would you like to see from the government to overcome existing barriers?
- 20) What are your future plans for improving food security within the Rosa Irrigation Scheme?

## APPENDIX 7

### AN INTERVIEW GUIDE FOR FOCUS GROUP DISCUSSION FOR MAZOWE RURAL DISTRICT

Dear respondent

I am Takudzwa Gatsi, a student at Bindura University of Science Education studying towards attainment of a Bachelor of Science, Honors Degree in Development. I am carrying out a research on the following topic, “**EXPLORING THE ROLE OF IRRIGATION SCHEME ON FOOD SECURITY. A CASE STUDY OF ROSA IRRIGATION SCHEME IN MAZOWE RURAL DISTRICT**”. The data collected for this study will be strictly confidential and used only for academic purposes.

Please answer the question as honestly and sincerely as you can. Your assistance will be greatly valued.

Thank you in advance for your time and assistance

- 1) How has the irrigation scheme in Mazowe district contributed to improving food security in the region?
- 2) What specific benefits have been observed as a result of the irrigation scheme on food production and availability?
- 3) In what ways do you believe the irrigation scheme has positively impacted food security within the community?
- 4) From your perspective, how can the Rosa irrigation scheme contribute to enhancing the socio-economic status of individuals within the community?
- 5) What potential opportunities exist for leveraging the irrigation scheme to uplift the economic well-being of participants?
- 6) In what ways do you envision the scheme playing a role in improving livelihoods and income generation among those involved?
- 7) What are some of the main challenges that irrigation user’s face in utilizing the scheme to enhance food security?
- 8) How do these challenges affect the overall effectiveness of the irrigation scheme in ensuring food security?
- 9) Are there any specific barriers that hinder irrigation users from maximizing their agricultural output and food production?