

**GENDER DYNAMICS IN WATER USE AND MANAGEMENT AT NYANYADZI  
SMALLHOLDER IRRIGATION SCHEME IN ZIMBABWE**

**By**

**Priscillah Muchemwa-Munasirei**

**(Student Number: 11595400)**

**A thesis submitted to the Institute for Rural Development in fulfillment of the  
requirements of the Doctor of Philosophy in Rural Development (PHDRDV) Degree**

**School of Agriculture**



**University of Venda**

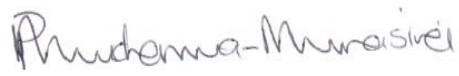
**SOUTH AFRICA**

**PhD Candidate** : P. Muchemwa-Munasirei  
**Promoter** : Prof. J. Francis  
**Co-Promoter** : Dr. M. Manjoro

**August 2018**

## DECLARATION

I, **Priscillah Muchemwa-Munasirei**, hereby declare that this thesis for Doctor of Philosophy in Rural Development (PHDRDV) Degree submitted to the Institute for Rural Development at the University of Venda has not been submitted previously for any degree at this or another university. It is original in design and in execution, and all reference material contained therein has been duly acknowledged.

**Signature:**  **Date: 22/08/2018**

Priscillah Muchemwa-Munasirei

**Promoter :** ..... **Date: 29/08/2018**

Prof. J. Francis

**Co-Promoter:**  **Date: 29/08/018**

Dr. M. Manjoro

## **ABSTRACT**

Throughout the world, irrigation is appreciated because of its immense contribution to agricultural production, food and nutrition security, combating poverty and enhancing development, especially in rural areas. The worsening effects of climate change on rainfall patterns as well as food and nutrition insecurity in sub-Saharan Africa are elevating the importance of irrigation schemes in smallholder farming. However, studies conducted in sub-Saharan Africa indicate that the performance of irrigation schemes remains suboptimal. In addition, the studies are highly skewed towards technical and physical dimensions of the schemes and ignore social aspects such as gender. Consideration of gender imperatives would help define and structure who uses water, when and how. This situation necessitated carrying out the PhD thesis research, aiming to explore and explain inherent gender dynamics in water use and management. The ultimate aim was to propose intervention strategies anchored on differential gender power dynamics embedded in irrigation water use in smallholder irrigation schemes. Specific objectives adopted for the study of the Nyanyadzi irrigation scheme in Manicaland Province of Zimbabwe were to: 1) assess the gendered nature of irrigation water use; 2) determine the gendered nature and extent of participation of male and female members of the irrigation scheme in water management; 3) identify the gendered challenges and constraints to irrigation water use; and 4) propose strategies for improved access and management of water.

An exploratory sequentially integrated mixed method research design was used in the two phased PhD studies. Seventy three farmers (26 men and 47 women) were the respondents in the first phase in which qualitative data were collected. The gender analysis matrix and activity profile were used to gather and document the perceptions of men and women farmers relating to use of irrigation water. One hundred and nine conveniently sampled respondents (47 men and 62 women) were the source of data in the second phase of the study, which was quantitative and confirmatory in nature. A questionnaire, requiring responses on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to collect data.

Qualitative data collected during the exploratory phase were analysed using the Cresswell (2013) Thematic Content Analysis technique. Pair-wise ranking was conducted to determine the major constraints to access, use and management of irrigation water. The Predictive Analytics Software Statistics 18 for Windows (PASW Inc: Chicago, IL, USA) was used to analyse quantitative data. Gender, age, marital status, location of irrigation plot, plot ownership and level of education were the independent variables used. Dependent variables included nature of water use, participation in water management and constraints to water use. Cross-tabulation was carried out and the

Pearson's Chi-square test for association used to establish if relationships existed between variables. Statistical significance was considered at  $P < 0.05$ . The Cramer's V post-hoc test was performed to measure the strength of association of the perceptions which the Chi-square test had determined to be significantly different.

The uses of canal water were found to be varied and gendered. More women than men used canal water for reproductive purposes such as laundry and bathing. Highly significant positive associations ( $P < 0.01$ ) were observed among gender, age, marital status, ownership of irrigation plot and level of education with use of irrigation water for laundry, bathing, livestock watering and other communal uses. However, location of plot was not associated with different types of water uses ( $P > 0.05$ ). With respect to farmers' participation in meetings, contributing in meetings, repair of canals, provision of labour in canal maintenance, hiring labour for canal maintenance and contributing cash for canal repairs and maintenance, highly significant positive associations ( $P < 0.01$ ) were observed with gender, age, marital status, level of education, and ownership and location of irrigation plot. Level of education of the farmer was observed to be not associated with his/her attendance of meetings ( $P > 0.05$ ). Plot location was negatively associated with participation, provision of labour for maintenance, contribution of cash and hiring labour for canal repairs ( $P > 0.05$ ). Exorbitant payments for using water were regarded as the major constraint to performance of the smallholder irrigation scheme. Highly significant positive associations ( $P < 0.01$ ) were observed between gender and plot location, and all the constraints to water use that the farmers identified. The constraints ranged from unequal water distribution between and within men and women, and upstream and downstream farmers; unfriendly water delivery times; conflicts and corrupt practices in water distribution; and discrimination with respect to schedules of delivering water.

Overall, gender imbalance in the use and management of irrigation water existed. This was evident in the disparities in uses and users of canal water that followed gender and social lines. Men dominated decision making in water management, especially in meetings. In contrast, women dominated in implementation stages mainly in relation to provision of labour for cleaning and maintaining water canals. Considering all the results obtained in the current study, it can be concluded that a combination of socio-economic and socio-cultural factors caused the water problems that the Nyanyadzi irrigation scheme experienced. The need for introducing gender-sensitive interventions in use and management of irrigation water was evident. Thus, gender needs, roles and responsibilities should be reconceptualised so as to align them with the socio-cultural context of the Nyanyadzi community. In addition to this, the fact that both men and women

are not homogeneous interest groups should be factored into irrigation water management. Lastly, it is crucial to incorporate various social hierarchies that interact with gender to influence irrigation water use and management. How this can be done deserves further scientific investigation.

**Key words:** gender, irrigation, participation, management, smallholder, water.

To my husband, David Kumbirai Munasirei, my greatest supporter and pillar of strength throughout this entire PhD journey. You never wearied any other day.

## **ACKNOWLEDGEMENTS**

Many people and organizations have helped me on this arduous and exhilarating lonesome journey towards completion of this PhD thesis.

My deepest appreciation goes to Nyanyadzi irrigation smallholder farmers who unselfishly shared and gave me insight into their social world by taking time to participate in the interviews which constitute the centre of this research. Chimanmani Rural District Council, I thank you for giving me permission to carry out my study in your territory.

I feel indebted to deeply express a special gratitude to my academic advisors in this doctoral journey, Prof Joseph Francis and Dr. Marizvikuru Mwale-Manjoro for their mentorship, highly scholarly advice, support and encouragement throughout my study programme. You walked with me throughout the journey and I had quite an experience with you people. I really learnt a lot of stuff from these great people. I thank you for the academic direction you gave me during all the stages of my PhD studies. It was a great honour and privilege to work with these great masters and academics. I THANK YOU.

I am also most grateful to the General Board of Global Ministries of The United Methodist Church: World Communion International Scholarship - the funders of my studies for four years. In my final academic year, I also received funding from the Institute for Rural Development. I am very grateful for that assistance which enabled me to successfully enjoy my last leap of studies without going through any financial stresses

I would also like to thank my employer Africa University for affording me the opportunity to complete my PhD studies whilst employed, using internet and library resources.

My colleagues in this academic journey, Dr. Timothy Marango and Anna Matodzi thank you guys for all the academic and social support. Mildred Mphaphathe, I acknowledge your advice and concern for me to push on and complete my studies. Thank you.

My family; mom, my sisters and their spouses, my one and only brother, my nieces, nephews, thank you for your encouragement and support. My twin sister you covered me a lot on household chores and other activities that needed to be done while I sat on that table. This is for you dear.

I also thank my best friend, my personal advisor and husband for all the support and encouragement you rendered throughout the course of my study. I am most grateful to the Lord for having given you to me. You have given so much of your time to help me achieve this. Never

a day you wearied or complained. You were always encouraging and believing even when all hope was gone, you still believed. May the Lord keep you for me because we still have some catching up to do. What we could not do in the last 6 years we ought to do and accomplish now.

Above all I give thanks to Yahweh, the Most High God for the grace and gift of life which has enabled me to get this far. A special mention to the great Prophets of God who lead me at United Family International Church (UFIC), Emmanuel and Ruth Makandiwa with whom their spiritual covering has made me a victorious lady.

## TABLE OF CONTENTS

DECLARATION .....	i
ABSTRACT.....	ii
ACKNOWLEDGEMENTS .....	vi
TABLE OF CONTENTS .....	viii
LIST OF TABLES.....	xii
LIST OF FIGURES .....	xiii
LIST OF APPENDICES .....	xiv
ABBREVIATIONS .....	xv
CHAPTER 1 INTRODUCTION.....	1
1.1 Background.....	1
1.2 Statement of the Research Problem.....	3
1.3 Rationale of the Study .....	4
1.4 Research Objectives .....	5
1.5 Research Questions.....	5
1.6 Research Hypotheses .....	6
1.7 The Concept of Gender .....	6
1.8 Definition of Key Terms and Concepts .....	6
1.9 Organization of the Thesis.....	8
REFERENCES .....	10
CHAPTER 2 LITERATURE REVIEW.....	13
2.0 Introduction .....	13
2.1 Contextualizing the Concept and Meaning of Smallholder Irrigation .....	13
2.2 Nyanyadzi Irrigation Scheme: The Current Water Situation.....	16
2.3 Smallholder Irrigation Farming and Rural Development.....	18
2.4 The Legal and Institutional Framework Governing Irrigation Water use and Management in Zimbabwe.....	20
2.4.1 The Zimbabwe Water Act of 1998.....	21
2.4.2 Agricultural policy.....	24
2.4.3 National Gender Policy (NGP) of Zimbabwe .....	24
2.4.4 Smallholder Irrigation Water Management in Zimbabwe .....	25
2.5 Gender and Agriculture Water .....	26
2.6 Gender Roles and Responsibilities in Irrigation Water Use and Management .....	27

2.7	Gender Access to Irrigation Water.....	28
2.8	Nature of Men and Women’s Participation in Irrigation Water Management .....	30
2.9	Theoretical Framework of the Study .....	31
2.9.1	The Gender Perspective in Smallholder Water Use and Management.....	32
2.9.2	The Social relations approach on gender and water use and management in smallholder irrigation .....	35
2.9.3	The patriarchal ideology concept .....	36
2.9.4	Participation .....	37
2.9.5	Levels of Community Participation .....	39
2.10	Identified Knowledge Gaps.....	40
	REFERENCES .....	45
	CHAPTER 3 RESEARCH METHODOLOGY .....	54
3.1	Introduction .....	54
3.2	Study Site Context.....	54
3.2.1	Nyanyadzi Irrigation Scheme .....	54
3.2.2	Physical and Social Landscape of Nyanyadzi .....	57
3.2.3	Economic Activities at Nyanyadzi.....	59
3.3	Research Design.....	60
3.4	Population and Sampling.....	63
3.5	Data Collection Tools .....	65
3.5.1	Key informant interviews (KII) .....	65
3.5.2	Participatory Focus Group Discussions.....	65
3.5.3	The gender analysis matrix (GAM).....	68
3.5.4	The gender activity profile .....	68
3.5.5	Inventory questionnaire for irrigation water use.....	68
3.6	Data Analysis .....	69
3.7	Ethical Considerations.....	72
3.8	Study Implementation Procedures.....	72
	REFERENCES .....	77

CHAPTER FOUR: NATURE OF IRRIGATION WATER USE AT NYANYADZI SMALLHOLDER IRRIGATION SCHEME .....	80
ABSTRACT .....	80
4.1 Introduction .....	80
4.2 Methodology.....	82
4.3 Results .....	82
4.3.1 Demographic profiles of study participants.....	82
4.3.2 Nature of canal water use – qualitative results .....	84
4.4 Discussion.....	86
4.4.1 Demographic profiles of study participants.....	86
4.4.2 Farmers’ perceptions on the nature of canal water use.....	88
4.5 Conclusion .....	92
REFERENCES .....	93
CHAPTER FIVE: NATURE AND EXTENT OF PARTICIPATION OF MEN AND WOMEN IN MANAGING IRRIGATION WATER IN NYANYADZI SMALLHOLDER IRRIGATION SCHEME	98
ABSTRACT.....	98
5.1 Introduction .....	99
5.2 Study Methodology.....	102
5.3 Results .....	102
5.3.1 Demographic profiles of study participants.....	102
5.3.2 Perceptions of men and women regarding their roles and responsibilities in canal water management. ....	102
5.4 Discussion.....	106
5.4.1 Demographic profiles of study participants.....	106
5.4.2 Nature and extent of men and women’s participation in canal water management . .....	106
5.5 Conclusion .....	114
REFERENCES .....	117
CHAPTER SIX: CHALLENGES IN CANAL WATER USE AT NYANYADZI IRRIGATION SCHEME .....	121
ABSTRACT.....	121
6.1 Introduction .....	121

6.2	Study Methodology.....	123
6.2.1	Data Collection Tools.....	123
6.3.1	Demographic Profiles of Study participants.....	124
6.3.2	Constraints in Smallholder Irrigation Water Use.....	124
6.4	Discussion.....	127
6.5	Conclusion .....	130
REFERENCES .....		131
CHAPTER 7: GENERAL DISCUSSION OF KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.....		134
7.0	Introduction .....	134
7.1	Summary of the Major Research Findings.....	134
7.2	Conclusions and Emerging Issues from the Study Findings .....	143
7.3	Methodological Reflections.....	146
7.4	Contribution to Scholarship .....	148
7.4.1	Scholarship of Discovery .....	148
7.4.2	Scholarship of Integration .....	149
7.4.3	Scholarship of Engagement.....	150
7.4.4	Scholarship of Application.....	150
7.4.5	Scholarship of Teaching and Learning.....	150
7.4.6	Digital Scholarship .....	150
7.5	Recommendations .....	150
7.5.1	Recommendations for Policy.....	151
7.5.2	Recommendations for Development Practice .....	151
7.5.3	Recommendations for Further Academic Research.....	153
7.6	Conclusions .....	154
REFERENCES .....		156

## LIST OF TABLES

Table 2.1	Levels of Community Participation .....	411
Table 2.2	Summary of Current (2014-2018) Literature used in Literature Review .....	42
Table 3.1	Focus Group Composition .....	67
Table 3.2	Interpretation of Cramer's V.....	671
Table 4.1	Demographic Profiles of Study Participants .....	83
Table 5.1	Perceptions of Men and Women on Participation in Canal Water Management.....	103
Table 6.1	Pairwise Ranking of Water Use Problems as perceived by Farmers at Nyanyadzi Scheme.....	126
Table 7.1	Summary of the PhD Thesis Research.....	135

## LIST OF FIGURES

Figure 3.1: Location of Nyanyadzi Small-scale Irrigation Scheme .....	55
Figure 3.2: Nyanyadzi Irrigation Scheme Block Layout .....	56
Figure 3.3: Sequential Exploratory Mixed Methods Design.....	61
Figure 3.4: Summary of research approach used to develop gender intervention strategies for irrigation water use at Nyanyadzi smallholder irrigation scheme.....	74

## **LIST OF APPENDICES**

APPENDIX A DATA COLLECTION TOOLS .....	157
Appendix A1 Key Informant Interview Guide .....	157
Appendix A2 Gender Matrix Tool .....	158
Appendix A3 Gender Activity Profile .....	159
Appendix A4: Pair Wise Problem Ranking of Water Problems .....	160
APPENDIX A5: Inventory Questionnaire for Irrigation Water Use .....	161
APPENDIX B ETHICAL CLEARANCE TOOLS .....	163
Appendix B1 Informed Consent Form .....	163

## **ABBREVIATIONS**

AGRITEX	Agricultural, Technical and Extension Services
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CRDC	Chimanimani Rural District Council
DA	District Administrator
DOI	Department of Irrigation
EIGE	European Institute for Gender Equality
FAO	Food and Agriculture Organization
G8	Group of Eight
GP	Gender Perspective
IFAD	International Fund for Agriculture Development
IFPRI	International Food Policy Research Institute
IMC	Irrigation Management Committee
NGO	Non-governmental Organization
PASW	Predictive Analytics Software Statistics 18 for Windows
PRA	Participatory Rural Appraisal
RECC	Research Ethics Clearance Certificate
SDGs	Sustainable Development Goals
USAID	United States Agency for International Development
WUA	Water User Association
ZIM-ASSET	Zimbabwe Agenda for Sustainable Socio–Economic Transformation
ZINWA	Zimbabwe National Water Supply Association

## CHAPTER 1 INTRODUCTION

### 1.1 Background

World over, irrigated agriculture is appreciated for its contribution to agricultural food production, rural food and nutrition security, poverty alleviation and rural development. Its importance particularly in light of the increasing devastating threats of climate change on rainfall patterns and food and nutrition security in sub-Saharan Africa cannot be understated. It has the potential to stabilize agricultural production and mitigate the negative impacts of climate change. In Asia, investment in irrigation was a key ingredient of the green revolution, which lifted large numbers of rural Asians out of poverty (Turrall *et al.*, 2010). In some parts of sub-Saharan Africa, smallholder irrigation has enhanced rural livelihoods and improved household food and nutrition security (van Averbeke *et al.*, 2011). Irrigation development represents the largest investment in agriculture and rural development in developing countries. For example, South Asia, East Asia and Pacific regions account for 67 % of the irrigated area in developing countries (FAO, 2015). In Central Asia, 37 % of its land is irrigable, followed by 14 % for Latin America and an estimated 6 % for Africa (FAO, 2015). In sub-Saharan Africa, smallholder irrigation schemes are perceived as the seedbed of rural development (Burney *et al.*, 2013). This is because irrigation could compensate for delayed or inadequate seasonal rainfall and protect rural farmers from food insecurity and climate risks.

In Zimbabwe smallholder irrigation schemes were established to provide a path out of food poverty. Smallholder irrigation schemes were conceived as a famine relief strategy particularly to boost rural food production so as to ensure food availability (Rukuni & Makhadho, 1994). The irrigation schemes were seen as effective and sustainable methods of alleviating poverty and improving the livelihoods of rural communities (Mutiro & Lautze, 2015). For example, Nyanyadzi irrigation scheme, one of the first to be established in Zimbabwe in 1934, became an envy of other irrigation schemes in Manicaland province (Magadlela, 1999). Nhundu & Mushunje (2012) alluded that the scheme surpassed the intended objectives of achieving food and nutrition security by also benefiting the surrounding communities, which were not in the irrigation scheme. The vibrancy of the scheme gave Nyanyadzi community the status of a booming area. Bolding (1996) alluded that it became the main source of income for the rural poor who depended directly or indirectly on the scheme.

The significance of smallholder irrigation farming is underscored in the United Nations Sustainable Development Goal (SDG) number 2 which aims to end hunger, achieve food and nutrition security, improve nutrition, and promote sustainable agriculture. One of the targets set for the realization of this goal is to ensure equal access to productive resources for both male and female smallholder farmers. This means that the gender factor in all facets of agriculture production must be addressed including gender in irrigation water use. This is because research has shown that gender inequalities affect both the distribution and production of agricultural resources for smallholder farming (FAO, 2011).

At the G8 Summit in 2009, the then United States President Barack Obama spoke about embracing the 'right irrigation' as one strategy to address food and nutrition security and poverty concerns in Africa. The 'right irrigation' was an all-encompassing concept which meant, building on local capabilities, acknowledging other water needs and a consideration of gender relations within the irrigation scheme among other important factors. Gender relations are significant in that they structure the direction and nature of irrigation related developments and consequently the success of irrigation interventions (Zwarteveen, 2017). Gender is, therefore, an important consideration in the quest for the right irrigation owing to the fact that it addresses concerns and water needs within the irrigation scheme that relate to both men and women. Gender defines who owns a resource, who does what, using which resource, who makes decisions and who has power. Gender is, therefore, a mediator in the process of development.

However, despite the importance of smallholder irrigation, not much empirical attention has been given to gender differences with respect to water needs and priorities of users. Guidance on gender in irrigation and agricultural water management remains limited for sub-Saharan Africa. In Zimbabwe for example, Phiri (2012) points out that, regardless of the significance given to gender in development interventions, irrigation planning and policies have typically ignored the gender factor in irrigation farming. Gender inequality in water resource distribution and use hinders the potential of smallholder farming to reduce poverty and food insecurity.

Most research on smallholder farming has focused on the construction and maintenance of irrigation systems and the efficient/inefficient distribution of irrigation water (Zwarteveen, 2011; Phiri, 2012; Bossenbroek & Zwarteveen, 2014). There also has been a misconception by irrigation engineers and planners that irrigators are men totally disregarding women in the process. (Zwarteveen, 2010; van Koppen *et al.* 2012). Yet research has shown that failure to recognize gender issues affects negatively agricultural productivity of irrigated crops and threatens

household food and nutrition security. Studies by Peterman *et al.* (2011) and van Koppen *et al.* (2013) established that gender inequalities exist in irrigated agriculture. Most improved irrigation systems are usually gender biased and often benefit men, leaving out women irrigators. This is despite many studies which have concluded that women play a significant role in agricultural production (FAO, 2011; van Koppen *et al.*, 2013). In order to enhance smallholder irrigation potential and to improve households' livelihood, the gender factor in irrigation water use and management must be addressed. Against this background, the need to investigate the gendered nature of canal water use and management at Nyanyadzi smallholder irrigation scheme was not in question.

## 1.2 Statement of the Research Problem

Nyanyadzi irrigation scheme used to be an envy of many irrigation schemes in Manicaland province and Zimbabwe in general (Magadlela, 1999). However, the scheme is now performing below the expectations. More often than not, the decline in the popularity of many smallholder irrigation schemes has been attributed mainly to technical and physical factors. Studies focusing on irrigation water problems at Nyanyadzi Irrigation Scheme continually ignore the influence and impact of a gender factor in development interventions. Yet gender is understood to be the central organizing principle of development. Authors of Nyanyadzi studies (Bolding, 1999; Pazvakavambwa & Van Der Zaag, 2000; Mujere, & Mazvimavi, 2005) have for a very long time kept their focus on the hardware technical aspects of irrigation with the hope of improving productivity and scheme sustainability. However, despite the studies, the scheme continues to experience water problems. Chifamba *et al.* (2013) observed that irrigation farming in Nyanyadzi is facing a number of challenges among which are unreliable and inadequate water delivery. On the same issue, Kemerink (2015) reported that the main problem at Nyanyadzi irrigation scheme is water shortage. The water supply at the scheme has never been able to cope with the continuous expansion of the scheme and the resultant increase in water demand, yet water is a major determinant in the success of smallholder irrigation farming. However, against this backdrop of water challenge at Nyanyadzi scheme, water use and management by men and women irrigators at Nyanyadzi scheme has not been adequately studied. Mainstream conceptualization on irrigation water use and management at Nyanyadzi hardly talks about gender. Studies by Nhundu & Mushunje (2010), Mujere (2011) and Chifamba *et al.* (2013) have continuously revealed water problems with inadequate scholarly focus and attention on the gendered nature of irrigation water use and management within the scheme. Solutions to water challenges at Nyanyadzi scheme have often focused on technological innovations, without

necessarily considering the social and gender issues of irrigation water use and management. Previous studies continually ignore to focus and lubricate the software (gender) aspects that make it possible for the hardware to operate efficiently. Yet other studies (Zwarteveen, 1994; Phiri, 2012; Ayalew *et al.*, 2015) have concluded that failure to recognize and consider the reality of gender relations in irrigation development interventions constitute a bottleneck to irrigated agriculture productivity and the general rural development whose bedrock is agriculture. Irrigation water management interventions at smallholder schemes need to take into account men's and women's context-specific roles and responsibilities at every level of water management in order to ensure sustainable agriculture and rural development.

A consideration of gender dynamics in irrigation water could be the missing link to the successful revitalization and resuscitation of Nyanyadzi irrigation scheme. There are relatively few studies that have investigated gender dynamics in smallholder irrigation water use in Zimbabwe, particularly at Nyanyadzi smallholder irrigation scheme. This study investigated the gender dynamics in irrigation water use and management and recommended local specific interventions strategies for water use and management at Nyanyadzi smallholder scheme.

### **1.3 Rationale of the Study**

The importance of smallholder agriculture is gaining momentum due to the increasing global climate threats. This necessitates the need to pay attention to irrigated agriculture particularly on the use and users of irrigation water resources. However, there are relatively few studies that investigated gender dynamics in irrigation water use in sub-Saharan Africa, particularly at Nyanyadzi smallholder irrigation scheme in Zimbabwe. Hence, the potential of this study to contribute to the gender and irrigation water body of knowledge at Nyanyadzi and Zimbabwe in particular. Study findings can be used in subsequent investigations on smallholder irrigation schemes as part of the search for models and frameworks that produce optimal results for rural food and nutrition security.

Agriculture is a major source of livelihood and a backbone of most rural areas in Zimbabwe (Chazovachii, 2013). As such, investing scholarly research in smallholder irrigation is one of the ways of developing and improving smallholder agriculture so as to be able to provide a path out of food poverty. Further, a study of this nature is in line with one of the four strategic clusters of the Zimbabwe Agenda for Sustainable Socio–Economic Transformation (Zim–Asset) programme (i.e. to ensure food and nutrition security). Irrigation water plays an important and powerful role in ensuring this goal comes to fruition. In driving towards the Zim-Asset goals, the government of

Zimbabwe embarked on smallholder irrigation resuscitation programmes by investing in irrigation water supply infrastructure. However, revitalization without wider user consultation is not enough. It is imperative to study and understand the perceptions of men and women as users of water for irrigation.

#### **1.4 Research Objectives**

The main study objective was to explore and understand the gender dynamics in canal water use and management in order to propose intervention strategies that consider differential gender power dynamics at Nyanyadzi smallholder irrigation scheme in Chimanimani District of eastern Zimbabwe. Specific objectives of the study were to:

- 1.4.1 assess the gendered nature of irrigation water use at Nyanyadzi smallholder scheme;
- 1.4.2 establish the gendered nature and extent of participation of men and women in managing irrigation water at Nyanyadzi irrigation scheme;
- 1.4.3 explore the gendered constraints and challenges in irrigation water use and management at Nyanyadzi smallholder scheme and
- 1.4.4 Propose gender equitable and neutral interventions that consider differential gender power dynamics at play in water use at Nyanyadzi irrigation scheme.

#### **1.5 Research Questions**

The main research question from the study was: what are the gender dynamics in irrigation water use and management at Nyanyadzi smallholder irrigation scheme in Chimanimani District of eastern Zimbabwe? Specific research questions of the study were:

- 1.5.1 Is the nature of irrigation water use at Nyanyadzi smallholder irrigation scheme gendered?
- 1.5.2 How is irrigation water used and distributed between men and women?
- 1.5.3 Are the roles and responsibilities of men and women farmers in canal water use and management at Nyanyadzi smallholder irrigation scheme gendered?
- 1.5.4 Is the nature and extent of participation of men and women in canal water use and management at Nyanyadzi smallholder irrigation scheme gendered?
- 1.5.5 Are the challenges and constraints experienced by men and women in canal water use and management at Nyanyadzi smallholder irrigation scheme gendered?
- 1.5.6 What gender equitable and neutral strategies can be proposed for irrigation water use and management at Nyanyadzi smallholder irrigation scheme?

## 1.6 Research Hypotheses

In line with the research objectives and questions, the following research hypotheses were formulated:

- 1.6.1 The nature of water use and management at Nyanyadzi smallholder irrigation scheme is not influenced by gender;
- 1.6.2 The extent of participation of men and women in water management at Nyanyadzi smallholder irrigation scheme is not influenced by gender and
- 1.6.3 The constraints in water use and management experienced by men and women at Nyanyadzi smallholder irrigation scheme is not influenced by gender.

## 1.7 The Concept of Gender

Gender is a concept that came into use in the 1970s. It was introduced to draw a distinction between nature and culture (Liebrand, 2014), highlighting that sex and gender are biologically and socially determined. While sex is the biological distinction between males and females, gender is learned and constructed through social and cultural practices. Gender is therefore the social differences between men and women. These differences are more pronounced in men and women's roles, responsibilities and relations. Cleaver and Elson (1995) noted that the southern African economies are structured by practices, norms, perceptions and networks that are distinctly gendered. Gender thus, determines the way households allocate resources between men and women. The conception of gender varies from time to time and culture to culture, and even within cultures (Wahaga, 2018). This means that as a social construction, gender is constructed, deconstructed and reconstructed from time to time and from place to place. This makes gender a fluid concept because of its variation over time, space and culture. Gender is also influenced by a variety of factors and variables ranging from class, age, caste, ethnicity, and religion. These attributes make gender relations power relations (Cornwall, 2007). However, it must be noted that gender is not a synonym for women and so neither are gender issues same as women's issues.

## 1.8 Definition of Key Terms and Concepts

In this study *a canal* referred to a man-made open waterway with a purpose to carry water from the source of water to the fields.

*Canal water or irrigation water* in the context of this study referred to artificial water for irrigation. In this study the word canal water was used interchangeably with irrigation water.

*Gender* has already been clarified in Section 1.7. In this regard, this study adopted the meaning of gender as defined by Agarwal (1994) who argued that, gender is the relations of power between women and men which are revealed in a wide range of practices, ideas and representations, including the division of labour, roles and resources between women and men and the ascribing to them of different abilities, attitudes, desires, personality traits, behavioural patterns, and so on. Gender relations are both constituted by and help constitute with practices and ideologies in interaction with other structures of social hierarchy such as class, caste and race. (Agarwal 1994)

*Gender dynamics* – the explanation of gender dynamics provided by the United States Agency for International Development (USAID) (2008) was adopted for this study. The USAID (2008) explains gender dynamics as the relationships and interactions between and among girls, boys, men and women. These, are informed by sociocultural ideas about gender and the power relationships that define them. They are influenced by the interaction of gender and other factors such as age, income, and marital status to shape and determine gender roles and responsibilities in society.

The definition of *irrigation* given by van Averbeké *et al.* (2011) clearly contextualizes the definition of irrigation adopted for this study. The authors define irrigation as the purposive, organized, controlled and artificial supply of water to a cropped area in order to complement rainfall and to overcome drought, and to reach a given crop production objective.

The definition of management by Manzungu, (1999) guided this study. He argues that management should be understood as relating to day-to-day actions/activities undertaken by a variety of actors in relation to water delivery/distribution... (Manzungu, 1999:6).

A *smallholder irrigation scheme* refers to a group of farmers irrigating together or alone and sharing the same water source and supply line. In this study, small-scale irrigation, communal irrigation and canal irrigation will be used interchangeably to refer to smallholder irrigation.

*Smallholder farmers* in the context of this study are resource-poor individuals who own small-based plots ranging between 0.1 to 2.0 hectares of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour (Bolding, 2004).

## 1.9 Organization of the Thesis

The thesis is made up of seven chapters. Chapter one provides the context through presenting the general background to the study. It orients the reader with background information to the significance of gender and water in smallholder irrigation building from a global view. The problem statement, objectives, research questions and justification of the study are presented in this chapter.

Chapter two reviews relevant literature related to gender and water in smallholder irrigation. It gives an overview of issues that pave the way for a clearer understanding of the research problem and identifies the knowledge gap related to canal water use by men and women in smallholder irrigation. It begins by explaining the key concept (smallholder farming), and elucidating what the term means in the context of study. Thereafter, an overview of the general state of affairs in relation to irrigation water at Nyanyadzi irrigation scheme is provided. This is followed by a discussion on the relevance of smallholder irrigation to rural development. The legal and policy framework guiding agricultural water management in Zimbabwe, which is the water Act of 1998 is then analysed. The remaining sections of this chapter highlight the links between gender and irrigation water. The available studies on gender roles and responsibilities in irrigation water use; gender and access to irrigation water and nature and extent of men and women participation in irrigation water use are examined, highlighting the 'missing links' particularly in the context of Zimbabwe, Nyanyadzi specifically.

Chapter three describes and justifies the study methodology that was used. It describes the mixed-method approach that was used; the modes of inquiry, the study area and why it was selected; sampling procedures; data analysis methods and the ethical procedures that were taken to ensure the safety of study participants.

Chapter 4 reveals the nature of irrigation water use at Nyanyadzi irrigation scheme.

Chapter 5 explores the extent of men and women's participation in canal water use at Nyanyadzi scheme.

Chapter 6 presents the findings and discussion of challenges and constraints faced by men and women farmers in canal water use at Nyanyadzi scheme.

Chapter 7 is a synthesis of all study findings including proposed interventions that consider differential gender power dynamics at play in water use at Nyanyadzi irrigation scheme. Study conclusions, policy and practice recommendations and direction for future research are also presented.

## REFERENCES

- Agarwal, B. (1994). *A Field of One's Own: Gender and Land Rights in South Asia*. Cambridge, UK: Cambridge University Press.
- Ayalew, A. D., Bowen, F. H., Deininger, K. W., and Duponchel, M. F. (2015). Investigating the gender gap in agricultural productivity: Evidence from Uganda. Policy Research working paper WPS 7262. Washington, DC: World Bank Group.
- Bolding, A. (1996). Wielding water in unwilling works: Negotiated management in water scarcity in Nyanyadzi irrigation scheme, winter 1995. pp. 69-101, In Manzungu, E. and Van Der Zaag, P. (eds.), *The practice of smallholder irrigation: Case studies from Zimbabwe*. University of Zimbabwe, Harare, Zimbabwe.
- Bolding, A. (2004). In hot water. A study on sociotechnical intervention models and practices of water use in smallholder agriculture, Nyanyadzi catchment, Zimbabwe. PhD thesis, Wageningen University, Wageningen, the Netherlands.
- Bossenbroek, L. and Zwarteveen, M. (2014). Irrigation Management in the Pamirs in Tajikistan: A Man's Domain? *Mountain Research and Development*, **34(3)**: 266-275.
- Burney, J., Rosamond, A., Naylor, R.S. and Postel, S.L. (2013). The case for distributed irrigation as a development priority in sub-Saharan Africa. *Perspective*, **110(31)**: 12513–12517.
- Chazovachii, B. (2013). Smallholder irrigation agriculture in distressed regions: A quest for pro-poor policies in Zimbabwe. *Journal of Sociology*, **1(1)**: 1-7.
- Chifamba, E., Nyanga, T. and Gukurume, S. (2013). Irrigation Water Pricing and Cost Recuperation for Sustainability of Irrigation Projects in Nyanyadzi, Zimbabwe. *Russian Journal of Agricultural and Socio-Economic Sciences*, **3(15)**: 39-53.
- Cornwall, A. (2007). Revisiting the Gender, Agenda. *Development and Change Special Issue*, **38(2)**: 69–78.
- Doss C. (2014). Data Needs for Gender Analysis in Agriculture, 55-68, In Quisumbing A., Meinzen-Dick R., Raney T., Croppenstedt A., Behrman J., Peterman A. (eds), *Gender in Agriculture*. Springer, Dordrecht
- Food and Agriculture Organization (2011). *The State of Food and Agriculture (2010). Women in Agriculture, Closing the Gender Gap for Development*. Available online at: <http://www.fao.org/docrep/013/i2050e/i2050e.pdf> [Accessed 01/07/2013].

Food and Agriculture Organization. (2015). AQUASTAT. Available online at: <http://www.fao.org/nr/water/aquastat/main/index.stm> Retrieved, (15 April, 2016).

Kemerink, J. S. (2015). Policies lost in Translation? Unravelling water reform process in an African waterscapes. PhD Thesis: Delft University of Technology Netherlands. Taylor and Francis, Leiden. Liebrand, J. (2014). Masculinities among irrigation engineers and water professionals in Nepal. PhD thesis, Wageningen University, Wageningen, the Netherlands.

Magadlela, D. (1999). 'Irrigating Lives: Development Intervention and Dynamics of Social Relationships in an Irrigation Project'. PhD thesis, Wageningen University, Wageningen, the Netherlands.

Manzungu, E. (1999). Strategies of smallholder irrigation management in Zimbabwe. PhD thesis, Wageningen University, Wageningen, The Netherlands.

Meinzen-Dick, R, Behrman, J., Menon, P. and Quisumbing, Q.R. (2012). "Gender: A Key Dimension Linking Agricultural Programs to Improved Nutrition and Health." Pp 135–44, In Shenggen, F and Pandya-Lorch, R (eds). *Reshaping Agriculture for Nutrition and Health*. International Food Policy Research Institute (IFPRI), Washington, DC, US.

Mujere, N. (2011). River flow variations and crop yields at Nyanyadzi Irrigation Scheme: Effects of river flow variations on irrigated crop yields at Nyanyadzi Irrigation Scheme in Zimbabwe. Lambert Academic Publishing, Saarbruken, Germany.

Mutiro, J. and Lautze, J. (2015). Irrigation in Southern Africa: Success or failure? *Irrigation and Drainage*, **64**: 157–298.

Nhundu, K., and Mushunje, A., (2010). Analysis of Irrigation Development Post Fast Track Land Reform Programme. A Case Study of Goromonzi District, Mashonaland East Province, Zimbabwe. *Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference*, Cape Town, South Africa, September 19-23, 2010.

Nhundu, K and Mushunje A. (2012). "Irrigation Development - Food Security and Household Income Perspective," pp43-65, In Kumar, M (ed.), *Problems, Perspectives and Challenges of Agricultural Water Management*, InTech, Rijeka, Croatia.

Peterman, A., Quisumbing, A. Berhman, J. and Nkonya, E. (2011), "Understanding the complexities surrounding gender differences in agricultural productivity in Nigeria and Uganda", *Journal of Development Studies*, **47**: 1482–1509.

Phiri, K. (2012). *Gender Irrigation Schemes and the Empowerment Question: Untold Experiences of Communal Irrigation Plot Holders in Zimbabwe*. LAP Lambert Academic Publishing, Saarbruken, Germany.

Poats, S.V. (1991). *The role of gender in agricultural development* (English). Consultative Group on International Agricultural Research, *Issues in Agriculture* **3**. Washington, D.C.

Rukuni, M. and Makhado, J. (1994). Irrigation development *pp* 127-139, In Rukuni, M and Eicher, C.K. (eds.), *Zimbabwe's Agricultural Revolution*. University of Zimbabwe Publications. Harare, Zimbabwe.

Turrall, H., Svendsen, M., Faures, J.-M., (2010). Investing in irrigation: reviewing the past and looking to the future. *Agricultural Water Management*, **97**: 551–560.

United States Agency for International Development (2008) *Glossary of Gender Terms and Concepts*. USAID's Office of Women in Development. USAID, Washington, DC.

van Averbeke, W., Denison, J. and Mnkeni, P.N.S. (2011). Smallholder irrigation schemes in South Africa: A review of knowledge generated by the Water Research Commission. *Water South Africa*, **37(9)**: 797-808.

van Koppen, B.; Hope, L.; and Colenbrander, W. (2012). *Gender aspects of small-scale private irrigation*. International Water Management Institute (IWMI). Colombo, Sri Lanka.

van Koppen B., Hope L. and Collebrander W. (2013). Gender aspects of smallholder private groundwater in Ghana and Zambia, *Water International* **38(6)**: 840-851.

Wahaga, E. (2018). "The gendered nature of productive and reproductive roles in the agricultural sector", *International Journal of Development and Sustainability*, **7(1)**: 120-146.

Zwarteveen, M. (1994). *Gender issues, water issues: A gender perspective to irrigation management*. International Irrigation Management Institute, Working Paper No. **32**. Colombo, Sri Lanka.

Zwarteveen, M. (2011). Questioning Masculinities in Water. *Economic and Political Weekly*, **65(18)**: 40-48.

Zwarteveen, M. (2017). Hydrocracies, Engineers and Power: Questioning Masculinities in Water, *Engineering Studies*, **9(2)**: 78-94.

## CHAPTER 2 LITERATURE REVIEW

### 2.0 Introduction

In Chapter 1 background information to the problem under study was outlined and articulated. In this chapter, related literature pertaining to the gender dynamics in irrigation water use is reviewed. To use irrigation water effectively and sustainably, it is important to understand the gender roles and responsibilities of men and women so as to target action appropriately. Firstly, the term smallholder shall be unpacked followed by an overview of the current state of affairs at Nyanyadzi irrigation scheme in relation to water use. The relevance of smallholder farming to rural development will be outlined. The legal framework guiding the use of irrigation water in Zimbabwe is also presented in this chapter. The chapter concludes by reviewing literature related to the nature and extent of irrigation water use by men and women in smallholder farming presenting examples of studies from South Asia and sub-Saharan Africa including Zimbabwe.

### 2.1 Contextualizing the Concept and Meaning of Smallholder Irrigation

Defining the concept smallholder irrigation farming is complex because there is no universally accepted definition. This is so because smallholder farmers are defined in various ways depending on the context, country and even ecological zone (Hazell, 2011). Often the term smallholder is interchangeably used with small-scale, resource poor and sometimes peasant farmer. In Latin America, smallholders are most often referred to as family farmers. Smallholder farmers differ in individual characteristics, farm size, resource distribution between food and cash crops, livestock and off-farm activities, their use. For example, Herrera *et al.* (2017) suggest that smallholder farmers face limited resource endowments relative to other farmers in the agriculture sector. In Zambia, small-scale farmers are those who are mainly located in rural areas where agriculture is the main activity to alleviate poverty and they are challenged by a number of constraints to increase productivity (Kamwamba-Mtethiwa *et al.* 2016).

The main criteria often used to classify farmers as smallholder farmers by various analysts includes landholding size, labour input at the farm, the farmers' purpose of production and income. The landholding size is one of the most frequently used variables to define smallholders. The Food and Agriculture Organization of the United Nations adopted a 2-hectare (ha) threshold as a broad measure of a smallholder farm. For example, the Malaysian government defines farmers with a landholding size below 46 hectares as smallholders, while in China and India smallholder farmers have far less than 2 hectares of land. In Brazil, the smallholder farm may be up to 50 hectares. However, the problem with this definition is that the size of the land cultivated

does not necessarily reveal how much money can be generated from the production and so it does not necessarily reveal the socio-economic situation of the farmer. Further, land size does not consider the fertility of the soil or the availability of water both of which make a significant difference to productivity. Thus, a single measurement hardly captures the sense of limited resources or the relative powerlessness characteristic of smallholders. While land is a necessary criterion it is not a sufficient one because other factors need to be taken into account, such as the location in relation to infrastructure and markets, soil return, the investments that the plot or farm has as well as the performance of the farmer. In other countries like the United States of America, size of a farm is measured by the volume of sales rather than the land holding area (Herrera *et al.* 2017).

A valuable definition of smallholder will need to be extended, by including further elements that define whether a farmer is a smallholder or not. Labour input is also a frequently used indicator to define smallholders. In Latin America labour input is an important indicator of smallholder farmer. Labour input in smallholder (family) farm is most often defined as being given primarily by family members. Todaro and Smith (2009) describes smallholder farmers as owning small plots of land on which they grow subsistence crops relying almost exclusively on family labour. The widely used concept of family farmers presumes that the family household is the major corporate social unit for mobilizing agricultural labour, managing productive resources, and organizing consumption. In their national definitions, Costa Rica and Brazil both agree that family farms are based on family labour. Other organizations and academic papers refer to labour input when defining smallholders. The Food and Agriculture Organization (FAO) (2012) defines family farms as operated units in which most labour and enterprise come from the farm family, which puts much of its working time into the farm. The validity of this criterion however is disputable. Although most definitions consider family members to be the major source of farm labour and only ascribe a marginal share to externally acquired labour force, either temporal or permanent, empirical analysis and experience prove differently. In many cases, smallholders hire external labour to do most of the work. This becomes apparent when considering average land sizes of 50 hectares and more for smallholders in parts of for example Brazil and Argentina.

Income is yet another variable that can be used as an indicator to define smallholders. Most definitions that do refer to income indicate that smallholders draw the majority of their household income from on-farm activities. In the FAO conception, smallholder's agricultural, forestry, or fishery activities should generate the major part of income for the farmers. Within most Latin American countries, income is used as a criterion to define family farms. The Food and Agriculture

Organization (FAO) (2012) alludes that smallholder farmers face limited resource endowments relative to other farmers in the sector. Their socioeconomic situation varies according to their geographic location and production system (Hallensleben, 2012). Smallholder farmers are, therefore, a heterogeneous group.

In Zimbabwe, smallholder irrigation schemes date back to 1928 when the colonial government introduced smallholder irrigation schemes as a famine relief strategy (Rukuni & Makadho, 1994). As a result the smallholder schemes are mostly confined to the poor natural farming regions which are characterized by low rainfall (Bolding, 1996). Smallholder irrigation schemes are crucial for the sustenance of rural livelihoods in semi-arid regions. In Zimbabwe smallholder irrigation schemes generally have the following attributes: (i) irrigated plot-holding ranging from 0.1 – 1.5 ha according to commonly agreed classification prior to the land redistribution program (pre-2000) and 0.1 – 5 ha according to new suggestions that include A1 farmers in the smallholder sector; (ii) shared infrastructure, in some cases including plot level infield infrastructure; (iii) self-management, joint management between farmers and government, or predominantly government management; (iv) communal land tenure; and (v) a community elected IMC (Zawe *et al.* 2015). Therefore a smallholder irrigation scheme can be defined as an irrigation scheme in which a group of farmers irrigate together, sharing the same water source and delivery line, with individual or joint control of irrigation and farming activities on their plot(s). However there is individual control of irrigation and farming activities by each farmer in his/her plot. In general the smallholder irrigation sector is known for its small farms that are labor-intensive, uses traditional production techniques and the majority of these family farms are located in communal areas. However, the problem with this definition is that it assumes smallholder farmers to be a homogeneous group. Cousins & Chikazunga (2013) argued that the problem of assuming that smallholders are a homogeneous group is that it tends to obscure inequalities and class-based differences within the large population of households engaged in agricultural production on a relatively small scale. Yet they are unique individuals whose interests, perceptions and decisions of farming vary due to their gender, plot ownership status and even location of plot along the irrigation canal as well as other factors. Smallholders are a diverse group. Thus, smallholder farmers differ in individual characteristics, farm size, resource distribution between food and cash crops, livestock and off-farm activities, their use of external inputs and hired labour, the proportion of food crops sold and household expenditure patterns.

In this study smallholder farmers are defined on the basis of the size of the landholding. The term smallholder is confined to farms of less than 2 hectares of owned land. This definition also

assumes that the farm family provides the primary source of labour and that farming constitutes main source of income for the family. The small scale famers in Zimbabwe are widely known as communal or peasant farmers who constitute 70 % of all farmers in Zimbabwe. Often the term 'smallholding' is interchangeably used with 'small-scale', and sometimes communal farmer. In Brazil smallholder farming is also known as family farming. In general terms small may refer to limited resource endowment, the number of workers within the scheme, capital invested or the size of land irrigated relative to other farmers in the agriculture sector. The next section elaborate further and provides the context of Nyanyadzi smallholder irrigation scheme.

## **2.2 Nyanyadzi Irrigation Scheme: The Current Water Situation**

Nyanyadzi irrigation scheme is a farmer-managed scheme which was developed by the government of Zimbabwe but owned and managed by the farmers through Irrigation Management Committees (IMCs) (refer to Section 2.5) with minimal government interventions in terms of management. The irrigation scheme was established to offset the impact of famine with the primary aim of enhancing household food and nutrition security (Manzungu & van der Zaag, 1996). At its inception Nyanyadzi was a model for a sustainable communal irrigation scheme (Magadlela, 1999). Its contribution to food availability and security to households of surrounding rural communities cannot be overemphasized. Farming at Nyanyadzi smallholder scheme was mainly to provide food for home consumption and some surplus for sell.

However, production levels have dwindled since the year 2000 due to heavy siltation of Nyanyadzi River upstream and irrigation canals. The practice of stream bank cultivation precipitated massive sedimentation in Nyanyadzi River upstream (Kemerink, 2015). The heavy silting affected half of the irrigation acres on arable land rendering it unproductive. Siltation along the river channel and diversion canal has contributed to poor irrigation water supply. Under these circumstances water woes at the irrigation scheme are not in question. This is despite the achievements by the Water Act of 1998 and the presence of an Irrigation Management Committee at the Scheme. Kemerink (2015) analyzed minutes of the Save Catchment Council and the Odzi Sub Catchment Council (OSCC) related to Nyanyadzi irrigation scheme and found that the sub catchment councils hardly discussed content issues related to water. Yet water management issues are the gist of smallholder agriculture productivity.

Many farmer initiated irrigation furrows have been developed across the catchment and compete with the Nyanyadzi project over scarce river water (Kemerink, 2015). Other land users have opened up new tracts of land on steep hills and in the close vicinity of riverbeds, thus adding a

flavour of silt to the river's storm floods. Droughts seem to occur more frequently during the last 20 years. This has made land users in the catchment even keener to enter into a productive engagement with the river, thus increasing competition over valuable water. During times of water scarcity Nyanyadzi irrigators literally bring the water of the river to their intake, through organized upstream raids destroying intakes of competing irrigation furrows.

Due to the upstream developments of informal irrigation furrows, plottolders in Nyanyadzi irrigation project are faced with frequent water shortages. The water administration, however, fails to find a suitable and lasting solution. Hence the plottolders and the project's management have no other option than to take the initiative. They organise raids up the river, destroying the diversion structures of the 10 numerous informal furrows (Kemerink, 2015). The raids however, prove futile because the effect is minimal in terms of water reaching the project, and the destructive raids are opposed by politicians and extension workers in the middle range of the catchment (*ibid*). Twice the District Administrator (DA) brokers a 'fair' water sharing arrangement between the informal and formal irrigators, but these arrangements are unstable. The deal is: one week the upstream furrows along Nyanyadzi River take in water; the other week they close their intakes and let the water flow to the Nyanyadzi irrigation project intake (van der Zaag *et al.*, 2001). The DA deploys principles of 'sharing' water in a 'fair' manner. However, the water left in the river during the other week never reaches the project intake: the water percolates and evaporates on its way down through a dry riverbed.

This water problem situation is further exacerbated by heavy siltation along Nyanyadzi River and its irrigation canals. The scheme is moving rapidly into a water paucity and water catastrophe situation (Chifamba *et al.*, 2013). This is evidenced by a number of water related constraints ranging from poor water management, unreliable and inadequate water delivery, unclear irrigation scheduling, inefficient water use and unequal water distribution between upstream and downstream farmers among other water problems (Pazvakavambwa & Van der Zaag, 2000; Mujere, 2011; Chifamba *et al.*, 2013). A study by Manzungu (2005) found that the representation of women in water user associations at Nyanyadzi small-scale irrigation scheme was token. Although efforts have been made towards addressing gender issues by the Zimbabwean government, a gender gap exists between how men and women access, use and manage agriculture water resources. Yet the management of irrigation water is critical especially when it is scarce. This scenario prompted this research to interrogate the place of gender in irrigation water use and management at Nyanyadzi scheme. Studies at Nyanyadzi continue to point out water problems but no scholarly attempt has focused on the gendered nature of irrigation water

use within the scheme. An exploration of the study of this nature enhances the effectiveness of smallholder irrigation as a rural development strategy which then increases food availability and security in rural communities.

### **2.3 Smallholder Irrigation Farming and Rural Development**

Agriculture is a vehicle for rural development in developing countries (Clevear, 2013). Globally, smallholder irrigation systems are viewed as critical common property resources that are needed to increase crop water supply and sustain livelihoods in semi-arid regions (FAO, 2015). Small-scale irrigation continues to be a plausible approach for achieving high agricultural production, rural food security among households and reduction in rural poverty in less developed countries (Sinyolo *et al.*, 2014). Small scale irrigation schemes have been prioritized as a rural development model by many developing countries in the past 5 decades, not only because they had higher returns on investment but also because they were found to be adaptable to the local farming systems (Mutambara *et al.*, 2017). Improving agriculture and enhancing productivity through smallholder irrigation is one of the key strategies for alleviating poverty and improving the livelihoods of rural communities (Mutiro & Lautze, 2015). The smallholder agriculture potential to contribute to food and nutrition security has been developed from the rural development thinking in the 1950s which emphasized agricultural development as a strategy to address rural problems like poverty. This was a necessary strategy for rural poverty alleviation given the fact that irrigation is a better option to improve and sustain rural livelihoods by increasing crop production (Wang *et al.*, 2010). Its significance to rural livelihoods is getting center-stage due to the increasing threats from the global climate changes which affect agriculture productivity and food supply (Conway & Schipper, 2011). Climate variability has led to an increase in midseason droughts, negatively affecting crop production in Zimbabwe. Irrigated agriculture, therefore, presents an attractive alternative under these conditions. This situation has given growing significance to smallholder farming in developing nations particularly in sub-Saharan Africa and Asia where 80 % of the farmland is managed by smallholders. Evidence from South and South-East Asia by Hussain & Hanjira (2003) indicated that access to irrigation water reduces the incidence and severity of poverty. Irrigation is a rural livelihood resilient strategy to reduce persistent poverty in rural regions and secure food and nutrition security. Irrigation can, thus significantly contribute towards food and nutrition security of rural people and trigger rural economic development at the household level. This then stabilizes the rural exodus. In this regard, irrigation can act as rural development nucleus. The role of smallholder irrigation in poverty alleviation has been demonstrated in Bangladesh where canal and tube-well irrigation has played a major role in the development and

implementation of efficient and effective smallholder irrigation schemes (Nhodo *et al.*, 2014). Irrigation development benefited the rural poor in reducing food prices resulting from increased production.

Irrigation is a necessary strategy for rural poverty alleviation in sub Saharan Africa, where 80 % of people in rural areas are dependent on agriculture for their livelihoods (FAO, 2010). For example, Akudugu (2013) alluded that, in Ghana, small-scale irrigation schemes constitute a primary source of livelihood to many rural households that have access to them. While in South Africa, smallholder agriculture has been identified as the vehicle through which the goals of poverty reduction and rural development can be achieved. This approach makes agriculture a vehicle for rural development in developing countries. Furthermore, the development of smallholder irrigation farms in rural economies contributes to overall growth and development. It also plays a pivotal role in improving the welfare and potentially plays an important role in enhancing food and nutrition security amongst the poor rural households. For example, smallholder agriculture in South Africa has been identified as the vehicle through which the goals of poverty reduction and rural development can be achieved. The South African government prioritizes irrigation development due to its potential in poverty reduction and food and nutrition security (van Averbeké *et al.*, 2011; Sinyolo *et al.*, 2014). While Moyo (2016) found sufficient evidence that smallholder irrigation farming makes a significant contribution to rural livelihoods through its effects on household food and nutrition security and the little income from surplus sales in South Africa.

Scholars agree that small-scale irrigation remains a feasible strategy for achieving improved agricultural production, household food and nutrition security and rural poverty reduction in the developing world (Sinyolo *et al.*, 2014; Mutiro & Lautze, 2015). Investment in irrigation development by the government of Zimbabwe was meant to reduce dependency on government, attain food and nutrition security and foster rural development and alleviate poverty. Investment in smallholder irrigation is seen as one of the most effective ways to develop smallholder agriculture and reduce rural poverty (Nhundu, 2013). It is a livelihood strategy of achieving positive rural livelihood outcomes such as reduced vulnerability and food security.

The development of smallholder irrigation schemes especially in rural areas of developing countries like Zimbabwe is significant in that it improves livelihoods of rural dwellers and contributes to household food and nutrition security. Irrigation farming is, therefore, a strategy to improve rural livelihoods and to grow the rural economy. It is against a background of such

realization that there have been massive investments in the rehabilitation and expansion of smallholder irrigation schemes by development agencies in partnership with the government of Zimbabwe. All these developments take place in an effort towards sustenance and enhancement of rural livelihoods in the semi-arid zones. Further, the achievement of Sustainable Development Goals (SDGs) 1 and 2 (End poverty in all its forms everywhere and End hunger, achieve food security and improved nutrition and promote sustainable agriculture) in sub-Saharan Africa requires a high prioritization of smallholder irrigators. Small-scale irrigation, therefore, continues to be a plausible approach for achieving high agricultural production, food and nutrition security among rural households and reduction in rural poverty and hunger in less developed countries (Akudugu, 2013; Sinyolo *et al.*, 2014).

Despite the positive intentions of smallholder farming, most researchers (Mutambara *et al.*, 2017) have concluded that the impact of smallholder irrigation schemes on the livelihoods and wellbeing of irrigators has been limited, despite the substantial public investments that have been made to construct, maintain and revitalize these projects. For example, Mnkeni *et al.* (2010) identified basic management practices, such as weed, water, and plant population management, and choice of cultivars, all of which were within the farmers' abilities to control, as the main agronomic factors limiting productivity in smallholder farming. Against a backdrop of such drawbacks, the social and economic value of using smallholder irrigation schemes as an option for rural development in sub-Saharan Africa has been questioned. In most smallholder schemes including Nyanyadzi, the unreliability of water supplies has significantly contributed to the poor performance of smallholder irrigation schemes (Nhodo *et al.*, 2014). Hence, the need to examine the gender dynamics of smallholder irrigation water use. This is because the antipoverty impact of irrigation water to rural development can be intensified through recognizing the multiple uses and users of this precious resource (Hussain & Hanjira, 2003). Effective rural poverty alleviation requires that irrigation development be targeted to poor communities. The next section presents the legal and policy framework guiding the use and management of irrigation water.

#### **2.4 The Legal and Institutional Framework Governing Irrigation Water use and Management in Zimbabwe.**

According to Zawe *et al.* (2015) for long, Zimbabwe has not had an irrigation policy to specifically guide irrigation development, but it has had development policies and legal instruments, most from other sectors of the economy, that have shaped the perception, implementation and management of irrigation in the country.

### 2.4.1 The Zimbabwe Water Act of 1998

Zimbabwe is a water scarce country, where the economy depends on irrigated agriculture, thereby increasing the importance of managing water (Derman *et al.*, 2000). Water management at irrigation schemes is a major factor influencing the success of smallholder irrigation schemes (Motsi *et al.*, 2001; Samakande, 2002). To understand the context in which water is used in smallholder irrigation farming it is important to look at how water resources are managed and distributed in Zimbabwe.

The Zimbabwe Water Act of 1998 is the cornerstone of the Government of Zimbabwe's legal framework governing water resources. It was enacted in 1998 with the view to reform the water sector and specifically to redress the inequities in access to water (Manzungu & Kujinga, 2002). The major aim of the Water Act of 1998 is to provide for the development, management and utilization of Zimbabwe's water resources. The Water Act of 1998 set the parameters of access and use of agricultural water. Under the Water Act of 1998, all water is vested in the state and all Zimbabweans should have access to water as a basic right and stakeholders should be involved in decision making in the development and management of the resource. The Water Act of 1998 provides for governance structures and mechanisms for stakeholder participation in water resources management. The Act reformed the water sector to ensure a more equitable distribution of water and a stakeholder participation to include everyone with an interest in the management of water resources which was prior limited to minority white commercial farmers under the 1976 Water Act.

A central tenet of Zimbabwe's Water Act of 1998 is the introduction of participatory water institutions which broaden stakeholder participation in water resource management. Under the 1998 Water Act, seven river catchments were identified based on Zimbabwe's seven hydrological boundaries, each of which is governed by catchment councils. The council members are elected and/or appointed stakeholder representatives, who have to, amongst others, develop integrated plans for the catchments, revise and review water allocation, issue permits and collect water levies (Manzungu & Kujinga, 2002). The catchment and sub-catchment councils are designed to capture the interests of various water users. The primary function of the catchment and sub-catchment councils is the allocation of raw water for various purposes to different users including smallholder irrigation farmers. These institutions are also responsible for plans development and utilization of the water resources (Manzungu, 1999). They also offer important platforms and forums for different stakeholders to participate in water resource management and discuss water related issues. The council members are elected and/or appointed stakeholder representatives,

who have to, amongst others, develop integrated plans for the catchments, revise and review water allocation, issue permits and collect water levies (Manzungu & Kujinga, 2002).

Another important aspect of Water Act of 1998 is the division of water into primary and productive categories. The Act distinguishes between use of water for primary and productive purposes and other usage. Primary purposes include domestic use and use for other domestic related needs such as making bricks for private use. It does not include use of water for irrigation purposes. In terms of section 34 (1) of the Act: *“No person shall abstract water for any purpose other than primary purpose except in terms of a permit”*. However, people’s perceptions and actual use of water do not fit within this neat dichotomy. Further, categorizing water into primary and productive use does not address issues to do with water quality or quantity, or its users which could have important implications on agricultural productivity as well as household use. It follows, therefore, that all farmers who require water for irrigation purposes must have a permit to use water. The permit to use water for irrigation purposes is applied for and is normally valid for twenty years but it may be renewed. However, when the land is sold the permit passes to the new owner. Access to water rights for the purpose of irrigation then, can become difficult for women because the current legal framework is based on a permit system which does not specifically provide for ensuring equity for women.

The Zimbabwe Water Act of 1998 prohibits private ownership of water but instead all water is vested in the President. The act introduced water user rights that are acquired through conditional permits. For any water use, other than primary water use, a permit is required. Primary use is defined in the Water Act as *“reasonable use of water for basic domestic needs in or about the area of residential premises, animal life (other than fish in fish farms or animals or poultry in feedlots), for making bricks for the owner, lessee or occupier of the land concerned or for dip tanks”* (GOZ,1998).

The Zimbabwe National Water Authority (ZINWA) plans and manages water resources on a catchment basis and involves all stakeholders. Other responsibilities include the management of the water permit system, operationalization of water pricing, operating and maintaining existing infrastructure. The Water Act proclaimed water as an economic good and noted that users of water should pay for the resource. The current policy is that ZINWA supplies water on the basis of the “user-pay” principle. There is no provision for the state to assist those farmers (including men and women farmers) who cannot afford the levies charged by the catchment councils and/or by ZINWA. Water rights for irrigation are, therefore, premised on a permit system which does not

specifically provide for ensuring equity in access for both men and women. Manzungu, (2001) and Mtisi, (2002) assessed how rural livelihoods were affected by water reforms and they seem to have the consensus that these reforms did nothing in the development of smallholder irrigation hence rendering the water reforms palliative. The water pricing in smallholder irrigation aggravated the plight of the farmers. For example, plot holders in the Mushandike smallholder irrigation scheme in Zimbabwe withdrew their cooperation because of water pricing (Chazovachii, 2013).

Notable inconsistencies in the implementation of the new water policy with respect to smallholder irrigation are that: (1) most farmers feel that they are not being consulted in arriving at water charges; (2) farmers are not meaningfully represented at sub-catchment level as envisaged by the Act or are not accorded an appropriate status and voice as ZINWA appears to dominate the Councils; (3) farmers in some schemes pay for water while others do not; (4) blend water charges, instead of catchment level determined charges are still being applied; (5) in most cases there are no water measuring devices against which to validate the water charges; and (6) even where measuring devices are available ZINWA is not always able to read the devices hence it is forced to estimate water consumption.

Despite the achievements by the Water Act of 1998, the water reforms have altered entitlements to water and, consequently, affected the distribution of water among the various water users within the catchment. For example, Nyanyadzi irrigation face a number of constraints related to water. Poor water management, unclear irrigation scheduling and inefficient water use at the scheme and plot levels are cause of concern for the success of smallholder irrigation schemes in Zimbabwe including Nyanyadzi (Motsi *et al.*, 2001). Manzungu (2006) reported that lack of coordination between the water institutions has affected water reforms and management in Zimbabwe. Other evaluation studies (Mujere, 2011; Jacobs *et al.*, 2013) have suggested that smallholder irrigation schemes have poor performance and are not sustainable due to poor water management problems. Problems identified include unreliable and inadequate water delivery due to weak water governance institutions, unequal water distribution between upstream and downstream farmers, poor water utilization, in terms of its timeliness and adequacy to the field, and poor water application to the field (Pazvakavambwa & van der Zaag, 2000; Chibisa *et al.*, 2008; Chifamba *et al.*, 2013). Yet management of irrigation water is critical due to the increasing scarcity of water. For example, the growing water scarcity at Nyanyadzi smallholder scheme poses a challenge to food production and also threatens household food and nutrition security. Pazvakavambwa & van der Zaag (2000) also found that at Nyanyadzi irrigation scheme, farmers

who had plots located close to water source had crop yields twice compared to those located at tail ends. This was because water delivery to tail-end farmers was unequal and unpredictable. Chifamba *et al.* (2013) alluded that Nyanyadzi irrigation scheme is moving rapidly into a water paucity and water catastrophe situation. These recurrent water shortages have led to tensions between the downstream and the upstream water users at Nyanyadzi irrigation scheme. Water distribution at Nyanyadzi smallholder irrigation scheme has proved to be a challenge despite the presence of an Irrigation Management Committee. This scenario prompted this research to interrogate the place of gender in irrigation water use at Nyanyadzi scheme. Studies at Nyanyadzi (Mujere, 2011; Chifamba *et al.*, 2013) continue to point out water problems at the scheme but no scholarly attempt has focused on the gendered nature of irrigation water use within the scheme, hence the focus of this study.

#### **2.4.2 Agricultural policy**

The most significant agricultural policy to smallholder irrigation was the Zimbabwe Agricultural Policy Framework (ZAPF) (1995-2020). The document set out the national agricultural policies and objectives within the agricultural sector, with particular focus on raising the incomes and standard of living of small-holder families and increased investment by private sector participation. The ZAPF reiterated the 1994 National Irrigation Policy and Strategy, with respect to irrigation development, with the following major strategies for small-holder irrigation development: (i) giving priority to farmer-managed and operated schemes, with government continuing to fund development while communities operated and maintained the schemes; (ii) continuing responsibility of government to develop major irrigation infrastructure on state land while the private sector would be encouraged to invest in irrigation; (iii) promotion of more efficient and equitable use of water; and (iv) strengthening of water users' associations.

#### **2.4.3 National Gender Policy (NGP) of Zimbabwe**

Regionally, Zimbabwe acceded to and ratified the Southern African Development Community (SADC) Protocol on Gender and Development of 2008. The Protocol seeks to promote women's full access to, and control over productive resources such as land. Nationally, Zimbabwe has made significant strides in amending and enacting legislation to advance the gender equality and equity objective. The 2013–2017 National Gender Policy (NGP) of Zimbabwe is the current national blueprint that seeks to establish a just society where both men and women participate in the development process on an equal platform. The National Gender Policy's primary goal is to mainstream gender in all sectoral policies and programmes and to eliminate all negative

economic, social and political policies, cultural and religious practices that impede equality of sexes. The goal of the NGP is to stamp out any form of discrimination or inequalities in all areas of life, as well as in the development arena. The policy seeks to achieve a gender just society in which men and women enjoy equity, contribute and benefit as equal partners in the development of the country. The policy goal is to eradicate gender discrimination and inequalities in all spheres of life and development. Participatory principles such as justice, equality, integration and inclusiveness underpin the NGP. A major weakness of the policy however, is that it does not clearly state in more detail how men and women's participation could be improved.

#### **2.4.4 Smallholder Irrigation Water Management in Zimbabwe**

According to Manzungu (1999), three operational realities are critical to irrigation management. These include water distribution, field irrigation and crop production and disposal. This study was interested in one aspect of irrigation management which included water use and distribution at Nyanyadzi irrigation scheme. Water management at the scheme and plot levels is a major factor influencing the success of smallholder irrigation schemes (Nhundu, 2013). Pazvakavambwa and Van der Zaag (2001) found on one irrigation scheme in Zimbabwe that farmers close to water sources had crop yields twice those at tail ends. Due to poor water management at the scheme, water delivery to tail-end farmers was unpredictable, and thus adversely affecting their crop yields.

In Zimbabwe water management at source point is done by the Zimbabwe National Water Authority (ZINWA) which is a parastatal agency responsible for water planning and bulk supply. ZINWA plans and manages water resources in conjunction with catchment councils. There are seven catchment councils in the country and each is supposed to represent all stakeholders in a given catchment. Irrigation schemes, both smallholder and large-scale commercial schemes, are represented in some of these catchment councils

The government's policy since 1980 has been to promote farmer-managed schemes where possible. At each farmer managed irrigation scheme in Zimbabwe, an Irrigation Management Committee (IMC) has been established as part of encouraging farmer management. The main objectives of the IMCs are to enhance farmer's participation in management and decision making at the scheme level, introduce a system of discipline among the farmers and to control infield water distribution (Nhundu, 2013). In the scheme the IMCs purpose is to monitor that farmers perform their tasks in adherence to by- laws agreed among themselves and also follows irrigation techniques as recommended. Ndamba *et al.* (1999) also put an idea that generally smallholder irrigators are expected to be familiar with and practise water scheduling in order to determine

when and how much to apply in crops. Ndamba *et al.* (1999) went on to say small holder irrigation are prone to problems of poor water distribution if there is lack of group cohesiveness and proper training or by-laws governing water distribution within the scheme. The IMCs major function is the co-ordination of activities in the irrigation scheme as well as liaison with water supply authorities on water allocation and usage. In the same vein, Matandare & Matandare (2018) in their study concluded that irrigation schemes that use surface irrigation must pay more attention to water management practices, because this is important for agricultural sustainability.

The Departments of Agricultural, Technical and Extension Services (AGRITEX) and Irrigation (DOI) play a central role in providing extension and training to the irrigation sector. In all irrigation schemes in the smallholder sector there is at least one full-time extension worker from AGRITEX.

## **2.5 Gender and Agriculture Water**

In irrigated agriculture, the interests for water usage between men and women are quite different in their preferences (Fikirie, 2016). Therefore, the importance of involving both women and men in the management of water resources is recognized at the global level. For example, the 1979 Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) advocates for gender equality. The 1995 Beijing Platform for Action calls for governments to promote knowledge and research on the role of women, particularly those in rural areas, in irrigation and watershed management and sanitation.

Gender determines access, use and management of agricultural water. This is because men and women have different priorities, needs and abilities to access, use and manage irrigation water. For example, in Sri Lanka, women and men smallholder farmers differ in the ways in which they use water as a productive resource (Meinzen-Dick & Bakker, 2001; Meinzen-Dick, 2002). They farm different crops and tend to keep different animals, which in turn have differing water needs. Women and men's relationship to water is, therefore, unequal. Addressing gender and water together acknowledges these imbalances and seeks to ensure that the needs of both men and women are recognized and considered.

In general, it is perceived that the gender gap in agriculture water resource management arises from the gendered norms of society, which allocate numerous water-related responsibilities to women in societies where the associated powers and rights are conferred to men (Svubure & Zawe, 2010). This is despite the fact that, globally women farmers constitute a vital human resource in agriculture representing an estimated average of 43 % of the agricultural labour force in developing countries (FAO, 2012). In sub-Saharan Africa women are the backbone of the rural

economy, accounting for 80 % of the smallholder farmers. Shumba (2011) reports that in Zimbabwe women provide 70 % of the labour in farming and other significant roles as primary managers of their homes where they spend about 49 % of their time on agricultural activities for their families' subsistence. In spite of this, water policies related to agriculture continue to wrongly assume that farmers are men only (Kroma, 2012). Mtisi & Nicol (2003), Manzungu (2005) and Walker (2006) also echoed the same sentiments when they examined water policies in Zimbabwe and found that neither do they address women's independent water rights nor address issues of power within households and communities regarding access to water resources that shape men and women's participation in both formal and informal water management institutions. These gender inequalities are however taking place in the backdrop of international conventions that call for the recognition of gender equality in all spheres of life.

In cases where policies have changed to reflect gender needs, practices at the water user level to mainstream gender practices have lagged behind. For example, studies at Nyanyadzi scheme found that inequitable water allocation often result in farmers close to water sources achieving crop yields twice as compared to those located at tail ends of distribution channels (Manzungu, 1999; Pazvakavambwa & van der Zaag, 2002; Samakande, 2002). It is of great importance to note that it is mostly the women owned plots that are located at the tail end of the canal thus presenting gender inequalities in access and use of irrigation water resources. It emerges from the above discussion that gender equality in agriculture water management is critical for food and nutrition security and the overall development of rural communities. Against this background, this study sought to unravel the gender dynamics in irrigation water use at Nyanyadzi Smallholder irrigation scheme in Chimanimani, Zimbabwe.

## **2.6 Gender Roles and Responsibilities in Irrigation Water Use and Management**

To use irrigation water effectively and sustainably, it is important to understand the different roles of men and women so as to target action appropriately. Gender roles can be described as social norms or rules and standards that dictate different interests, responsibilities, opportunities, limitations as well as behaviors that a society considers appropriate for men and women (Chant, 2013). They however, vary with time and place. This is because they are determined by different ideological, religious, cultural, economic factors and other social variables that view certain tasks or activities as the preserve of male or female (Zwarteveen, 2012; FAO, 2013). The dynamic nature of the gender roles and responsibilities in irrigation agriculture make gender roles in irrigation water use difficult to predict. Bossenbroek & Zwarteveen (2014) found that innovations and interventions in irrigated agriculture often focused on technological innovations, without

considering the social and gender disparities. Yet men and women are differentially impacted by technological interventions due to other variables like gender, marital status among other social variables. For example, Kulkarni (2011) and Clement (2012) observed that male and female farmers within the same irrigation enterprise had joint and separate interests. In this instance men and women used irrigation water from the same source in different ways and at different times. In another study Leite (2010), found that in Brazil women used irrigation water for multiple domestic purposes including backyard vegetable gardens while men primarily used water on livestock and cash crop farming. However, these studies (Leite, 2010; Kulkarni, 2011; Clement, 2012) fail to highlight the implications of such gendered roles to smallholder irrigation sustainability and to household food and nutrition security for irrigation farmers. Further, the studies do not capture the perceptions and implications of the gendered roles in irrigation water use. The new way forward proposed by this study is to capture the perceptions and voices of men and women smallholder farmers concerning their roles and responsibilities regarding the use of irrigation water.

Phiri (2012) observed that women contribute more labour than men in smallholder irrigation schemes in Zimbabwe. The study however, does not offer adequate explanation on the determinants of gender roles in water user associations nor does the study explain how irrigation water is distributed and used by men and women practicing smallholder irrigation farming. There is, therefore, a great need to pay attention to how men and women use irrigation water and the implications of such to the sustainability of the irrigation scheme. This study examined the gender roles and responsibilities of men and women irrigating at Nyanyadzi smallholder scheme in water management in order to understand how gender affect the men and women's use of water resources in irrigated agriculture.

While much has been written about the gender roles in irrigation water, there is need to link this discourse to the actual impact on men and women. The study looks at the implications of the gender roles on the sustainability of the irrigation scheme with regards to water use. Recognizing the different roles that men and women play in smallholder agriculture helps in identifying the diverse challenges they face and tailoring projects and programmes on their specific needs.

## **2.7 Gender Access to Irrigation Water**

Access to water for irrigation is expected to enable rural households gain access to more food and to a more diverse diet (Moyo *et al.*, 2016). In general, access to irrigation farming allows poor people to intensify food production. Gender shapes how men and women access or benefit from water resources (Cleaver & Hamada, 2010). Research on gender and irrigation development in

South America has highlighted problems faced by men and women in gaining access to and control over productive resources, such as irrigated land and water (Delgado & Zwarteveen, 2007). The same trend was observed in Southern and East Africa (Bob & Bangura, 2014). This is because, access is structured and shaped by formal and informal institutional laws, policies and customary rights (Khumalo, 2014; Knapman & Sutz, 2015). As a result, men and women have different access modes. In Africa, access to and control over land and water resources is highly gendered (Bob & Bangura, 2014). In other words, gender affects the distribution and use of resources. Yet access to irrigation water is one of the important factors in agricultural productivity. A study by van Koppen *et al.* (2013) to explore the gender dimensions in the adoption of irrigation technologies in Zambia and Ghana revealed that, merely understanding the gender dimensions does not guarantee gender equality in access to and control of irrigation water. A separate study is, therefore, necessary to establish the gender issues that are found in accessing and using irrigation water. Existing literature indicates that women in rural Africa are equally productive as men; however this is subject to some access to land and other productive resources which women have significantly less ownership across the world (Quisumbing & Pandolfelli, 2010). Women, therefore, often find it difficult to access irrigated land or even irrigation water.

Access rights to irrigated land are predominantly vested in men. In East Asia, South Asia and Southern Africa it was observed that land ownership is a precondition for access to irrigation water yet women held little or no land (Zwarteveen, 2010; Shumba, 2011; Meinzen-Dick *et al.*, 2014). This situation confirms that gender norms around access to and control over land and water resources are shaped by local power structures and community-based socio-cultural patterns (Knapman & Sutz, 2015). However Lambrecht (2016) contend that, the argument that gender differences in access to land and water are mainly driven by social norms and perceptions warrants rethinking. Instead the author suggests questions for further research which include, does equality in access to land equals gender equity? Are women with more access to land necessarily better-off? It must however, be borne in mind that, water without guaranteed access to land will not be sufficient to a farmer and vice versa (IFAD, 2007). In the end women resort to getting informal access to both land and water resources through their male relatives or neighbours (Zwarteveen, 2010; van Koppen *et al.*, 2012). Social and structural constraints shape individual access to resources and opportunities (Okali & Keats, 2015). The implication of this gender inequality in access to resources is that it hinders the potential of smallholder farming to reduce poverty and food insecurity. This is especially true considering that gender is a mediating factor in development. This study, therefore, seeks to understand the determinants of access to

irrigation water by men and women, factors considered for men and women farmers to use irrigation water and institutional arrangements in place for irrigation water use by men and women.

## **2.8 Nature of Men and Women's Participation in Irrigation Water Management**

The matter of gender in irrigation water does not simply involve issues of use and access to water only. It also encompasses questions of rights, responsibilities and participation (equal participation by both men and women) at all levels. Theoretically, active participation of women has always been highlighted at most international platforms but practically gender balance has not been seen yet in many of the developing countries (Cleaver & Hamada, 2010). Carret (2015) noted that participation in agriculture water management is a privilege that is endowed mostly to men. Strict patriarchal norms regulate control over water and practically exclude women from irrigation management. Equal opportunities for participation by gender are not always guaranteed. From Brazil, De Moraes (2015) observed that women in poor rural regions of the developing world are often responsible for water management at the household level but are very under-represented in water management decision-making processes. In Cambodia, Nang & Ouch (2014) found that women had less experience than men in water and irrigation management. Their participation in commune affairs was hampered by the demands of both reproductive and productive roles. Studies in India by Singh (2006; 2008) indicate that women's participation in agricultural water management was interwoven with gender hierarchies and roles within different cultures resulting in obstructions to women's participation in water management. The Water User Association tended to target men land owners yet women were the primary users of water. Studies from South Asia (Dasthagir, 2012; Soomro, 2013; Udas, 2014) and sub-Saharan Africa (Phiri, 2012; Simiyu, 2012; Khumalo, 2014) indicated minimal participation by women in irrigation water user associations and irrigation water boards due to socio-cultural and personal reasons. Women's demanding domestic workload and the social-cultural barriers they face stand out as major constraints to their participation. These constraints reflect norms and traditions that shape social structures, form masculine and feminine identities, govern the division of labour and reinforce social hierarchy (Mandara *et al.*, 2017). van Koppen *et al.* (2006) and Cleaver's (1998) research, in the Pedi community in South Africa and the Nkayi community in Zimbabwe, respectively, found that women participated more effectively within informal networks. This, therefore, implies that lack of membership in formal water committees does not imply that women do not use irrigation water. The situation at Nyanyadzi was also interrogated in this study. Confusion over the role and powers of the irrigation associations contributes to the lack of profitability and sustainability of the schemes, as highlighted by (Mandara *et al.*, 2017).

Mtisi & Nicol (2003), Manzungu (2005) and Walker (2006) examined water policies in Zimbabwe and found that neither do they address independent water rights nor issues of power within households and communities and access to water resources that shape men and women's participation in both formal and informal water management institutions. Yet access to productive resources is one factor that influences men and women's participation in irrigated agriculture (Zwarteveen, 2008). Catchment Councils offer an equal opportunity for farmers to participate in irrigation water management but in practice, women face various constraints that limit their involvement. These gender specific constraints stem from the fact that men and women have different roles and responsibilities regarding use of irrigation water (Rinkus *et al.*, 2017). From the above studies it emerges that there is a difference between a numerical increase in women representatives in water committees, and the representation of women's interests in decision-making regarding water use. One does not automatically lead to the other. According to IFAD (2007) water management programs that fail to address the multiple uses of water have been recognized as one of the causes of poor participation of women in WUAs. There is, therefore, a gender gap in WUAs. It will be of interest in this study to assess the implications of men and women's participation or non-participation in irrigation water use and management on the sustainability of the irrigation scheme as well as on household food and nutrition security of irrigation farmers.

## **2.9 Theoretical Framework of the Study**

Parpart *et al.* (2000) describe a theoretical framework in the social sciences as a system of ideas or conceptual structures that help to 'see' the social world, understand it and explain it. It consists of basic assumptions about the nature of the social world and how it works, providing a systematic way of examining social issues. The functions of a theoretical framework include delimitation of scope, providing a context of meaning and interpretation, prediction of outcome(s), and integration of research findings. A theoretical framework also provides a set of concepts to be used to clarify a problem or issue, which fundamentally shape research approaches (Parpart *et al.*, 2000). The study theoretically anchored its analysis on four different but interrelated theories and concepts namely the gender perspective, the social relations approach, the patriarchal ideology concept and the concept of participation. These are briefly discussed in the following sub sections. The subsequent empirical research-based Chapters 4-7 apply one or a combination of them because these perspectives are interrelated in many ways.

### **2.9.1 The Gender Perspective in Smallholder Water Use and Management**

Gender is an important consideration in development in that gender relations mediate the process of development. This is useful in explaining the role of men and women in irrigation water management processes. In practice, this means that various questions are analysed and discussed from the perspectives of both men and women. Gender an integral component of every aspect (economic, social, cultural and political) of the daily lives of individuals and societies. This is succinctly supported by the UN Human Development Report of 2010 which stipulates that, if development is not engendered, it is endangered. Adopting a gender perspective for this study, helps to understand the institutional forces that determine how men and women participate in and benefit from irrigation water use and management.

A gender perspective gives the ability to detect if and when men and women are affected differently or similarly by a situation. A gender perspective takes into account gender based differences when looking at any social phenomenon or programme. A gender perspective exposes and attempts to understand how gender based differences in status and power relations affect men and women in development interventions. Cornwall (2007) explained that the key to understanding gender is to focus on relationships between and within men and women.

Hence, the successful implementation of policies, programmes and project goals of both international and national organizations is directly affected by the impact of gender. Thus, in analysing the gender dynamics in small scale irrigation water use, a gender perspective is adopted as a guiding theoretical framework because it best encapsulates the gendered complexities involved irrigation water use. Further, a gender perspective is adopted because it seeks to address concerns that relate not only to women, but to men as well. According to Nkhoma and Kayira (2016) a gendered analysis to irrigation agriculture is desirable for a number of reasons. First, it helps one go beyond a 'household' as a unit of analysis while not completely dismissing it. This is because prior to the 1970s, it was assumed that much agriculture was organized on the basis of a family such that the household was mostly used as a unit of analysis (Zwarteveen, 2010). This tended to obscure rather than reveal the composite nature of a household because in the context of patriarchy, the male farmer was usually depicted as representing it. It is however clear from literature on a gendered analysis that the different members of a household perform varied labour roles on family farms. Secondly, a gendered analysis pays special attention to the agency of each of the members of a given household (Johnson, 1998). This agency can even operate beyond the household and can sometimes conflict with established rules of production. Thirdly, a gendered analysis is also desirable

because it does not consider men or women as homogenous categories (Zwarteveen, 1996). It takes into cognizance the differences existing between and also within sexes. Women, just like men, do not fall into the same category. While some are married others are not and yet others are widowed. Such groups are likely use water differently in irrigation farming. It is through this conceptualization that a gender perspective (GP) was adopted to help explore, analyse and understand the relationship between men and women in water use and management of irrigation water at Nyanyadzi irrigation scheme.

According to Chant (2013) a gender perspective is a comprehensive approach used to identify the gendered implications of a programme. In using the gender perspective the research objectives and questions were analyzed and discussed from the perspectives of both men and women. Using the gender approach best encapsulated the gendered complexities involved irrigation water use and management.

A gender perspective, firstly, recognises that gender does not predominately refer to women (Zwarteveen, 2017). Instead, a GP seeks to address concerns that relate to both men and women and within men and women. In practice, this means that various questions are analysed and discussed from the perspectives of both men and women. Secondly, a gender analysis demonstrates and differentiates the specific roles and responsibilities of men and women in irrigation water. Further, a gender analysis gives an appreciation of which type of women or men (married, widow, single, or divorced) use water for what purpose, at what time and why (Doss, 2014). It also goes to indicate which factors (cultural, economic, social and political) determine which women or men to participate in irrigated agriculture. According to Phiri (2012) this aspect of breaking down each item to its lowest terms contributes to the build-up of an informed development intervention, which addresses and meets the situation and needs of both men and women.

The gender perspective (GP) recognizes and responds to the male-female differences in smallholder water use. First, the GP focuses on and seeks to understand the roles, responsibilities, resources and priorities of women and men within the context of smallholder water use by examining the social, economic, political, cultural and environmental factors which influence their roles and decision-making capacity (Wahaga, 2018). Second, the GP understands that, the nature and extent to which smallholder irrigation water use is gendered is determined by the power relations that are influenced by the socio-cultural and political contexts of the various institutions in society (Zwarteveen, 2017). By adopting gender neutral lens, the perspective

considers the attitudes, interests, roles and responsibilities of men and women in irrigation water and how these interact and are expressed. This is because the perspective does not only identify discordances or concordances between men and women, but probes deeper into questions of why these variances or harmonies exist (Poats, 1991). When these are known men and women can jointly manage and use the water resource in an equitable fashion. As Meinzen-Dick *et al.* (2012) puts it, gender matters not only for agricultural production but also for resources used to produce the food. Adopting a gender perspective in this study helped to bring out the complex nature of the gender dimensions in irrigation water use. A gender analysis of the users and uses of irrigation water was necessary because it helped to come up with intervention strategies that help to improve water management at Nyanyadzi irrigation schemes.

In the context of this study, the gender approach was adopted because it exposes the gender based differences in the use and management of irrigation water. The gender approach thus, recognizes and responds to the male-female differences in small scale irrigation water use. It focuses on the roles of men and women in small scale irrigation water use. It seeks to understand the roles, responsibilities, resources and priorities of women and men within the context of small scale irrigation water use by examining the social, economic, political, cultural and environmental factors which influence their roles and decision-making capacity. Such kind of analysis offers equal chances for men and women to jointly manage small scale irrigation water. Further, a consideration of the gender perspective in small scale irrigation water use makes it easy to identify the gender dynamics inherent water use and management thus giving an understanding and appreciation of the social differences and gender inequalities that are inherent in Nyanyadzi irrigation water use and management. It also exposes the gender power relations in water management which strengthen or weaken the ability of individuals and groups to exercise their human rights. Furthermore, the gender perspective reveals that gender-based practices and ideas are largely directed and influenced by varying cultural, political and economic factors. The nature and extent to which small scale irrigation water use and management is gendered is determined by the power relations that are influenced by the socio-cultural and political contexts of the various institutions in society. In the context of this study, the gender perspective would stimulate the study to unravel the gender dynamics present in smallholder irrigation water use and management at Nyanyadzi smallholder irrigation.

## **2.9.2 The Social relations approach on gender and water use and management in smallholder irrigation**

According to the World Bank (2009), the underlying causes of inequalities regarding opportunities and constraints of men and women within the agricultural sector can be seen in social structures dominating in households and societies. In order to investigate the gender dynamics in water use and management at Nyanyadzi smallholder irrigation scheme the Social Relations Approach (SRA) for gender analysis developed by Keeber (1994) was adopted for the study. The SRA is intended as a method of analyzing existing gender inequalities in the distribution of resources, responsibilities, and power. The SRA has three aims which are as follows:

- a) To analyze existing gender inequalities in the distribution of resources, responsibilities, and power;
- b) To analyze relationships between people, their relationship to resources and activities, and how they are reworked through institutions and,
- c) To emphasize human well-being as the final goal of development

In the SRA, Kabeer (1994) argues that the underlying causes of social inequalities can be found in different institutions (state, market, community and household) which produce and reproduce social relations. Institutions have rules and regulations that guide and constrain individual and organization's behaviour and shape the interaction of human beings. These social relations have an influence on the division of roles and responsibilities in society (March et al. 1999). The framework focuses on relationships and negotiations between people and their relationship to resources and activities. It specifically focuses on gender biases and norms at different institutions ranging from the state, market, community, and family/household. The question that arises is about how performance can be derived from rules or norms of behavior. These institutions create and perpetuate social inequalities among social groups in society. This approach argues that the relationship between social groups within one society determines identities, roles and responsibilities and rights of certain social groups. Social relations between different social groups determine individual access to and control over resources.

The approach argues that rules, like laws, norms, values, and traditions, determine what is done, by whom, how, and to who's benefit, which activities are associated with which social group, how resources are distributed between social groups, who is included in and excluded from certain social groups, and therefore included or excluded from access to resources, responsibilities, and certain positions in hierarchies. Power relations of authority and control between social groups

are based on unequal distributions of resources and responsibilities, which are promoted and legitimized by certain rules. Meinzen-Dick *et al.*, (2014) argue that the ability to use natural resources is often highly gendered, with men and women enjoying differential levels of rights to different kinds of resources, which are embedded in customary and statutory legal institutions. Therefore irrigation water use and management at Nyanyadzi scheme is institutionally mediated.

The social relations approach was applied in order to understand how gender roles and relationships in irrigation water use and management at Nyanyadzi scheme are shaped and perpetuated in different social institutions such as household, community and irrigation water management committee, and how this affects the water use and management rights and opportunities of men and women. The framework provided a richer understanding of how social differences and inequalities in gender roles and responsibilities in water use and management are produced and reproduced by household, community and irrigation water management institutions within the context of Nyanyadzi smallholder irrigation community. Furthermore, the approach states that social relations are not immutable and can be changed by human action (Meinzen-Dick *et al.*, 2014). The SRA approach thus, encourages reflection on the immediate, intermediate and structural causes of inequalities at the different institutional levels. Such an analysis helps to identify suitable development interventions, which benefit both men and women irrigators at Nyanyadzi scheme.

### **2.9.3 The patriarchal ideology concept**

In attempting to understand the gender dynamics in irrigation water use and management, the role of patriarchy was analyzed. The term patriarchy essentially means the rule of the father or the patriarch (Hartmann, 1980). Defined simply, it implies a system in which the father or a male member who is considered as the head of the family, controls all economic and property resources, makes all the major decisions of the family and thereby maintains ongoing control over all members of the family and those related to it (Alcoff, 1990). McFadden (2003) has argued that in the African context patriarchal power entails the silencing and suppression of women including the control of their bodies. Various definitions of patriarchy show that it is a social system that centres on male control of most aspects of women's lives and actions (Sharp and Spiegel 1990; Bourdillon, 1976; Gaidzanwa, 1988). Patriarchy encompasses the totality of structures of domination and exploitation that affect women's position in society (Walby, 1990; Larsson and Schlyter, 1995). Power is disproportionately held by men in a patriarchal society. Feminist theory characterizes patriarchy as an unjust social system that is oppressive to women. The patriarchal

society sets the parameters for women's structurally unequal position in society. The unequal power relationship between men and women accrues power to men such that women have no significant input in the decision making arena. Very clearly, this system establishes male dominance and control over women in society, in general, and particularly so within the family. In the Zimbabwean context, Bourdillon (1976) in his study of the Shona people documented how patriarchy played a role in shaping gender roles and relations. His analysis of patriarchal power and the subordination of women was evident and reflected in gender dynamics in Nyanyadzi irrigation scheme.

Although formal institutions have been put in place in Zimbabwe to redress gender imbalances, gender inequalities in smallholder irrigation water use and management persist owing to the dominance of patriarchy (Nhundu, 2013; Nhodo *et al.*, 2014). The patriarchal customary law systems exclude women from property ownership despite the existence of statutory laws that recognize women's property rights. Gender relations in a society which practice patriarchy are skewed in favour of men (Blackden and Canagarajah, 2003; Bradshaw 2002; March *et al.*, 1999). Compared to men, women have been shown to command limited ownership of, access to and control over land and water resources. In most sub-Saharan African communities, gender ideologies and social norms deny women the right to equal inheritance of property such as land, the most important signifier of wealth and basis of livelihood construction in the predominantly agricultural-based economies of the region. For example, about 70 to 90 percent of formal owners of farmland are men in many Latin American countries (Herrera *et al.*, 2017), and similar patterns are seen in Sub-Saharan Africa (Doss 2005; Gaidzanwa, 2005). This gendered pattern means that women are strategically dispossessed of the means of production and the products they produce.

Patriarchal social structures and institutions are the underlying cause of social and cultural attitudes that buttress gender inequalities. A closer analysis of the concept could provide a clear picture of the gender dynamics present in small scale irrigation water use and management at Nyanyadzi irrigation scheme. This is because the concept shapes and determines gender relationships and rights in a society.

#### **2.9.4 Participation**

Participation is one of the key concepts that is explored in this study. Participation of stakeholders at local level is evolving worldwide as a mechanism to address complex environmental problems

such as water resource management. The nature and extent of participation between men and women in agriculture water management is influenced by various socio-cultural, socio-economic and socio-political factors. In this study, these various factors were analysed in order to bring forth the gender dynamics inherent in irrigation water use at Nyanyadzi scheme. It is viewed from a broader perspective involving the 'who', 'how' and 'why' of participation. As Agarwal (2001:1624) writes: there are different views "on how participation is defined, whom it is expected to involve, what is expected to achieve, and how it is to be brought about." Definitions of participation range from the narrow perspective where it is defined in terms of nominal membership in a group, to a broad perspective where participation is seen as a dynamic interactive process in which different groups have voice and influence in decision making (Agarwal, 2010).

This study drew on the Arnstein (1969) ladder of citizen participation and Agarwal's (2001; 2010) typology of participation. Arnstein's ladder of citizen participation, interpret the importance of how the space for participation is created, closed, invited or invented. Agarwal identifies the following forms of participation: nominal, passive, consultative, activity specific, active and interactive (empowering) participation. The typology distinguishes different levels of participation, from passive participation, which encompasses being informed of decisions at meetings, to interactive participation, where one can have a voice on the decision made and/or hold a position in local decision making. She also identifies the "striking neglect of a gender perspective on who participates, what effects this has, and what factors constrain participation" (Agarwal, 2001:1624). This study offers such a gendered analysis. The participation of men and women is positioned in gender relations and arenas (Mandara *et al.*, 2017). Gender relations are the socially constructed practices that manifest themselves in the division of labour, roles, responsibilities and resources between men and women, based on attitudes, perceptions and behavioural patterns while the gender arenas in this study include the household/domestic setting in which water is needed, used and managed, and the community, in which irrigation water is governed through irrigation management committee.

Cornwall (2002) suggests that, invited spaces and opportunities to participate that are made available are often structured and owned by those who provide them, no matter how participatory they may seek or seem to be. This study will therefore, delve into the nature and extent of participation between men and women in small scale irrigation water management at Nyanyadzi irrigation scheme.

### 2.9.5 Levels of Community Participation

Several authors (Arnstein 1969; Pretty 1995; Agarwal 2010) have suggested ladders of participation which classify it into different forms, levels and degrees. This classification is based on the nature and extent at which participation occurs in the development project cycle. The levels of participation presented in Table 2.1 range from participation being essentially an act of manipulation to a degree of participation in which stakeholders become partners in the development initiative and assume full responsibility for its management. According to Pretty (1995), manipulation is central to modes one and two and implies that the level of participation is questionable. Brett (2003) conceptualizes these levels in terms of weak and strong participation. He regards weak participation as that which involves informing and consulting stakeholders while strong participation means partnership and control. Arnstein (1969) argues that at the symbolic level, people are allowed to participate, but are not given the opportunity to change programmes to their own needs. As a result, the status quo in power relations is maintained. Here, grassroots participation can be said to be the illusion of a voice without the voice itself. Relating these levels of participation (Table 2.1) to dimensions of participation in section 2.4, the first five modes can be interpreted as participation as means while the last three levels can be viewed as participation as an end (Pretty, 1995).

The problem that has been labelled against these levels is that they imply coherence, when in reality most development organizations operate simultaneously within a wide range of participatory modes (Mosse, 1996). Cornwall (2008) laments that one level on the continuum is not necessarily better than any other as different levels are appropriate at different times and contexts to meet the expectations and interests of different stakeholders. Cornwall (2008) further asserts that in practice all the forms and meanings of participation identified in Table 2.1 may be found in a single project or at different stages in a project. Some levels of participation can even happen simultaneously. Uphoff (1992) shares the same view and argues that even if these levels of participation are distinguishable, there are usually connections and feedback among them. For example, participation in decision making is likely to contribute to participation in benefits.

The nature of activities or decisions to be undertaken determines the level and type of participation that is attainable. On the same note, the World Bank (1996) states that participation is a rich concept that means different things to different people in different settings. Hence different types and levels of participation are appropriate in different situations and at different stages of the project. The categorization of the various levels of participation clarifies the confusion between

non-participation, symbolic participation and genuine participation. Arnstein (1969) explains that this classification is necessary because it lays bare how professionals and policy makers manipulate people in the garb of community participation projects. Therefore, this classification should be considered on the basis of identifying the real motives behind participatory projects.

Also, Table 2.1 reveals that participation as it relates to development work, is a multi-dimensional and dynamic process. There is a wide range of opinions and interpretations on what constitutes participation, especially considering the context and background to which participation is applied.

## **2.10 Identified Knowledge Gaps**

Table 2.2 provides a summarized version of the current literature (2014-2018) consulted in the review of literature in this study. Literature reviewed has revealed some gender gaps in irrigation water use in smallholder farming. One of the knowledge gaps identified from literature review is related to the issue of access to irrigation water. The studies by Leite (2010) and Udas (2014) do not provide the actual magnitude and effects of gender dynamics to irrigation water use and access in smallholder irrigation farming. Udas (2014) indicated that there are formal and informal means of accessing water by women and men. However, the implications of such informal interactions have not been adequately explained. More contextual research is needed to explain these less understood aspects of gendered irrigation water and how they impact on both men and women. Hence, this study intended to cover that knowledge gap.

Literature, (Bob & Bangura, 2014; Knapman & Sutz, 2015) has indicated that gender influences how communities and institutions are organized, how decisions are made, how resources are accessed, shared and used, not much is known about the gender dynamics in smallholder irrigation water use. There is, therefore, need to contextualise the use of irrigation water taking into consideration the social, historical, economic and political context in which it is used. The study investigated into the social interactions that occur in the use of irrigation water smallholder farmers at Nyanyadzi irrigation scheme.

**Table 2.1 Levels of Community Participation**

Level of participation	Mode of participation	Type of participation	Key elements
Non-Participation	Co-opted	Manipulative participation	Tokenism, participation is pretense people have no real power. The developers run the projects without any listening to local people's opinions.
	Inactive	Passive participation	People participate by being told what is going to happen or has already happened. It is a unilateral announcement by leaders or project management without listening to people's responses or even asking their opinion.
		Participation in Information Giving	People participate by answering questions posed by extractive researchers using questionnaire surveys or similar approaches. People do not have opportunity to influence proceedings, as the findings of the research are neither shared nor checked for accuracy. The main drawback at this stage is that emphasis is placed on one-way communication, with neither channel for feedback nor power for negotiation.
Symbolic Participation	Consulted	Participation by consultation	This level entails two-way communication, where stakeholders have the opportunity to express suggestions and concerns, but no assurance that their input will be used at all or as they intended. The most frequent approaches to consultation are chaired meetings where stakeholders do not contribute to the agenda, public hearings, and surveys.
	Cooperating	Participation by material incentives	People participate by providing resources e.g. their time or labour. Outsiders decide agenda and direct the process. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.
	Collaboration	Functional participation	Local people work together with outsiders to determine priorities. Such involvement tends to occur after major decisions have already been made by outsiders. Responsibility remains with outsiders for directing the process
Genuine Participation	Co-learning	Interactive participation	People have greater involvement and their rights are recognized and accepted. People participate in joint analysis of problems, which leads to action plans and the formation of new local groups or the strengthening of existing ones.
	Collective Action	Self-mobilization	Here stakeholders interact in order to understand each other and arrive at negotiated positions which are tolerable to the entire group. They take initiatives independent of external institutions to change system/situation. They set the agenda and mobilize to carry it out. A common drawback is that vulnerable individuals and groups tend to remain silent or passively submit to any ideas.

Adapted and Modified from Agarwal, (2001; 2010) Arnstein (1969), Pretty (1995),

**Table 2.2 Summary of Current (2014-2018) Literature used in Literature Review**

Reference	Study Title	Study Problem	Research/Knowledge Gap
<b>South Asia</b>			
Zwarteveen, (2017).	Hydrocracies, Engineers and Power: Questioning Masculinities in Water	A review paper which critically disentangles how the irrigation profession becomes or is made masculine.	The continued masculinity of irrigation is a problem that urgently requires critical investigation.
Johansson (2016)	How integrated are women and gender in Integrated Water Resource Management? - a Discourse Analysis	The thesis examines how gender and women are included, constructed and represented in Integrated Water Resource Management in Cambodia and Zambia	The inclusion of women and gender issues is still not evident within water management
Udas (2014)	Gendered Participation in Water Management in Nepal: Discourses, Policies and Practices in the irrigation and Drinking Water Sectors	How do gender discourses, organizational /professional cultures, and power relations structure the outcomes and processes of planned efforts to increase women's participation in irrigation and drinking water users' organizations?	Attempts to improve women's participation in formal domains of user organization will not be enough by themselves to ensure users' access to water and redress gender-based inequities in water in access to and control over water.
Nang & Ouch, (2014).	Gender and Water Governance: Women's Role in Irrigation Management and Development in the Context of Climate Change in Cambodia (Kampuchea).	This study aims to establish women's roles and constraints of women's major challenges in water resource management	Findings, suggest that traditional attitudes and gender stereotypes put as pressures on women to remain subordinate to men in every aspect of their daily lives
Bossenbroek & Zwarteveen (2014).	Irrigation Management in the Pamirs in Tajikistan: Man's Domain?	This article uses a detailed gendered analysis of farming and irrigation practices in 2 villages in Gorno Badakhshan to further reflect on the linkages between formal institutions—focusing on water rights—and women's agency.	Appreciating gender differences in irrigation management in terms of equity or agency requires looking beyond the boundaries of the system, placing it in a broader historical and socio-economic livelihoods context.
<b>South America</b>			
Herrera, <i>et al</i> , 2017	Smallholder farming in Brazil: An overview for 2014.	The study aims to generate a portrait of family farming in Brazil in 2014.	The analyses show that family farming continues to grow and plays an important role in Brazilian agricultural production
Rinkus <i>et al.</i> , 2017	Ninguém Me Chama - Nobody Asked Me: Gendered Patterns of Participation in sea Turtle Conservation in Northeast Brazil	This research examines the role of gender in sea turtle conservation participation and whether gendered patterns of access, attitudes and beliefs, and social networks provide sufficient explanation.	Findings indicate that men and women's participation in conservation is more likely a result of access and agency than conservation perceptions.
De Moraes, (2015).	Advances and setbacks in women's participation in water management in Brazil.	The effectiveness of participatory water management practices is seldom examined from a feminist perspective. This article establishes a methodological framework for such an inquiry, drawing on ecofeminist theory and the Brazilian concept of 'feminist transformative leadership' to consider gender, race and class aspects of participatory water management in Brazil.	Despite Brazil's progressive water governance system, there is little indication yet that poor women are moving into positions of leadership on water management issues.
<b>sub-Saharan Africa Studies</b>			
Bob & Bangura, (2014)	Contextualizing and conceptualizing gender and climate change in Africa	This review paper provides an overview of the gender and climate change debates, in Africa which include women as consumers, access to land and natural resources, agricultural production and food security, health aspects, security issues and adaptation and mitigation support.	The review highlighted in the need for development of appropriate interventions and policies that require more detailed information on dynamics at the local level and utilising a gender perspective which provides a critical lens to assess socially differentiated impacts as well as consider the needs and concerns of diverse groups in society.
Knapman & Sutz, (2015)	Reconsidering approaches to women's land rights in sub-Saharan Africa	Discussions around gender equality in land governance in sub-Saharan Africa often highlight the fact that only a small percentage of women own land, and many projects addressing land and gender in the region focus on women's ability to acquire land. But this framing does not fully convey the breadth of challenges women face in relation to land stewardship	The way in which environmental resources such as water are managed is shaped by social and structural expectations and formal and informal institutions. This briefing suggests that any attempt to tackle gender inequalities in land governance must also take into account local contexts and gender dynamics.

Reference	Study Title	Study Problem	Research/Knowledge Gap
<b>East Africa</b>			
Caretta, (2015).	East African Hydropatriarchies: An analysis of changing waterscapes in smallholder irrigation farming.	The study investigates the factors behind the consistent marginalization of women from water management and their subordinated role in agricultural production.	This thesis provides insights that are important both for the planning of current irrigation schemes and the rehabilitation or the extension of older systems.
Mandara <i>et al</i> , 2017	Women and Rural Water Management: Token Representatives or Paving the Way to Power?	This paper discusses how informal structures intersect with women's participation in formally created decision-making spaces for managing domestic water at the village level in Tanzania.	The results reveal the influence of the informal context on women's access to and performance in the formal decision-making spaces.
Fikirie (2016)	The Role Of Gender In Small Scale Irrigation Agriculture Among Smallholder Farmers In Lume District In The Central Rift Valley Of Ethiopia	the role of gender in small scale irrigation among smallholder farmers	The study concluded that gender has significant roles and implications in small scale irrigation agriculture through its direct influence in participation, labour division, crop preference and involvement in income generating activities.
<b>Southern Africa</b>			
Zawe, <i>et al</i> , (2015).	'Trends and Outlook: Agricultural Water Management in Southern Africa'	The study focus on national agricultural water management in Malawi, South Africa, Zambia and Zimbabwe	Zimbabwe has a definite need to create an irrigation policy that provides enabling conditions for smallholder irrigation. The policy should empower local individuals and institutions, such as IMCs, by legalizing them and providing.
Khumalo, (2014).	Exploring the role of women in subsistence and smallholder farming: implications for horticultural crop value chain development in Swayimane and Sweetwaters, KwaZulu Natal, South Africa	The study examines the influence of gender and the role of women in subsistence and smallholder agriculture.	Women in both study areas play an important role in providing food for their families compared to their male counterparts but are faced with various gender based constraints such as access to assets crucial for production. They lack access to land, water, credit, infrastructure, strong extension service and other institutional support.
Nkhoma & Kayira 2016	Gender and power contestations over water use in irrigation schemes: Lessons from the lake Chilwa basin, Malawi	The study analyses how water scarcity has affected the relationship between men and women in the irrigation schemes of Lake Chilwa basin in Southern Malawi.	Using the existing political and traditional structures in the management and use of water, women have competitively managed to gain monopoly over water, and sometimes outdone their male counterparts.
<b>Zimbabwe</b>			
Matandare, & Matandare, (2018).	An Assessment of Water Management Practices on Smallholder Surface Irrigation Schemes: Case study of Insukamini Irrigation Scheme, Lower Gweru, Zimbabwe.	The aim of the paper was to assess the water management practices on smallholder surface irrigation schemes.	The paper concludes that Insukamini irrigation scheme has poor water management practices and recommends that water management practices on smallholder irrigation schemes that use surface irrigation must be improved so that sustainable yields can be attained and productive land may not be lost due to water logging.
Nhodo, <i>et al</i> , 2014	The socio-cultural dynamics in smallholder irrigation schemes in rural Zimbabwe. A case study of Rupike irrigation scheme in Masvingo South, Zimbabwe.	The study examines socio-cultural dimensions to irrigation.	Eminence has been given to the technical and managerial approach to irrigation agriculture at the expense of social needs and aspirations of farmers.
<b>Nyanyadzi</b>			
Kemerink, (2015).	Jumping the queue changing waterscapes under water reform processes in rural Zimbabwe	The thesis studies the implications of the implementation of water reform policies in a catchment within a rapidly changing context due to instability in land tenure and collapse of the national economy.	This case study show how people respond to the changing conditions, including the water reform process, by reordering their physical environments and moving their agricultural activities upstream, where their water use is regarded illegal yet cheaper and more secured.

Regarding participation and decision-making in smallholder irrigation water management, studies by (Zwarteveen, 2008; Udas, 2014; Rinkus *et al.*, 2017) show that disadvantaged groups are often excluded. The local water world is dominated by men and more privileged groups, who seem to be more represented in formal water institutions. However, not much is known about the extent of participation in more transformative modes of participation in water management, such as representation in all processes of decision-making, membership in water institutions, voices, needs and interests from a gender perspective. The study by Kemerink (2015) at Nyanyadzi does not show the gender dimensions of irrigation farming at Nyanyadzi. There has been little focus on the gender dynamics in irrigation water use. Therefore, this study sought to fill the above critical knowledge gaps in gender and irrigation water use, using a case study of Nyanyadzi smallholder irrigation scheme in the eastern rural part of Zimbabwe. The next Chapter covers the study methodology adopted to implement the study.

## REFERENCES

- Agarwal, B. (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. *World Development*, **29(10)**:1623-1648.
- Agarwal, B. (2010). Does women's representation strength affect their participation? Governing local forests in South Asia. *World Development*, **38(1)**:98-112.
- Akudugu, J.A. (2013). Sustainability Concerns of Smallholder Irrigation Schemes in the Bawku Municipality of Ghana. *Environmental Management and Sustainable Development*, **2(1)**:154-166.
- Bolding, A. (1996). Wielding water in unwilling works: Negotiated management in water scarcity in Nyanyadzi irrigation scheme, winter 1995. pp. 69-101, In Manzungu, E. and Van Der Zaag, P. (eds). *The practice of smallholder irrigation: Case studies from Zimbabwe*. University of Zimbabwe, Harare, Zimbabwe.
- Bob, U. and Babugura, A. (2014). Contextualizing and conceptualizing gender and climate change in Africa, *Agenda*, **28(3)**: 3-15.
- Bossenbroek, L. and Zwarteveen, M. (2014). Irrigation Management in the Pamirs in Tajikistan: A Man's Domain? *Mountain Research and Development*, **34(3)**: 266-275.
- Bourdillon, M. (1976). *The Shona Peoples: Revised Edition*, Mambo Press, Gweru.
- Caretta, M. A. (2015). *East African Hydropatriarchies: An analysis of changing waterscapes in smallholder irrigation farming*. PhD Thesis, Stockholm University. Sweden: Holmbergs.
- Chibisa, P., Mautsa, A. and Mukoto, B. (2008). Smallholder Irrigation Schemes in Nyanga North as Strategies for Poverty Reduction and Sustainable Rural Livelihoods. *Journal of Sustainable Development in Africa* **10(2)**: 653-676.
- Chifamba, E., Nyanga, T. and Gukurume, S. (2013). Irrigation Water Pricing and Cost Recuperation for Sustainability of Irrigation Projects in Nyanyadzi, Zimbabwe. *Russian Journal of Agricultural and Socio-Economic Sciences*, **3(15)**: 39-53.
- Chant, S. (2013). 'Cities through a "Gender Lens": A Golden "Urban Age" for Women in the Global South?' *Environment and Urbanization*, **25(1)**: 9-29.
- Cleaver, F. (1998). Incentives and informal institutions: Gender and the management of water, *Agriculture and Human Values*, **15**: 347-360.

Cleaver, F and Hamada, K. (2010). 'Good' water governance and gender equity: a troubled relationship, *Gender and Development*, **18(1)**: 27-41.

Clement, F. (2012). Literature Review: Gender and water management organisations in Bangladesh. G3: Water Governance and Community Based Management. International Water Management Institute. Dhaka, Bangladesh: CPWF. Available online at <http://hdl.handle.net/10568/35138> Accessed 16 July 2015.

Conway, D. and Schipper, E.L.F. (2011). Adaptation to climate change in Africa: Challenges and opportunities identified from Ethiopia. *Global Environmental Change*, **21(1)**: 227-237.

Cousins, B. and Chikazunga, D. (2013). Defining smallholder farmers in South Africa. A brief note developed by Ben Cousins and Davison Chikazunga. *Institute for Poverty, Land and Agrarian Studies (PLAAS), University of the Western Cape for an Innovation Lab on 13-14th August 2013*.

Dasthagir, K. G. (2012). Fencing Women in Water User Associations. An Appraisal of Gender Strategy for Participatory Irrigation Management in Tamil Nadu. *Water Policy Research Highlight* **24**.

Delgado J. V. and Zwarteveen, M. (2007). The public and private domain of the everyday politics of water: The constructions of gender and water power in the Andes of Peru. *International Feminist Journal of Politics*, **9(4)**: 503–511.

De Moraes, A.F.J. (2015). Advances and setbacks in women's participation in water management in Brazil. In Buechler, S. and Hanson, A.M. S. (eds.). *A Political Ecology of Women, Water and Global Environmental Change*. London: Routledge. New York, NY, USA, 2015; pp. 77–97

Derman, B., Ferguson, A. and Gonese, F. (2000). "Decentralization, Devolution, and Development: Reflections on the Water Reform Process in Zimbabwe." Madison, WI: BASIS CRSP.

Food and Agriculture Organization (1999). *Zimbabwe: Smallholder Irrigation Development Project*. Preparation Report, Volumes 1-3. Report No 99/030 ADB-ZIM. Rome.

Food and Agriculture Organization (2015). Towards a water and food secure future. Critical perspectives for policy-makers. White paper. Rome: Food and Agriculture Organization of the United Nations and Marseille: World Water Council.

Food and Agriculture Organization (2012). Men and women in agriculture: closing the gap. Available online: <http://www.fao.org/sofa/gender/did-you-know/en/> [Accessed 2016-07-01]

Food and Agriculture Organization, (2013). FAO Policy on Gender Equality. Attaining Food Security Goals in Agriculture and Rural Development. Rome: FAO.

Gaidzanwa, R. B. (1988). Women's Land Rights in Zimbabwe: An Overview. Occasional Paper, No 13, Department of Rural and Urban Planning, University of Zimbabwe.

Hallensleben, N. (2012). Characterizing Poor Smallholder Farmers in Nicaragua: Factors Influencing the Success or Failure of Micro-Irrigation Users. Master's Thesis, University Of St. Gallen, Nicaragua.

Hazell, P. (2011). Five Big Questions about Five Hundred Million Small Farms. *Conference on New Directions for Smallholder Agriculture*, 24-25 January 2011, Rome, and IFAD HQ.

Herrera, G.P., da Costa, R. B., de Moraes, P. M., Mendes, D.L.F and Constantino, M. (2017). Smallholder farming in Brazil: An overview for 2014. *African Journal of Agricultural Research*, **12(17)**: 1424-1429.

Hussain, I and Hanjra, M. A. (2003). 'Does irrigation water matter for rural poverty alleviation? Evidence from South and South-East Asia. *Water Policy*, **5(5)**: 429-442.

International Fund for Agricultural Development, (Wahaj, R and Hartl, M) eds (2007). Securing water for improved rural livelihoods: The multiple-uses system approach. *Gender and Water*. Available online at: [http://www.ifad.org/gender/thematic/water/gender\\_water.pdf](http://www.ifad.org/gender/thematic/water/gender_water.pdf) [Accessed 16 July 2011]

Jacobs, C., Chitima, M., Klooster, C. E. V., and Bwanali, K. (2013). Determinants of the productivity and sustainability of irrigation schemes in Zimbabwe and pre-investment framework.

Johansson, K. (2016). How integrated are women and gender in Integrated Water Resource Management? – A Discourse Analysis. PhD Thesis, Swedish University of Agricultural Sciences.

Kabeer, N. (1994). *Reversed Realities: Gender Hierarchies in Development Thought*. Verso, London.

Kamwamba-Mtethiwa, J., Weatherhead, K. and Knox, J. (2016). Assessing Performance of Small-Scale Pumped Irrigation Systems in Sub-Saharan Africa: Evidence from a Systematic Review. *Irrigation Drainage*. 65: 308 – 318.

Kemerink, J. S. (2015). Policies lost in Translation? Unravelling water reform process in an African waterscapes. PhD Thesis: Delft University of Technology Netherlands. Taylor and Francis, Leiden.

Khumalo, S. (2014). Exploring the role of women in subsistence and smallholder farming: implications for horticultural crop value chain development in Swayimane and Sweetwaters. Masters' Thesis, African Centre for Food Security, Food Security Programme, School of Agricultural, Earth and Environmental Sciences. Pietermaritzburg University of KwaZulu-Natal, South Africa.

Knapman, C. and Sutz, P. (2015). 'Reconsidering approaches to women's land rights in sub-Saharan Africa', *International Institute for Environment and Development (IIED) Policy Briefing* 17310.

Kroma (2012). Engendering the African Renaissance in Agriculture. Available online at: <http://agragender.wordpress.com/about-2/> [Retrieved on 28/05/12].

Kulkarni, S. (2011). "Women and Decentralised Water Governance: Issues, Challenges and the Way Forward. *Economic and Political Weekly*, **XLVI (18)**: 64-72.

Leite, M. (2010). After the summit: women's access to water and policy making in Brazil, *Gender and Development* **18(1)**: 69-79.

Lambrecht, I. (2016). As a Husband I Will Love, Lead, and Provide." Gender as a Social Construct in Shaping Women's Access to Land in Ghana. *Paper prepared for presentation at the 2016 World Bank Conference on Land and Poverty* The World Bank - Washington DC, March 14-18, 2016.

Magadlela, D. (1999). 'Irrigating Lives: Development Intervention and Dynamics of Social Relationships in an Irrigation Project'. PhD thesis, Wageningen University, Wageningen, The Netherlands.

Manzungu, E and van der Zaag, P. (1996). Introduction, In Manzungu, E and van der Zaag, P (eds.). *The practice of smallholder irrigation: Case studies from Zimbabwe*. Harare: University of Zimbabwe.

Manzungu, E. (1999). Strategies of smallholder irrigation management in Zimbabwe. PhD thesis, Wageningen University, Wageningen, The Netherlands.

Manzungu, E. and Kujinga, K. (2002). The theory and practice of governance of water resources in Zimbabwe. *Zambezia*, **29(2)**: 191-212.

Manzungu, E. (2006). "The role of regional water resources management in addressing food security challenges in southern Africa," in Hollingworth, B.; and Chiramba, T. (Editors), *Implementing the SADC Regional Strategic Action Plan for Integrated Water Resources Management (1999-2004): Lessons and best practice*, InWent, GTZ, SADC, UNDP, Gaborone, pp.111-115.

Matandare, M. A. and Matandare, T. O. (2018). An Assessment of Water Management Practices on Smallholder Surface Irrigation Schemes: Case study of Insukamini Irrigation Scheme, Lower Gweru, Zimbabwe. *International Journal of Progressive Sciences and Technologies (IJPSAT)*, **6(2)**: 235-242.

Meinzen-Dick, R.S., and M. Bakker. (2001). Water rights and multiple water uses: Issues and examples from Kirindi Oya, Sri Lanka. *Irrigation and Drainage Systems*, **15(2)**: 129-148.

Meinzen-Dick, R.S. (2002). Shared water use in irrigation systems. *Agriculture and Rural Development*, **9(2)**: 21-23.

Meinzen-Dick, R., Kovarik, C and Quisumbing, A. (2014). Gender and sustainability. *Annual Review of Environment and Resources*, **39**: 29–55.

Mnkeni P.N.S, Chiduza C, Modi A.T, Stevens J.B. and Monde, N. (2010) Best Management Practices For Smallholder Farming On Two Irrigation Schemes In The Eastern Cape And Kwazulu-Natal Through Participatory Adaptive Research. WRC Report No. 578/2/00. Water Research Commission, Pretoria.

Motsi, K. E., Zirebwa, J. and Machingambi, L. (2001). Assessment of the smallholder irrigation performance: Management of conveyance and distribution infrastructure at Murara and Nyamatanda north-east of Zimbabwe. *Journal of Applied Science in Southern Africa*, **7(1)**: 9-22.

Moyo, T. (2016). The contribution of smallholder irrigation farming to rural livelihoods and the determinants of benefits distribution: The case of Limpopo Province South Africa. PhD Thesis: University of Pretoria, South Africa.

Mtisi, S and Nicol, A (2003) “Caught in the Act: New Stakeholders, Decentralisation and Water Management Processes in Zimbabwe.” Sustainable Livelihoods in Southern Africa Research Paper 14. Brighton, UK: Institute of Development Studies, University of Sussex.

Mujere, N. (2011). River flow variations and crop yields at Nyanyadzi Irrigation Scheme: Effects of river flow variations on irrigated crop yields at Nyanyadzi Irrigation Scheme in Zimbabwe. Lambert Academic Publishing, Saarbruken, Germany.

Murphy, S. (2010). *Changing perspectives: Small-scale farmers, markets and globalisation*. London: International Institute for Environment and Development (IIED); The Hague: Hivos.

Mutambara, S., Darkoh, M.B.K. and Athhopheng, J.R. (2017), “Water supply system and the sustainability of smallholder irrigation in Zimbabwe”, *International Journal of Development and Sustainability*, **6(7)**; 497-525.

Mutiro, J. and Lautze, J. (2015). Irrigation in Southern Africa: Success or failure? *Irrigation and Drainage*, **64**: 157–298.

Nang, P. and Ouch, C. (2014). Gender and Water Governance: Women’s Role in Irrigation Management and Development in the Context of Climate Change in Cambodia. *Cambodia Development Resource Institute Working Paper Series No. 89*

Nhodo, L., Mafongoya, O. and Dube, K. (2014). The socio-cultural dynamics in smallholder irrigation schemes in rural Zimbabwe. A case study of Rupike irrigation scheme in Masvingo South. *Journal of Social Anthropology* **5(2)**: 247-255.

Nhundu, K. (2013). Effectiveness of Irrigation Water Management Institutions in Zimbabwe: A new institutional economic theory approach. PhD thesis, University of Fort Hare, South Africa.

Okali, C. and Keats, S. (2015). Changing gender relations in a changing rural environment: what is the evidence. ODI Report. London: Overseas Development Institute

Pazvakavambwa, G. T. and Van Der Zaag, P. (2000). The value of irrigation water in Nyanyadzi smallholder irrigation scheme, Zimbabwe. Paper presented at the 1st WARFSA/WaterNet Symposium: Sustainable use of water resources. Maputo, 1-2 November 2000. Maputo.

Phiri, K. (2012). Gender Irrigation Schemes and the Empowerment Question: Untold Experiences of Communal Irrigation Plot Holders in Zimbabwe. Lambert Academic Publishing, Saarbruken, Germany.

- Quisumbing, A. R. and Pandolfelli, L. (2010). Promising approaches to address the needs of poor female farmers: resources, constraints, and interventions. *World Development*, **38(4)**: 581-592.
- Rinkus, M. A, da Cal Seixas, S. N. and Dobson T. (2017). Ninguém Me Chama - Nobody Asked Me: Gendered Patterns of Participation in sea Turtle Conservation in Northeast Brazil. *Human Ecology*, **45(4)**: 487–498.
- Rukuni, M. and Makhado, J. (1994). Irrigation development pp 127-139, In Rukuni, M and Eicher, C.K. (eds.), *Zimbabwe's Agricultural Revolution*. University of Zimbabwe Publications. Harare, Zimbabwe.
- Samakande, I. (2002). Improving the performance of smallholder surface irrigated schemes. pp. 151-158. In: Manzungu E. (Ed.). *The processes and dynamics of catchment management in Zimbabwe*. Save Africa Trust Publications, Harare.
- Shumba, D. (2011). Women and Land: A Study on Zimbabwe. *Journal of Sustainable Development in Africa*. **13(7)**: 236 -244.
- Simiyu, R. (2012). "I don't tell my husband about vegetable sales": Gender aspects of urban agriculture in Eldoret, Kenya. *African Studies Collection*, vol. 46 Leiden: African Studies Centre.
- Singh, N. (2006). Women's Participation in Local Water Governance: Understanding Institutional Contradictions. *Gender, Technology and Development*, **10(1)**: 61-76.
- Singh, N. (2008). "Equitable Gender Participation in Local Water Governance: An Insight into Institutional Paradoxes." *Water Resources Management* **22**: 925-942.
- Sinyolo, S., Mudhara, M., and Wale, E. (2014). The Impact of Smallholder Irrigation on Household Welfare: The Case of Tugela Ferry Irrigation Scheme in KwaZulu-Natal, South Africa. *Water SA*, **40(1)**: 145-156.
- Soomro, A. (2013). Participation of women in irrigation and water management in Sindh on-farm water management and irrigation system rehabilitation project. TRITA-LWR Degree Project 13:10
- Svubure, O. and Zawe, C. (2010). The Elusive Multiple Uses Of Irrigation Water: Some of the Forgotten Issues in Smallholder Irrigation Schemes Designing in Zimbabwe. *Sustainable Development in Africa*, **12(3)**: 70-86.
- Todaro, M.P and Smith, S.C. (2009). Economic development, 10th edition. USA: Addison Wesley.

Udas, P.B. (2014). Gendered Participation in Water Management in Nepal: Discourses, Policies and Practices in the irrigation and Drinking Water Sectors. PhD thesis, Wageningen University, Wageningen, the Netherlands.

van Averbeke, W., Denison, J. and Mnkeni, P.N.S. (2011). Smallholder irrigation schemes in South Africa: A review of knowledge generated by the Water Research Commission. *Water South Africa*, **37(9)**: 797-808.

van der Zaag, P., Bolding, A. and Manzungu, E. (2001). Water-networks and the actor: the case of the Save River Catchment, Zimbabwe. In: Hebinck, P and Verschoor, G. (Eds.), Resonances and dissonances in development; actors, networks and cultural repertoires. Van Gorcum, Assen; pp. 257-279.

van Koppen, B., Khumbane, T., de Lange, M., and Mohapi, N. (2006). Gender and agricultural productivity: Implications for the revitalization of smallholder irrigation schemes program in Sekhukhune District, South Africa. In K. Lahiri-Dutt (Ed.), Fluid bonds: Views on gender and water. Calcutta: Stree

van Koppen, B., Cossio Rojas, V. and Skielboe, T. (2012). Project politics, priorities and participation in rural water schemes. *Water Alternatives*, **5(1)**: 1-15

van Koppen B., Hope L. and Colenbrander, W. (2013). Gender aspects of smallholder private groundwater in irrigation Ghana and Zambia, *Water International*, **38(6)**: 840-851.

Wahaga, E. (2018). "The gendered nature of productive and reproductive roles in the agricultural sector", *International Journal of Development and Sustainability*, **7(1)**: 120-146.

Walker, M. M. (2006). Women, Water Policy, and Reform: Global Discourses and Local Realities in Zimbabwe. *Women and International Development*, Working Paper #287, Michigan State University, United States of America.

Wang, J., Huang, J., Zhang, L., Huang, Q., and Rozelle, S. (2010). Water governance and water use efficiency: The five principles of WUA management and performance in China. *Journal of the American Water Resources Association*, **46(4)**: 665-685.

Zawe, C., Madyiwa, S and Matete, M. (2015). 'Trends and Outlook: Agricultural Water Management in Southern Africa'. Country Report Zimbabwe. Southern Africa Regional Program of the International Water Management Institute.

Zimbabwe National Water Authority Act. (1998). Chapter 20: 25. Harare, Government Printers.

Zimbabwe Water Act. (1998). Government Printers, Harare.

Zwarteveen, M. (2008). Men, masculinities and water powers in irrigation. *Water Alternatives*, **1(1)**: 111-130.

Zwarteveen, M. (2010). "A Masculine Water World: The Politics of Gender and Identity in Irrigation Expert Thinking", pp 75–98, In Boelens, R., Getches, D and Guevara, A. (eds.), *Out of the Mainstream*. Earthscan, London: UK.

Zwarteveen, M. (2012). Seeing women and questioning gender in water management. In A. Prakash, S. Singh, C. Gurung Goodrich and S. Janakarajan (eds.), *Water Resources Policies in South Asia: Analyzing Regional and Country Experiences*. New Delhi: Routledge, pp. 38-65.

Zwarteveen, M. (2017). Hydrocracies, Engineers and Power: Questioning Masculinities in Water, *Engineering Studies*, **9(2)**: 78-94.

## CHAPTER 3 RESEARCH METHODOLOGY

### 3.1 Introduction

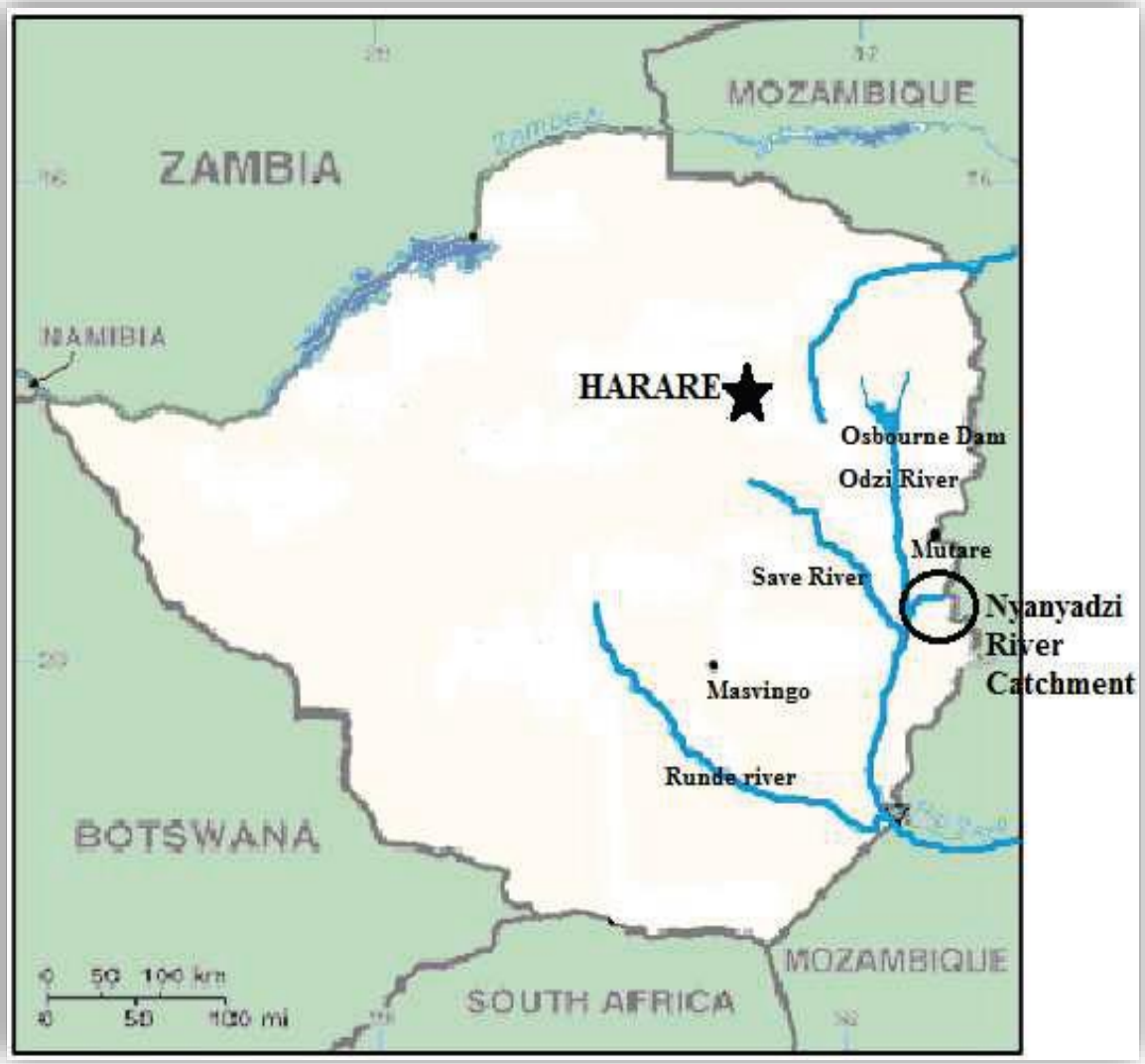
A comprehensive methodology of how the study was conducted is presented in this chapter. Details of the study area, sampling design, data collection and analysis methods as well as the ethical considerations are explained and justified.

### 3.2 Study Site Context

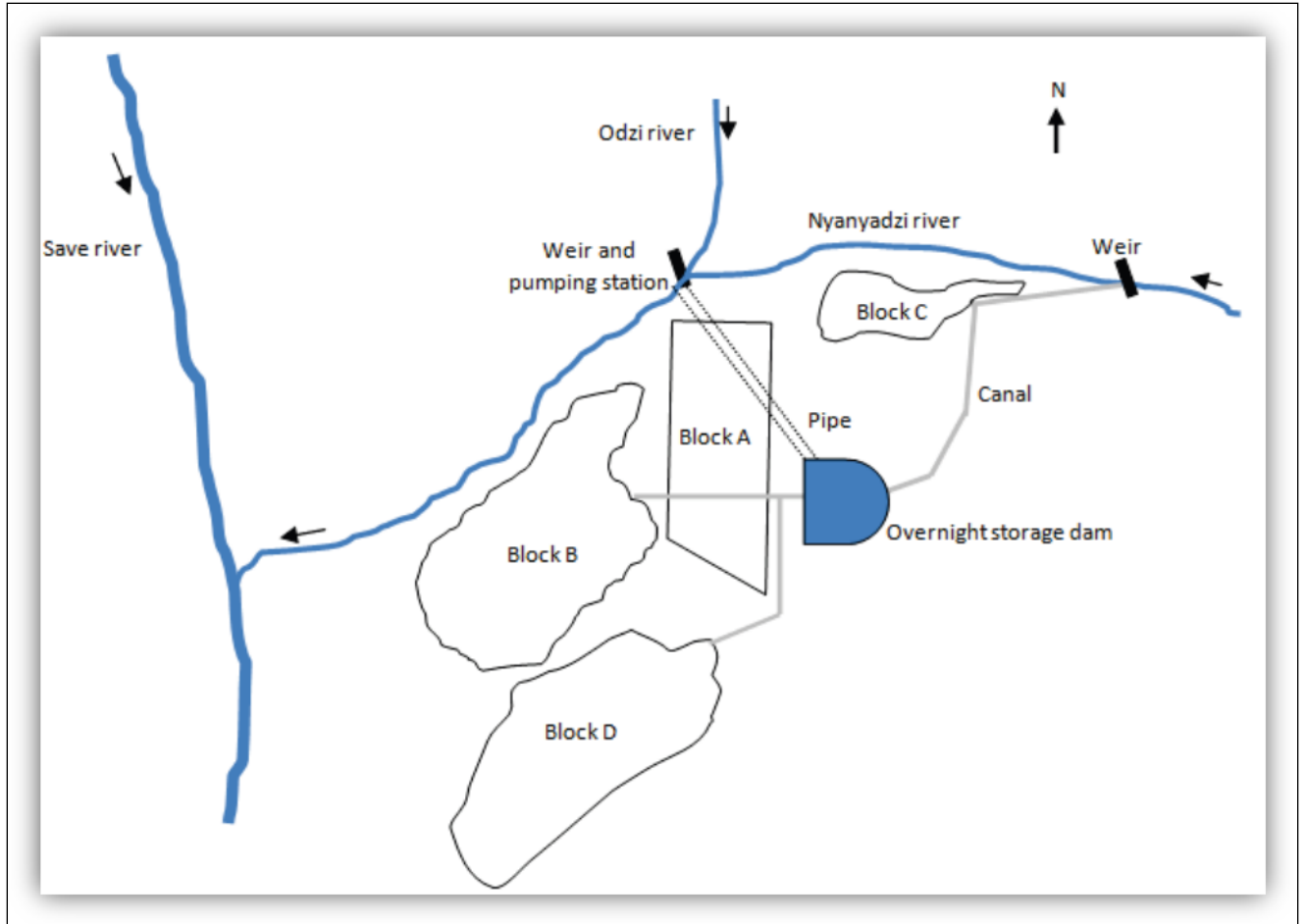
#### 3.2.1 Nyanyadzi Irrigation Scheme

The study was carried out at Nyanyadzi Smallholder Irrigation Scheme which is located in Muusha communal lands in Chimanimani Rural District of Manicaland Province in the eastern part of Zimbabwe (Figure 3.1). Nyanyadzi irrigation scheme lies at the 100 kilometer peg along the Mutare-Birchnough road, south of Mutare in the Manicaland Province of Zimbabwe. Geographically, the scheme lies at an altitude of 530 m above sea level within the Save Valley and on the foot slopes of the Eastern Highlands (Gotosa *et al.*, 2002). The scheme lies at the confluence of Nyanyadzi and Odzi rivers in the Manicaland Province of Zimbabwe. It was established by the then colonial government in 1934 to reduce the vulnerability of peasant farmers from crop failures associated with rain-fed crop production (Bolding, 1996; 1999).

According to Kemerink (2015) Nyanyadzi scheme started off with one block, which is currently referred to as block C, but expanded into three more blocks (Block A, B and D) further downstream (Figure 3.2). It stretches on 412 hectares of land, that are divided into four irrigation blocks; A (131 ha), B (147ha), C (65 ha) and D (69 ha). The layout of the irrigation blocks is indicated in Figure 3.2. The average plot sizes in the Nyanyadzi irrigation scheme decreased as result of subdivision of plots amongst heirs (Bolding, 2004). Each block receives its irrigation water supply between 0600 and 1600 hours depending on need and payment of electricity charges. Water for the irrigation scheme is drawn from Nyanyadzi River catchment which originates from Chimanimani Mountains. Nyanyadzi River is a tributary of Odzi River just before the confluence of the Save River. The scheme supports 721 registered farmers. Farmers use the flood irrigation method to draw water from the canals. Nyanyadzi irrigators pay \$25 for irrigation per one acre of land. The general cropping pattern is maize and groundnuts during summer (October-March), beans, wheat and tomatoes in winter (April-September). In addition, to these there are some profitable horticultural vegetables and mango fruit trees planted on the edges of the plots along the irrigation canals.



**Figure 3.1: Location of Nyanyadzi Small-scale Irrigation Scheme**  
(Zimbabwe National Water Authority, 2012)



**Figure 3:2 Nyanyadzi Irrigation Scheme Block Layout**

(Pazvakavambwa & Van der Zaag, 2000)

### **3.2.2 Physical and Social Landscape of Nyanyadzi**

Nyanyadzi irrigation scheme is located in Nyanyadzi ward 8 of Chimanimani Rural district Council. A dual system of leadership, including both 'traditional' and bureaucratic government structures exists in Nyanyadzi. The structures are supported by legislation that include the Provincial Councils and Administration Act No. 12 (Revised edition of 1996), Rural District Councils Act (Revised edition of 1996) and the Traditional Leaders Act Chapter 29:17 Number 25 of 1998. The Constitution of Zimbabwe also provides for the establishment of traditional leadership in Zimbabwe (EISA Report 2007:79). The head of state appoints traditional leaders who have been selected at local levels according to customary laws.

Nyanyadzi community is densely populated by people of the Ndau tribe. The institution of traditional leadership at Nyanyadzi comprise the Chief at the helm who works with the headman and village heads. These individuals are appointed on the basis of custom which is governed by hereditary, rather than elective democratic principles. Chief Muusha heads the traditional council at Nyanyadzi. The headman assist the chief to carry out his duties. The headman also reports to the chief. Nyanyadzi ward has 6 villages. Each village is headed by a village head who in turn reports to the headman. The village heads are physically closest to the people and thus have most interactions with community citizens. For example, one village head was a member of IMC within the irrigation scheme. The chief's council usually handles water disputes that arise between scheme members and non-members (Chikozho and Latham, 2005). The ward is politically represented by an elected councillor who reports to the Rural District Council.

The agricultural land in the catchment is customarily owned by the chief. No customary rights are specified for ownership of grazing land, forest and water resources (Chikozho and Latham, 2005). Water is viewed as more than the physical form in which it is found. Instead, water is regarded as a divine gift and annually rain making ceremonies take place to worship ancestors (Magadlela, 1999; Vijfhuizen, 1999). It attains a religious dimension and becomes that natural resource the people receive when ancestral spirits are approached to intercede for a successful rainy season, and that natural resource which ancestral spirits make available in certain rivers and springs even in the event of the mother of all droughts (Mtisi and Nicol, 2003). Thus the custodian of water is the chief and his people, and the ultimate owners are the ancestral spirits. The implication is that traditional leaders and communal farmers have access to water because it belongs to them and their ancestors.

Communal land distribution is the responsibility of the chief, although in some cases this has been modernized to include councilors and agricultural extension staff. Traditional leadership has the

authority to allocate communal land. Land for crop fields and homesteads can be privately owned, however grazing areas, rivers, boreholes, wild fruits and firewood are communally owned, and use is controlled by the community. Generally men own the land and women have the right to use it. Women own land in cases where their husbands have died.

The predominant religious practices in Nyanyadzi are Christianity and traditional beliefs. About 80 per cent of people practice Christianity and the main churches are the United Methodist, Roman Catholic, Church of Christ, Zion and Apostolic sects.

The Nyanyadzi river flows from its origins in the eastern highlands of Chimanimani district westward into the Odzi river, which in turn flows into the Save river. The water within the Nyanyadzi catchment originates from the Chimanimani mountains on the border with Mozambique (Kemerink, 2015). Nyanyadzi River has its main tributaries, the Shinja, Biriwiri and Makwe streams which collect water from a catchment area of 800 km<sup>2</sup>. The river has presented two pressing problems. Firstly, its flow tends to decrease to a trickle during the crucial dry season months. Secondly, it tends to deposit increasing amounts of silt in the Nyanyadzi project, choking its diversion weir, main canal and night storage dam. These changes in the river's behaviour pose a threat to the sustained operation of the project, and are attributed by the irrigators to developments upstream.

Nyanyadzi lies in natural region V of Zimbabwe's agro ecological zones. Region V experiences mean annual rainfall of about 490 mm. The rainfall in the area is too low and erratic for the production of maize; the staple crop in Zimbabwe, and is even unreliable for production of drought resistant crops such as millet. This situation makes it difficult to practice rain-fed crop production. This region experiences water stress even when there are normal rains in other regions (Chinguno, 2012). Most of the streams within the catchment are perennial with extreme low flows during winter, from May to August, while most rain falls in summer between November and March. To augment water from Nyanyadzi River, a pipe which draws water from the Odzi River has been constructed. However, abstracting irrigation water from the Odzi River requires power. Currently, electricity to pump water from Odzi is provided by the Zimbabwe Electricity Distribution Company but the costs are prohibitive. Farmers are charged an irrigation fee of \$25 per one acre of land, which is way beyond the reach of the majority of farmers (kemerink, 2015). A lot of farmers could not afford to pay for pump services.

The upstream part of the Nyanyadzi catchment generally has rich loamy soils and with the abundant rainfall is ideal for intensive maize cultivation and fruit production. However, the middle

and downstream parts of the catchment generally have poor sandy soils and farmers use fertilizers and rely on supplementary irrigation to realise a harvest. Temperatures range from 12 to 15°C during the cold season and 18 to 26°C during summer (Pazvakavambwa & van Der Zaag, 2000). Soils are of alluvial origin comprising deep, well-draining sandy loams and clays underlain by coarse river sand (Mujere & Mazvimavi, 2005). Despite Nyanyadzi Irrigation Scheme being a major source of livelihood for many households in ward 8, it requires rehabilitation. Siltation of fields as well as canals and presence of gullies within the irrigation scheme present challenges for sustained crop production.

### **3.2.3 Economic Activities at Nyanyadzi**

Nyanyadzi community has a mixed economy, with subsistence agriculture being the main economic activity. Agriculture is based on extensive rearing of cattle and cultivation of rice, beans, maize on irrigated lands and millet on dry lands. Drought is the main climatic hazard interacting with the socio-economic and biophysical environment to heighten livelihood vulnerabilities of people in Nyanyadzi community. As a result, livelihoods depend on both off and on farm income. The major economic livelihood strategies common in Nyanyadzi Ward include; illegal selling of fire wood/charcoal, informal gold and diamond panners, brick molding, sand abstraction, crafts, village social savings and lending clubs, vending, bee keeping , and casual labour in exchange for food and cash.

The advent of formal mining operations in Marange in 2009 brought an end to thriving informal diamond mining and trade activities around Nyanyadzi community. Presently, increased security measures in the diamond fields have driven most remaining illegal panners out of Marange diamond fields to seek alternative shelter in communities around Nyanyadzi, Chakohwa, Chasiyama and Hot Springs business centres (Simango, 2015). These panners linger around during the day whilst waiting for opportunities to pounce into mining concessions to pan for diamonds. Members of the Nyanyadzi community and business operators regard panners as their source of income because they promote their retailing and vending businesses.

Infrastructure wise, there is a tarred main road which connects the Nyanyadzi community with the provincial capital (Mutare). There is a rural service center in Nyanyadzi which has a few retail shops. The centre offers a variety of services including a post office, a training centre and a health centre. There is a government owned clinic which has 29 general beds and 6 maternity beds. Nyanyadzi rural service centre is electrified, has telephone services and has piped water as well as the surrounding villages. However, it has a poor cellphone network reception. There are 3 dip

tanks owned by the Rural District Council and 1 animal health and management centre owned by the council.

### 3.3 Research Design

A sequential exploratory mixed methods research design was used to conduct this study whereby the collection and analysis of qualitative data was followed by a collection and analysis of quantitative data. The study adopted a single case of Nyanyadzi smallholder irrigation scheme. As shown in Figure 3.3, this type of research design is characterized by an initial qualitative phase of data collection and analysis, followed by a phase of quantitative data collection and analysis, with a final phase of integration or linking of data from the two separate strands of data (Berman, 2017).

The sequential exploratory research design was selected because of its ability to broadly explore and understand the gender dynamics in irrigation water use and the ability of quantitative data to explain and confirm relationships found in the qualitative data (Creswell & Plano Clark, 2011). The design allowed for elaboration, corroboration, complementarity and contradiction of study findings (Hesse-Biber & Johnson 2015). Further, the gender – irrigation water phenomenon which was under study has many facets, which could not be explained by one method, as such, it was therefore, vital to adopt a mixed methods research design. As Cleaver (2003) suggests, there are almost three different parameters to consider when talking about gender and water: culture, social relations and institutions. Hanson *et al.* (2005) suggest that such a design is ideal when the variables to be investigated are not known and where elaboration of findings is required. For example, qualitative research findings helped to understand the findings from quantitative research and vice versa. Furthermore, adopting a mixed-methods approach created the opportunity to compensate for inherent method weaknesses at the same time capitalizing on the inherent strengths of each approach and offsetting inevitable methodological biases. Mixed methods research is an approach to inquiry that combines or associates quantitative and qualitative strategies (Creswell, 2012) so that the overall strength of a study is greater than either quantitative or qualitative research alone. It is for this reason that the sequential exploratory mixed methods research was used in this study.

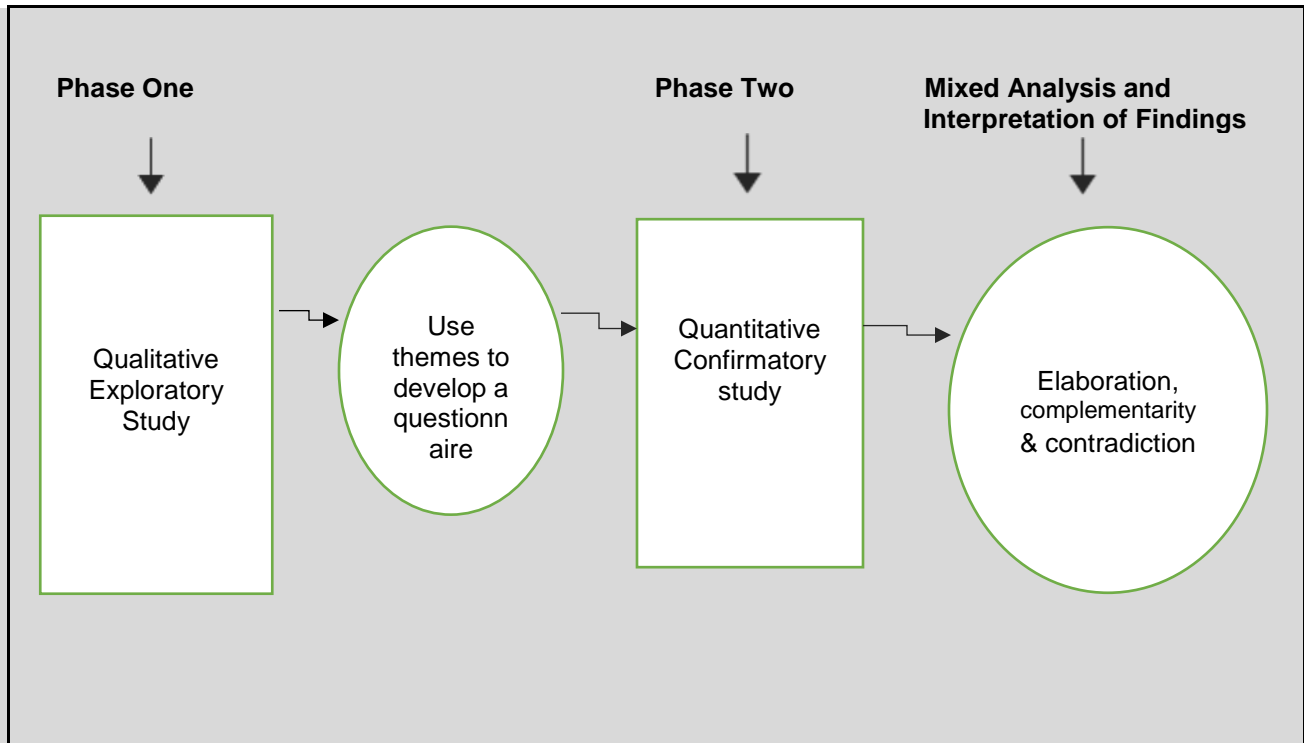


Figure 3.3: Sequential Exploratory Mixed Methods Design Adopted by the Study

The first phase of the study was an exploratory qualitative case study design which focused on describing and understanding context specific accounts of experiences of irrigation water users from participants' point of view. The second phase of the study was quantitative and descriptive in nature. It helped to quantify the problem under investigation. The strategy of using mixed design added rigor, breadth, complexity, richness and depth to the inquiry. This triangulation added value to the study findings in that biases of one particular data source or method were neutralized by other data sources and methods (Creswell, 2012). The use of a sequential exploratory research design in a case study was a powerful research strategy in that it added completeness to the gender issues in water use and management that were under exploration. This was made possible through the ability of a case study to utilise both qualitative and quantitative data sources. Thus the combination of a case study strategy and a sequential exploratory research design was flexible and allowed the use and mixture of multiple data collection strategies. Multiple approaches to data collection are important in an exploratory study because they have the possibility of covering up weaknesses produced by another technique or method.

The use of a case study further, made it possible to collect data in the real life settings and situations of irrigation farmers. This helped to understand the social world in which the gender dynamics in water use and management are embedded. The flexibility of the case study research strategy allowed this study to capture real life farming experiences of Nyanyadzi farmers in a holistic and meaningful manner. For instance, the study was interested in water use and management within an irrigation scheme, hence the information was captured in the real social settings as events unfolded. The critical value of a case study in this research was that it examined the local and context specific dynamics pertaining to issues relating to irrigation water use, management and gender.

Moreover, the case study design was functional in combining different qualitative methods. Especially multiple repeated focus groups and in-depth interviews provided the type of data the research was looking for to answer, for example the "how" research questions (Yin, 2009).

The major challenge of a case study is that findings cannot be generalized to other areas but however, it can still provide a unique understanding of the social processes in context allowing for the experiences of participants to be taken into account.

The major challenge of using the exploratory research design was the time factor. It was time consuming in implementation, though the challenge was offset by the benefits gained. As such, there was no solution sought to counter this challenge.

### 3.4 Population and Sampling

Purposive sampling and convenience sampling techniques guided the sampling process. Nyanyadzi Irrigation scheme was purposively selected because it is one of the oldest irrigation schemes in Zimbabwe. Since its inception, the scheme has undergone a significant metamorphosis from being a once vibrant irrigation scheme to one in a deteriorating state. Furthermore, it was purposefully chosen because of its water problem issues as reported by Chifamba et al, (2013), Mujere (2011) and Nhundu & Mushunje (2010).

The target population consisted of a total population of 721 registered farmers comprising 216 (30%) women and 505 (70%) men practicing irrigation farming at Nyanyadzi Irrigation Scheme.

A total sample of 73 (10%) participants comprising 26 (36%) men and 47 (64%) women participated in the initial exploratory study. Of these, a sample of 62 (85%) participants comprising 19 (31%) men and 43 (69%) women was conveniently sampled to participate in focus group discussions, while 11 of the 73 were purposively selected to participate in key informant in depth interviews. These comprised 7 men and 4 women. A sample size of 73 was defined during data collection, as new categories, themes and explanations ceased to emerge while in the field. It was possible to arrive at data saturation because collected data were analysed daily after fieldwork to identify gaps, but also, to ensure that further coding was unlikely. Leiner (2016) recommend sample selection to the point of redundancy. They argue that in purposeful sampling the size of the sample is determined by informational considerations. If the purpose is to maximize information, the sampling is terminated when no new information is forthcoming from new sampled units; thus redundancy is the primary criterion (Patton, 2002).

A total of 109 (15%) participants comprising 47 (43%) men and 62 (58%) women was conveniently sampled and participated in the second phase of the study which was quantitative in nature. The sample of 109 participants in the quantitative study included the 71 participants who had initially participated in the qualitative study. Since, this was a confirmatory study, it did not matter whether one had participated in the initial study or not. This is because confirmatory cases are additional examples that fit already emergent patterns; these cases confirm and elaborate the findings, adding richness, depth, and deepening initial analysis (Patton, 2002).

The easy accessibility and availability of participants to the researcher necessitated the adoption of a convenient sampling technique for both phases of the study. The convenient sampling strategy specifically suited the study, because it was not clear which farmers were active with

farming and available at the time of research. This was because farmers in Nyanyadzi irrigation scheme engage in other non-farm livelihood activities. Thus, even though the irrigation scheme register was there, it did not indicate who is was an active farmer. The researcher therefore, adopted the convenient sampling technique and identified and elicited information from farmers who were readily available at their irrigation plots at the time of collecting data.

Another contributory factor which prompted the use of a convenient sampling strategy was the geographical proximity of the irrigation scheme compared to farmers' households. An added advantage of convenient sampling technique was therefore its ability to work with readily available participants.

Furthermore, the likelihood of finding participants at their plots was higher compared to finding them at their homesteads, given that it was a raining season and farmers were busy at their plots. As such, the likelihood of finding farmers at home was limited. It also became time saving and cheaper to meet participants at their irrigation plots than to conduct research at the farmers' respective households. This made it easier to organize focus groups.

In addition, convenient sampling was applied because of its characteristic ability which enabled the researcher to work with willing and available participants. This characteristic agrees very well with the research ethics principle of voluntary participation in research. Study participants were engaged at their irrigation plots as they carried out their daily tasks. Those who agreed to participate in the study voluntarily signed the informed consent forms.

The major drawback of a convenient sample however, is that it presents a likelihood of bias, with regards to the sample selected (Saunders *et al*, 2015). The convenient sample tend to over or under represent the population hence the possibility of biased results. However, in this study this weakness was offset by spreading the sample to include farmers from different sections of the irrigation scheme which included; 36% of upstream farmers, 21% of middle stream and 43% of downstream farmers. This ensured that the study get the water use and management experiences of men and women farmers located in different sections of the scheme.

The purposive sampling strategy was used to select 10 key informants interviewed in the current study. According to Benoot *et al*. (2016), the basic principle behind the use of purposeful sampling strategy is to gain greater insights into a phenomenon by looking at it from a wide range of angles. This was achieved through interviewing various knowledgeable individuals who shared their views on gender dynamics in water use at Nyanyadzi scheme. These included, two agricultural

extension officers, two local community leaders who were also members of Nyanyadzi scheme, three block irrigation chairpersons and three irrigation water management committee members. Their diversity helped to capture a wide range of perspectives, attributes, behaviours, experiences, situations relating to gender dynamics in irrigation water use at Nyanyadzi.

### **3.5 Data Collection Tools**

Data for the study were collected in two phases. The first phase was a qualitative exploratory study. The qualitative data collection tools used included focus group discussions, key informant interviews (Appendix A1) and gender participatory tools namely gender matrix tool (Appendix A2), gender activity profile (Appendix A3) and a pair wise problem ranking tool (Appendix A4). The second phase was a quantitative confirmatory study. In order to verify and quantify information collected from the qualitative phase of the study an inventory questionnaire was designed and used to collect quantitative data (Appendix A5).

#### **3.5.1 Key informant interviews (KII)**

Key informant sampling strategy was adapted to identify key informants for the study. The key informants comprised 2 Agriculture Technical and Extension Service Officers (AGRITEX) who were both males stationed at Nyanyadzi to work with Nyanyadzi irrigation farmers, 1 male village head who was also a farmer in the scheme, 3 block irrigation chairpersons (males), 1 water distributor (male) and 2 females who were committee members of the Irrigation Management Committee (IMC) and 2 elderly women who were widows and had more than 20 years of irrigation farming experience at Nyanyadzi. These, were chosen because of their knowledge, experience and role in irrigation farming and water management at Nyanyadzi scheme. The total sample of key informants was 11 participants (6 men and 4 women). Key informant interviews provided answers to the not so obvious questions that related to gender dynamics in irrigation water use (Appendix A1). Key informant interviews did not only help understand the extent of participation in canal water management by men and women farmers at Nyanyadzi scheme, but also helped to answer the why component. For example, on the basis of KII the researcher was able to find reasons why men were the majority attendees at community water meetings. In this instance, key informant interviews provided rich in-depth information that would not have been easy to get.

#### **3.5.2 Participatory Focus Group Discussions**

Focus group discussions facilitated the collection of data using the gender analysis matrix tool (Section 3.5.3 and Appendix A2) and the gender activity profile (Section 3.5.4 and Appendix A3).

Feminist standpoint theorist, Harding (2004) argues that men and women are totally different from each other and therefore must be studied separately in their own right. A total of 62 participants participated in 7 focus group discussions that were organized and categorized according to gender, marital status and age variables. The category of women included those who were married, widowed and single. The married women were further categorized according to their age and social status, such that in the end there were two groups of female participants who were married. The male participants were all married, hence they were categorized according to age and social status. The social statuses for both married men and women depended on whether one was a daughter/son in law or a mother/father in law and whether they had any influential position within the irrigation scheme. These categories were important because they help to determine why, how and when an individual uses and participate in water management. These social variables also determine the social relations in water use and management. Furthermore, these categorizations catered for the intra-gender power relations that lie within the different cultural set ups and therefore made it possible for participants to express themselves freely in a non-threatening environment without fear of cultural barriers or victimization. Focus groups were held at the water distribution point where their water is diverted to plots. The focus groups were organized as indicated in Table 3.1.

The most obvious advantage of using the focus group method in this study was its ability to collect a relatively large amount of data from a relatively large number of research participants at one time. The other important advantage was that the focus group method was culturally, socially, and politically appropriate in that it allowed for the separation of participants by gender, age and marital and social status.

Furthermore, the focus group discussion method helped to reduce the risk of a hierarchical relations between the researcher and the researched which is most common in interviews. Focus groups dissolved the power relations between the researcher and the participants through establishing good rapport with participants. Harding (2004) expressed that the focus group method has the ability to give study participants who have no experience of speaking in public get the opportunity to do so. This advantage was experienced and observed especially in the categorized focus groups of young women participants. They were very confident and free to express themselves. The minimal engagement of the researcher, allowed by this method enabled the natural social interactions that were between participants to surface with their internal hierarchy and cultural codes.

**Table 3.1 Focus Group Composition**

<b>Focus Group Number</b>	<b>Gender</b>	<b>Marital Status</b>	<b>Total Number of Participants</b>
Focus Group 1	Males	Married	7
Focus Group 2	Males	Married	7
Focus Group 3	Females	Married (daughter in laws)	10
Focus Group 4	Females	Married (mother in laws)	9
Focus Group 5	Females	Widowed	9
Focus Group 6	Females	Single	10
Focus Group 7	Mixed group	Mixed social group	10
<b>Total</b>			<b>62</b>

In order to increase validity, member checks were used during the discussion to clarify responses and ensure that all participants' views were represented by repeating or summarizing what had just been said and asking if all participants agreed with the statement or had any additional information or opposing statements to add (Denzin and Lincoln 2005).

Furthermore, focus group interactions enabled the elaboration and extension of an initially sketchy skeletal account of participants. This was because this method is a collectivistic rather than an individualistic data collection method that focuses on the multivocality of participants' attitudes, experiences, and beliefs (Madriz, 2000). Participants in the focus groups were able to react to and build upon the responses of other group members creating a 'synergistic effect' (Stewart & Shamdasani, 1990). This enhanced the construction of a more defined participant account of events. Moreover, focus groups facilitated "horizontal interview among participants" (Madriz, 2000, p. 840) who through discussion and internal agreement validated their common experience.

### **3.5.3 The gender analysis matrix (GAM)**

The gender analysis matrix GAM (Appendix A2) captured information pertaining to the gender roles and responsibilities of men and women in irrigation water use (Chapter 4). The tool was best suited given the constraints imposed by shortage of time, illiteracy among participants and the lack of sufficient or non-existent quantitative data on gender roles and responsibilities in water use at the Nyanyadzi smallholder scheme. In homogenized focus groups, the GAM tool encouraged participatory behaviour among participants and enabled them to point out gender differences between men and women regarding water use practices.

### **3.5.4 The gender activity profile**

The gender activity profile (GAP) (Appendix A3) tool was used for to capture the gender roles and responsibilities of men and women in canal water management (Chapter 5). This tool was best suited for examining the gender-based division of labour in irrigation water management. The strength of the tool lied in the fact that it categorised the different activities of men and women by showing who did what, when and where, thereby providing the gender dimensions of irrigation water management at Nyanyadzi Irrigation Scheme.

### **3.5.5 Inventory questionnaire for irrigation water use**

The inventory questionnaire (Appendix A5) for irrigation water use allowed for an objective assessment of the impact of gender on water use at Nyanyadzi scheme (Siebert *et al.*, 2010). The inventory questionnaire had 30 perceptions requiring responses on a Likert-type scale of 1 (strongly disagree) to 5 (strongly agree). The perceptions were related to the objectives of the

study (i.e. nature of irrigation water use, extent of participation in irrigation water use and challenges in irrigation water use). The scores that were given by respondents indicated the extent to which the respondents agree or disagree with a given perceptive statement.

Questionnaire respondents were selected using a convenient sampling technique. The researcher took advantage of the irrigation farmers' briefing day which happens at the irrigation scheme one day per week in the morning at 0600 hours. It was at this briefing that farmers volunteered to participate. The questionnaire was administered to a convenient sample of 109 respondents comprising 47 males and 62 females who were all registered farmers at Nyanyadzi irrigation.

### **3.6 Data Analysis**

Data were analyzed in two phases. Initially, responses gathered from the qualitative phase of the study were analyzed manually using the thematic approach (Anderson, 2007; Campbell *et al.*, 2008). Responses that emerged from focus group discussions and key informant interviews were categorized into themes. The themes were then analyzed in terms of frequency counts. The identified themes were reduced to a manageable number through elimination of themes that were referred to, in less than five responses. The cut-off point of five responses was chosen due to the fact that themes which were raised in less than five responses tended to be vague, under-developed and minor (Campbell *et al.*, 2008). This was also done to reduce the data set into a manageable size for the study.

The study findings from the first phase of the study were tested in the second quantitative confirmatory phase of the study. The themes which emerged were then developed into a closed-ended inventory questionnaire which required Likert type responses on a scale of 1 (strongly disagree) to 5 (strongly agree). Data collected through the inventory questionnaire for irrigation water use were cleaned to remove errors and outliers then organized, coded, entered and stored in MS Excel spreadsheets. Data were cleaned by performing frequencies analyses on each variable to see if there were any which had values outside the possible range. Thereafter, the data were imported into the statistical software known as Predictive Analytics Software Statistics 18 for Windows (PASW Inc: Chicago, IL, USA) for analysis. Variables which included gender, age, marital status, plot location, plot ownership and education level were the independent variables for analysis purposes. Pearson's Chi-square test ( $\chi^2$ ) for association was used to determine association between variables while cross-tabulations were used to analyse interrelations between two variables and their interaction. Frequency distributions were used to

describe the basic features of the data collected during the study. Statistical significance was considered at  $P < 0.01$  or  $P < 0.05$ .

However, because the chi-square statistic only conveys the existence or nonexistence of the relationships between the variables investigated, by only saying there is a significant relationship between variables, it does not give any information about the strength of the relationship i.e. it does not say just how significant and important this is. Therefore, Cramer's  $V$  post-hoc test was performed to measure the strength of association of those perceptions which chi-square test had determined to be statistically significant. Cramer's  $V$  is a post-hoc test to give this additional information. Cramer's  $V$  varies between 0 and 1. Close to 0 it shows little association between variables. Close to 1, it indicates a strong association.

$$\phi_c = \sqrt{\frac{\chi^2}{N(k-1)}}$$

Where:

$\phi_c$  denotes Cramer's  $V$

$\chi^2$  is derived from Pearson's chi-squared test

$N$  is the sample size involved in the test

$k$  is the lesser number of categories of either variable.

Cramer's  $V$  was adopted because the cross tabulation table was larger than  $2 \times 2$ , therefore Cramer's  $V$  became the best choice. Cramer's  $V$  is a measure of substantive significance. It is commonly used to describe the magnitude of association between categorical variables for a contingency table larger than  $2 \times 2$ . This means that Cramer's  $V$  can be used with tables that have more than 2 rows or columns.

Cramer's  $V$  equals 0 when there is no relationship between the two variables, and generally has a maximum value of 1, regardless of the dimension of the table or the sample size. This makes it possible to use Cramer's  $V$  to compare the strength of association between any two cross classification tables. Tables which have a larger value for Cramer's  $V$  can be considered to have a strong relationship between the variables, with a smaller value for  $V$  indicating a weaker relationship. Cramer's  $V$  can range from 0 (no association) to 1 (perfect association) as indicated in Table 3.2.

**Table 3.2 Interpretation of Cramer's V**

<b>Level of Association</b>	<b>Description and Meaning of the Level of Association</b>
.00 - .10	Negligible association
.10 - .30	Weak association
.30 - .50	Moderate association
.50 - .60	Relatively strong association
.60 - .80	Strong association
.80 – 1.00	Very strong association

**Source:** Cohen (1988)

### **3.7 Ethical Considerations**

Ethical approval to carry out research was granted by the University of Venda's Research Ethics Committee. This ethical clearance letter was then presented to Chimanimani Rural District Council (CRDC) where approval to carry out research at Nyanyadzi irrigation Scheme was sought. Approval and permission to conduct research was granted by CRDC. Negotiations for entry into the study area were done with community political leaders of Nyanyadzi (i.e. Nyanyadzi Ward 8 Councillor and Ward leaders), community traditional leaders (i.e. the Chief and the village Headman) and Nyanyadzi Irrigation Scheme Chairperson and the AGRITEX officials working with Nyanyadzi irrigation Scheme farmers.

There was a significant alteration on the procedure of the study. The community workshop which was scheduled to be an introductory workshop was cancelled. The AGRITEX officers who work with the farmers at Nyanyadzi irrigation scheme advised that the time we intended to collect data was a busy one for farmers, as such it would consume a lot of time for farmers. The AGRITEX officers also anticipated that there would be a low turnout of participants due to the reason that the data collection period coincided with the peak of farming season and busy period for farmers. The rains that were falling at the time also contributed to the change of plans. As such, AGRITEX officers advised the researchers to meet the participants at their irrigation plots while they were working in their fields. This plan worked well for the research team, as it also provided an opportunity to observe gender roles of study participants in the irrigation farming cycle. For example, the researcher observed that more women than men provided labour in weeding and planting while most men attended to water issues such as repairing irrigation canal leakages. In line with the informed consent principle, study participants were provided full information regarding the a) research purpose and objectives, b) procedures for data collection, c) benefits of the research, d) confidentiality. Study participants were assured of confidentiality on all the information they shared with the research team. Further, participants were informed of the voluntary participation principle which dictates that people should be involved in research willingly. It was also stressed to them that they were free to withdraw from participating in the study at any stage during the research process.

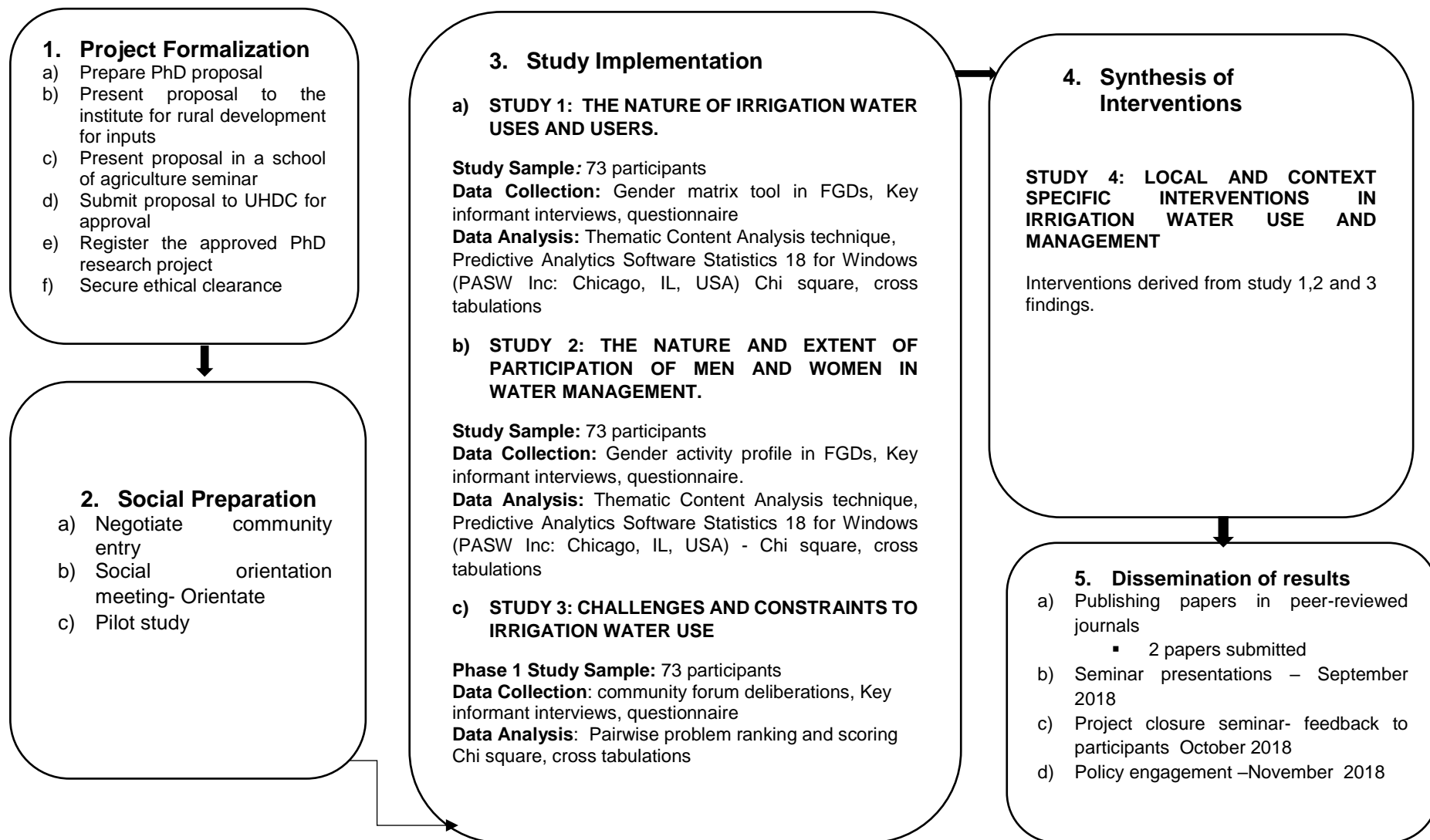
### **3.8 Study Implementation Procedures**

Figure 3.4 outlines the research approach which was adopted in developing gender sensitive intervention strategies for irrigation water use at Nyanyadzi smallholder irrigation scheme. The study journey started with preparations for writing a PhD project proposal and presenting the

proposal to the Institute for Rural Development for inputs then subsequently presenting it at the school of Agriculture. The proposal was then submitted to the University Higher Degrees Committee (UHDC) where it was approved.

Permission to go out and carry the study was then sought from the University of Venda Research Ethics Committee where a Research Ethical Clearance Certificate (RECC) was granted. The RECC was then presented to Chimanimani Rural District Council (CRDC) in which Nyanyadzi irrigation Scheme lies. The CRDC then granted the permission to carry out the research at Nyanyadzi irrigation Scheme.

After approval was granted, social preparations for the research study began. This involved negotiating entry and access into Nyanyadzi irrigation scheme members for the purposes of carrying out research. Clearance was first given by the local police and the Ward Councilor. The researcher then met two AGRITEX Officers who work with Nyanyadzi irrigation scheme farmers. The AGRITEX Officers then introduced the researcher to the Nyanyadzi Irrigation Scheme Chairperson. A social orientation meeting was then organized for the following day. The meeting was held with the two AGRITEX officers, a policer officer, the ward Councilor and the Nyanyadzi irrigation scheme chairperson who also happened to be the Village Head. The main purpose and task for this social orientation meeting was to explain the purpose and procedure of the research to these community leaders as well as set and agree on the dates to collect data.



**Figure 3.4: Summary of research approach used to develop gender intervention strategies for irrigation water use at Nyanyadzi smallholder irrigation scheme**

Pilot testing of the data collection instruments was organized and carried out at Chakohwa Smallholder Irrigation Scheme where 15 farmers comprising 9 women and 6 men were purposively selected but volunteered to participate in the pre-testing of research instruments. Chakohwa irrigation scheme is situated 73km from Mutare along the Mutare - Birchinough Bridge road south of Mutare in the Manicaland Province of Zimbabwe. This irrigation is nearby Nyanyadzi irrigation scheme which lies at the 100 kilometer peg along the Mutare-Birchnough road, south of Mutare in the Manicaland Province of Zimbabwe. The pre-testing provided opportunities to evaluate research assistants' capabilities of handling the research instruments. The phase also helped to identify possible weaknesses of the instruments, estimate time needed by participants to complete each instrument and ensure respondents would understand and interpret the questions in a manner expected. This was a learning exercise to all the participants.

Qualitative data collection tools (focus groups, gender matrix analysis, gender activity profile and key informant interviews) were tested for:

- Evaluating language competency and content validity of data collection materials.
- Estimating time length of full focus groups and key informant interview delivery and marking periods of respondent fatigue.
- Assessing the feasibility and fidelity of translation and transcription protocols in preparation of the interview text for qualitative analysis.

Data collected from this pilot phase was analysed thematically and the emerging themes were merged with themes from the qualitative phase of the main study. The themes were then used to develop the structured questionnaire (Section 3.5.5).

While in the process of negotiating community entry, the researcher noted that the social structures were male dominated. To get permission from Chimanimani Rural District Council, permission was sought from Manicaland Provincial Administrator (male), Chimanimani Rural District Council Chief Executive Officer (male), Nyanyadzi ward 8 Councilor (male), Traditional leadership (3 males) AGRITEX Officers (3 males), Irrigation Officer (male) and the local police post (6 males). This scenario is a major feature of the traditional society which is highly patriarchal in nature. This could be a sign of a society in which women are restricted of opportunities to participate in formal workplaces. The striking absence of women in leadership positions presented by this scenario is an issue which warrants policy and practice attention in another different fora.

Data were collected in two phases, whereby qualitative data were initially gathered in the exploratory phase of the study. In this phase, 73 participants participated in focus group

discussions and key informant in depth interviews. Focus group discussions were held onsite within the irrigation scheme at the community's usual meeting point for water distribution. The themes that emerged from the exploratory study were then developed into perceptions that were used in the design of the inventory questionnaire, which was then used as the data collection instrument in the second phase of the study which was confirmatory in nature. The detailed results and analysis of the study are specified per objective in Chapters 4, 5 and 6.

## REFERENCES

- Anderson, R. (2007). Thematic Content Analysis: Descriptive Presentation of Qualitative Data, (pp. 69-73), In W. Braud & R. Anderson (Eds) *Transpersonal research methods for the social sciences: Honoring human experience*. Thousand Oaks, CA: Sage Publications.
- Benoot, C., Hannes, K. and Bilsen, J. (2016). The use of purposeful sampling in a qualitative evidence synthesis: A worked example on sexual adjustment to a cancer trajectory. *Medical Research Methodology*, **16(21)**: 1-12
- Berman, E. A. (2017). "An Exploratory Sequential Mixed Methods Approach to Understanding Researchers' Data Management Practices at UVM: Integrated Findings to Develop Research Data Services." *Journal of eScience Librarianship*, **6(1)**: e1104.
- Bolding, A. (1996). Wielding water in unwilling works: Negotiated management in water scarcity in Nyanyadzi irrigation scheme, winter 1995. pp. 69-101. In: Manzungu, E. and Van Der Zaag, P. (Eds.). *The practice of smallholder irrigation: Case studies from Zimbabwe*. University of Zimbabwe, Harare.
- Bolding, A. (1999). Caught in the catchment: Past, present and future of Nyanyadzi water management. pp. 123-152. In: Manzungu, E. Senzanje, A and van Der Zaag, P. (Eds.) *Water for agriculture in Zimbabwe: Policy and management options for the smallholder sector*. University of Zimbabwe, Harare.
- Campbell, C., Gibbs, A., Maimane, S., and Nair, Y. (2008). Hearing community voices: Grassroots perceptions of an intervention to support health volunteers in South Africa. *Journal of Social Aspects of HIV/AIDS*, **5(4)**: 162-177.
- Caretta, M. A. (2015). *East African Hydropatriarchies: An analysis of changing waterscapes in smallholder irrigation farming*. PhD Thesis, Stockholm University. Sweden: Holmbergs.
- Chinguno, N.L. T. (2012). *From paper to practice: An analysis of the impact of the water reforms on the water use practices in Nyanyadzi River catchment, Zimbabwe*. MSc thesis, UNESCO-IHE, The Netherlands.

Cleaver, F. (2003). Incentives and Informal Institutions: Gender and the Management of Water. *Agriculture and the Human values*, 15(4):347-360.

Creswell, J.W. (2012). *Qualitative Inquiry and Research Design, Choosing Among Five Approaches*. Thousand Oaks: Sage Publications.

Creswell, J. W., and Plano Clark, V. L. (2011). *Designing and Conducting Mixed Methods Research*. Thousand Oaks: Sage Publications.

Denzin, N. K., and Lincoln, Y. S. (2005). *The SAGE handbook of qualitative research*, Sage Publications, Thousand Oaks, CA.

Gotosa, J., Gichuki F. N. and Senzanje, A. (2002). Performance assessment of water delivery to a smallholder irrigation scheme in Zimbabwe. *Journal of Applied Science in Southern Africa*, 8(1): 37-51.

Harding, S. (2004). *The Feminist Standpoint Theory Reader: Intellectual & Political Controversies*. New York: Routledge.

Hanson W.E, Creswell J.W, Clark V.L.P, Petska K.S. and Creswell J.D. (2005). Mixed methods research designs in counseling psychology. *Journal of Counseling Psychology*. 52: 224–235.

Hesse-Biber, S. and Johnson, R. B. (Eds.). (2015). *The Oxford handbook of mixed methods research inquiry*. Oxford; New York: Oxford University Press.

Kemerink, J.S. (2015). *Policies lost in translation? Unravelling water reform processes in African waterscapes*. PhD dissertation, Delft University of Technology. Leiden: Taylor and Francis.

Leiner, D. J. (2016). Convenience Samples and Respondent Pools. *American Journal of Theoretical and Applied Statistics*. 5(1): 1- 4.

Magadlela, D. (1999). 'Irrigating Lives: Development Intervention and Dynamics of Social Relationships in an Irrigation Project'. PhD thesis, Wageningen University, Wageningen, The Netherlands.

Mtisi, S. and Nicol, A. (2003). 'Caught in the act: new stakeholders, decentralization and water management processes in Zimbabwe'. *Sustainable Livelihoods, in Southern Africa Research Paper 1*. Institute of Development Studies, Brighton.

Mujere, N., and Mazvimavi, D. (2005). Challenges affecting Irrigation Water Supply at Nyanyadzi Smallholder Irrigation Scheme in Zimbabwe. *Paper presented at the 6th WaterNet/WARFSA/GWP Symposium, Swaziland, November 2005.*

Patton, M. Q. (2002). *Qualitative research and evaluation methods* 3rd ed. Thousand Oaks, CA: Sage.

Pazvakavambwa, G. T. and Van Der Zaag, P. (2000). The value of irrigation water in Nyanyadzi smallholder irrigation scheme, Zimbabwe. *Paper presented at the 1st WARFSA/WaterNet Symposium: Sustainable use of water resources. Maputo, 1-2 November 2000. Maputo.*

Saunders, M., Lewis, P. and Thornhill. A. (2015). *Research Methods for Business Students* (6th Ed). Pearson Education Limited.

Siebert, S, Burke, J, Faures J. M, Frenken K., Hoogeveen, J., P. Döll, and Portmann, F. T. (2010). Groundwater use for irrigation – a global inventory. *Hydrology Earth Systems Science*, **14**: 1863–1880.

Subedi, D. (2016). Explanatory Sequential Mixed Method Design as the Third Research Community of Knowledge Claim. *American Journal of Educational Research*, **4(7)**: 570-577.

Stewart, D. W. and Shamdasani, P. N. (1990). *Focus Groups: Theory and Practice*, Sage Publications, Newbury Park, California.

Zimbabwe National Water Authority (2012). Harare, Government Printers.

## CHAPTER FOUR: NATURE OF IRRIGATION WATER USE AT NYANYADZI SMALLHOLDER IRRIGATION SCHEME

### ABSTRACT

Climate change poses a continual challenge to the availability of water resources especially in the extensive semi-arid and arid areas of the developing world, where rural livelihoods are strongly influenced by water use. As the water scarcity increases so does the demand for different other uses. This study examined the nature of irrigation water use at Nyanyadzi Smallholder Irrigation Scheme. An exploratory sequential mixed methods research design was adopted. Qualitative data were collected using key informant interviews, focus group discussions and a gender analysis matrix while quantitative data were collected using an inventory questionnaire for irrigation water use requiring likert type responses ranging from 1 (strongly disagree) to 5 (strongly agree). Qualitative data were thematically analysed and results revealed while quantitative data were subjected to Predictive Analytics Software Statistics 18 for Windows (PASW Inc: Chicago, IL, USA). Pearson's Chi-square test ( $\chi^2$ ) for association was used to determine relationship between variables ( $P < 0.01$  or  $P < 0.05$ ). Qualitative results revealed that men and women have different needs and concerns regarding canal water use while quantitative findings revealed highly significant differences ( $P < 0.01$ ) on the nature of irrigation water uses across gender, age and marital status variables. The gender variable interacts with other social variables such as age and marital status to influence the uses of water by men and women. The study concluded that the use of irrigation water is gendered. Women use water for both domestic and productive purpose and buy contrast men do not engage in domestic water uses. The uses of canal water by men and women farmers sometimes complement each other while at other times contradict each other. The study calls for an adoption of a gender neutral integrated approach to irrigation water use in order to cater for water needs of both men and women.

**Keywords:** canal water, domestic, gender, irrigation, productive water use

### 4.1 Introduction

While the preceding chapter laid out the methodological procedures to be implemented in the study, in this chapter, the first objective of the study which sought to examine the nature of irrigation water use is set in motion. Water is a fundamental human right and vital basic human need for survival. It is essential for enhancement of economic activities. Hall *et al.* (2014) allude that, its availability domestically and productively enhances livelihoods of rural people. This is especially true in the extensive semi-arid and arid areas of the developing world where rural

livelihoods are strongly influenced by water use (Mutambara *et al.*, 2016). Nhundu *et al.* (2015) on the other hand point out that, water availability is very critical for agriculture productivity in smallholder agriculture. Its good use in smallholder farming households contributes to poverty reduction and improved household income. This is especially significant considering the vulnerabilities and sufferings presented by climate change (Sultana, 2014). Climate change poses a continual challenge to the availability of water resources (Upadhyaya, 2016). The author notes that, as the water scarcity increases so does the demand for different other uses. The increasing climate threats call for the need of an integrated water resource use where for example irrigation water can meet other needs besides irrigating crops. This view recognizes that water use in agriculture, and especially irrigation water, serves the needs of many users and uses including fisheries, livestock, bathing and small-scale industry (Bakker *et al.*, 1999). Understanding the multiple uses and users of water requires new ways to view water. Meinzen-Dick & Van der Hoek (2001) also argue that, within an irrigation system, especially in arid and semi-arid areas, irrigation water may be the only source of domestic supplies available to the households. Thus, when irrigation water is provided to meet both domestic and productive water needs, a wide range of benefits can be realized. For example, Hall *et al.* (2014) indicate that the benefits range from livelihood enhancement, household food and nutrition security to improved school attendance especially for girls. Meinzen-Dick & Van der Hoek (2001) point out that non-irrigation uses of irrigation water contribute to an improved health and quality of life among farmers and surrounding communities.

In his opening speech at the G8 meeting in 2009, the former President of United States of America, Barrack Obama spoke about the 'right irrigation' as a missing link for Africa to be self-reliant with regards to food security. The 'right irrigation' encompasses all and acknowledges every water user, uses and other water needs within the irrigation scheme.

Guidance on the nature of irrigation water use and users has not been well documented in Zimbabwe particularly for Nyanyadzi smallholder irrigation scheme. Nyanyadzi scheme is one of the first initiatives in Zimbabwe and was established in 1934. However, since its inception, no empirical research relating to the nature of gender dynamics in water use has been carried out. Instead, earlier studies (Pazvakavambwa & van de Zaag, 2000; Samakande, 2002; Nhundu & Mushunje, 2010) focused on technical aspects of irrigation water in relation to the crops grown. Yet, irrigation water when supplied to poor rural communities also meets other needs (Jehangir *et al.*, 1998). Off farm requirements of irrigation water are not often considered when decisions regarding operation and maintenance of the irrigation infrastructure are made. This gap in

knowledge triggered the current study. Bakker *et al.* (1999) posits that it is important to recognize the full spectrum of water uses and users in an irrigation system and the interaction between these different uses and users. Against this background, the current study was undertaken to examine the nature of irrigation water uses and users at Nyanyadzi irrigation scheme in order to come up with strategies that appreciate other uses of irrigation water besides agriculture. This is an important step towards an irrigation management system which accommodates multiple water needs.

More so, an integrated irrigation water use system has become more important in recent times due to the increasing climate variability patterns. Climate changes present competing demands for water uses among different water users. As water scarcity in the world intensifies, there will be an increasing pressure to transfer water from agricultural uses to non-agricultural uses of water (Bakker *et al.*, 1999). Competing demands for water by other users indicate the need for a change in the way irrigation programs are conceived and designed (Johansson, 2016). In this study, it was assumed that appreciating other uses of irrigation water would reduce cases of informal diversions and abstraction by other members within and outside the scheme.

## **4.2 Methodology**

The methodology which was adopted for this study is provided and outlined in detail in Chapter 3 from Section 3.2 through 3.8.

## **4.3 Results**

In this section, results of the demographic profiles of study participants are presented in Section 4.3.1. This is followed by a presentation of qualitative and quantitative results in Section 4.3.2 and 4.3.3 respectively.

### **4.3.1 Demographic profiles of study participants**

Table 4.1 presents demographic profiles of study participants. There were more females (57%) who participated in the study compared to males (43%). Women were in the majority while men's representation was low. Regarding participants' ages, the 50-69 years category represented the highest (54%) number of participants.

**Table 4.1 Demographic Profiles of Study Participants**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Gender</b>		
Female	62	56.9
Male	47	43.1
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>Age</b>		
30-49	30	27.5
50-69	59	54.1
70+	20	18.3
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>Highest Education Level</b>		
None	16	14.7
Grade 7	23	21.1
O Level	47	43.1
ZJC	23	21.1
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>Marital Status</b>		
Married	81	74.3
Single	14	12.8
Widowed	14	12.8
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>Plot Location</b>		
Downstream	46	42.2
Upstream	41	37.6
Middle stream	22	20.2
<b>Total</b>	<b>109</b>	<b>100.0</b>
<b>Plot ownership</b>		
Inheritance from Parents	36	33.0
Usufruct rights	27	24.8
Rent	17	15.6
Inheritance from Spouse	16	14.7
Own purchased	13	11.9
<b>Total</b>	<b>109</b>	<b>100.0</b>

In terms of the educational level variable, 43 % of the participants went through formal schooling up to 'Ordinary' Level. Of these, the proportion of men was significantly higher (55 %) compared to the proportion of women (45 %).

Forty nine percent of the participants attended middle high school up to Zimbabwe Junior Certificate (ZJC). Fifteen percent of the participants never attended formal schooling. Of these, women were in the majority (14 %). With regards to the marital status variable, 73 % of participants were married and these represented the largest category in terms of marital status. Of these, all the 26 men who participated in the study were married. Participants who were widows and single represented the small portion of 13 % each. These all happened to be women. Relating to the plot location variable, 24 % of men had their plots located upstream compared to women (14 %). On the other hand, more women (27 %) had plots located downstream compared to men (16 %). With regards to the plot ownership variable, the highest number (33%) of participants owned plots through inheritance while those who own through buying from previous owners were the least (11%). Only women (25 %) owned plots through usufruct rights, on the other hand no males owned plot in this category. The same results were found in the plot ownership category of inheritance from spouse where, only 15 % of women owned plots through inheriting from spouses while no men inherited from their spouses.

#### **4.3.2 Nature of canal water use – qualitative results**

All the study participants agreed that canal water is used for irrigation of crops. One male participant who was in complete agreement with this view elaborated further and said that,

*Canal water is for irrigating our plots, that's why we are members of this scheme, the ultimate purpose is to use water for irrigating our plots.*

The majority of men (73 %) asserted that irrigating was the main purpose for canal water. On the other hand all women participants across focus groups agreed that canal water's major purpose was to irrigate plots in the scheme.

Regarding the use of irrigation water for laundry, the majority of women (91 %) expressed that they use irrigation water for laundry. The confirmatory study revealed a significant association between gender and the use of irrigation water for laundry ( $\chi^2 = 97.50$ ,  $p < .001$ ). Cramer's  $V$  value was significant (Cramer's  $V = .95$ ) and it indicated a very strong strength of the association. More than half of the male participants (65 %) argued that women illegally used water meant for

productive purposes like agriculture to do laundry. On this perception, a male participant pointed that,

*These women steal our water, by using it for laundry. They don't pay for laundry so it's illegal to use canal water for laundry. Canal water is for irrigating crops and other productive uses.*

More than half (58 %) of the participants mentioned that they use irrigation water for bathing. Of these, women represented the majority of them (72 %). There was a statistical association between the gender variable and use of irrigation water for bathing ( $\chi^2 = 61.161$ ;  $p < .001$ ). Cramer's V value was significant (Cramer's  $V = .74$ ) indicating a strong strength of the association.

Of these women, the majority are married. One middle aged married female participant pointed out that,

*Every time I come here to the fields I take a bath. As ladies we have a hidden place nearby the canal specifically reserved for bathing.*

Another young married female participant further expressed that,

*We also carry bath water for our husbands and young children to bath at home. That's why we bring wheelbarrows; they are for carrying water for household use.*

Only a handful man (31 %) expressed the same sentiments. One male participant expressed that,

*I can't call it bathing but I just use it to scrub off the mud from the plot. When I get home my wife and children provide me with decent bath water.*

With regards to using irrigation water for livestock uses, all the male participants reported that they use irrigation water for livestock drinking while 26 % of female participants also alluded to using irrigation water for livestock drinking. There was a statistical association between the gender variable and the use of irrigation water for livestock drinking ( $\chi^2 = 51.32$ ;  $p < .001$ ). Cramer's V value was significant (Cramer's  $V = .73$ ) indicating a strong strength of the association. Women indicated that they were mostly involved with watering goats. They also said they normally did it with their teen children regardless of gender. They reported that livestock drank water on a daily basis. However, both men and women agreed that livestock damaged the canal walls in the process of drinking water.

Age was statistically found to be a factor against the use of irrigation water for other communal purposes. ( $\chi^2 = 74.140$ ;  $p < .001$ ). Cramer's  $V$  value was significant (Cramer's  $V = .83$ ) indicating a very strong strength of the association. Half of the men (50 %) use irrigation water for brick making compared to a few women (19 %). A few participants (26 %) agreed that they use irrigation water for various religious practices, such as baptism and other rituals. Irrigation water is also used for various religious practices, such as baptism and other rituals like traditional cleansing ceremonies by both men and women. Women had a higher (31 %) representation compared to men (23 %) in the religious use of irrigation water.

## 4.4 Discussion

### 4.4.1 Demographic profiles of study participants

The study revealed that both men and women are involved in smallholder irrigation farming. The involvement of both men and women in smallholder rural farming boosts agriculture productivity while also enhancing household food and nutrition security (Ojulu, 2015; Nahusenay & Tesfaye, 2015). Further, the presence of men and women in smallholder farming is in agreement with the concept of family farming programme initiated by the United Nations General Assembly. It is spearheaded by the Food Agriculture and Organization (FAO). Larson *et al.* (2014) argue that its role is to raise the profile of family farms and smallholder farming in order to eradicate hunger and poverty whilst providing food and nutrition security and improving livelihoods particularly in rural areas.

More women participated in this study compared to men, indicating the active involvement of women in smallholder irrigation agriculture. A study by Chifamba *et al.* (2013) in the similar study area yielded same results, in which women constituted the majority of study participants. Another recent study by Munyati & Chitongo (2017) in Zimbabwe is in congruent with these findings. The high number of women participants in the study substantiates conclusions by other studies that rural agriculture is dominated by women in Africa (Dzingirai *et al.*, 2014; Doss *et al.*, 2015). The findings also corroborate Boserup's (1970) famous works in sub-Saharan Africa in which she concluded that the female role in agricultural production (planting/sowing, weeding, and harvesting crops) was dominant in African subsistence agriculture. However, viewed from another perspective, women's dominance in smallholder agriculture at Nyanyadzi, could also be that men 'stepped out' of smallholder farming in order to augment household income with non-farm activities while women are 'hanging in' to maintain productivity at the plots as proposed by Dorward (2009). The author proposed three livelihood strategies, in which individuals adopt as an

escape way out of poverty namely; 'hanging in', 'stepping up' or 'stepping out'. A scenario in which men 'step out' of smallholder farming in search of alternative employment creates a trend in agriculture whereby women increasingly become dominant in agriculture as they 'hang in'. This also entails a shift in traditional gender roles, whereby women are now spending more time doing agricultural work rather than domestic chores (Abdelali-Martini & Dey de Pryck, 2015). This dominance of women in smallholder farming could also be the basis for the increasing feminization of agriculture in rural communities. However, of concern is the fact that even though women were in the majority this does not tally with their land ownership status. Most women did not customarily own any piece of land in their own right. Rather, they had secondary land rights which they held through their husbands. These rights allowed them to use the land while the ultimate responsibility remained with the owner of the plots who were men either their husbands, fathers, sons or uncles. Only a few elderly widows owned portions of plots within the irrigation scheme through inheritance from their husbands. This finding validates Gaidzanwa (1995) and Shumba (2011)'s claims that a married woman can only have access to the land through her husband in rural Zimbabwe. This situation reveals some socio-cultural gender norms which marginalize and limit them the rights to own land. This is despite women's dominance in agricultural production. These findings further show how women smallholder farmers are typically located at the 'base' of the agricultural economy, being mainly involved in manual labour without owning any productive resources.

However, on the other hand these findings challenge Ellis (2007) who claimed that lack of land ownership and insecure land rights may discourage women from making the necessary investments in their land. Yet, the majority of women in this study had usufruct rights and spent quality time on agricultural activities on the land they knew they did not own.

The majority of participants in the study were in the economically active age range (30-65 years). This indicated a population that was capable of participating in smallholder agricultural activities. The absence of a young population that is below 30 years could be attributed to rural-out migration of youths (Simango, 2015). Or alternatively this category is more involved in off-farm activities particularly illegal diamond mining in nearby diamond mines (ibid.). The off-farm activities the youth could be engaged in include the repairing of vehicles, car washing, welding, carpentry and building at the Nyanyadzi and other surrounding service and business centres such as Chasiyana, Nemaramba, Nenhwe, Chakohwa and Hot Springs along the road that links Mutare and Masvingo (Simango, 2015). Or more still, the youths could have migrated to neighboring countries like Mozambique, South Africa or Botswana.

In relation to participants' educational levels, men attained highest educational levels or qualifications compared to women even though at the lower levels of education. The lowest levels of women's education could explain the reluctance of women to participate in irrigation water committees as was also observed by Simango (2015) in eastern Zimbabwe and Phiri (2012) in Matabeleland South province, Zimbabwe.

With regards to participants' marital status, the married were in the majority represented by 73% of the total study participants. Chifamba *et al.* (2013) found similar results in their study at Nyanyadzi. The dominance of married participants in the study could mean that marriage is still an important and valued social institution in the study area. In rural areas, traditional values of marriage are still given prominence and are therefore still being promoted (Marcel & Quisumbing, 2005). This therefore could have contributed to the stability of marriages.

#### **4.4.2 Farmers' perceptions on the nature of canal water use**

Both men and women agreed with the perception, *I use canal water to irrigate crops*. Agreement with this perception meant that both men and women are involved in irrigated agriculture. However, in all the female focus group discussions, women indicated some gender power dimensions to this perception. For example, in a female focus group comprising single women, one participant who shared a plot with her brother (who inherited from parents) explained how the brother exploited her by diverting the flow of irrigation water from her land portion to his crops. This was despite the woman paying for the water. These sentiments echo Bennett *et al.* (2008) who observed that any productive connection between women and water is erased by masculine dominance. In this case, the female farmer is deliberately made invisible. The same issue emerged in other female focus groups albeit with a new gender twist. In other plots where a husband and a wife were both involved in irrigated agriculture, women alleged that they first irrigated man's portion or crops then ended by irrigating women's portion. One woman participant hinted on a fight in one of the plots due to watering conflicts between a husband and a wife as explained in Chapter 6. In this scenario the woman had paid for the water, only for the husband to divert and abstract the flow towards his portion. This scenario shows that conflict is pervasive in nature. Furthermore, these results indicate gender stratification in priorities and preferences over the use of irrigation water. Women bear the brunt of inhibitive socio-cultural systems. As shall be seen in the next chapter, water problems within the irrigation system were common. According to Herrera & Torelli (2013) women cannot compete or even cooperate with men on equal terms in the irrigated agriculture sector. This indicates some gender imbalances in irrigation water use. Women are in a very disadvantaged position in their endeavor to participate in irrigated

agriculture compared to men. These gender contestations and contradictions emanating from water use confirm Zwarteveen (2006:22)'s sentiments that,

*Irrigation is not something that men just do, but also something that culturally belongs to the male domain and that is associated with masculinity.*

These sentiments imply and reinforce the perception that irrigation is a man's world whereby women are socio-culturally rendered powerless. Other scholars have also found irrigation farming to be highly gendered and predominantly masculine (Zwarteveen, 2008; Liebrand, 2010; Udas, 2014).

The use of irrigation water to do laundry by women indicated another gender dimension present in the use of irrigation water. Women represented the majority of participants who strongly agreed with the perception *I use irrigation water for laundry*. They did the laundry a few metres away from the canal, for easy water access. As a result water pollution was inevitable. On the other hand no male participant in the study alluded to this perception. This finding indicates the gendered nature of irrigation water use. In the focus groups women admitted having knowledge of the restriction of using canal water to do laundry, however, women argued that canal water was convenient for them. Women presented their reasons for using canal water to do laundry. Firstly, they argued that doing laundry at the canal allowed them to multi-task. For instance, while they wait for their laundry to dry they attend to their irrigation plots, a thing they cannot do if they do their laundry at the borehole. This finding validates Wahaga's (2018) argument that improvements in agriculture add more workload to women on both productive and reproductive tasks. Secondly, women argued that doing laundry at the canal was easy because more people can obtain water at the same time along the canal rather than at the borehole where water extraction was done on an individual basis thus consuming more time. They also expressed that extracting water at the borehole was strenuous and yielded less amount of water which in turn made them limit the amount of water they use for laundry. This resulted in not so well washed clothes. Thirdly, women claimed that the hard water from borehole consumed more washing soap and reduced the cleansing power of washing detergents. As a result it was time consuming and expensive to do laundry using borehole water unlike canal water. These findings confirm observations by Leavens and Anderson (2011) and Fox (2016) that women's domestic responsibilities are continuous, time-intensive and energy consuming. However, these arguments valid as they are, coming from an actor's perspective, these gender responsibilities of women go unnoticed and are even invisible to men.

Men on the other hand complained that women misused, polluted and diverted irrigation water for non-productive purposes. One male participant in particular protested that,

*These women steal our water, they use it illegally, and they don't pay for laundry use. This is bad because water is scarce and is meant for irrigating plots and productive uses only.*

These expressions show the contested and gendered nature of irrigation water. The results show that men tend to focus and value productive work more than reproductive. As a result, women are overloaded with both productive and reproductive work. The disgruntlement expressed above by a male participant and which most men concurred with, was regardless of the fact that the laundry by women along the canal also included men's clothing. A significant point worth noting here is the way men possess canal water, by giving it a masculine label 'our water'. This finding substantiates sentiments by Zwarteveen (2006) that, the very activity of irrigating is often seen and labelled as distinctly masculine. This possessive nature of males towards irrigation water then becomes the source of power and conflict in the use of canal water between men and women. This shows a strong domination of masculine traditions within the domains of irrigation water (Bossenbroek & Zwarteveen, 2014).

There was also a relatively strong association recorded between the age variable and the use of water for laundry. This implication is that age is a factor in determining the use of irrigation water. Older women did not agree with the perception while young women who were still in the child bearing ages strongly agreed. The reason could be due to the many roles and responsibilities that are tied to being a young mother (Singh, 2008). A woman who is still in child bearing age range has more reproductive tasks within a household compared to an older woman. A young woman serves the older one on different household tasks such as fetching bath water as well as doing laundry for older women including other family and household members.

With regards to the perception *I use irrigation water for bathing* women represented the majority of participants who agreed with this perception. The majority of women reported that they used canal water to bath all the time they worked at the irrigation plots. Women argued that canals offered conducive nearby shrubs and bushes for 'jungle bathing' unlike the open spaces surrounding the borehole water point sources. Women concurred that 'jungle bathing' along the canal provided privacy than bathing at the designated communal borehole site. Their argument was that canal water provided an opportunity to access large amounts of water which were more than enough for a decent bath. One middle aged married woman expressed that, it was more of the convenience (i.e. easy accessibility) that canal water provided for bathing that made her prefer

'jungle bath'. This finding is in line with the study by Bakker *et al.* (1999) who found that bathing along the canal was convenient for women especially during their menstruation time. Women further conveyed that they bring their husbands bath water to bath at home. van Houweling (2016) in her study on gender roles and water practices in Mozambique observed the same trend, whereby women brought their husbands bath water as part of their expected gender roles. A few men alluded that they take baths at the built bathrooms within the irrigation plots.

Distinct gender differences in canal water use for livestock watering emerged from the study. The majority of male participants voiced that they use irrigation water for livestock drinking and watering. Livestock such as goats, cattle and donkeys are consumers of water on a daily basis hence; men are responsible for tending cattle and donkeys to the irrigation canals to drink water. This was despite the fact that men had earlier indicated that canal water was for irrigating crops only. Men defended their position and argued that the animals did not pollute canal water compared to women's laundry. Men further justified their actions and argued that cattle and donkeys provided draught power to irrigation plots as result these animals deserved water from the canal. A handful of women asserted that they also use canal water for livestock drinking with the assistance of their young children between ages of 9 and 15 years. However, women and young children tended to small livestock namely goats and sheep, while men watered cattle and donkeys. This finding indicates distinct age and gendered division of work. It is imperative however, to point out that despite this responsibility, women opined that they did not own or have control over the livestock. The decision to sell or slaughter for home consumption rested with men, except in female headed households. This finding is in agreement with Rauch *et al.* (2016) who expressed that the involvement of women in irrigated agriculture increased their workload but their efforts do not tally with an improvement in their social position. Women still suffer from hegemonic male dominance in the social relations of power.

A number of issues are worth noting from these findings, first men tend to appreciate other uses of canal water if they are involved and benefitting from such activities. Livestock are considered as productive assets and therefore, roles and responsibilities related to livestock keeping and watering are mostly valued as productive. This is because livestock production of bigger stock like cattle was a traditionally male preserve while women were confined to smaller livestock such as goats and rabbits (Njuki & Mburu, 2013). The visibility of women in livestock watering could be signifying a shift in traditional gender roles thereby confirming the view that gender roles are dynamic hence can change over time as has already been alluded to in section 2.6 (Chapter 2).

Secondly, the other deduction that can be given as a result of male dominance in livestock watering could be that men are 'stepping up' as asserted by Dorward *et al.* (2009). In 'stepping up' farmers increase livelihood strategies by diversifying, and engaging in other on-farm activities in order to boost livelihoods. Livestock provide a safety net, helping keep poor households from falling into poverty (Njuki & Sanginga, 2013). Therefore, men could have perceived that livestock farming is a better escape way out of poverty.

In the focus groups deliberations participants agreed that other community people illegally abstract irrigation water for off-farm commercial activities like construction, brick making, and car washing to boost their livelihoods strategies. This scenario has created tension with formally recognized canal water users. Nyanyadzi is a water scarce area, as a result it could be that, other community members have no other alternative means of getting water hence they illegally abstract canal water. This is further exacerbated by the fugitive nature of water which makes it difficult to control and track the persons who use it, the purpose it is used and at what time. This finding is in line with observations by Meinzen-Dick & Van der Hoek (2001) who found that within some irrigation systems, especially in arid and semi-arid areas, irrigation water may be the only source of domestic water supplies available to the households and community.

#### **4.5 Conclusion**

Overall, there is a gendered nature of irrigation water use at Nyanyadzi Irrigation Scheme. For instance, women used water for both productive and reproductive uses while in contrast men mostly used it for productive purposes only. These results indicate that men and women have different water needs. However, the needs sometimes complement each other and at other times contradict each other. The evident and clear picture that emerged from the findings is that irrigation water at Nyanyadzi is used for multiple purposes. The gender variable interacts with other variables such as age and marital status to influence the uses of water. Irrigation water is therefore critical for both domestic and productive purposes. The study recommends the adoption of a context specific gender approach to irrigation water use. The next chapter focuses on nature and extent of men and women's participation in irrigation water use and its management.

## REFERENCES

- Abdelali-Martini, M. and Dey de Pryck, J. (2015). Does the feminisation of agricultural labour empower women? Insights from female labour contractors and workers in northwest Syria. *Journal of International Development*, **27**: 898–916.
- Bakker, M., R. Barker, Meinzen-Dick, R. and F. Konradsen, eds. (1999). *Multiple uses of water in irrigated areas: A case study from Sri Lanka*. SWIM Paper 8. Colombo, Sri Lanka: International Water Management Institute.
- Bennett, V., Dávila-Poblete, S and Nieves, M. Rico (2008) Water and Gender: The Unexpected Connection That Really Matters. *Journal of International Affairs*, **61(2)**:107-126
- Boserup, E. (1970). *Woman's role in economic development*. London: George Allen and Unwin.
- Bossenbroek, L. and Zwarteveen, M. (2014). Irrigation Management in the Pamirs in Tajikistan: A Man's Domain? *Mountain Research and Development*, **34(3)**:266-275.
- Chifamba, E., Nyanga, T. and Gukurume, S. (2013). Irrigation Water Pricing and Cost Recuperation for Sustainability of Irrigation Projects in Nyanyadzi, Zimbabwe. *Russian Journal of Agricultural and Socio-Economic Sciences*, **3(15)**: 39-53
- Dorward, A. (2009). Integrating contested aspirations, processes and policy: Development as hanging in, stepping up and stepping out. *Development Policy Review*, **27(2)**: 131–146.
- Dorward A., Anderson S., Nava Y., Pattison J., Paz R., Rushton J. and Sanchez Vera E. (2009). Hanging in, stepping up and stepping out: livelihood aspirations and strategies of the poor. *Development in Practice*, **19(2)**: 240 – 247.
- Doss, C., Kovarik, C., Peterman, A., Quisumbing, A. R. and van den Bold, M. (2015). Gender Inequalities in Ownership and Control of Land in Africa: Myths versus reality. IFPRI Discussion Paper 1308. Washington, D.C.: International Food Policy Research Institute (IFPRI)
- Dzingirai, V, Mutopo, P and Landau, L. (2014). Confirmations, Coffins and Corn: Kinship, Social Networks and Remittances from South Africa to Zimbabwe, Migrating out of Poverty Research Programme, University of Sussex, Sussex.

Ellis, A. (2007). *Gender and Economic Growth in Tanzania*. The World Bank: Washington, D.C.

Fox, L (2016): *Gender, Economic Transformation and Women's Economic Empowerment in Tanzania. Supporting Economic Transformation*. Last downloaded September 25, 2017:[http://set.odi.org/wp-content/uploads/2016/03/Gender-application-to-Tanzaniapaper\\_March\\_Final.pdf](http://set.odi.org/wp-content/uploads/2016/03/Gender-application-to-Tanzaniapaper_March_Final.pdf).

Gaidzanwa R (1995) *Land and the Economic Empowerment of Women: a Gendered Analysis*. *SAFERE*, **1(1)** 1-12.

Hall, R. P., Van Koppen, B., and Van Houweling, E. (2014). *The Human Right to Water: The Importance of Domestic and Productive Water Rights*. *Sci Eng Ethics*, **20**: 849–868.

Herrera, J. and Torelli, C. (2013). "Domestic Work and Employment in Africa: What is the Trade-Off for Women?", in De Vreyer, P. and F. Rouband (Eds.), *Urban labour Markets in Sub-Saharan Africa*, Africa Development Forum Series, World Bank, Washington, DC.

Hope, R., Dixon, P-J., von Maltitz, G., (2003). *The role of improved domestic water supply in livelihoods and poverty reduction in Limpopo Province, South Africa*. International symposium on Water, Poverty and Productive uses of Water at Household.

Jehangir, W.A., Mudasser, M., Hassan, M. and Ali, Z. (1998). *Multiple Uses of Irrigation water in the Hakra 6-R, Distributary Command Area, Punjab, Pakistan*

Larson, D. F., Otsuka, K., Matsumoto, T., and Kilic, T. (2014). *Should African rural development strategies depend on smallholder farms? An exploration of the inverse-productivity hypothesis*. *Agricultural Economics*, **45(3)**, 355–367.

Leavens, M.K. and Anderson, C.L. (2011): *Gender and Agriculture in Tanzania*. EPAR Brief No.134, Evans School Policy Analysis and Research (EPAR), Evans School of Public Affairs, University of Washington.

Liebrand, J. (2010). *Masculinities: A Scale Challenge in Irrigation Governance in Nepal* pp. 53-72. In Pradhan, Prachanda; Upendra Gautam, Naveen Mangal Joshi (Eds.). *Dynamics of Farmer Managed Irrigation Systems: Socio-Institutional, Economic and Technical Contexts*. Proceedings

of the Fifth International Seminar, held on 25-25 March 2010, Kathmandu, Nepal. FMIS Promotion Trust, Nepal.

Marcel, F., and Quisumbing, A.R. (2005). "Assets at Marriage in Rural Ethiopia." *Journal of Development Economics*, **77 (1)**: 1-25.

Meinzen-Dick, R. and Van Der Hoek, W. (2001). Multiple Uses of Water in Irrigated Areas. *Irrigation and Drainage Systems*, **15**: 93–98.

Munyati, G and Chitongo, L. (2017). Irrigation Schemes and Poverty Reduction in Zimbabwe the Case of Musena Irrigation in Chirumanzu District, Zimbabwe. *The International Journal of Humanities & Social Studies*, **5(7)**: 323-329.

Nahusenay, A. and Tesfaye, T. (2015). Roles of Rural Women in Livelihood and Sustainable Food Security in Ethiopia: A Case Study from Delanta Dawunt District, North Wollo Zone. *International Journal of Nutrition and Food Science*. **4(3)**: 343-355.

Nhundu, K., and Mushunje, A., (2010). Analysis of Irrigation Development Post Fast Track Land Reform Programme. A Case Study of Goromonzi District, Mashonaland East Province, Zimbabwe. *Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference*, Cape Town, South Africa, September 19-23, 2010.

Nhundu, K., Mushunje, K., Zhou, L. and Aghdasi, F. (2015). Institutional determinants of farmer participation in irrigation development post "fast-track" land reform program in Zimbabwe. *Agricultural Biotechnology and Sustainable Development*, **7(2)**: 9-18.

Njuki, J. and Mburu, S. (2013). Gender and Ownership of Livestock Assets, p 21-38, In Njuki, J. and Sanginga, P. C. (Editors) *Women, Livestock Ownership and Markets: Bridging the gender gap in Eastern and Southern Africa*. Rutledge, Nairobi, Kenya.

Njuki, J. and Sanginga, P. C. (2013). Gender and Livestock: Key Issues, Challenges and Opportunities, p 1-8, In Njuki, J. and Sanginga, P. C. (Editors) *Women, Livestock Ownership and Markets: Bridging the gender gap in Eastern and Southern Africa*. Rutledge, Nairobi, Kenya.

Ojulu, L. O. (2015). Gender Differences and Relations in Rural Household Livelihoods of Gog District, Anywaa Zone, Gambella Region, South Western Ethiopia. *International Journal of Gender and Women's Studies*, **3(1)**: 51-79.

Pazvakavambwa, G. T. and van der Zaag, P. (2000). The value of irrigation water in Nyanyadzi smallholder irrigation scheme, Zimbabwe. Paper presented at the 1<sup>st</sup> WARFSA/WaterNet Symposium: Sustainable use of water resources. Maputo, 1-2 November 2000. Maputo.

Phiri, K. (2012). Gender Irrigation Schemes and the Empowerment Question: Untold Experiences of Communal Irrigation Plot Holders in Zimbabwe. Lambert Academic Publishing, Saarbruken, Germany.

Rauch, T., Beckmann, G., Neubert, S. and Rettberg, S. (2016). Rural Transformation in Sub-Saharan Africa – Conceptual Study. Seminar für Ländliche Entwicklung (SLE) Discussion Paper number 01/2016. Centre for Rural Development (SLE) Berlin.

Samakande, I. (2002). Improving the performance of smallholder surface irrigated schemes. pp. 151-158. In: Manzungu E. (Ed.). The processes and dynamics of catchment management in Zimbabwe. Save Africa Trust Publications, Harare.

Shumba, D. (2011). Women and Land: A Study on Zimbabwe. *Journal of Sustainable Development in Africa*, **13(7)**: 236 -244.

Simango, P. M. (2015). An Assessment of Women's Participation in Agricultural Production: A Case Study of Marange Irrigation Scheme in Zimbabwe. Master's Thesis, University of the Western Cape: South Africa.

Singh, N. (2008). Equitable gender participation in local water governance - An insight into institutional paradoxes, *Water Resources Management*, **22**: 925–942.

Sultana, F. (2014). Gendering Climate Change: Geographical Insights, *The Professional Geographer*, **66(3)**: 372-381.

Udas, P.B. (2014). Gendered Participation in Water Management in Nepal: Discourses, Policies and Practices in the irrigation and Drinking Water Sectors. PhD Thesis, Wageningen University Netherlands.

Upadhyaya, A. (2016). Integrated Water Resources Management and Climate: Change Adaptation Strategies. *Irrigation Drainage Systems and Engineering*, **5(3)**:1-5.

van Houweling, E. (2016). "A Good Wife Brings Her Husband Bath Water": Gender Roles and Water Practices in Nampula, Mozambique. *Society & Natural Resources*, **29(9)**: 1065-1078.

Wahaga, E. (2018). "The gendered nature of productive and reproductive roles in the agricultural sector", *International Journal of Development and Sustainability*, **7(1)**: 120-146.

Zwarteveen, M.Z. (2006). Wedlock or deadlock: feminists' attempts to engage irrigation engineers. PhD thesis, Wageningen University, Wageningen, the Netherlands.

Zwarteveen, M. Z. (2008). Men, masculinities and water powers in irrigation. *Water alternatives*, **1(1)**: 111-130.

## CHAPTER FIVE: NATURE AND EXTENT OF PARTICIPATION OF MEN AND WOMEN IN MANAGING IRRIGATION WATER IN NYANYADZI SMALLHOLDER IRRIGATION SCHEME

### ABSTRACT

Farmer participation is a major factor influencing the success of smallholder irrigation schemes. Yet most smallholder irrigation schemes in sub-Saharan Africa suffer or lack proper irrigation water management systems among other factors. Against this background, this study interrogated the nature and extent of men and women's participation in canal water management at Nyanyadzi Irrigation Scheme. The study specifically sought the roles and responsibilities of men and women in canal water management. A two phase sequential exploratory mixed methods research design was adopted for the study. Seventy three farmers participated in the initial qualitative phase of the study while 109 farmers participated in the 2<sup>nd</sup> phase of the study which was quantitative in nature.

Focus group discussions facilitated the collection of qualitative data through the gender activity profile tool. Thematically analyzed qualitative data revealed 2 major themes related to men and women farmer's participation in water management, that is decision making and implementation. In the four themes that emerged from the decision making spectrum namely; membership in IMC, attending meetings, speaking during meetings and concerns being considered men participated more than women. For instance regarding membership in IMC, 75 % of members were men while the remaining 25 % were women. Regarding participation in making contributions during water related meetings, 88 % of men held that they contribute ideas while 76 % of women said that they do not speak at meetings. In the implementation spectrum, 72 % of women hire labour for canal repairs while 81 % of men do canal repairs themselves.

The second phase of the study was confirmatory and quantitative in nature. An inventory questionnaire requiring likert responses was the data collection instrument. Results collected through the questionnaire were analyzed using the Predictive Analytics Software Statistics 18 for Windows (PASW Inc: Chicago, IL, USA). Highly significant positive associations ( $P < 0.01$ ) were observed across the socio-economic variables such as gender, age, marital status, level of education, ownership of irrigation plot and plot location with participation in meeting attendance, speaking at meetings, repair of canals, labour provision in canal maintenance, hiring labour for canal maintenance, contributing cash for canal repairs and maintenance and concerns and interests. However, there was no association between the level of education and attendance of meetings ( $P > 0.05$ ). Results revealed that farmer participation in water management at

Nyanyadzi is gendered. Socio-cultural norms that are influenced by the patriarchal ideology shape men and women's level of participation in canal water management. These norms constitute a major barrier to men and women's effective and genuine participation in irrigation water management. A thorough understanding of the context in which participation occurs is therefore needed in order to get a meaningful engagement of both male and female farmers in water management.

**Keywords:** canal water management, gender, irrigation, participation, smallholder irrigation scheme.

## 5.1 Introduction

While the previous chapter looked at the nature of canal water use at Nyanyadzi smallholder farming, this chapter focuses on the roles and responsibilities of farmers in the use of this precious resource. Farmer participation in irrigation water management has been found to be significant in improving productivity, sustainability and viability of smallholder irrigation schemes (Fikirie *et al.*, 2016). Farmer participation is a major factor influencing the success of smallholder irrigation schemes. Yet most smallholder irrigation schemes in sub-Saharan Africa suffer or lack proper irrigation water management systems among other factors (Molden *et al.*, 2010; Nhodo *et al.*, 2014). On a global level, Meinzen-Dick & van Der Hoek (2001) concluded that, farmer participation in water management at smallholder schemes is not gender neutral.

Globally, Aladuwaka & Momsen (2010) found that the leading organisations engaged in water management are very male dominated. For example in China, women are water users, both in irrigation and domestic spheres, but they have neither equitable access to water nor a fair influence in the management of water (Caizhen, 2008). In Bangladesh, women are not involved in agricultural water management at all (Kulkarni, 2011). In Zimbabwe, one of the central tenets of the Water Act of 1998 is the decentralization of water resources management which entails stakeholder participation. This provides an opportunity for rural communities to actively participate in and contribute to the management of their development. Stakeholder participation in water resources management requires that everyone utilizing a water basin, catchment or sub catchment participate in the decision making process of how water resources are used. Catchment Councils offer an equal opportunity for catchment residents to participate in decision making in water management, but in practice, irrigation management domain is still masculine and heavily skewed towards men. In Zimbabwe, Mtisi & Nicol (2003) observed that socio-cultural

constraints such as norms defining appropriate gender roles can discourage women to speak out at public meetings, thus limiting their public participation. This is despite the dominance of women in agriculture. This can be attributed to the fact that, Zimbabwe is a highly patriarchal society, where traditional and religious beliefs and practices still largely dictate men and women's behaviour in society and within the home and family. This also goes to show how gender relations are power relations.

Traditionally, women were assumed to be solely responsible for domestic uses of water while men took on the productive uses (Clement, 2012). This categorization overlooked women's productive water needs and even men's domestic water needs as well. This assumption was based on simplistic views which considered either men or women as a homogenous group, whose water needs and priorities were the same and therefore required at the same time. Further, the fluid and fugitive nature of water characterized by flowing, seeping, evaporating and transpiring does not allow it to fit in such neat categories of productive and domestic water uses (Young *et al.*, 1986). Rather, Singh (2006) argues that the social status of an individual detect the nature and extent of their participation in water use and management. For example, within the gender category some men and women are single, while others are married and yet others are widowed (Cornwall, 2000). This is likely to influence how and why they participate in irrigation water management. Gender intersects with other social variables like class, age and social status to determine and influence level of participation and use of irrigation water.

Cleaver (1998) and Manzungu (1999) ascribe the failure of smallholder schemes in Africa to ineffective or absence of water management institutions. Nyanyadzi is a water-scarce region, this makes the management of water in the irrigation sector crucial (Kemerink, 2015). Water management at the scheme and plot levels is a major factor influencing the success of smallholder irrigation schemes (Motsi *et al.*, 2001; Samakande, 2002). Against this backdrop, this study interrogated the roles and responsibilities of farmers in the management of canal water at Nyanyadzi scheme.

The concept of participation emerged from a critique of top-down state-led development strategies that failed to adequately consider the views of ordinary people in decision-making and development processes. The top-down strategies did not promote development of poor rural areas. Instead, in the hands of powerful people, development became a tool of marginalization and disempowerment which seemed to ignore the human factor. An important milestone in

people's participation in rural development was the 1979 World Conference on Agrarian Reform and Rural Development in Rome (WCARRD). The conference declared that participation by rural people in the institutions that governed their lives was a basic human right. It was also established that for rural development to realize its potential, disadvantaged rural people had to be actively involved in designing policies and programmes that affected them.

In line with this declaration was one key recommendation from the Rio Earth Summit in 1992 which laid that water management should be decentralized and that stakeholders should play a key role in the management of natural resources including water. As such, it is expected that men and women who are involved in smallholder irrigation participate in canal water management. This makes sense, given the significance of smallholder irrigation's potential to enhance agricultural productivity and food and nutrition security under the growing threats of climate variabilities (Thierfelder *et al.*, 2017). Further, this study is in accordance with the United Nations Sustainable Development Goals (SDGs) which call for an end to poverty (Goal 1), end hunger, achieve food security and improved nutrition, promote sustainable agriculture (Goal 2), achieve gender equality (Goal 5) and ensure availability and sustainable management of water (Goal 6). Smallholder agriculture potential to contribute to the achievement of these goals cannot be underestimated, however under good water management practices. This is particularly true considering assertions by scholars such as Burney *et al.* (2013) who perceived that, smallholder irrigation schemes are the seedbed of rural development and Nhundu *et al.* (2015) who declared that good water management in smallholder farming contributes to poverty reduction and improved household income. Therefore, participation in smallholder water management including its use cannot be overemphasized, due to the factor that water plays a critical and central role in the success and sustainability of smallholder agriculture. It therefore follows that even its management is crucial.

Embracing the 'right irrigation', is one strategy of addressing food and nutrition security and poverty concerns in Africa. The 'right irrigation' builds on local capacities and embraces gender relations within the irrigation scheme among other important factors. The study bemoans the non-recognition of gender in irrigation water management at Nyanyadzi Irrigation Scheme. It could be that the low productivity levels experienced at Nyanyadzi scheme could be a result of the exclusion of the men and women farmers' participation in water management including its use.

Hence, the study examined the roles and responsibilities of men and women in irrigation water management. This was done in order to recommend all-encompassing intervention strategies for

irrigation water management that incorporate all actors' priorities, needs and interests in decision making and implementation. The study was guided by the research question- what is the role of men and women farmers in canal water management?

## **5.2 Study Methodology**

The detailed study methodology has already been explained in Chapter 3. Refer to Sections 3.2 through 3.7.

## **5.3 Results**

### **5.3.1 Demographic profiles of study participants**

Results of the demographic profiles of study participants for this study were presented in Chapter 4 under Section 4.3.1.

### **5.3.2 Perceptions of men and women regarding their roles and responsibilities in canal water management.**

Regarding men and women farmers' participation in decision making, four themes related to decision making emerged namely; membership in the Irrigation Management Committee (IMC), attend water related community meetings, speaking at meetings and consideration of concerns raised at meetings (Table 5.1). Findings from both key informants interviews and focus group discussions revealed that 75 % of IMC members were men while women were represented by 25 %. Results further show that men held top decision making positions in IMC namely; the chairperson, vice chairperson, treasurer, secretary, vice secretary and water distributor. Women were merely committee members.

Along the decision making spectrum in water management, the theme of participation by meeting attendance emerged with the majority of men (87 %) alluding to attending community water related meetings while the majority of young and middle women (76 %) indicated that they do not always attend water related meetings owing to time constraints while. The confirmatory study revealed a significant association between gender and meeting attendance ( $\chi^2 = 49.82$ ;  $p < .001$ ). Cramer's  $V$  value was significant (Cramer's  $V = .68$ ) and it indicated a strong association.

**Table 5.1 Perceptions of Men and Women on Participation in Canal Water Management**

Level of Participation	Gender Roles and Responsibilities	Men			Women		
		<i>Not Involved</i>	<i>Less Involved</i>	<i>More Involved</i>	<i>Not Involved</i>	<i>Less Involved</i>	<i>More Involved</i>
Decision making	1. Membership in IMC			X		X	
	2. Attend water related meetings			X		X	
	3. Speak at meetings			X		X	
	4. Concerns considered			X		X	
Implementation	1. Provide labour			X			X
	2. Distribute water			X	X		
	3. Repair canal			X	X		
	4. Clean canal			X			X
	5. Payment for water charges		X			X	
	6. Contribute cash for repairs		X				X
	7. Hire labour to do canal repairs and cleaning	X					X

**Key:** x = Men and women's level of involvement in canal water management

Sixty nine percent of the respondents agreed with the perception *I attend meetings* relating to irrigation water. Of these, men were in the majority (63 %). Thirty one percent of the respondents who all happened to be women did not agree with this perception. In terms of age, 65 % of the respondents who were in the 50-69 years age category agreed with the perception. With regards to marital status, 88 % of the married respondents also agreed with the perception. Forty eight percent of upstream farmers agreed most with this perception. Women cited various reasons why they do not always attend meetings. A considerable number of women (60 %) cited that they do not attend meetings because the meetings are too frequent while a handful of them (28 %) mentioned that their husbands, mothers or male relatives attended the meetings on their behalf. One young woman aged between 26-30 years stated that;

*I cannot attend meetings when my husband and in-laws are all there. I use that time to do other reproductive activities within the home.*

Another single woman narrated that,

*How can I attend meetings when there is no food at home, how can I attend a meeting when my kids have no school fees I sell tomatoes and other vegetables, I do door to door vending. I therefore do not have time to attend meetings. I just accept the decision made by others, because I know the decisions will be good for us.*

These results were also confirmed in key informants' interviews by the 2 women who were IMC committee members. One of the 2 women opined that,

*I am not a member of IMC by my own choice but it's just that people think I am capable. The actual fact is I have no time to attend IMC meetings regularly, they are too frequent for a woman.*

Another theme which emerged from the decision making spectrum, was the issue of speaking or contributing ideas during community irrigation water meetings. Majority of male participants (88 %) professed that they speak their hearts out during meetings while a considerable number of women (76 %) expressed that they do not always speak during meetings. The confirmatory study revealed a significant statistical association between gender and participation through speaking at meetings ( $\chi^2 = 32.84$ ;  $p < .001$ ). Cramer's V value was significant (Cramer's  $V = .55$ ) indicating a relatively strong association. One female participant in the focus groups remarked that,

*It is not good for women to speak in front of their in-laws.*

The final theme which emerged along the decision making spectrum was related to the nature and extent at which *concerns raised in meetings were considered*. The confirmatory study revealed a significant statistical association between the plot ownership variable and the perception *my concerns raised in meetings are considered* ( $\chi^2=83.53$ ;  $p < .001$ ). Cramer's  $V$  value was significant (Cramer's  $V = .86$ ) indicating a very strong association. The majority of male participants (92 %) alluded that their views were considered for implementation while (72 %) female participants stated that their concerns were not always easily accepted and considered. One female participant mentioned that,

*I have lost interest in attending these meetings because my issues have never been addressed. For example, I have always complained about delays in water delivery to my plot but the issue has not been addressed.*

Results also revealed different shades of farmer participation in implementation. Seven sub-themes emerged from the major theme of farmer participation in implementation (Table 5.1). The majority of men and women farmers (88 %) alluded that they provide labour and cash for canal maintenance and repairs. From the focus group discussions more men (81 %) testified that they participate in canal repairs. Women do not participate in canal repairs, instead 72 % of them testified that they hire labour for canal repairs. A handful (28 %) of men contribute cash towards canal repairs compared to 57 % of women.

A significant statistical association was observed between the gender variable and participation in the repair of canals ( $\chi^2=93.90$ ;  $p<.001$ ). Cramer's  $V$  value was significant (Cramer's  $V = .99$ ) indicating a very strong association.

Age was a significant factor against the perception of participation in labour provision in canal maintenance ( $\chi^2=97.006$ ;  $p<.001$ ). Cramer's  $V$  value was significant (Cramer's  $V = .94$ ) indicating a very strong association. Both men and women equally indicated and agreed that they participate in canal cleaning with the exception of those farmers over 80 years regardless of gender who are automatically socio-culturally exempted by cultural norms and practices of the community.

With regards to the perception *I contribute cash for canal repairs and maintenance*, there was a significant association between gender ( $\chi^2=8.105$ ;  $p<.004$ ), age ( $\chi^2 =32.940$ ;  $p < .001$ ) and marital

status ( $\chi^2 = 15.406$ ;  $p < .001$ ) and the perception *I contribute cash for canal repairs and maintenance*. Cramer's  $V$  value was significant (Cramer's  $V = .27$ ;  $.54$ ;  $.38$ ) respectively.

There was a statistical association between gender and I hire someone to do canal maintenance work on my behalf ( $\chi^2=31.378$ ;  $p<.001$ ); age ( $\chi^2=45.406$ ;  $p<.001$ ) and marital status ( $\chi^2=30.223$ ;  $p<.001$ ). Cramer's  $V$  value was significant (Cramer's  $V = .56$ ;  $.64$ ;  $.53$ ) respectively.

Results also revealed that 27 % of men were more involved in water distribution to the plots, whereas women did not participate in this task. Both men and women farmers expressed that they pay for the water to get it delivered to their plots.

## **5.4 Discussion**

### **5.4.1 Demographic profiles of study participants**

The same study participants who participated in the study presented in Chapter 4 participated in this study as well. Refer to Section 4.4.1 in Chapter 4 for detailed analysis of the demographic profiles of study participants.

### **5.4.2 Nature and extent of men and women's participation in canal water management**

Empirical findings revealed different modes and levels of farmer participation in canal water management between men and women. Findings from focus group discussions revealed that IMC membership is gendered in that only 2 out of the 8 member committee were women. This shows that women are under-represented in the IMC. This finding is in agreement with Masanyiwa *et al.* (2014) who found that women are under-represented in village meetings.

Results further indicate a gender bias in irrigation water committee positions. Men occupied the decision making and influential positions in the IMC. For example, the committee positions of the chairperson, vice chairperson, secretary, water distributor and treasurer were all occupied by males. Women on the other hand do not occupy influential or active decision making positions within the IMC. Women are merely committee members whose role may be equated to formally help meet the required quota when major decisions have to be passed by the committee. The above findings of women being marginalized in the participation process are corroborated with other studies on gender and irrigation water. Agarwal (2010), found that women in community forestry institutions in rural India and Nepal usually occupied 'supportive' leadership positions as

vice-presidents, joint secretaries and co-treasurers. Duncker (2001) made similar observations in his study in South Africa. He found that, the women in water committees were only there to fulfil the then quota of 30 percent expected by policy and supported by the funding agencies. Mandara *et al.* (2017) observed the same findings in his study in Zambia where they observed that key positions such as the chairperson, vice chairperson and secretary were dominated by men. Hemson (2002) found that women tended to hold the less powerful positions as 'auxiliaries' to the main positions rural water committees in South Africa. This form of participation is tokenistic, in that it has no effect on the decisions being made. The findings point to a scenario in which participation in decision making in canal water management is a privilege that is endowed mostly to men.

The above scenario contradicts the whole essence of participatory water management whose central aim is the inclusion of those most affected by the proposed intervention in decision-making (Dewan *et al.*, 2014). Decision making is a crucial component of stakeholder participation, hence if women are not able to contribute to decision making, their membership is merely tokenism. Basing on the classic framework of citizen participation by Arnstein (1969) the kind of participation experienced by women farmers is merely token whereby they are manipulated into accepting decisions that have already been made. There is little transfer of decision making power to women. These findings correspond with Dewan *et al.* (2014) who also found that women are marginalized in the participation process. Power imbalances within the community, intra-household and family relations limit abilities for women to effectively participate in water management.

Another issue which emerged from the results was that the membership of women into the IMC was an imposition by community leaders. Agarwal (2010) also found similar results in her case study on community-based forest management in Nepal where male executive committee members choose women members in their absence and without consulting them. This imposition could explain the reluctance of women to participate in IMC and their reluctance to attend the IMC weekly meetings. Imposition of membership in water management does not promote inclusive participation; in fact it results in nominal participation. With reference to Agarwal's (2001) typology of participation, participation at nominal level is characteristic of just being a member of a group. Hence in this scenario, women do not make decisions nor attend meetings they are just there to add numbers to IMC membership, there is literally non-participation. The reluctance by women to be members of IMC could be an indication of gender norms that define men and women's roles and responsibilities. These place a heavy burden on women as they are expected to engage in

triple roles before participating in community meetings. Individual social barriers due to women's low levels of education and lack of experience and knowledge on IMC could contribute to the reluctance to participate in IMC as portrayed by women.

There was a very strong association between gender and the perception *I attend meetings*. Cross tabulations confirmed that the majority of men agreed with the perception more than women. The majority (55%) of women confessed that they did not attend community meetings. This was surprising however, given that women represent the larger number of participants in irrigated agriculture. During focus group discussions young women (30-49 years) pointed out that they did not attend the meetings because of time constraints. Majority of the women perceive that the timing of meetings are inconvenient in that they clash with domestic roles. In Tanzania, Masanyiwa *et al.* (2014) found similar results in their study in which more men than women attended public meetings. The assumption by women who do not attend meetings is that if male relatives or neighbours attend meetings then, they are represented. However, this conception of household head is narrow and insufficient. A household is not a homogeneous entity (Dewan *et al.*, 2014). The household head may fail to represent the reality of the social unit they represent.

Or it could be that there is a general lack of interest by women to attend the meetings under the assumption that men represent them. These findings are in agreement with Caizhen (2008) who concluded that women's dependence on men and lack of self-confidence impeded them from attending water user meetings in Gansu Province, China. The general implication among women was that they tended to view community meetings as a 'men's thing'. However, such attitude could have been informed by patriarchal customary beliefs which disproportionately accrue power to men (and the in-laws) at the expense of women.

One female participant who is a member of IMC pointed out that she did not attend the IMC weekly meetings owing to the frequency of the meetings which were too much for her. As a result she could not keep up with the pace. Women agreed with each other on this sentiment and expressed that their other reproductive roles as wives, mothers, daughter in-laws, household managers and caregivers did not permit them adequate time to frequently attend meetings. These expressions could however be a manifestation of customary and cultural practices and beliefs that restrict women from the public arena and confine them to the private sphere which is the home. In Tanzania, Mandara *et al.* (2017) found that having women in local water management bodies challenged the pervasive socio-cultural notion that such bodies are a public, hence a male

domain. This shows how irrigation farming is still viewed as a masculine world (Zwarteveen, 2001; Udas, 2014). These findings correspond with Murray *et al.* (2016) who found that restrictive gender norms prevent women from stepping out of their households. This could be true, considering that Nyanyadzi is a highly patriarchal community. As a result women tend to be invisible actors along the decision making spectrum of canal water management. Another single female farmer participant lamented that,

*How can I attend meetings when there is no food at home, how can I attend a meeting when my kids have no school fees I sell tomatoes and other vegetables, I do door to door vending. I therefore do not have time to attend meetings. I just accept the decision made by others, because I know the decisions will be good for us.*

These opinions give the impression that, attending meetings may be a luxury when one is poor. These sentiments reveal that poverty is a constraint to participation in community meetings. It is often not acceptable to people, in societies where the privatization of life has gone far that additional demands for community participation can only be met through foregoing personal activities (Masanyiwa & Kinyashi, 2008). The rural poor will only actively participate in programmes and projects that offer highly desirable and tangible benefits, sufficient enough to overcome their situation. Masanyiwa & Kinyashi (2008) found that, most people in developing countries struggle to meet their basic and felt needs as a result, they are often pre-occupied with searching for food in order to survive. This then may imply that attending community meetings may be a luxury that they cannot afford. These findings also indicate socio-economic conditions of individuals are a major determinant of participation in water management.

Women further expressed that the times the meetings were held were not convenient for their household gender roles. They expressed that it was possible for older women to attend meetings because they did not have other pressing duties in the home due to their age. Older women were said to have daughter in-laws and there are less burdened with household tasks, therefore they have time to attend meetings. Singh (2008) and Bossenbroek & Zwarteveen (2014) found similar results in their study in south Asia. These views show that women are not a homogenous social group. Cornwall (2000) points out that this categorization of men or women into single entities merely oversimplifies complex realities. Being of same gender does not equate to sameness as often depicted.

Men on the other hand expressed that they had no social limitations that prevented them from attending community meetings. They felt it was their responsibility as heads of households and families to attend community meetings. One middle aged (50-59 years) male participant commented that there was no need for his wife to attend community meetings when he was also in attendance. However, even though the majority of men and few women acknowledged to attending community water related meetings, merely attending meetings is a lower level of participation. It is a passive form of participation, where farmers just attend and listen without contributing to decision making.

During a community briefing of all study participants (men and women mixed together) before they went into their actual respective focus group discussions, the researcher observed that women preferred sitting at the back in isolation. They did not feel comfortable sitting closer to men. This observation was also made by Danquah (2003), who observed that, during community meetings, women are grouped behind men or at the blind side of the main facilitators or speakers of the meeting. Thus, despite concrete efforts to promote women's greater involvement in community projects, the belief that, men should predominate in this domain remains entrenched in women's minds.

A relatively strong association emerged between gender and the perception *I speak my heart out at the meetings*. The majority of men concurred with this perception. This was evident in mixed focus group discussions where men freely expressed themselves in giving their views compared to women. Women in the mixed focus group had to be probed further and further again in order to give their opinions. In one female focus group of middle aged married women, participants alleged that it was not proper to just speak and compete with men publicly especially if one is a woman. One participant commented that,

*A dignified woman does not oppose what men speak in public, if you just do so, you lose respect and honour in the community.*

This quote reveals a deep belief in patriarchal values. It also shows how deeply entrenched the patriarchal beliefs are fixed in these rural women. Key informant interviews with the IMC Chairperson who is man confirmed this finding. He agreed that it was not part of the tradition for women to be vocal in public spaces. Same observations were noted by (Mangoma, 2011) in her ethnographic study in Mufiri Ward 20 of Shurugwi District in the Midlands Province in Zimbabwe. During informal discussions with women, one woman said that *'it is not proper for a woman to be*

*very vocal and challenge men openly at meetings, hachisi chivanhu chedu (it is not part of our [African] tradition) for women to behave as such in public spaces’.*

These sentiments expressed by this female participant are in agreement with what other women who participated in focus groups in Masanyiwa that,

*If a woman is too talkative in public meetings, men will say don’t marry from that clan, their women are very noisy.*

These sentiments show how the prevailing notions of culturally expected human social behaviour for men and women exert influence on how they interact and participate in water management meetings. The findings reveal gender variations on what men and women can speak about in public meetings and how they should speak about it. According to Zwarteveen & Neupane (1996) and Chancellor (1997) these sentiments also indicate the strength of cultural stereotypes and social constraints that restrict women from expressing themselves in public gatherings in Africa and Asia. The results further reveal that despite the relatively high number of women in public meetings, very few women can voice their concerns and speak up. This finding is also in line with Dewan *et al.*, (2014) and Mandara *et al.*, (2017) who found that prohibitive cultural attitudes and perceptions such as being thought of as *‘loose women’* or *‘unfit mothers’* and being falsely accused of having *extramarital affairs* were suppressing the participation of women in public meetings. The case of women not speaking at meetings exacerbate challenges of gender inequalities in water management in that women’s water needs and preferences are not formally taken into account. If women fail to speak at the meetings their water issues remain unsolved. This finding further questions the opinion and belief that women must participate. The question or issue then becomes, what kind of participation is idle for women empowerment. Women involvement should go beyond their physical presence in meetings. Giving women a voice and ensuring that, that voice’s demands are heard, actioned and implemented is what must be ensured in irrigation water management institutions.

A considerable number of elderly women declared that they speak at liberty during public meetings. This could be because they have acquired a social status in community because of old age. Gachenga (2015) noted that this privilege is granted customarily to older women who are in post-menopause. Zwarteveen & Nepaune (1996) allude that usually these women have grown up children and are less burdened with household tasks. Here, gender is further seen as intersecting

with other variables such as age, marital and social status, which all play a role in enabling or constraining effective women's participation in water management.

Results show that the decision making is a gendered and contested arena dominated by men. The majority of women (82%) did not agree with the *perception my concerns and interests are considered*. They felt that water management issues were biased in favour of men. It was established in the study that, women are active participants in implementation stages, yet they are underrepresented in decision making. This scenario is similar to findings by Udas (2014) who author found gender inequities in decision making related to irrigation water management in Nepal. On the other hand all male respondents agreed with the perception. The men concurred that their issues and interests were considered. However, 18% of the women who concurred with this perception had societal ascribed roles and responsibilities that privileged them to influence decisions. These were older women who had reached menopause and had rights, privileges and responsibilities that were markedly different from those of the younger women due to their age and status within the community. This result agrees with Cornwall (2000) who found that in many African contexts, older women participate in decision-making forums as a result of their relationship with men either as chief's wives, or in their own right along ethnic and clan relations. Cornwall (2000) further expressed that young men have less power in relation to older men, and even sometimes in relation to older women. At this juncture it must be noted that in a patriarchal system, roles and responsibilities are ascribed according to gender, age and marital status. These roles are highly differentiated between men and women, and even amongst women themselves. For example older women who are in the generation of mother-in-law occupy very senior positions in society and can influence decisions and can even override decisions by men (Singh, 2006). In this study, these women also influenced decisions related to water management and also expressed themselves in meetings. These findings show that men and women's participation in water management is shaped by socio-cultural relations and the social structure (patriarchy) within which the genders operate. These findings reveal that women are a heterogeneous social group, where some are privileged to express themselves while others are marginalized by the same system that upholds others.

Results also reveal that both men and women participated in implementation stages of canal water management at varying spectrums. Participation in implementation mainly involves three major activities at Nyanyadzi scheme namely; repair and maintenance of the canal infrastructure, distribution of water and rehabilitation works including canal cleaning. It is important to note that the non-participation of women in decision making spheres and in attending irrigation meetings

does not discourage them from participating in the maintenance, cleaning and repair of irrigation canals. This finding is contrary popular belief that if beneficiaries do not participate in decision making, they are less likely to participate in implementation stages. The findings are consistent with Carter & Burman (2014) who found women to be active participants in labour provision in irrigated agriculture compared to the decision making and attending meetings in India. The gender division of labor observed in the study has not radically changed since Boserup (1970) published her analysis of women's contribution to agricultural production in Africa more than 48 years ago. Women continue to lack a strong voice in agriculture water management issues. The subordination of women, inherent in patriarchal societies, thus becomes apparent in irrigated agriculture (Zwarteveen, 2008).

Women opined that their participation in canal maintenance and cleaning was influenced by the consequences of not participating in these activities. They expressed that individuals who do not contribute to canal repairs, maintenance and cleaning are blocked from using irrigation water to their plots. The majority of women also pointed out that their active involvement in these activities was further triggered by the fact that cleaning, maintenance and repair works to the canal made it easier for them to access clean water for other domestic uses such as laundry or bathing as alluded to in Chapter 4. These sentiments show that women involve themselves in activities which guarantee them immediate and tangible benefits for instance, having clean water for other purposes. In this study the benefits of participating in the canal maintenance were immediate and more evident compared to attending meetings. This implies that men and women may have other different motives or a combination of factors that influence the extent of their participation in irrigation water management.

The overall results indicate gender inequalities in the nature and extent of participation in irrigation water management at Nyanyadzi irrigation. These gender inequalities stemming from patriarchal structures and authority affect women's participation in public spheres as men continue to view women's roles as being confined to the domestic spheres. Gaidzanwa (1988) points out such patriarchal tendencies affect women's participation in the public arena and in decision-making processes within and outside the household. She further argues that most Zimbabwean women, because of their socialization, continue to live within the confines of patriarchal authority and existing societal expectations. These sentiments have been confirmed by the findings from this study as well. In Agarwal's (2010) typology of participation, speaking up in the meeting is a more active and higher level of participation than just attending meetings. Results from the study

revealed that only few elderly women speak up in the scheme's water meetings. Findings on women's participation in local water governance structures do not seem to deviate much from the picture found in the literature. Other studies in Africa have established that, for example, women were simply described as committee members and occupied secondary and supportive positions in the committees (Masanyiwa *et al.*, 2014; Mandara *et al.*, 2017). Descriptions like these substantiate Hicks' (2011) argument that women's involvement in local governance follows their traditional roles. The patriarchal system is a major constraint to women's effective participation.

## 5.5 Conclusion

With regard to the nature and extent of participation of men and women in irrigation water management, the empirical results reveal different participation opportunities for men and women. Participation in irrigation water management is gendered at Nyanyadzi. Participation in these spaces, however, differs between men and women, and is influenced by the socio-cultural norms within the household and community. Results confirm that men have better access to participation opportunities. They dominate the decision-making positions in IMC while women do not hold influential positions. Women are more limited in their participation opportunities in terms of making decisions.

It must however, be understood why the opportunities of men and women, with regards to their participation are so different. This parallels findings elsewhere. The empirical results reveal that the underlying causes are found on different levels, shaped and perpetuated in different institutions. At the household level, gender-based roles and responsibilities of men and women, as well as intra-household power relations in regard to decision-making, determine gender inequalities with regards to the nature and extent of participation in water management. Furthermore, the social structures and processes at community level and the irrigation water committee, perpetuate gender roles and support gender inequalities. The nature of women's participation is influenced and affected by various socio-cultural and socio-political factors. For example connected to cultural factors is the patriarchal ideology which provides and perpetuates the context upon which women play and accept a subordinate role. Furthermore, these findings show that many rules of the game that structure and guide people participation are found in household and community institutions that are created, communicated and enforced outside water management institutions.

The patriarchal culture system impedes women's agency in participating in and speaking up in meetings. The patriarchal norms and beliefs that divide men and women's work into separate spheres, i.e. 'private domestic sphere' for women and the 'public productive sphere' for men, constitute a major barrier to men and women's genuine participation in irrigation water management. Strict patriarchal norms regulate control over water and practically exclude women from taking part in irrigation management publicly. For example, when women could not attend meetings due to demands of domestic work, men were not bound by any commitments. This reveals how cultural and religious norms make it difficult for women to attend or express themselves in irrigation meetings.

The analysis of men and women participation in water management has indicated that even though women have extensive knowledge about irrigation water use, their participation in decision making on issues to do with water is still very patchy.

Despite the absence or under-representation of women in IMC and decision making echelons, they were equally (as men) actively involved in the provision of labour and resources in specific activities along the spectrum of participation by implementation. The study has established that participation of men and women in irrigation water management is not only influenced by gender but rather, other socio-economic variables such as age, marital status, plot location and plot ownership status intersect with gender to impact on men and women's roles and responsibilities in water management. The differences in the ways in which men and women are involved water management are also indicative of the patriarchal relations which shape and influence men and women's roles and responsibilities in society. The roles and responsibilities of men and women within the patriarchal ideology framework vary along socio-cultural and socio-economic lines. Hence, the nature and extent of men and women's participation in canal water management is divided along the gender lines. Therefore, understanding the contextual factors affecting men and women's participation in irrigation water management is crucial for formulating sustainable smallholder irrigation water policies.

Findings have revealed how institutionalized gender rules, in particular the household and community shape the nature and extent of men and women's participation in irrigation water management. The traditional codes of conduct for men and women which are determined by the patriarchal system are shaped and reinforced within the household, community and water management institutions, often limiting women's well-being and autonomy over their choices of water use and management.

The social relations of men and women, expressed in gender-specific rights, roles and responsibilities, determine the unequal use and management of the irrigation water resource at Nyanyadzi irrigation scheme. Research findings have shown that men and women farmers' social relations, with regards to water use and management are produced and reproduced within households and communities.

## REFERENCES

- Agarwal, B. (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. *World Development*, **29(10)**: 1623-1648.
- Agarwal, B. (2010). Does women's representation strength affect their participation? Governing local forests in South Asia. *World Development*, **38(1)**:98-112.
- Arnstein, S.R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, **35(4)**: 216-24.
- Bossenbroek, L. and Zwarteveen, M. (2014). Irrigation Management in the Pamirs in Tajikistan: A Man's Domain? *Mountain Research and Development*, **34(3)**: 266-275.
- Burney, J.A., Rosamond, B., Naylor, R.S. and Postel, S.L. (2013). The case for distributed irrigation as a development priority in sub-Saharan Africa. *Perspectives*, **110(31)**: 12513–12517.
- Caizhen, L. (2008) Gender Issues in Water User Associations in China: A Case Study in Gansu Province, *Rural Society*, **18(3)**, 150-160.
- Carter, E. B. and Burman, J. R. (2014). For Better and for Worse? A Gender Analysis of the Jhabla Watershed, a Community Based Natural Resource Management Initiative. *International Development and Management*, **1(3)**: 113-129.
- Chancellor, F. (1997). Women and Smallholder Irrigation Development in Africa - Constrains and Opportunities', *Proceedings of the Workshop on Gender and Water*, 15-19 September 1997, International Water Management Institute, Habarana, Sri Lanka.
- Cleaver, F., (1998). Incentives and informal institutions: Gender and the management of water. *Agriculture and Human Values*, **15**:347-360.
- Clement, F. (2012). Literature Review: Gender and water management organisations in Bangladesh. G3: Water Governance and Community Based Management. International Water Management Institute. Dhaka, Bangladesh: CPWF. Available online at <http://hdl.handle.net/10568/35138> Accessed 16 July 2015.

Cornwall, A. (2000) Making a Difference? Gender and Participatory Development. *IDS Discussion Paper*, no. 378. November.

Danquah, J. L. (2003). The gender agenda: Walking the talk at all levels. Dawuro. *The News Letter of Water Aid-Ghana Programme*, **5**:9.

Dewan, C., Buisson, M.C. and Mukherji, A. (2014). The imposition of participation? The case of participatory water management in coastal Bangladesh. *Water Alternatives* 7(2): 342-366.

Duncker, L. (2001). 'Strategies for empowerment of women in water supply and sanitation projects', South Africa *Water Research Commission Report*: 817/1/99, Water Research Commission.

Fikirie, K, Tesfaye, Y and Tesema, E. (2016) Gender Dynamics in Small Scale Irrigation Agriculture among Smallholder Farmers in Lume District in the Central Rift Valley of Ethiopia. *Journal of Culture, Society and Development*, **(24)**: 10-19.

Gachenga, E., (2015). Gender Dimensions of Customary Water Resource Governance: Marakwet Case Study, p 179-214, In Hellum, A., Kameri-Mbote, P. And Van Koppen, B. (Editors), *Water Is Life: Women's Human Rights In National And Local Water Governance In Southern And Eastern Africa*. Weaver Press: Harare.

Gaidzanwa, R. B. (1988). Women's Land Rights in Zimbabwe: An Overview. Occasional Paper, No 13, *Department of Rural and Urban Planning, University of Zimbabwe*.

Hemson, D. (2002). 'Women are weak when they are amongst men': women's participation in rural water committees in South Africa. *Agenda*, **17(52)**: 24-32.

Hicks, J. 2011. Strengthening women's participation in local governance: Lessons and strategies. *Community Development Journal* 46(S1): 136-150.

Kemerink, J.S. (2015) Policies lost in translation? Unravelling water reform processes in African waterscapes. PhD dissertation, Delft University of Technology. Leiden: Taylor and Francis.

Kulkarni, S. (2011). 'Women and Decentralised Water Governance: Issues, Challenges and the Way Forward', *Economic and Political Weekly*, **XLVI (18)**: 64-72.

- Mandara, C.G.; Niehof, A. and van der Horst, H. (2017). Women and rural water management: Token representatives or paving the way to power? *Water Alternatives*, **10(1)**: 116-133.
- Manzungu, E. (1999). Strategies of smallholder irrigation management in Zimbabwe. PhD thesis, Wageningen University, Wageningen, The Netherlands.
- Masanyiwa, Z.S. and Kinyashi, G.F. (2008). Analysis of community participation in Projects Managed by Non-Governmental Organizations: *A Case of World Vision in Central Tanzania*. UK: Institute of Development Studies.
- Masanyiwa, Z.S., Niehof, A. and Termeer, C.J.A.M. (2014). Gender perspectives on decentralisation and service users' participation in rural Tanzania. *The Journal of Modern African Studies*, **52(1)**: 95-122.
- Meinzen-Dick, R. and van Der Hoek, W. (2001). Multiple Uses of Water in Irrigated Areas. *Irrigation and Drainage Systems*, **15**: 93–98.
- Molden, D., Oweis, T., Steduto, P., Bindraban, P., Hanjra, M.A. and Kijne, J. (2010). Improving agricultural water productivity: Between optimism and caution. *Agricultural Water Management*, **97(4)**: 528-535.
- Motsi, K. E., Zirebwa, J. and Machingambi, L. (2001). Assessment of the smallholder irrigation performance: Management of conveyance and distribution infrastructure at Murara and Nyamatanda north-east of Zimbabwe. *Journal of Applied Science in Southern Africa*, **7(1)**: 9-22.
- Mtisi, S. and Nicol, A. (2003). 'Caught in the act: new stakeholders, decentralization and water management processes in Zimbabwe'. *Sustainable Livelihoods Southern Africa*, **1**: 8.
- Murray, U., Gebremedhin, Z., Brychkova, G. and Spillane, C. (2016). Smallholder farmers and climate smart agriculture: technology and labor-productivity constraints amongst women smallholders in Malawi. *Gender, Technology and Development*, **20(2)**:117-148.
- Nhodo, L., Mafongoya, O. and Dube, K. (2014). The socio-cultural dynamics in smallholder irrigation schemes in rural Zimbabwe. A case study of Rupike irrigation scheme in Masvingo South. *Journal of Social Anthropology*, **5(2)**: 247-255.

- Nhundu, K., Mushunje, K., Zhou, L. and Aghdasi, F. (2015). Institutional determinants of farmer participation in irrigation development post “fast-track” land reform program in Zimbabwe. *Agricultural Biotechnology and Sustainable Development*, **7(2)**: 9-18.
- Samakande, I. (2002). Improving the performance of smallholder surface irrigated schemes. pp. 151-158. *In: Manzungu E. (Ed.). The processes and dynamics of catchment management in Zimbabwe*. Save Africa Trust Publications, Harare.
- Singh, N. (2006). The Changing Role of Women in Water Management: Myths and Realities (Special issue on Women and water in past, present and future') *Wagadu* **3(1)**: 94-113.
- Singh, N. (2008). "Equitable Gender Participation in Local Water Governance: An Insight into Institutional Paradoxes." *Water Resources Management* **22**: 925-942.
- Thierfelder, C., Chivenge, P., Mupangwa, W., Rosenstock, T.S., Lamanna, C and Eyre, J. X. (2017). How climate-smart is conservation agriculture (CA)? – Its potential to deliver on adaptation, mitigation and productivity on smallholder farms in southern Africa. *Food Security*, **9(2)**: 1 – 24.
- Udas, P.B. (2014). Gendered Participation in Water Management in Nepal: Discourses, Policies and Practices in the irrigation and Drinking Water Sectors. PhD Thesis, Wageningen University Netherlands.
- Young R. A., Daubert J. T. and Morel-Seytoux H. J. (1986). Evaluating Institutional Alternatives for Management an Interrelated Stream-Aquifer System, *American Journal of Agricultural Economics*, **68(4)**: 787 -797.
- Zwarteveen, M. and Neupane, N. (1996). Free-riders or victims: Women’s nonparticipation in Irrigation Management in Nepal’s Chhattis Mauja Irrigation Scheme. Research Report No. 7. Colombo, Sri Lanka: International Irrigation Management Institute.
- Zwarteveen, M. (2008). Men, masculinities and water powers in irrigation. *Water Alternatives*, **1(1)**: 111-130.

## CHAPTER SIX: CHALLENGES IN CANAL WATER USE AT NYANYADZI IRRIGATION SCHEME

### ABSTRACT

Smallholder farming is the mainstay of rural households. Its viability depends on availability of water. This is especially true in regions where rain-fed agriculture yields low or no production. Most smallholder irrigation schemes in sub-Saharan Africa experience water inefficiencies due to poor distribution systems and lack of proper irrigation water management among other factors. At Nyanyadzi smallholder scheme accessing water for productive agricultural use remains a challenge. The study investigated the water related constraints faced by irrigation farmers. Data were collected during a community forum using a pair wise ranking matrix tool, key informant interviews and an inventory questionnaire. Qualitative data were thematically analysed while quantitative data were imported from excel spreadsheets into the statistical software known as Predictive Analytics Software Statistics 18 for Windows (PASW Inc: Chicago, IL, USA) for analysis.

Qualitative results revealed that 89 % of farmers agreed that high water charges were a major constraint to the use of irrigation water. Seventy six percent of study participants indicated that there was unequal water distribution and discrimination in water delivery. Confirmatory study results from the quantitative phase of the study on the other hand revealed, a strong positive association ( $P < 0.01$ ) between gender and plot location against the majority of the water problems identified by farmers namely; *water shortages, unfair delivery times, unequal distribution, high water tariffs, hydro-conflicts and hydro-corruption*. Hence the study concluded that the water problems bedevilling Nyanyadzi scheme are a combination of ineffective water management institutions that do not consider the socio-cultural and socio-economic contextual factors that interact with gender, age, marital status and plot location to influence the access and use of irrigation water. There is, therefore, need to holistically address these constraints and barriers in order to ensure gender aware intervention strategies in the use of irrigation water.

**Key words:** gender, irrigation, productivity, smallholder, water.

### 6.1 Introduction

Smallholder irrigation-driven farming is a key intervention to the enhancement of rural livelihoods and food and nutrition security in developing economies (Sinyolo *et al.*, 2014). It is an important factor in improving the lives of poor households and in determining escape routes out of poverty. Burney *et al.* (2013) argues that smallholder farming is the seedbed for rural development in sub-

Saharan Africa while Mujere (2011) calls it a spring board towards rural development and sustainable rural livelihoods in the semi-arid regions. In Zimbabwe, smallholder farming is the mainstay of rural households. This is especially true in regions associated with low and erratic rainfall, where rain-fed agriculture yields very low or no production. The viability of smallholder irrigation is, therefore, dependent on water availability. Access to water allows farmers to increase production and to diversify income opportunities as alluded to in chapter 4. Water is, therefore, a vital resource for smallholder agriculture production, and also for livelihoods and other purposes.

Most smallholder irrigation schemes have been associated with poor performance in sub-Saharan Africa. The World Bank (2008) reported that throughout Africa there is no record of successful and sustainable farmer-managed smallholder irrigation schemes. This is so despite efforts of Governments, Non-governmental Organizations (NGOs) and the private sector. Mutiro & Lautze (2015) allude that smallholder irrigation schemes in southern Africa, have largely failed in their objective to improve rural livelihoods and sustainable crop production for food and nutrition security and poverty alleviation. Yet, the factors that have been affecting the sustainability of irrigation schemes are not well understood (Manzungu & van der Zaag, 1996). There is therefore need to interrogate further and understand the underlying causes of problems in smallholder water use. This is because development initiatives can only be successful if the constraints in smallholder water use experienced by men and women farmers are understood.

Jacobs *et al.*, (2013) established that, smallholder irrigation schemes have numerous challenges, with more failures than successes being reported. The reasons are varied and multi-dimensional ranging from technical to non-technical. For example, Jacobs *et al.*, (2013) and Mujere *et al.*, (2011) point to inaccessible markets; unreliable and inadequate water delivery; substandard infrastructure; and government policies on land tenure that do not support a conducive environment for the successful operation of irrigation schemes as barriers to smallholder productivity in Zimbabwe. In Zimbabwe, smallholder irrigation schemes have proved to be unsustainable beyond external support (Mutambara & Munodawafa, 2014). They have to date been characterized by low production and minimal direct contribution to the national economy (Nhundu & Mushunje, 2010). Many of these schemes have challenges which have left some of them in a state of disrepair or operating below their design capacity (Mutambara & Munodawafa, 2014). Malanco *et al.*, (2018) concluded that water shortages experienced at the Mushandike irrigation scheme were a result of inefficient water management. However, Nam *et al.*, (2017) alludes that, this is further compounded by uncertainties related to climate change and recurrent droughts. Other social and economic factors such as gender, time constraints, poverty and level

of participation in canal water management or membership in IMC among other factors as has already been alluded to in Chapter 5 have contributed to water problems along the canal at smallholder irrigation schemes. For instance, Nkhoma & Kayira (2016) noted that the intensification of water scarcity generated conflicts among irrigation farmers, with women being the most affected. These have fueled growing competition over the dwindling water resources among the different users within and outside the irrigation schemes including Nyanyadzi (Kemerink, 2015).

Research evidence indicates that Nyanyadzi Irrigation Scheme is in a state of flux and performing below capacity (Chifamba *et al.*, 2013; Kemerink, 2015). Nyanyadzi irrigation scheme, was a once flourishing scheme which provided food and nutrition security to surrounding communities and beyond (Magadlela, 1999). The scheme was a source of livelihood for several families before its productivity levels dwindled in early 2000 due to siltation and other socio-technical and socio-political problems (Kemerink, 2015). Accessing water for productive agricultural use remains a challenge at Nyanyadzi Scheme. Against this background, the objective of this study was to identify the constraints faced by male and female farmers in irrigation water use at Nyanyadzi scheme so as to propose intervention strategies.

## **6.2 Study Methodology**

The study methodology has already been explained in detail in Chapter 3. Refer to Sections 3.2 through 3.7.

### **6.2.1 Data Collection Tools**

A collaborative community forum was held to investigate and gain a deeper understanding of the constraints experienced by men and women farmers with regards to the use to irrigation water. A community forum provided a highly interactive discussion among study participants. While traditionally the word community has been thought of as a group of people in a given geographical location, in this study the community referred included a group of smallholder farmers who were active and officially registered with Nyanyadzi irrigation scheme. In the community forum, farmers were able to share their experiences and knowledge in relation to the constraints they encountered in using irrigation water. Men and women farmers were separated to allow for free expression of views. Participants for the community forum were categorized by sex, age and marital status. All in all a total of 6 community forums were held comprising 2 forums for men and 4 for women. Within these forums, participants deliberated on the challenges they faced in using

irrigation water. Responses from the community forums for each group were recorded on community report cards.

After the men and women farmers identified and listed the constraints they face in water use in community forums, they engaged in a problem ranking exercise using a pair wise problem ranking tool (Appendix A4). In the pair wise ranking exercise each item is compared to the other items individually and then the number of times it was chosen is summed. This exercise was repeated until all problems had been compared with each other. The item with the largest sum is deemed to be the most important item. Farmers ranked the problems they had identified in order of their severity according to what they considered and perceived as the most severe problem. Those water problems that were chosen the most (when compared to other problems) were the priority water problems for farmers at Nyanyadzi as shall be presented in Section 6.3.2.

### **6.3.1 Demographic Profiles of Study participants**

Refer to Chapter 4, Section 4.3.1 for a description of results of demographic study participants.

### **6.3.2 Constraints in Smallholder Irrigation Water Use**

Table 6.1 shows the water problems in order of the farmers' perceived priority according to severity of the problem. Results of the pair-wise ranking exercise show that all genders agreed that high water charges was a major constraint to irrigation water use. This perception was ranked as the number 1 water related constraint in irrigation farming at Nyanyadzi. Seventy six percent of the participants expressed that they had reduced their irrigative land as a measure of cutting the high water costs. One middle aged male farmer alluded that:

*Most of us have reduced the size of irrigable land to offset the high water costs.*

Eighty two percent of the farmers revealed that they were sub leasing portions of their land while 72 % revealed that they had reduced number of irrigation times from 3 to 2 times a week in order to reduce the costs of water charges. All the farmers agreed that the water costs were beyond their means. However, more women (68 %) were found in this situation than men. Young women ranked unfriendly water delivery times as their number 2 water problem while elderly women ranked unequal distribution times as number. In relation to this water problem one female participant argued that,

*The problem with water distributors is that they don't understand that we have other household duties we have to do first. For example, we have to prepare for our young*

*children to school. How then, can we just wake up and go the plots. As a result I can't make it at 6.a.m. Consequently, most times I miss out on my water allocation.*

Another female farmer added that,

*The problem is that the water distributors are men. They deliberately ignore our water requirements requests.*

An elderly woman interjected and argued that,

*There is no problem with water distribution times, these young women are just lazy to wake up very early to do those domestic roles. Traditionally we used to get irrigation water very early in the morning, at dawn but we managed our domestic work very well.*

One male farmer agreed with the views of the elderly woman and added that,

*These young women are a problem, that's why these plots are meant for men. We can't start irrigating at 10.a.m. because we have other duties to do in the day.*

One elderly widow who had her plot located downstream reported that;

*My maize crop is now wilting due to lack of water. I paid for irrigation water two weeks ago but up until now I have not yet received my ration. If I was a man I would have received the water since some men in our downstream location are regularly receiving water immediately after their payment.*

Men saw non irrigative water uses a major constraint to water availability. The problem of hydro-conflicts in water use was ranked number 3 by young women and men. One young single female participant said that,

*Some people don't talk to each other in this scheme because of water conflicts. Even a husband and wife can quarrel due to water issues.*

The water problem related to distribution time had 4 scores and ranked as the number 5 challenge.

The water scarcity problem was ranked number 8, 7 and 4 by young women (married and single), elderly women and men (mixed ages but all married) respectively. A high (49 %) proportion of downstream farmers reported that they experience water scarcity. Of these, more than half were women (51 %) while a few (14 %) were men. One key informant strongly expressed that, water does not reach many downstream plots at the scheduled time in the right quantities. The hydro-corruption theme was ranked at number 3 by elderly women, indicating that it was a major problem to them. The problem of hydro-corruption was raised by the majority of downstream elderly women farmers. They stated that the water distributors were paid money to deliver water to some other farmers who would have jumped the water queue.

**Table 6.1 Gendered Pairwise Ranking of Water Use Problems**

<b>Water Problem</b>	<b>Young Women (Married &amp; Single)</b>	<b>Elderly women (Married &amp; Widowed)</b>	<b>Mixed Age Group of Men (All Married)</b>
Exorbitant water charges	1	1	1
Hydro-conflicts	3	6	3
Discrimination	7	4	8
Unequal water distribution	5	2	5
Unfriendly Water delivery times	2	8	7
Water scarcity	8	7	4
Hydro-corruption	6	3	6
Non irrigative uses	4	5	2

Confirmatory study results from the quantitative phase of the study, revealed a strong positive association ( $P < 0.01$ ) between gender and plot location and all the water problems identified by farmers.

#### **6.4 Discussion**

The perception of high water charges was reported as a huge constraint towards the access and use of water for irrigation at Nyanyadzi scheme. Regardless of gender, all the farmers who participated in the study revealed that water charges were too high for them. Chibisa *et al.* (2008) found similar results at Nyakomba smallholder irrigation scheme in north eastern Zimbabwe. Due to high water costs notably due to pump electricity the majority (87 %) of farmers were failing to pay for water charges for their plots. This scenario also confirms observations by Mdemu *et al.* (2017) who declared that lack of finance is a barrier to the overall productivity of smallholder schemes in Africa. This finding implies that, the water pricing system at Nyanyadzi Irrigation Scheme could be a threat to its viability and sustainability. Findings from earlier previous studies reported that the scheme was performing below capacity due to water pricing systems (Chifamba *et al.*, 2013). The authors argue that, many communal irrigation schemes in Zimbabwe have been known to experience financial problems to the extent that most fail to pay their electricity and water bills, and this has led to the practice of plot leasing. The withdrawal and reduction of active plot size by other farmers from Nyanyadzi irrigation scheme confirm assertions by Madhuku (2014) that increases in tariffs result in the collapse of an irrigation scheme. In the same vein Chazovachii (2012) explained that financial constraints are the reason why some communal irrigation schemes become non-functional. Due to lack of adequate financial support, communal irrigators fail to meet the demands to sustain their irrigation schemes.

High water charges due to pump electricity could be a root cause threatening productivity and sustainability of Nyanyadzi irrigation farming.

In addition to the water problem discussed above, farmers expressed experiencing constraints in the water delivery distribution times. Firstly, gender differences between and within gender were noted regarding the timing of water delivery to individual plots. The majority of young women who were still in child bearing years did not agree with the scheduled water delivery times to plots. Their preferred time did not match with the scheduled delivery time to individual plots. The scheduled delivery time was 6.a.m. while young women preferred to get water a little later after mid-morning around 10.a.m. This group of young women argued that the scheduled time for water

distribution was not compatible with their other domestic roles and responsibilities. They argued that it was the expected norm to do routine household chores first before engaging non-domestic chores. For example these young women cited that a woman cannot start a day without sweeping the yard and cleaning the house. The water delivery time therefore conflicted with their daily household tasks. These findings are consistent with Bossenbroek & Zwarteveen (2014) and Zwarteveen (2012) who found that convenience of water delivery timing to irrigation plots was different for men and women farmers.

Although this assertion is unique it goes to show that women's daily activities revolve around balancing between domestic and productive work. Women are primarily responsible for reproductive activities such as child bearing and rearing; household maintenance, including cooking and fetching water and fuel wood; and caring for elderly and sick family members. In this context it is also important to note that there are certain daily domestic routine activities or tasks that are rigid and have a fixed time plan like, preparing meals or breakfast for the family, attending to school-going children, collecting water for the home and fetching firewood.

As a result they cannot be postponed or adjusted. These activities place a heavy burden on women. These findings corroborate analysis by Dadvar-Khani (2015) who asserted that household roles and responsibilities are shaped by patriarchal norms and inhibit any change.

Women had diverging opinions regarding the water delivery times. They did not agree on the convenient time they preferred to get irrigation water distributed to their plots. A substantial number of middle aged and elderly women indicated that they preferred to have water for irrigation early in the mornings as was scheduled. These emerging and diverging concerns among women show that women are not a homogenous group. They have very varied interests depending on their social, economic and cultural conditions at a given time. However, the bottom line is that rural women perform a wide spectrum of duties in maintaining the household and attending to productive activities. These research findings indicate a gendered division of labour in which women bear a disproportionate work burden in comparison to men. These daily tasks are unpaid and often go unrecognized by men. In the end irrigation schedules that work for men do not always work for women who must juggle childcare and house.

Men had no problems with the scheduled water distribution time. This can largely be attributed to the fact that irrigation water distribution and allocation was predominantly decided on by men. Or it could possibly be due to the fact that men dominate the IMC as has been shown by study findings in Chapter 5. Water initiatives therefore, tend to be often informed by men's experience

and knowledge. This is evident by men's inability to adjust the water delivery schedule to meet other users in this case, women's convenient times to get irrigation water. It is even surprising to note that this is happening even when women pay for the water and more so when women contribute more labour than men at the irrigation plots. The findings also reinforce Bob & Bangura's (2014) assertion that, land and water resource use is highly gendered. Women find it difficult to access irrigated water for their plots. Women are made powerless by the traditional patriarchal ideology systems which favour men at the expense of women.

Significant differences were noted between downstream farmers and upstream farmers on the problem of water shortages. Regardless of gender, downstream farmers complained of water abstraction of water by farmers upstream. Plots located near the water source received water more timely and in more adequate quantities, while the tail-end plots received water haphazardly. These findings echo sentiments by Bjornlund *et al.* (2017) who opined that small-scale irrigation schemes face many challenges around water resource use between upstream and downstream users. Consequently, crops at the tail-end suffer water shortage. The findings reinforce observations by Muchara (2015) that, upstream farmers often violate water usage rosters thereby starving off their colleagues downstream. As a result hydro-conflicts between upstream and downstream farmers become inevitable. This finding could be an indication that water scarcity at Nyanyadzi is a result of water management problem within the scheme whereby there is inequitable and unequal water delivery between head end and tail end farmers. This has resulted in some downstream farmers converting some proportions of their land from irrigated to rain-fed agriculture due to scarcity of water downstream. Nkoma & Kayira (2016) made similar observations in their study on gender and power contestations over water use in irrigation schemes in Malawi. The two authors observed that, farmers cultivating in upstream plots often diverted water to their fields making it difficult for the irrigation schemes downstream adequately access water. Consequently, such a scenario limits productivity on downstream farms.

Results show that the majority (51 %) of women have plots located at the tail end of the scheme where water supply is a challenge. The same scenario was reported by Lebel *et al.* (2015) in their study on gender relations and water management in different eco-cultural contexts in Northern Thailand. Women were found to be major plot owners in the uplands while men owned the majority of lowlands plots where irrigation water was plentiful. In this study female farmers who had downstream plots alleged unequal distribution of water and hydro-corruption by water distributors. Elderly women who were widows reported inequitable and delayed distribution of water to their plots by water distributors. These women alleged that they were unfairly treated by

water distributors and felt discriminated because of their age and marital status. The finding, that water supply in Nyanyadzi irrigation scheme is unreliable and inequitable confirm findings of earlier studies by Pazvakavambwa & Van der Zaag (2000) in the same irrigation scheme. Inequity in the use of irrigation water among farmers on the head, middle and tail end positions of the scheme is a major setback on performance of small holder irrigation schemes.

Even though there are water scarcity problems downstream, women were the worst affected. These women are rendered powerless even though they meet the basic requirement to receive water (payment for water). They experience late delivery of water to their plots due to gender and age discrimination. As a result, these water delivery delays and shortages have generated some hydro-conflicts between upstream and downstream farmers and also between downstream farmers and water distributors. Perhaps the unequal and underrepresentation of women in irrigation water management bodies (Chapter 5) may also be a contributing factor to water-related insecurities experienced by women (Huisingsh & Kevany, 2013). However, these findings reveal that a major consequence of water scarcity is conflict over water delivery, allocation and distribution among the various claimants as was reported in Chapter 4. Hydro-conflicts tended to be more prevalent during the dry season, when there was no alternative means of getting water.

## **6.5 Conclusion**

Water problems experienced at Nyanyadzi scheme are due to a combination of socio-economic and socio-cultural factors. It was revealed in the current study revealed that water scarcity problems that included water shortages, unfair delivery times, unequal distribution, high water tariffs, hydro-conflicts, and hydro-corruption limit productivity, cause tension and conflicts between men and women and between upstream and downstream farmers. The water problems reveal how gender interacts with other social variables like age, marital status and plot location to constrain or allow farmers to access and use water productively and reproductively. The study concludes that the water problems bedevilling Nyanyadzi scheme are a combination of socio-economic and socio-cultural factors. There is, therefore, need to holistically address these constraints and barriers to irrigation water use in order to achieve gender equitable use and management of water at Nyanyadzi scheme. This will be addressed in Chapter 7, in which the central tenets of the entire study will be synthesised in view of the founding objectives.

## REFERENCES

- Bjornlund, H., van Rooyen, A. and Stirzaker, R. (2017). Profitability and productivity barriers and opportunities in small-scale irrigation schemes. *International Journal of Water Resources Development*, **33(5)**: 690-704.
- Bob, U. and Babugura, A. (2014). Contextualising and conceptualising gender and climate change in Africa. *Agenda: Empowering women for gender equity* 28(3): 3-15.
- Bossenbroek, L. and Zwarteveen, M. (2014). Irrigation Management in the Pamirs in Tajikistan: A Man's Domain? *Mountain Research and Development*, **34(3)**: 266-275.
- Burney, J.A., Rosamond, B., Naylor, R.S. and Postel, S.L. (2013). The case for distributed irrigation as a development priority in sub-Saharan Africa. *Perspectives*, **110(31)**: 12513–12517.
- Chazovachii, B. (2012). The impact of small scale irrigation schemes on rural livelihoods: The case of Panganai irrigation scheme Bikita District, Zimbabwe. *Journal of Sustainable Development in Africa*, **14 (4)**: 217–231.
- Chibisa, P., Mautsa, A. and Mukoto, B. (2008). Smallholder Irrigation Schemes in Nyanga North as Strategies for Poverty Reduction and Sustainable Rural Livelihoods. *Journal of Sustainable Development in Africa* **10(2)**: 653-676.
- Chifamba, E., Nyanga, T. and Gukurume, S. (2013). Irrigation Water Pricing and Cost Recuperation for Sustainability of Irrigation Projects in Nyanyadzi, Zimbabwe. *Russian Journal of Agricultural and Socio-Economic Sciences*, **3(15)**: 39-53.
- Dadvar-Khani, F. (2015). Geographical perspective on gender relations in rural areas: A comparative study in north and west of Iran. *The Journal of Rural and Community Development*, **10(2)**: 63-77.
- Huisingh, D. and Kevany, K. (2013). 'A review of progress in empowerment of women in rural water management decision-making processes', *Journal of Cleaner Production*, **60**: 53–64.
- Jacobs, C., Chitima, M., Klooster, C. e. V., and Bwanali, K. (2013). Determinants of the productivity and sustainability of irrigation schemes in Zimbabwe and pre-investment framework. Final report 30 May.
- Kemerink, J.S. (2015). Policies lost in translation? Unravelling water reform processes in African waterscapes. PhD dissertation, Delft University of Technology. Leiden: Taylor and Francis.

- Lebel, L., Lebel, P., Sriyasak, P., Ratanawilailak, S., Bastakoti, R.C. and Bastakoti, G.B. (2015). Gender relations and water management in different eco-cultural contexts in Northern Thailand, *International Journal of Agricultural Resources, Governance and Ecology*, **11(3)**: 228–246.
- Sinyolo, S., Mudhara, M. and Wale, E. (2014). The Impact of smallholder irrigation on household welfare: The case of Tugela Ferry irrigation scheme in KwaZulu-Natal, South Africa. *Water South Africa*, **40(1)**: 145-156.
- Madhuku, T. (2014, October 10). High Electricity Tariffs Impacts Negatively on Farming Scheme in Birchenough Bridge. SW Radio Africa.
- Magadlela, D. (1999). 'Irrigating Lives: Development Intervention and Dynamics of Social Relationships in an Irrigation Project'. PhD thesis, Wageningen University, Wageningen, Netherlands.
- Manzungu, E. and van dar Zaag, P. (1996). Continuity and controversy in smallholder irrigation. In Manzungu E and Van dar Zaag, P. (Eds.). *The practice of smallholder irrigation: Case studies from Zimbabwe*. University of Zimbabwe Publications, Harare
- Mdemu, M. V., Mziray, N., Bjornlund, N. and Kashaigili, J. J. (2017). Barriers to and opportunities for improving productivity and profitability of the Kiwera and Magozi irrigation schemes in Tanzania. *International Journal of Water Resources Development*, **33(5)**: 725-739.
- Muchara, B. (2015) Irrigation water value for potato farmers in the Mooi River Irrigation Scheme of KwaZulu-Natal, South Africa: A residual value approach. *Agricultural Water Management*, **164(2)**: 243-252.
- Mujere, N. Chazovachii, B., Chifodya, G and Mushuku, A. (2011). Evaluating Factors Influencing the Variation of Irrigated Wheat Yields. A Case Study of Chinyamatumwa Irrigation Scheme in Zimbabwe. *Journal of Sustainable Development in Africa*, **13(4)**: 177–188.
- Mujere, N. (2011). River flow variations and crop yields at Nyanyadzi Irrigation Scheme: Effects of river flow variations on irrigated crop yields at Nyanyadzi Irrigation Scheme in Zimbabwe. LAP LAMBERT Academic Publishing Saarbruken, Germany.
- Mutambara, S.1 and Munodawafa, A. (2014). Production Challenges and Sustainability of Smallholder Irrigation Schemes in Zimbabwe. *Journal of Biology, Agriculture and Healthcare*, **4(15)**: 87-96.

Mutiro, J. and Lautze, J. (2015). Irrigation in Southern Africa: Success or failure? *Irrigation and Drainage*, **64**: 157–298.

Nhundu, K. and Mushunje, A., (2010). “Analysis of irrigation development post fast track land reform programme. A case study of Goromonzi district, Mashonaland East Province, Zimbabwe”. Proceeding of the Joint 3rd AAAE and 48th AEASA Conference, Cape Town, South Africa.

Nkhoma, B. and Kayira, G. (2016). Gender and power contestations over water use in irrigation schemes: Lessons from the lake Chilwa basin. *Physics and Chemistry of the Earth*, **92**: 79-84.

Pazvakavambwa, G. T. and Van Der Zaag, P. (2000). The value of irrigation water in Nyanyadzi smallholder irrigation scheme, Zimbabwe. Paper presented at the 1st WARFSA/WaterNet Symposium: Sustainable use of water resources. Maputo, 1-2 November 2000. Maputo.

World Bank (2008). “Mobilizing public-private partnerships to finance infrastructure amid crisis is focus of World Bank conference”. World Bank Press Release No: 2008/175/WBI.

Zwarteveen, M. (2012). Seeing women and questioning gender in water management, In A. Prakash, S. Singh, C. Gurung Goodrich and S. Janakarajan (eds.), *Water Resources Policies in South Asia: Analyzing Regional and Country Experiences*. New Delhi: Routledge, pp. 38-65.

## **CHAPTER 7: GENERAL DISCUSSION OF KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

### **7.0 Introduction**

In sub-Saharan Africa, including Zimbabwe, providing guidance on irrigation water management remains limited because of a dearth of knowledge in location-specific gender dynamics. Yet, gender consciousness is increasingly gathering momentum because of its critical significance for the successful achievement of development objectives. The current study was premised on the argument that despite the importance of irrigation water in smallholder agriculture, not much empirical attention has been given to the social and gender dynamics with respect to water use, needs and priorities of users. Various studies (Pazvakavambwa & van der Zaag, 2000; Mujere, 2011; Kemerink, 2015) at Nyanyadzi have continuously revealed water problems with inadequate scholarly focus on the gendered nature of irrigation water use and management within the scheme. Thus, the aim of this research was to uncover the gender dynamics in irrigation water use at Nyanyadzi smallholder irrigation scheme in order to propose and recommend gender neutral strategies in smallholder irrigation water use.

The main purpose of this chapter is to reconsider the origins of the study and provide a more incisive plus authoritative commentary on key methodological imperatives, findings of the study and implications of the results. This will help draw solid conclusions and recommend areas for further research and practice in use of water in irrigation schemes and also distil policy issues starting at local level.

### **7.1 Summary of the Major Research Findings**

In view of the above facts, the overall research objective of the study was to explore and understand the gender dynamics in irrigation water use and management at Nyanyadzi smallholder scheme. Table 7.1 provides a synthesis of the study. The focus was particularly on how gender shapes and impact on men and women's relations in smallholder agriculture water use. This was done in order to advance new knowledge and strategies on gender and irrigation water use and management at Nyanyadzi scheme in south-eastern Zimbabwe.

**Table 7.1 Summary of the PhD Thesis Research**

Component of study	Objectives		
	1	2	3
1. Research problem	The nature of irrigation water use and users has not been well documented at Nyanyadzi smallholder irrigation scheme. Yet, irrigation water when supplied to poor rural communities also meets other needs. It is therefore important to recognize the full spectrum of water uses and users in an irrigation system in order to recommend strategies that accommodate all water needs. Hence the current study was undertaken to examine the nature of irrigation water uses and users at Nyanyadzi scheme	Nyanyadzi is a water-scarce region hence the management of water in the irrigation sector crucial. Water management at the scheme and plot levels is a major factor influencing the success of smallholder irrigation schemes. Against this backdrop, this study interrogated the roles and responsibilities of farmers in the water management at Nyanyadzi scheme. This was done in order to recommend all-encompassing intervention strategies for irrigation water management that incorporate all actors' priorities, needs and interests in decision making and implementation.	Research evidence indicates that Nyanyadzi Irrigation Scheme is performing below capacity. This study identified the constraints faced by male and female farmers in irrigation water use at Nyanyadzi scheme so as to propose intervention strategies.
2. Research design	The study adopted an exploratory sequential mixed methods research design which was characterized by an initial qualitative phase of data collection and analysis, followed by a phase of quantitative data collection and analysis, with a final phase of integration or linking of data from the two separate strands of data.	Same as objective 1	Same as objective 1
3. Sample size and sampling procedure	A convenience sampling technique was used. Qualitative study phase had a sample of 73 farmers (26 men and 47 women) Quantitative phase sample had 109 (47 men and 62 women)	Same as objective 1	Same as objective 1
4. Data collection method, techniques and tools	Qualitative data: focus group discussions facilitated the collection of gender disaggregated data using the gender analysis matrix tool, key informants' interviews.	Qualitative data: focus group discussions facilitated the collection of gender disaggregated data using the gender activity profile tool. Key informants' interviews.	Qualitative data: community forum, pair wise problem ranking participatory exercise, key informants' interviews.

Component of study	Objectives		
	1	2	3
	Quantitative data: closed ended inventory questionnaire with likert type responses.	Quantitative data collection: same as objective 1.	Quantitative data collection: same as objective 1
5. Data analysis method, techniques and tools	Qualitative data: thematic Content Analysis Quantitative data: Pearson's Chi-square test ( $\chi^2$ ) of association.	Same as objective 1	Same as objective 1
6. Major Findings/conclusions	Study results show that the use of irrigation water is gendered ( $P < 0.01$ ). These findings indicate that the uses and users of water are divided along gender and social lines. Women use water for both productive and reproductive activities while men mostly use water for productive uses. Thus irrigation water has multiple uses and that non-agricultural but these are not easily accepted. The uses of canal water by men and women farmers sometimes complement each other while at other times contradict each other.	Quantitative findings confirmed qualitative research results by indicating that the nature and extent of farmer's participation in canal water management is gendered ( $P < 0.01$ ). The socio-cultural norms and practices which are context specific influence the level of farmers' participation in canal water management. Men dominated the decision making spectrum of canal water management while women's visibility was more pronounced in the implementation spectrum in labour provision particularly in canal cleaning, and maintenance.  Socio-cultural norms influenced by the patriarchal ideology shape men and women's level of participation in canal water management. These norms constitute a major barrier to men and women's effective and genuine participation in irrigation water management. The socio-cultural structures and institutions do not provide sufficient space for transformative	Highly significant positive associations ( $P < 0.01$ ) were observed across gender and plot location variables against all the water problems identified by farmers. Water problems experienced by farmers are a result of a combination of social, cultural and economic factors that limit farmers' access to canal water. High water costs threaten viability and sustainability of Nyanyadzi Irrigation Scheme. The study concluded that the water problems bedeviling Nyanyadzi scheme are a combination of socio-economic and socio-cultural factors.

Component of study	Objectives		
	1	2	3
		participation in canal water management particularly in decision making especially for women.	
7. Limitations and Delimitations	<p>Delimitations: The study was limited in only to Nyanyadzi irrigation scheme and the official registered farmers who were practising irrigation within the scheme. The study only focused on the nature of water use by men and women farmers within Nyanyadzi Irrigation scheme only.</p> <p>Study limitations – the purposive sampling adopted decreases the generalizability of findings.</p>	<p>Delimitation of study site and participants same as objective 1 The study focused on the levels of farmers' participation in canal water management at Nyanyadzi Irrigation scheme only. Study limitations same as Objective 1</p>	<p>Delimitation of study site and participants same as objective 1 The study was delimited to the water problems faced by farmers within Nyanyadzi Irrigation scheme only.  Study limitations same as Objective 1</p>
8. Proposed Interventions	<p>Incorporate and encompass a multi-purpose irrigation system that builds on local capabilities, that acknowledges other water needs and users within the catchment. Adopting an integrated approach to irrigation water use has a positive impact on poor rural households and the overall rural development especially if deep rooted socio-cultural and institutional challenges of access are taken into consideration. The equitable availability of water for both productive and reproductive purposes to rural households contributes to poverty reduction and to the general improvement of the well-being of rural populace.</p>	<p>Results call for the need to understand the local socio-cultural structures, local customs and practices and relationships in order to get a meaningful engagement of both men and women developing irrigation water management interventions. Men and women are not homogenous individuals, they experience a dynamic and unique social status in different given contexts. Thus, it is imperative to understand the local context in which gender roles and responsibilities are shared and distributed the related opportunities, constraints and the impacts they present on both men and women in canal water management.</p>	<p>The need for introducing gender-sensitive interventions in use and management of irrigation water is required in order to minimise the negative impact on men and women. Gender needs, roles and responsibilities should be reconceptualised so as to align them with the socio-cultural context of the Nyanyadzi community. In addition to this, the fact that both men and women are not homogeneous interest groups should be factored into irrigation water management for smallholder farming. It is crucial to incorporate various social hierarchies that interact with gender to influence irrigation water use and management.</p>

Component of study	Objectives		
	1	2	3
	Overall, a proposal and consideration of gender engineers in the Ministry of Agriculture, particularly the Irrigation Department. These gender engineers would complement the technical irrigation engineers.		
9. Contribution to scholarship	<p><b>Scholarship of Discovery</b> The study expands current knowledge in the discipline of rural development, sociology and agriculture through original research on:</p> <ul style="list-style-type: none"> <li>• the gendered nature of irrigation water use at Nyanyadzi smallholder irrigation scheme.</li> <li>• the gendered nature and extent of participation of men and women in irrigation water use and management at Nyanyadzi smallholder irrigation scheme.</li> <li>• the gendered constraints and challenges of men and women to irrigation water use and management at Nyanyadzi smallholder irrigation scheme</li> </ul> <p>Through production of papers for possible scientific publication (Section 7.4.1).</p> <p><b>Scholarship of Integration</b> The study makes connections across disciplines and shapes a more coherent and integrated use of knowledge through the adoption of a mixed methods approach to research (Section 7.4.2)</p> <p><b>Scholarship of Engagement</b> The study used a cocktail of participatory tools to generate knowledge on gender dynamics within smallholder irrigation scheme (youth and adult perspectives unravelled), (Section 7.4.3).</p>		
10. Recommendations for:			
a) Practice	<p>Irrigation water system at Nyanyadzi must recognize and consider the provision of canal water for different uses and users as this is already provided for in the current Water Act of 1998.</p> <p>Design and construct laundry and livestock basins to reduce canal water pollution</p>	Incorporate social and cultural aspects of the local area in canal water management for the successful participation of men and women and the general rural development.	

Component of study	Objectives		
	1	2	3
b) Policy	Policy to incorporate and include local customs and practices and the various social hierarchies that interact with gender when developing irrigation water management interventions.	Introduce and maintain a gender quota system for IMC membership.	Policy to holistically address the constraints and barriers to canal water use and management in order to boost productivity at Nyanyadzi scheme.
c) further research	A further follow up study focusing on the influence of socio-cultural factors in irrigation water use and management in other communal smallholder schemes is recommended.	A follow up study to interrogate the influence of informal socio-cultural institutions on male and female farmer's participation irrigation water management practices	A similar study be carried out in other communal irrigation schemes to validate findings from this study so as to be able to generalize findings from this study.

The first study objective investigated the nature of irrigation water use and users at Nyanyadzi scheme (Chapter 4). Overall study findings established that the use of canal water has a social and gender dimension. Results revealed marked significant gender differences ( $P < 0.01$ ) on the nature of water use. For example, while both men and women use canal water for productive irrigative purposes, significant gender and marital differences ( $P < 0.01$ ) were noted on the perception relating to preferred water delivery times to the irrigation fields. In this instance the young married women preferred to receive their water rations in mid mornings after they had finished household tasks while men and older women preferred to get their water rations to the fields in the early mornings. Further, indications from the study were that the majority of women found it convenient to use canal water for bathing and laundry while a majority of men perceived these reproductive uses as misuse of irrigation water. The general implication worth noting from these findings is that the gender and social position of a water user determine the purpose and time of using water. From the findings, the social dimension of water emerged. Irrigation water needs and preferences vary with age, marital status and one's social position in the community and within the household. The findings show that the gender variable interacts and intersects with other socio-economic and socio-cultural variables to influence men and women's water needs, interests and preferences.

Another significant finding related to the nature of irrigation water is that, canal water at Nyanyadzi irrigation scheme has multiple uses and users. For instance, women use canal water for both reproductive (household and domestic works) and productive purposes while the majority of men prefer to use it for productive exercises ranging from irrigating crops to watering livestock. Findings further show that reproductive uses of water are not very well appreciated by men. This emerged in focus group discussion forums when men alluded that women steal their water. Hence, the contested and gendered nature of canal water use emerged. These findings also indicate that the uses and users are divided along gender and social lines. The findings have shown that canal water does not just meet a single water requirement especially in a semi-arid rural community like Nyanyadzi. Instead, canal water serves a variety of purposes ranging from productive to reproductive. It is, therefore, imperative to recognize all uses of water in an irrigation system so as to appreciate users of water.

The second study objective investigated the nature and extent of men and women's participation in canal water management (Chapter 5). Overall findings from this objective revealed that the nature and extent of participation by men and women in canal water management is divided along the gender lines with women on the receiving end. First, significant gender differences were observed in

irrigation management committee membership. Results revealed that more men occupy top decision making positions compared to women. This result is astonishing given that, women are the majority practicing smallholder farming at Nyanyadzi. Second, gender differences were also noted in meeting attendance and in influencing decisions. The study revealed that women are excluded or have a limited voice in participating and expressing themselves in irrigation water management platforms largely due to social and cultural factors. Socio-cultural perceptions influenced the men and women's participation in the various water management spectrums ranging from meeting attendance to decision making. The findings have established that the nature and extent of participation by men and women in irrigation water use is influenced and determined by the underlying socio-cultural context that shapes the gender relations in irrigation farming and in the household and community at large. For example, results revealed that, household chores make it difficult for women to actively participate in meetings. The majority of young women also stated that they do not feel comfortable speaking at scheme meetings. This is in accordance with their local customs and practices, which do not allow women of young age to publicly speak in the presence of male community elders let alone strangers. However, this was not the case with elderly women. Elderly women had a freewill approach to express themselves and speak in meetings due to their social status. However, their contributions are not well considered by males. Thus overall results, point to the fact that formal participation in water management is multifaceted and gendered with women being the most vulnerable. However, along the participation spectrum, results further revealed that both men and women are actively involved in resource and labour provision towards canal cleaning and maintenance.

The implications of study findings are problematic for agricultural productivity, poverty alleviation and the overall rural development in general due to the fact that lack of active and genuine representation and participation in decision making in irrigation water committee does not guarantee women's water needs, interests and priorities. This is because men and women tend to have different priorities and perspectives regarding the nature and purpose of participation in canal water use. Their preferences in terms of time and reasons may also vary. As such, the unequal participation of men and women in the irrigation water management spectrum leads to gender inequalities in the whole irrigative processes. The subsequent result is the marginalization of women's water needs, interests and priorities reinforced by cultural norms that do not embrace women in the public domain. Therefore,

water management and policy that does not take both men and women's viewpoints into consideration nearly always becomes ineffective.

The third study objective identified the challenges and constraints faced by men and women farmers in irrigation water use at Nyanyadzi scheme (Chapter 6). Overall study findings indicate significant differences between and within gender over a number of hydro-conflicts (water distribution times; unequal water distribution; water shortages; hydro-corruption). For example, notable differences were observed between upstream and downstream farmers. Regardless of gender, downstream farmers reported water shortages as a major constraint to their farming. As a result marked hydro-contestations between upstream and downstream farmers ensued. Downstream farmers alluded to practising rain-fed agriculture on major portions of their land due to water shortages to their plots. Findings from this objective also revealed constraints experienced by female farmers related to discriminatory practices towards women especially towards middle-aged and elderly members. These women reported delayed water distribution to their plots due to hydro-corruption by water distributors. Water is unevenly accessed and distributed according to gender, and other social hierarchies. Further, the study also found that, regardless of gender, farmers experience high water tariffs due to high electricity charges. This has led to a reduction of irrigable farming portions or land. This has negatively impacted on the productivity of Nyanyadzi. Overall, results show that water challenges and constraints experienced at Nyanyadzi are a combination of a variety of factors ranging from ineffective water management institutions that are not context specific and other socio-cultural and socio-economic factors that work to influence access and the use of irrigation water.

The fourth study objective, addressed in this chapter proposes and recommends possible strategies that consider differential gender power dynamics at play in water use at Nyanyadzi scheme. Overall findings from the study indicate that current irrigation water management initiatives do not seem to appear to match the local social constructions underlying gender and water use and management. The study findings have established that existing gender and social relations manifesting in water use and management at Nyanyadzi irrigation scheme need to be considered and locally contextualized so that the water needs and uses of all users are incorporated. Hence, recommendations and strategies specific to findings from this study are proposed.

## 7.2 Conclusions and Emerging Issues from the Study Findings

The overall major emerging issue from the study is that irrigation water use and management at Nyanyadzi is gendered in nature. This is evidenced by the maleness features that characterize water use and management at Nyanyadzi. Irrigation is perceived as a masculine domain at Nyanyadzi scheme, and women continue to be marginalized. Membership and participation in irrigation management committee at Nyanyadzi is male dominated. Female membership is minimal and their participation in the decision making arena is obscure and tokenistic. Tokenism here is characterized by making merely a perfunctory effort or symbolic gesture of including women toward the accomplishment of a goal in water use. This scenario reveals a gender imbalance in irrigation water management structures at Nyanyadzi scheme. Women have passive roles in the decision making spectrum of water management. This means that their water requirements and priorities are not well represented given the male dominated irrigation management platform at hand. This is despite women being in the majority of irrigated agriculture at Nyanyadzi. However, it must be noted that these observations and conclusions are arrived at in view of the fact that women head count does not merely warrant effective participation and representation of women in water management committees.

Gender-based roles and responsibilities also result in differences in the participation and management of water resources. The patriarchal norms and practices deeply ingrained in men and women at Nyanyadzi community influence the nature and extent of participation in irrigation water management. These social norms divide and shape men and women's work into separate spheres namely the private sphere (which confines women to the family and the home) and the public sphere (which confines men outside the home). Hence, the lack of interest by women to attend water meetings due to domestic work demands is a very welcome and understood reason by men as well as by women themselves. Further, these socio-cultural norms interact with gender and other social variables like marital status and age to determine the extent of individual participation in various decision making spectrums in canal water management. Indirectly, these norms and beliefs constitute a major barrier to the genuine participation of women in irrigation water management meetings. This is reflected in focus group discussions, where for instance, women attend meetings but cultural and religious norms make it impossible for them to speak publicly or express themselves

in the presence of men. Hence, women cannot directly voice their concerns publicly for fear of being labelled as 'loose women' or 'uncultured women'. In the end they have to rely on their male relatives or their relationships with males from other social networks like neighbours or male church mates to express their views hoping these will eventually find expression in male-dominated committees. The study shows that the social structures and institutions provide insufficient space for transformative participation in water management particularly in decision making especially for women. This is further exacerbated by patriarchal beliefs, norms and identities that lower women's status and hamper their participation in water management.

The levels and types of participation of men and women at Nyanyadzi smallholder irrigation vary. Furthermore, participation even varies among and between men and women. Men participate both in labour contribution and decision making process whereas women participate more in labour contribution and do so negligibly in decision-making. Until and unless women are involved in the water users association which is the deciding body regarding irrigation water management it cannot be said that women are effectively participating in irrigation process.

The implications of such findings are that, socio-cultural norms are gender blind to women's roles and responsibilities in water management. They fail to recognize, appreciate and acknowledge differences between men and women's water needs and priorities. Therefore, irrigation water priorities and considerations for both men and women must be taken into account on a gender equality basis in order to improve household food and nutrition and to reduce poverty levels among rural populace. Recognizing gender roles and responsibilities of all water users can greatly improve rural peoples' livelihoods and reduce poverty. Gender blindness in irrigation water use and management can unintentionally introduce or exacerbate gender disparities in social norms and practices, and can even create gender inequalities and new barriers for women. Therefore, understanding the social and cultural norms of men and women's water use help to explain the nature and extent of men and women's participation in water management.

Another interesting emerging issue from this study is that neither men nor women are a homogenous category with regards to the needs, priorities and uses of canal water and management. Gender

intersects and interacts with other socio-cultural variables (ranging from age, marital status, plot ownership and plot location) to determine how, when and where men and women can access or use water. Indications are that, men and women do not always and automatically have the same interests and needs with respect to canal water use. Even within each gender category water needs and uses sometimes complement each other while at other times contradict each other depending on the purpose and time of use. For instance, due to social obligations and responsibilities to the home and family young women had time constraints in terms of water distribution and delivery times to their plots compared to men and older women. These gender differences make water needs and use by the less powerful users undervalued and sometimes misunderstood.

Another major emerging issue worth noting is that canal water at Nyanyadzi has multiple uses. This is despite the fact that the irrigation system was designed for single use. As a result, men and women's integrated need for and use of water at Nyanyadzi do not match the ways in which the canal irrigation system is organized. This mismatch presents a number of challenges. For example, water allocation and management decisions do not account for non-irrigation uses. Possibilities that the irrigation system could be handy for other community services like laundry are overlooked. This presents negative implications on productivity levels and the general rural development in particular in that irrigation water requirements of the poor always extend beyond productive needs and provide a wide range of other uses that enhance their livelihoods besides irrigating crops. As a result social problems and hydro conflicts (within and between men and women and between upstream and downstream men and women) water users arise as they do not always agree on when and how to use water. In such a scenario, water is distributed in accordance with the influential power of groups. Incidentally, women and other vulnerable social categories like the aged, widowed and downstream users are likely to suffer the consequences. The findings of this study imply the need to rethink the gender-based water initiatives in irrigation water use and management. This means reconceptualising gender needs, roles and responsibilities to fit within the local socio-cultural and socio-economic context of Nyanyadzi community. For that reason, the following section presents recommendations that are specific to findings of this study.

### 7.3 Methodological Reflections

The methodology employed in this study was guided by the research aim which was to capture the gendered experiences of irrigation water use and management by men and women farmers at Nyanyadzi smallholder scheme. The study adopted both the qualitative and quantitative methods of research in data collection and analysis.

The strength of adopting a mixed methods, participatory approach to this research was its ability to capture the gendered experiences of water use and management by men and women farmers of Nyanyadzi scheme in their own terms. Overall, the use of focus group discussions through gender activity profile, gender matrix analysis tool and the pairwise problem ranking tool helped to reveal the intra and inter gender differences and dynamics in the use and management of irrigation water Nyanyadzi scheme. The tools revealed that water use activities may differ due to gender, age, marital status and other social divisions. Inter and intra gender differences among men and women were detected using these participatory techniques and tools. This empowered research participants to tease out underlying meanings and processes inherent in the use of water and its management. These tools were adopted in recognition of Fine (1992) who argued that, if social feminist researchers do not take critical, activist and open stances in their own work, they may end up colluding in reproducing social silences through the social sciences. Thus, these tools helped to reduce the social silences and increase the visibility of men and women's experiences in the use and management of water. This was particularly important considering the gendered power dynamics in patriarchy that operate to constrain women's visibility and participation in arenas outside the home. Furthermore, the use of participatory techniques made the invisible activities that men and women often engage in to be exposed. The ranking exercises served as useful sources to tease out and expose inter and intra gender difference in water problems (Chapter 6).

One of the major strengths of participatory research is the flexible and constantly learning research process that it promotes. Participatory research is a learning approach to accessing and analysing information and experiences. This study attempted to reduce power differences between the researcher and participants by involving participants in the process of data collection and analysis (pairwise rankings and responding to questionnaire requiring Likert responses). The active engagement of men and women in this research made the study a collaborative one between

researcher and participants (Etherington, 2004). The research methods were chosen to fit the focus of the study which was to understand who uses irrigation water and for what purposes or activities; who manages the use of that water and how; what problems are experienced in using the water and how gendered are the problems.

Generally, the participatory methodologies used in this study provided the basis for the collection of a rich volume of community level information. The methods provided the opportunity to probe and explore the themes that were under investigation in a flexible manner. For example the use the gender matrix analysis tool (Chapter 4) helped to establish the nature of water use with regards to who used water for what, when and where, while in Chapter 5 the gender activity profile revealed the roles, responsibilities and relations between and among men and women with regards to the extent and form of participation in water management. This tool also revealed why men and women participate in some activities and not in others. The tool also made it possible to understand the socio-cultural determinants of extent of men and women participation in water management. The pairwise ranking exercise revealed inter and intra gender differences in water problems in Chapter 6.

One of the difficulties encountered in using the participatory was ensuring that false expectations were not created. Some men and women questioned the outcomes of the research, especially whether the research will result in the implementation improved water access to farmers especially elderly women. Explaining the intentions and objectives of the research and dispelling false expectations tended to be time consuming but proved to be extremely worthwhile.

Undeniably, using a variety of methods that were drawn from participatory and gender methodologies generated a wide range of information about the gendered use, management and problems of water at Nyanyadzi scheme. This triangulation of data sources and methods helped to make internal and external comparisons, and contributed to validity of research findings. This study offers a useful methodological example of integrating qualitative and quantitative methods to provide an analysis of an area of irrigation water use and management which has received little attention from a gender perspective.

## 7.4 Contribution to Scholarship

The study made a significant contribution to scholarship based on Boyer's (1990) academic model of scholarship. The model advocates for the expansion of the traditional definition of scholarship and research into four types of scholarship. According to Boyer, traditional research, or the scholarship of discovery, had been the centre of academic life and crucial to an institution's advancement but it needed to be broadened and made more flexible to include not only the new social and environmental challenges beyond the campus but also the reality of contemporary life.

He proposed that scholarship include four different categories; scholarship of discovery, teaching and learning, integration, and application.

- a) The scholarship of discovery is understood as original research that expands or challenges current knowledge in a discipline.
- b) The scholarship of integration relates to making connections across disciplines and shaping a more coherent and integrated use of knowledge.
- c) The scholarship of teaching and learning involves stimulating active learning, critical thinking and the commitment to life-long learning.
- d) Scholarship of application involves dynamic engagement and the translation of new knowledge in practical interventions that solve problems or improve the difficulties experienced by individuals and society

### 7.4.1 Scholarship of Discovery

This study contributes to the scholarship of discovery in that it is original research that advances better a better understanding of the gender dynamics in water use and management in smallholder irrigation farming through the submission of scholarly publications for possible production in internationally recognized journals as indicated below.

1. Muchemwa-Munasirei, P., Francis, J. and Manjoro, M. 'A dignified woman does not oppose what men say in public': Nature and Extent of Men and Women's Participation in Water Management at Nyanyadzi Smallholder Irrigation Scheme in Eastern Zimbabwe, *South African Journal of Agricultural Extension*.

2. Muchemwa-Munasirei, P., Francis, J. and Manjoro, M. 'These Women Steal Our Water': Nature of Smallholder Irrigation Water Use in South-eastern Zimbabwe, *African Journal of Agricultural and Resource Economics*.

Through these possible publications, the study adds new knowledge to existing literature on gender and irrigation water even though it is specific to the Nyanyadzi irrigation scheme. Further, the study has also engineered a new product or concept namely '*gender engineers*' in smallholder irrigation. The academic contribution to the body of knowledge made by this investigation is an understanding of the social and gender dynamics in irrigation water use through an in-depth exploration of gender dynamics in a specific socio-cultural context using a participatory and gender specific research methodology.

The thesis provides unique accounts of men and women at Nyanyadzi smallholder irrigation scheme regarding irrigation water use. It documents their exclusive experiences as they compete and struggle to access and use irrigation water for various purposes in a specific context clouded by social and cultural barriers. The study, therefore, provides a rich literature and an alternative understanding of the social and cultural context that is grounded in the complexities of everyday life of Nyanyadzi irrigation water users.

#### **7.4.2 Scholarship of Integration**

This study brings an integration of knowledge from different sources. The study brings findings together from different disciplines to discover convergence across disciplines, i.e. agriculture, rural development and sociology – dealing with gender, water use, management and challenges within the context of smallholder irrigation farming. The main methodological contribution of this research was in its ability to complement qualitative and quantitative methods of data collection and analysis. Contrary to previous studies (Kemerink, 2015; Chifamba, 2013; Mujere, 2011) undertaken at Nyanyadzi, the study used a wide range of gender analytical tools to capture perceptions of men and women farmers regarding irrigation water use. This was an important methodological contribution towards the study of gender dynamics in irrigation water use at Nyanyadzi irrigation scheme as no other study has used the same methodology to study the same phenomena at Nyanyadzi and elsewhere in Zimbabwe. The use of gendered participatory methodologies enabled cross-referencing

and validation of results, and deepened the findings and patterns found when analysing the data. By taking into account gender and other social characteristics, these gender and participatory methodology tools helped to bring out the not so obvious gender issues that have not been explored in previous studies at Nyanyadzi Irrigation Scheme.

#### **7.4.3 Scholarship of Engagement**

In the scholarship of engagement, the study used a cocktail of participatory tools to generate knowledge on gender dynamics within smallholder irrigation scheme (youth and adult perspectives unraveled). Further, the study integrates education with community development through engagements with the Department of Smallholder Irrigation within the Ministry of Agriculture and Rural Development (Zimbabwe) in designing strategies to revitalize efficient and gendered sustainable water use and management practices at smallholder irrigation schemes in Chimanimani and Chipinge Rural district Councils.

#### **7.4.4 Scholarship of Application**

The study has also contributed to the scholarship of application through the partnership between Africa University (current work station) and Chimanimani and Chipinge Rural District Councils.

#### **7.4.5 Scholarship of Teaching and Learning**

The study contributes to the development of new and substantially revised courses and curricula. Further innovative teaching strategies are also adopted from this study, professional conferences and/or in peer-reviewed publications and field works related to the study.

#### **7.4.6 Digital Scholarship**

This study has also contributed to digital scholarship through blogs as communication in virtual spaces.

### **7.5 Recommendations**

Agriculture performance and productivity has declined at Nyanyadzi smallholder irrigation scheme due to a number of socio-cultural water challenges which have been established in this study. These challenges have impacted negatively on the general performance of irrigation agriculture. In this

section, strategies for policy and practice recommendations are made in view of the findings obtained from this study.

### **7.5.1 Recommendations for Policy**

- a) The study recommends for the consideration of *gender engineers* in the Ministry of Agriculture, particularly the Irrigation Department. These gender engineers would complement the technical irrigation engineers.
- b) Based on findings from objective 1, the uses of canal water are gendered and divided into domestic and productive. Domestic uses are given a secondary priority. However, this sectoral divide does not reflect the actual livelihood realities of poor rural communities. The study, argues for an irrigation water system that recognizes and takes into consideration the provision of canal water for different uses and users. This provision is already recognized in the current Zimbabwe Water Act (1988), therefore it is a matter of reinforcing its implementation. This is more relevant, given that Nyanyadzi is a water stressed region. It, therefore, makes social and economic sense to consider a holistic approach to the use of canal water.
- c) Integrated water resource management has been limited and confined to the physical and hydrological aspects of water management. Yet the challenges and constraints faced by men and women at Nyanyadzi emerging from the study are emanating from social and institutional arrangements. The study therefore recommends for policy to incorporate and include local customs and practices when developing irrigation water management interventions. Existing gender and social relations manifesting in irrigation water use and management at Nyanyadzi irrigation scheme need to be considered in the Irrigation Management Committees so that the water needs of all users (men and women) are incorporated.
- d) It is also recommended that smallholder irrigation policy planners be aware that neither men nor women are a homogeneous group. Therefore, planning must incorporate the various social hierarchies that interact with gender to influence irrigation water use and management.

### **7.5.2 Recommendations for Development Practice**

- a) The nature of canal water use at Nyanyadzi is gendered and highly skewed towards men. As a result its use is always contested due to multiplicity of uses and gender disparities between users. However, it must be noted that these gender differences are not unique to the irrigation system

alone, instead they are a miniature version of the society at large. They reflect wider gender imbalances inherent in society. As a result, to address the gender differences occurring at the irrigation system in isolation is impractical. Interventions to address gender inequality in canal water use and management must be based on a nuanced picture of the wider societal gender and social relations to avoid conflicting interventions with wider societal beliefs and practices. Further, a nuanced approach avoids recreating greater inequality between men and women. Social and cultural norms and beliefs that shape and influence men and women's roles and responsibilities in canal water use and management must be embraced in the process of seeking better intervention strategies in irrigation water management structures at Nyanyadzi scheme. An ability to incorporate social and cultural aspects in canal water management is essential for successful participation of men and women towards the general rural development.

- b) It has also emerged from the study that the use of irrigation water for reproductive activities like laundry pollutes the canal water body through detergents used. This problem is exacerbated by the fact that there are no formally designated sites for doing laundry nor designed laundry structures or basins. As such people tend to do their laundry nearer the canal or even inside the canal. Also, the use of canal water for livestock drinking harms the physical canal structures. Therefore, there is need for an adjustment of the canal system to consider the multiplicity of water needs derived from the current canal system. For example, a consideration of designing and constructing laundry and livestock basins.
- c) Study findings indicate that women are poorly represented in irrigation management committee partly due to their reluctance and partly due to institutional arrangements that are gender discriminatory in nature. Careful attention is required to devise innovative ways of ensuring women's and poor men's meaningful participation in such forums. Against this background it is recommended to organize awareness-raising and educational programs to highlight women's rights in water management.
- d) Findings indicated that women face socio-cultural obstacles to interact in public arenas especially when there are men present. In view of this finding, it is recommended that separate women's groups be set up. In these women's groups, women deliberate on issues of concern to them and then inputs from such group meetings are formally forwarded and linked to the larger irrigation

water committee. Inclusive bottom up development approaches should be adopted for irrigation water management.

- e) To improve women's participation in irrigation management committee the following strategies are recommended:
- I. Introducing and maintaining a justifiable male to female ratio system for IMC membership. This helps ensure that women's interests in IMCs are represented. However, it must be known that this recommendation is made in view of the fact that, a mere increase in women head count does not warrant effective participation and representation of women in IMC.
  - II. Ensure that membership criteria to IMC is inclusive and does not solely depend on men or other discriminative variables like marital status; age, plot ownership, plot location and education level.

### **7.5.3 Recommendations for Further Academic Research**

- a) A further study of similar nature to other communal irrigation schemes in Zimbabwe is recommended. This would facilitate a further understanding of gender dynamics in water management in the smallholder irrigation sector in other parts of Zimbabwe.
- b) Future research that extends the analysis by focusing on more and specific details of the influence of socio-cultural factors in irrigation water use and management in communal smallholder schemes in Zimbabwe is needed.
- c) What factors determine the degree of participation of women in water management committees?
- d) Water is a 'fugitive' resource that is expected to fulfil many human needs, that include productive, reproductive and community needs. Unfortunately, a few steps have been taken to reconcile the multiple uses of water in communal irrigation schemes like in Zimbabwe. Much more needs to be done in research and practice to achieve the potential of multiple use irrigation systems in rural communities in Zimbabwe.
- e) Study findings are based on formal water management institutions in smallholder irrigation at Nyanyadzi irrigation scheme. Yet, results also revealed the influence of the informal socio-

cultural context on women's access to and performance in the formal decision making spaces. Future investigations that focus on the influence of informal institutions in irrigation water management practices are therefore proposed.

- f) Findings have established that assuming homogeneity among men and women is problematic for agricultural productivity. Future research should therefore not only focus on differences between men and women but also examine differences within these groups regarding their water needs, uses and interests.

## 7.6 Conclusions

The use and management of irrigation water by men and women at Nyanyadzi is based on the social-gender hierarchies in which they are situated. Social structures and institutions provide insufficient space for transformative participation in water management particularly in decision making especially for women. Socio-cultural patriarchal system and the resultant social relations of power influence and shape the ultimate use of water and participation of men and women water management.

Gender is a major underlying variable in irrigated agriculture water management. Therefore, gender considerations at every level of irrigation water management is crucial and must therefore be considered in order to ensure gender neutral water use and management approaches at Nyanyadzi irrigation scheme. The argument presented in this study however, does not advocate for sameness between men and women, neither does it call for over-prioritization of women's interests in irrigation water use and management. Both men and women's voices and interests in canal water management need to be amplified because of their different social roles and status in society.

The overall findings point to the need to understand the local context in which canal water is used. Due to the varying gender roles and responsibilities, irrigation and water resources policies need to take into account all uses and users of water within the irrigation system. This is because water can never be available to meet only a single need (Kulkarni, 2011). Furthermore, men and women are not homogenous individuals, they experience a dynamic and unique social status in different given contexts. Thus, rather than assuming that one group or individual is disadvantaged by another, it is imperative to understand the local context in which gender roles and responsibilities are shared and

distributed the related opportunities, constraints and the impacts they present on both men and women in canal water management.

In view of the conclusions cited above, it is critical to understand the given specific contexts of men and women in which they use irrigation water and their multiple and diverse positions within those contexts because, neither men nor women are a homogenous category. Contextualization in this scenario fulfils the gendered and social water needs and interests of men as well as women. Context specific gender considerations provide sustainable solutions to gender inequality problems in irrigation water management in that the interventions are founded on a nuanced picture of the local context. Men and women farmers operate within different social, economic and political contexts, not as isolated individuals therefore, understanding and appreciating these contexts help to formulate gender neutral development interventions that have a positive and welcome impact, meaningful to men and women farmers at Nyanyadzi. Furthermore, a consideration of farmer's local contexts avoid creating greater gender divide, or even conflict, between men and women in water management.

## REFERENCES

- Banister, P., Burman, E., Parker, I., Taylor, M. and Tindall, C. (1995). *Qualitative Methods in Psychology: A Research Guide*. Buckingham: Open University Press.
- Boyer EL (1990). *Scholarship Reconsidered: Priorities of the Professoriate* San Francisco: Jossey-Bass Publishers.
- Etherington, K. (2004). *Becoming a Reflexive Researcher: Using Our Selves in Research* London: Okica Lingsley.
- Kemerink, J. S. (2015). *Policies lost in Translation? Unravelling water reform process in an African waterscapes*. PhD Thesis: Delft University of Technology Netherlands. Taylor and Francis, Leiden.
- Kulkarni, S. (2011). "Women and Decentralised Water Governance: Issues, Challenges and the Way Forward. *Economic and Political Weekly*, XLVI (18): 64-72.
- Mujere, N. (2011). *River flow variations and crop yields at Nyanyadzi Irrigation Scheme: Effects of river flow variations on irrigated crop yields at Nyanyadzi Irrigation Scheme in Zimbabwe*. LAP LAMBERT Academic Publishing Saarbruken, Germany.
- Pazvakavambwa, G. T. and Van Der Zaag, P. (2000). *The value of irrigation water in Nyanyadzi smallholder irrigation scheme, Zimbabwe*. Paper presented at the 1st WARFSA/WaterNet Symposium: Sustainable use of water resources. Maputo, 1-2 November 2000. Maputo.

## LIST OF APPENDICES

### APPENDIX A DATA COLLECTION TOOLS

#### Appendix A1 Key Informant Interview Guide

##### Encircle the applicable social category

Sex	Male	Female		
Household head type	Male head	Female -head		
Plot Holding Status	Own	Renting	Sharing	
Marital status	Married	Single	Divorced	Widowed
Age	18-30	31-40	41-50	50 and above

##### Section A

**Key informant questions aimed at providing the institutional perspective of the gendered nature of irrigation water use at Nyanyadzi Irrigation scheme.**

1. How do men and women use irrigation water?
2. How is irrigation water distributed between men and women at Nyanyadzi?
3. How do the roles and responsibilities of men and women in the use of irrigation water impact on household food and nutrition security of Nyanyadzi irrigation farmers?

##### Section B

**Key informant questions aimed at identifying the factors that influence farmer's participation in decision making in irrigation water management at Nyanyadzi.**

4. What is the gender composition of irrigation water committee members?
5. How often do you hold meetings concerning irrigation water use?
6. At what time of the day do you hold your meetings?
7. Are the times convenient to both men and women farmers?
8. Who makes decisions over irrigation water use?
9. Who sets the agenda for the meeting?
10. Can new issues be added by males or females to the agenda?
11. How do existing formal and informal water institutions affect the use of irrigation water between men and women?

## Appendix A2 Gender Matrix Tool

Gender Matrix of Irrigation Water Use by Male and Female Farmers at Nyanyadzi Irrigation Scheme

---

### Encircle the applicable social category

Sex                                      Male    Female

Household head type                Male head    Female -head

Plot Holding Status                Own    Renting                Sharing

Marital status                        Married                Single                Divorced                Widowed

Age                                      18-30                31-40                41-50                50 and above

Total number of participants

---

The gender matrix to show the variations in irrigation water uses by men and women at Nyanyadzi irrigation scheme.

<b>Water Use</b>	<b>Men</b>	<b>Women</b>
Irrigation		
Drinking		
Laundry		
Bathing		
Animals		
Brick Molding		
Backyard garden		
Car washing		
OTHER USES		

## Appendix A3 Gender Activity Profile

---

### *Encircle the applicable social category*

Sex	Male	Female		
Household head	Male head	Female -head		
Plot Holding Status	Own	Renting	Sharing	
Marital status	Married	Single	Divorced	Widowed
Age	18-30	31-40	41-50	50 and above

---

These questions aim to provide gender comparative data on the different roles and responsibilities of male and female farmers in irrigation water use.

<b>Roles and responsibilities in water management activities</b>	<b>men</b>	<b>women</b>
WUA membership		
Position in WUA committee		
Meeting attendance		
Decision making		
Contribution in meetings		
Water distribution		
Labour provision		
Canal cleaning		
Canal repairs		
Plot irrigation		
Payment of labour for canal cleaning and repairs		

## Appendix A4: Pair Wise Problem Ranking of Water Problems

	1	2	3	4	5	6	7	8	No of Listed times	Rank
1										
2										
3										
4										
5										
6										
7										
8										

1. Unequal water distribution
2. Water scarcity
3. Water charges
4. Hydro-conflicts
5. Hydro-corruption
6. Non irrigative uses
7. Gender discrimination
8. Distribution time

## APPENDIX A5: Inventory Questionnaire for Irrigation Water Use

How far do you agree with the following statements as they relate to irrigation water use and management?

Tick the applicable

No	Statement	Strongly disagree (1)	Disagree (2)	Not sure (3)	Agree (4)	Strongly agree (5)
1	I use canal water to irrigate crops					
2	I use canal water for laundry					
3	I use canal water for bathing					
4	I use canal water for livestock drinking					
5	Other people from the community use water for other activities					
6	I attend meetings relating to irrigation water					
7	I speak my heart out at the irrigation meeting gatherings					
8	My concerns and interests on canal water distribution are taken into account at the irrigation meetings					
9	I participate in the repair of canals					
10	I provide labour in canal maintenance					
11	I contribute cash for canal repairs and maintenance					
12	I hire someone to do canal maintenance work on my behalf					
13	I experience water shortages in my plot					
14	I have been involved in hydro-conflicts					
15	There is hydro-corruption in water distribution					
16	I pay to use canal water for irrigation					
17	The water charges are affordable					
18	Electricity charged are too high					

No	Statement	Strongly disagree (1)	Disagree (2)	No	Statement	Strongly disagree (1)
19	I receive adequate water for irrigating my crops					
20	I am satisfied with the consistence of water supply					
21	There is fair distribution of water among farmers in the scheme					
22	I am satisfied with the water distribution time					
23	I am satisfied with my plot's position along the canal					
24	I would be happy if there were improvements in the current water supply					
25	Current water distribution practices negatively affect crop productivity					
26	Sustainability of the scheme is compromised by high power (electricity) charges					
27	Non-irrigative uses of canal water contribute to water problems in the scheme					
28	Water scarcity at Nyanyadzi affect scheme's sustainability					
29	There is inequitable water distribution of water in the scheme					
30	I am satisfied with the Water committee representation					

## **APPENDIX B ETHICAL CLEARANCE TOOLS**

### **Appendix B1 Informed Consent Form**

#### **TITLE OF STUDY**

GENDER DYNAMICS IN WATER USE IN A SMALLHOLDER IRRIGATION SCHEME IN ZIMBABWE

#### **PRINCIPAL INVESTIGATOR**

Priscillah Muchemwa-Munasirei

Institute for Rural Development

School of Agriculture

University of Venda

pmunasirei@yahoo.com

+263774775455

#### **INTRODUCTION**

You are invited to participate in a research study conducted by Priscillah Muchemwa-Munasirei.

This study will contribute to the researcher's completion of her PhD in Rural Development. You were selected as a possible participant because you are a farmer at Nyanyadzi irrigation scheme.

Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. Please read the following information carefully. Please ask the researcher if there is anything that is not clear or if you need more information.

#### **PURPOSE OF STUDY**

The purpose of this study is to explore the gender dynamics (i.e. gender roles and responsibilities) in irrigation water use at Nyanyadzi smallholder irrigation scheme in Chimanimani District of eastern Zimbabwe. The study takes cognizance of the fact that irrigation water management is a major factor influencing the success of smallholder farming in Zimbabwe. Nyanyadzi has an opportunity in irrigation led development, if stakeholders address critical gender challenges in the planning, design, water delivery and maintenance of its irrigation systems.

## **RESEARCH PROCEDURES**

Should you decide to participate in this research study, you will be requested to sign this consent form once all your questions have been answered to your satisfaction. The study duration is 5 days. The proceedings of each day are outlined below.

## **RISKS**

In this study there are no known or foreseeable risks above the risks of everyday life. You may decline to answer any or all questions and you may terminate your involvement at any time if you choose.

## **BENEFITS**

There will be no direct benefit to you for your participation in this study. However, the information obtained from this study will help to enhance the role of men and women in smallholder irrigation water use. Further the study findings also contribute to the existing body of knowledge relating to gender and irrigated agriculture.

## **PAYMENT**

You will not be paid for participating in this study. However, you will be provided with refreshments on the days that you participate

## **CONFIDENTIALITY**

Your responses to this study will be anonymous. Please do not write any identifying information on your responses. Every effort will be made by the researcher to preserve your confidentiality for example, assigning code names/numbers for participants that will be used on all research notes and documents and keeping notes, interview transcriptions, and any other identifying participant information in a locked file cabinet in the personal possession of the researcher.

Also, note that participant data will be kept confidential except in cases where the researcher is legally obligated to report specific incidents. These incidents include, but may not be limited to, incidents of abuse and suicide risk.

## CONTACT INFORMATION

If you have questions at any time about this study, or you experience adverse effects as a result of participating in this study, you may contact the researcher whose contact information is provided on the first page. A copy of this form will be given to you to retain for future reference. If you have questions regarding your rights as a research participant, or if problems arise which you do not feel you can discuss with the Primary Investigator, please contact my promoters for this research:

Promoter      Prof. Joseph Francis  
Cell number      +27 764093976  
Email Address      joseph.francis@univen.ca.za  
Co-Promoter      Dr. Marizvikuru Manjoro  
Email      Marizvikuru.Manjoro@univen.ac.za

## VOLUNTARY PARTICIPATION

Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be requested to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

### Consent

I have read this consent form and I understand what is being requested of me as a participant in this study. I have been provided information and I have had the opportunity to ask questions. I have been given satisfactory answers to my questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study. I freely consent to participate. I certify that I am at least 18 years of age. I give consent to be (video/audio) taped during my interview.

\_\_\_\_\_  
Name of Participant (Signed)

\_\_\_\_\_  
Date

*Priscillah Muchemwa-Munasirei*

**Priscillah Muchemwa-Munasirei**

\_\_\_\_\_  
Name of Principal Investigator (Signed)

\_\_\_\_\_  
Date