

**INVESTIGATING WATER ACCESS CONSTRAINTS AND LAND-BASED
LIVELIHOODS FOR EMPOWERMENT OF RURAL FARMING
WOMEN AND IMPLICATION FOR HOUSEHOLD
FOOD SECURITY: THE CASE STUDY OF THREE
IRRIGATION SCHEMES IN LIMPOPO**

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Abstract

Agriculture plays an important role in rural livelihoods. However, poverty and food insecurity still persist in rural communities of South Africa where women are central to ensuring household food security through several livelihood activities including agriculture. Women engage in land-based livelihood such as irrigated agriculture to increase household food security and reduce reliance on cash to feed their households. However, poor access to water and insecure access to productive resources such as land threatens rural livelihoods and are a major constraint to poverty reduction in rural areas. According to IFPRI (2012)'s Women Empowerment in Agriculture Index (WEAI), access to production resources is an important domain for empowerment of women farmers. The aim of the study was to investigate dynamics under which rural women operate when accessing water to improve the land-based livelihoods that they engage in for improving livelihoods and household food security and to investigate the knowledge rural women possess or lack in empowering themselves for improved land-based livelihoods and improving household food security. Three small scale irrigation schemes from three district municipalities in Limpopo province, South Africa, were investigated using mixed methods approach, involving quantitative and qualitative approaches, was employed. Sampling of the participants in each irrigation scheme was done through purposive sampling. Structured questionnaires, administered to women farmers through face-to-face interviews, key informant interviews, focus group discussions and observations were used for data triangulation. The study revealed that women faced various challenges when accessing water which ranged from distant sources, unreliable and inadequate supply of water and poor irrigation infrastructure to insecure land rights. Women engaged in irrigated agriculture and livestock farming. They possessed adequate knowledge on soil preparation, weeding and harvesting. However, lack of knowledge on water management and conservation, pest management and markets was observed as an impediment to women empowerment. Ensuring secure access to adequate land and water to rural women and providing skills and knowledge for agriculture and production while ensuring access to markets may contribute to empowerment of rural women and improved land-based livelihoods that rural women engage in to improve household food security which leads to poverty reduction.

DECLARATION

I, Nkanyiso Brighton Gumede declare that:

- i. The research reported in this dissertation, except where otherwise indicated is my original research.
- ii. This dissertation has not been submitted for any degree or examination at any other university.
- iii. This dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from those persons.
- iv. This dissertation does not contain other authors' writing, unless specifically acknowledged as being sourced from other authors. Where other written sources have been quoted, then:
 - a. their words have been re-written but the general information attributed to them has been referenced;
 - b. where their exact word have been used, their writing been placed inside quotation marks, and referenced.
- v. This dissertation does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the references sections.

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CHAPTER 1

RESEARCH PROBLEM AND ITS SETTING

1.1 Introduction

Water plays a critical role in economic activity and in human well-being for domestic use and production purposes such as irrigation and livestock farming (Crow & Sultana, 2002). Women play an active role in agriculture through involvement in rainfed and irrigated agriculture (IFAD, 2007). Women are most often the collectors, users and managers of water in households as well as the farmers of irrigated crops for household food security (Aureli & Brelet, 2004). However, women lack control and have limited access to resources such as land and water due to poor land rights (Reddy & Moletsane, 2009; Thamaga-Chitja *et al.*, 2010). Water is one of the most important production assets, and securing access, control and management of water by women is the key to enhancing rural livelihoods (Faurès & Santini, 2008). Reddy & Moletsane (2009) argue that participation in small-plot agriculture is important to food security, with women taking major responsibility for it as a livelihood strategy.

Food insecurity is more prevalent in rural parts of South Africa (Koch, 2011; Altman *et al.*, 2009). Rural households engage in multiple and diverse livelihood strategies such as arable farming, livestock husbandry, and consumption and trade in natural resources to achieve food security (Andrew *et al.*, 2003; Shackleton *et al.*, 2001). Wages from low skilled jobs, remittances, government social protection sources are important for generating livelihoods in rural South Africa (Andrew *et al.*, 2003). Over one third of rural households continue to engage in agricultural production as livelihood strategy (Machethe, 2004). Water is an essential resource in food production and a critical factor in food security (Wenhold, 2007). It has contributed greatly in increasing agricultural production and improving rural livelihoods (Hanjra & Qureshi, 2010). However, the growing scarcity and competition for water from different sectors has been identified as a major threat to future advances in poverty alleviation and greatly affects poor rural people, especially women (Hanjra & Qureshi, 2010; IFAD, 2007). MacDonald and Calow (2009) argue that water access and water security for women is fundamental to eliminating poverty since most rural households are headed by women. Easier access to fresh water would improve living conditions women

and that of girls who generally drop out of school and start working in the fields and fetching water at a very young age (Aureli & Brelet, 2004).

Agriculture remains the main source of rural livelihoods (FAO, 2011). Women play a major role in reducing household food insecurity through their knowledge of crop production (IFAD, 2007). Rural women engage in small irrigation schemes for food production and income generation for their families (Perret, 2001). However, the success of the small irrigation schemes to improve crop production and the rural livelihoods in South Africa has been very minimal (Fanadzo, 2012). Modest performance of the smallholder irrigation schemes is attributed to poor infrastructure, limited knowledge of crop production among smallholders, limited farmer participation in the management of water, ineffective extension and mechanisation services and lack of reliable markets and effective credit services” (Crosby *et al.*, 2000). Nah and Chau (2010) noted that the lack of knowledge and skills in crop production and post-harvest handling to be a major constraint to success of small irrigation schemes. Other challenges are land size and tenure security, water availability and assurance of supply, inappropriateness of irrigation and drainage designs, farmers’ skills and knowledge of irrigation farming and market availability and accessibility (Machete *et al.*, 2004). According to Van Averbeké and Mohamed (2007), predominance of subsistence-oriented farming is also another factor that constrained the economic impact of smallholder irrigation. These challenges affect women more than any other stakeholders, as women are a majority in the small scale irrigation schemes (Oni *et al.*, 2011).

Women empowerment and gender equality are vital for the reduction of poverty, hunger and disease (UN, 2010). According to Allahdadi (2011) empowerment enables women to ‘participate, as equal citizens, in the economic, political and social sustainable development of the rural communities’. International Food Policy Research Institute’s Women Empowerment in Agriculture Index (IFPRI, 2012) lists being able to make decisions on agricultural production; access to and decision making power over productive resources such as land and water; control over use of income; leadership in communities; and use of time as the five domains in the empowerment of women farmers.

A third of all South African households are headed by women who are considerably poorer than male headed household (Koch, 2011). Women empowerment accelerates the fight

against hunger and extreme poverty which is more prevalent in rural areas (FAO, 2011). Women's knowledge has been the mainstay of crop production, animal husbandry, dairy and forestry (Agrawal, 2002). IFAD (2010) argue that women need skills and knowledge for effective. Training and capacity development for women enables them to take up leadership roles, to voice their concerns and to enhance their technical skills which subsequently lead to poverty reduction and improved livelihoods (IFAD, 2007). Empowerment through knowledge for improved food production, water use and management, and markets improves rural household food security and rural livelihoods. Obidike (2011), argues that information and knowledge for agriculture is required for agricultural development and any constraints may lead to poor agricultural returns. Therefore, access to water and knowledge for land-based livelihoods by rural women is vital for empowering rural communities out of poverty and attaining household food security in the developing world.

1.2 Importance of the Study

In rural parts of South Africa, people continue to experience hunger, poverty and food insecurity (Reddy and Moletsane, 2009). The most affected are women, children and the elderly (Reddy and Moletsane, 2009). According to Kapungwe (2005) the vulnerability of women is due to their limited access to productive assets, credit, legal rights, especially to property and land, and a voice in the political system. Insecure access to water for consumption and productive uses is a major constraint on poverty reduction in rural areas of sub-Saharan Africa which are mainly headed by women (MacDonald & Calow, 2009). Households facing water shortages are more likely to be poor or fall into poverty than households not facing such shortages (Faurès & Santini, 2008). Vulnerable groups, with women included, often lack the power to make decisions about how their household's resources are to be used (Reddy & Moletsane, 2009). Lack of knowledge and skills in crop production and post-harvest handling, skills and knowledge of irrigation farming and market availability and accessibility limit success of irrigation schemes where women are majority role players (Nah & Chau, 2010; Machete *et al*, 2004). These findings necessitate empowerment of women for improved land-based livelihoods for improved household food security.

The aim of the study was to investigate the dynamics under which rural women operate when accessing water for land-based livelihoods for improved household food security. Further, it

was to investigate the land-based livelihoods rural women engage in and what knowledge rural women possess or lack for empowerment to improve land-based livelihoods and household food security.

1.3 Research problem

What is the role of access to water and agricultural knowledge in the empowerment of rural women for improved land-based livelihoods for household food security?

1.4 Hypothesis

Water access and agricultural knowledge for empowerment of rural women improves land-based livelihood for household food security.

1.5 Research Objectives / Research Sub-problems

- How do rural women access water for land-based livelihoods to improve household food security and the constraints involved?
- What land-based livelihoods are rural women involved in?
- What knowledge do rural women possess for empowerment in order to improve household food security?

1.6 Study assumptions

The study assumed that respondents answered all questions honestly and provided factual information.

1.7 Study limits

The study covered only three small scale irrigation schemes from three District Municipalities in Limpopo Province of South Africa, therefore the results may not be generalised for all rural areas in Limpopo as a province or South Africa as a country. Use of non-indigenous language in questionnaire might have resulted in information loss during translation but great care was taken. Openness of elderly women to a young male researcher could not be guaranteed and may have led to some information omission to protect family integrity. However, respondents assured the researcher to cooperate fully and honestly.

1.8 Structure of the mini-dissertation

This mini-dissertation consists of Chapter One which introduces the study, outlines the importance of the study, research problem, hypothesis, research objectives or research sub-problems, study assumptions and limitations. Chapter Two contains literature review to the study. Chapter Three is the area description and methodology. Chapter Four is the results which are organised into two draft manuscripts titled: “*Investigating the challenges of water access by rural farming women for land-based livelihoods and implications for household food security*” and “*Investigating land-based livelihood and knowledge that rural women possess for empowerment to improve household food security*”. Chapter Five contains conclusion and recommendations.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

One of the Millennium Development Goals is to halve hunger and extreme poverty by 2015 (FAO, 2007). One of the important ways to achieve this goal is through public investments and policies that promote increased food production by smallholder farmers for all rural households who make up the great percentage of the worlds' poor. The rural population constitute at least 70 per cent of the worlds' very poor (IFAD, 2010). South Asia and sub-Saharan Africa regions have the greatest number of poor rural people and highest incidences of rural poverty and food insecurity (Sally *et al.*, 2003). South Africa is no different as food insecurity is most severe in rural areas (Koch, 2011). IFAD (2010) argue that 55 per cent of the population in the developing world still live in rural areas (IFAD, 2010). Thirty-Five per cent of the South African population is vulnerable to food insecurity with more prevalence in rural areas (Dunne & Edkins, 2005). Food insecurity is a state where "people do not have adequate physical, social or economic access to food" (FAO, 2009).

The Rural Poverty Report 2011 (IFAD, 2010) reported that over 80 per cent of the poorest households in rural areas rely heavily on farming and agricultural labour for livelihoods. Abayawardana and Hussain (2002) and Bell (2001) argue that provision of water is fundamental in poverty reduction and for developing sustainable rural livelihoods of the poor as water is the key input in agricultural and non-agricultural production processes. Rajasenani (2010) defines livelihoods as "the means by which households obtain and maintain access to essential resources to ensure their immediate and long-term survival" while sustainable livelihood is defined as a "livelihood which can cope with and recover from stress and shocks, and provide for future generations" (Frankenberger *et al.*, 2000). Thamaga-Chitja *et al.*, (2010) argue that proper use, access and management of water resources improve agricultural production which is important to achieve household food security. The impact of water provision on poverty reduction is further emphasized by Smith (2005), Fraser *et al.*, (2003) and Hussain *et al.*, (2002) when stating that supplying water for rural household livelihoods contributes to considerable reduction of poverty and hunger in most developing countries. Water access is essential for human survival, health, wellbeing and livelihoods (Hazell, 2008). However, Bruns *et al.*, (2005) argue that water scarcity is a threat to rural

livelihoods which are mostly dependent on agriculture whose success relies on the availability of water. Therefore, water provision is vital to achieve rural and agricultural development; national food security and economic growth as improved access to water for poor rural people reduce hunger and poverty (Cleveringa *et al.*, 2009; Hussain *et al.*, 2002).

Poor rural households derive their livelihoods from a number of diverse sources (Andrew *et al.*, 2003). These include multiple land-based livelihood strategies such as arable farming, livestock husbandry, and consumption and trade in natural resources (Shackleton *et al.*, 2001). Rural livelihoods are also derived from sources such as wages, remittances, state welfare grants and income from informal economic activities (Andrew *et al.*, 2003). Land-based livelihoods are critical to the survival and health of most rural households (Andrew *et al.*, 2003). High unemployment rate and high food prices increase food insecurity in poor households (Baiphethi & Jacobs, 2009) and some poor rural households resort to subsistence production as a coping strategy during high food prices (Bryceson, 2002). Subsistence production increases household food security and reduces reliance on cash to feed the household (Baiphethi & Jacobs, 2009). According to Statistics South Africa's (Stats SA) Census results (2011), the poorest women in rural South Africa depend on subsistence agriculture for food which makes access to water critical for the most vulnerable in South Africa, as it is the key element in rural women's land-based livelihoods (Thamaga-Chitja *et al.*, 2010).

Knowledge is crucial for social, economic, political development and empowerment (Devarajan, 2004). Access to knowledge by rural households enhances family well-being and sustainable use of resources (Parveen, 2008). Rural women utilize and conserve natural resources such as land, water, forests and wildlife to supply basic needs for their families (VFA, 2009). Women constitute a large percentage of the rural population which is vulnerable and marginalised (Parveen, 2008; (Bob, 2002). They have limited access to information and knowledge due high level of poverty poor and illiteracy (VFA, 2009). United Nations Development Program defines adult illiteracy as the percentages of the population at the age of 15 and older, who cannot read and write a simple statement about their everyday life with understanding (Iskandar, 2005). Lack of access to agricultural education and farming extension programs is major constraint to women's food production and income (Mintzer, 2010). It is important to provide women with knowledge to empower

them for survival, to produce food, provide for shelter or achieve control of their own lives (Devarajan, 2004). Knowledge must include water use and management, as water pollution and improper use greatly affect rural women's livelihoods and health.

2.2 Women and Access to Water

Rural women head a third of rural households and are the poorest and more vulnerable in developing countries (Koch, 2011; Prakash, 2003). They are often primary users of water for subsistence agriculture, domestic consumption, health and sanitation (Abayawardana & Hussain, 2002). Poor rural households may use water from infrastructure developed for agricultural or domestic for the aforementioned uses (Van Koppen *et al.*, 2006). Women are often associated with domestic and subsistence production use of water and excluded from commercial use (Peters *et al.*, 2002). This limits women's opportunities for water-based income generation through gardening and farming, livestock, aquaculture, forestry, and other water-based enterprises (van Koppen, 2001). Schreiner *et al.*, (2004) argue that women's economic empowerment is essential and should be pursued to escape poverty as subsistence for the families depend upon women.

Secure access to land and its water resources for productive use by rural women in productive agriculture and livestock rearing is vital as land ownership is a precondition for access to water in some countries, mostly in Latin America (Brewster *et al.*, 2006). Land ownership and access to land by women has a direct impact on women's capacity to have access to financial and other productive resources through basic means for subsistence and market production. Secure access to land by rural women leads to secure water rights, water security and improved livelihoods for improved food security (IFAD, 2007). Water security is "the reliable availability of an acceptable quantity and quality of water for health, livelihoods and production, coupled with an acceptable level of water-related risks" (Grey & Sadoff, 2007). Water security allows women to be involved in water-related work such as women's processing and selling food and beverages, crafts production and cleaning (Khosla *et al.*, 2004) which eventually leads to improved household income and food security. Brewster *et al.*, (2006) concludes that equitable access to water for productive use can empower women and address the root causes of poverty and gender inequality. Securing access, control and management of water is imperative to enhancing rural livelihoods.

2.3 Women empowerment and knowledge for rural livelihoods

Knowledge is crucial for economic, social and political development (Devarajan, 2004). Lack of knowledge in crops, livestock and aquaculture production affects food security (IFAD, no date). According to Godfray *et al.*, (2010), obtaining best yields depends on the capacity of farmers to access and use knowledge on seeds, water, nutrients, pest management, soils and biodiversity. Women constitute a large percentage of the rural population and play a major role in reducing household food insecurity through their knowledge of crop production and other land-based livelihoods despite constituting two thirds of the world's illiterates (Bob, 2002; IFAD, 2007; Abedi, 2011). Women empowerment enables women to participate in the economic, political and social sustainable development of the rural communities as equal citizens (Allahdadi 2011). According to the Women Empowerment in Agriculture Index by IFPRI (2012), women are empowered when they: 1) can take decisions about agricultural production, (2) have access to and decision making power over productive resources, (3) have control over use of income, (4) are involved in community leadership, and (5) satisfied with time allocation for productive and domestic tasks and the available time for leisure activities. United Nations (2010) argue that women empowerment and gender equality are vital for the reduction of poverty, hunger and disease. Women empowerment allows women to realize their potential in all spheres of life by developing their capabilities and assets to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives (NAAS, 2001; Narayan *et al.*, 2004). Devarajan (2004) argue that knowledge empowers women for survival, to produce food, provide for shelter and achieve control of their own lives

Women have been active in agricultural production systems such as seed storage. Women expertise and knowledge has been used in conceptualising the seed bank where they are key actors in selecting and preserving seeds for the next ploughing season (Ramdas *et al.*, 2001). This helped families to have enough nutritious food from one year to the next. Abedi (2011) argue that it is impossible to develop rural societies without considering the rural women as they are basic producers of different basic agricultural products. Rural women utilize and conserve natural resources such as land, water, forests and wildlife to supply basic needs for their families (VFA, 2009). Rural women engage in irrigated and rain-fed agriculture to produce food for household consumption and sale as individuals or schemes, however the

success has been limited (Machethe, 2004; Oni *et al.*, 2011). Poor performance of small-holder irrigation has been identified to be due to poor infrastructure, limited knowledge of crop production among smallholders, limited farmer participation in the management of water, ineffective extension and mechanisation services and lack of reliable markets and effective credit services (Crosby *et al.*, 2000).

Responding to the needs of poor farmers requires detailed understanding local knowledge systems (Brewster *et al.*, 2006). Women play a vital role as rural information sources (Prakash, 2003). Local knowledge is recognized as a role player in sustainable resources use and development (Ramdas *et al.*, 2001). Pandey *et al.*, (2007) argue that local knowledge improves livelihoods and is vital for sustainability of natural resources such as water, forests and agro-ecosystems. A study conducted in India by (Ramdas *et al.*, 2001) showed that though women performed 50 to 90 per cent of all day-to-day care and management activities of domestic livestock, women still had limited knowledge or were denied access to relating to the healing of animals. They relied on their or local healer's, mostly men, for treatment. Women's restriction to animal healing knowledge was related to gendered modes of knowledge transmission that existed within the communities which was a 'father to son mode'. After it was realized that 60 to 90 per cent of all livestock-related work is done by women and men often leave villages in search of work, women were trained. Women were able to attend to their sick animals and prevented possible loss. Women shared knowledge with other women and gained status in the family as well as in the society.

Diverse local water management and harvesting techniques have been used over the years to conserve water and still continue to survive. Rainwater harvesting is the collection and storage of rainfall water for use in meeting demands of human consumption or human activities (Barron, 2009). It improves water access for domestic and agricultural production (Baiphethi & Jacobs, 2009). Improving the management of water resources increase access to water for consumption and sanitation which improves health of rural households. Improving knowledge on water use and management is vital because practices that compromise water from streams, underground and rivers directly affect the welfare of women and their families (VFA, 2009). Protection of water is important for economic security and human well-being (Pietersen & Beekman, 2006).

Education and extension training enable farmers to adopt new farming methods and technologies (Oni *et al.*, 2011). Most rural women are poor and highly illiterate and have limited access to information and knowledge (VFA, 2009). Low levels of education worsen the challenge of investment in human capital and empowerment through knowledge that enables decisions and actions for increased future food production (Backeberg & Sanewe, 2010). Low levels of education results in the inability of farmers to use written information which is major constrain to extension services along with lack of funds for training purposes and remoteness of the areas where rural farmers are found (Machethe, 2004). Mintzer (2010) argues that women farmers are ignored by extension services which include advisory services, information and training, and access to production inputs such as seeds and fertilizers which are critical for increasing the productivity of farm activities. Access to extension services improves agricultural knowledge which is necessary to improve household food security and empower human society (Abedi, 2011). According to FAO (2002), knowledge generation, dissemination systems and links among small scale farmers, agricultural educators, researchers, extension workers and communicators must be strengthened to improve food security and livelihoods. Increasing capacity of farming communities allows them to undertake their own development activities (Abedi, 2011). Rural men need to be engaged in empowering rural women, particularly in societies where the support of men for such initiatives is required (IFAD, 2007). Provision of technical knowledge and skills on water harvesting, irrigation, fertilizer application, machinery, crop-protection and soil-conservation measures to small-scale women farmers can increase production, improve household food production and lead to women empowerment.

2.4 Land and Water Rights

Section 27 (1) (b) of the South African Constitution states that “everyone has the right to have access to sufficient food and water” (RSA, 1996). National Water Act of South Africa (Act 36 of 1998) supports the involvement of all South Africans in decision making with regards to the right to access water and water issues while the Water Service Act (Act 108 of 1997) indicates that water and sanitation are to be provided equally, affordably, effectively, efficiently and sustainably to all South Africans (Sigenu, 2006). Water Act also advocate for the formation of Water Users Associations which must ‘enable a community to pool financial and human resources in order to carry out more effectively water related activities’ (Perret, 2002).

However, the majority of rural population struggle to secure the right to water which is still dominated by those with access to land and economic power (Gabru, 2005). Water rights are defined as the rights to use water from water sources such as river, ponds, streams or source of groundwater (UDWR, 2009). Women are the most affected by insecure water rights as they mainly head rural households (Brewster *et al.*, 2006). They enjoy limited rights, authority and decision making over key productive resources such as land and water despite the significant roles they play in agriculture and food security in many developing countries (Peters *et al.* 2002). Women's limited access to water is due to that water and rights to irrigation are interlinked with rights to land which are held by men (Brewster *et al.*, 2006; van Koppen, 1998).

Rural women use land to provide for their families without legal rights to water and land (Brewster *et al.*, 2006). Access to productive resources by women has been through men, either by kinship or through marriage (Parveen, 2008). In some cases, women access land through male relatives (Thamaga-Chitja *et al.*, 2010). In cases where women have legal rights to land, customs often prevent them from taking actual control of land and natural resources (Brewster *et al.*, 2006). Women's ability to exercise their rights where legislation is in place is limited by lack of legal knowledge and weak implementation (Quisumbing & Pandolfelli, 2009). Women are sometimes excluded in land reform programmes (Gender and Water Alliance, 2003). When husbands are present, the legal land tenure or right to access land is allocated to them and excludes women (Gender and Water Alliance, 2003). Women hold less than 2% of the world's private land title (Deda & Rubian, 2004). They engage in food crop and livestock farming, without property rights on land and water resources, in case of spousal death or male migration for job search which results in women's limited access to water (Narayan, 2000).

Further studies have revealed that women's water needs are often ignored (RCSA, 2003). According to Mjoli (1998), it is important for water policies to take a gender-based approach to ensure sustainability and women empowerment. For instance, in Nepal (South Asia), women were excluded in water services project design and their water collection time increased significantly because the tap stands and the tube wells were located along the roadside, where women could not bath freely and wash their clothes. Women never used the new water equipment and carried water from other resources far from their homes or waited

until dark to access water. This undermined the success of the project and had a negative impact on women's lives (Aguilar, 2009). In some case, women cannot reach or manipulate water pump handles and are not trained to repair these pumps. Water and sanitation projects are more sustainable when women are involved in their design, operation and maintenance since they are adversely affected by project failure (Mjoli, 1998). In cases where projects fail, women undertake extra labour of returning to traditional sources of supply which includes long distances walk to and from the river every day, like in Nepal. Ignoring women's needs in Nepal resulted in increasing women's burden (Sandy, 2005). Women involvement in water delivery should include access to resources, decision-making and management, for women empowerment and equitable society to be achieved (Hemson, 2000).

2.5 Women and Water Management

Women are not recognized as the main primary stakeholders in local water management systems and are typically in a less favourable position to claim their rights than men (RCSA, 2003). Female farmers have little or no access to irrigation water for agricultural purposes and are entirely dependent on rainfall (Brewster *et al.*, 2006). Rural poor households are marginalised in access to irrigation schemes, land, market access and credit by infrastructure and institutions (Hope *et al.*, 2003). Irrigation systems are vital to rural livelihoods in providing water for livestock and fish production, domestic use, and many small enterprises which contribute to household food security. Deprivation of access to water and food on the basis of gender deteriorate the level of food security (Rijsberman & Molden, 2001). Poverty is not only about lack of access to sufficient food but lack of access to productive assets, services and markets (Prakash, 2003). Brewster *et al.*, (2006) argue that lack of water rights is the reason for the greater poverty of female-headed households. Access to enough water by poor people reduce poverty and create livelihood opportunities (Ziganshina, 2008).

Many women depend on small scale or hand irrigation and have difficulties coping with drought due to lack of access to water (Thamaga-Chitja *et al.*, 2010). Various studies show that unreliable supply of water for irrigation is related to poverty (Ziganshina, 2008). However, Quisumbing and Pandolfelli (2009) argue that secure tenure and access to water results in increased yields, diversified agricultural production and improved livelihoods for

women. Ziganshina (2008) argue that irrigated agriculture provides direct employment to millions of poor farmers and indirect opportunities to produce food for their own consumption. Therefore, it is important to provide water for agriculture as improved access to water has a significant impact on improved yields for subsistence production (Baiphethi & Jacobs, 2009).

2.6 Women and Land-based Livelihoods

Women play a crucial role in agriculture and rural development in most countries (Prakash, 2003). They are responsible for about 50 per cent of world's food production (Karl, 2009). In some sub-Saharan countries, women provide between 60 and 80 per cent of the food for household consumption as unpaid labourers on family plots (Karl, 2009). Women's subsistence production has positive contribution to food security (Brewster *et al.*, 2006). Subsistence production has the potential to improve the food security of poor households in both rural and urban areas by increasing food supply (Baiphethi & Jacobs, 2009). According to Lee *et al.*, (2008), more than 90 percent of African agricultural production is estimated to come from small-scale producers. Access to irrigation water increase crop productivity and allows more food to be produced from the same-sized land holding (van Koppen, 1999). Rural Poverty Report of 2011 by IFAD (2010) acknowledges that growth in agriculture generates the greatest improvements for the poorest people and can be a primary engine of rural growth, key driver of development and poverty reduction.

Rural households engage in multiple land-based livelihood strategies such as arable farming, livestock husbandry, and consumption and trade in natural resources (Shackleton *et al.*, 2001). Land-based livelihoods are critical rural household's survival (Andrew *et al.*, 2003). Women play a crucial role in agriculture and rural development in most countries (Prakash, 2003). Access to agricultural assets such as community gardens, irrigated plots and secure land tenure is crucial to rural women as it increases household food security (van Koppen 2000; Hope *et al.*, 2003). Women maintain food gardens and look after small animals such as poultry and pigs (Bob, 2002). Livestock remains a critical component of the livelihoods of rural households (Shackleton *et al.*, 2001). Small-scale agriculture offers and agricultural enhancement reduce rural household vulnerability to hunger and poverty (Hope *et al.*, 2003). Access to productive resources by women enhances knowledge on farm management and

income generation, develops decision making power, improves children's schooling and health, increases networks (Parveen, 2008).

Rural households also rely on natural resources to generate sustainable livelihoods (Lee *et al.*, 2008). Natural resources use and consumption by rural people has mainly been for subsistence (Sunderlin *et al.*, 2005). Rural households use natural resources as indigenous wood for fuel and fencing, wild fruits, wild herbs, medicinal plants, wood for utility items, grazing for livestock and thatch, clay and sand (Shackleton *et al.*, 2001). Rural poor livelihoods are also dependent forest and fisheries (Lee *et al.*, 2008). Rural households procure a wide variety of natural resources for home consumption or sale (Shackleton *et al.*, 2001). This generates both employment and income for rural dwellers and contributes significantly to food security.

2.7 The impacts of the poor access to water by women

Insecure access to water for consumption and productive use is a major constraint on poverty reduction in rural areas. Lack of access to water is a threat to rural livelihoods (Bruns *et al.*, 2005) as rural livelihoods are based on agriculture (Sally *et al.* 2003). According to Rijsberman & Molden (2001), water scarcity is when an area has little or no additional water supplies to meet their needs. Water scarcity exists because of “inadequate rights, infrastructure, or management efforts to deliver water services to all people” (Rijsberman & Molden, 2001). According to Aliber (2009), there is a decline in number of South African households that engage in subsistence agriculture as the main source of food and income with lack of water being of reasons. However, Stats SA (2011) states that the very poor in rural provinces turn to subsistence agriculture due to extreme poverty to supplement food sources, especially women. Lack of water greatly affects food production. It forces farmers to keep their land uncultivated during the agricultural season (Ramdas *et al.*, 2001) which perpetuates poverty and hunger.

Lack of water greatly affects the poor as they depend on agriculture and related activities for their livelihoods. Changes in patterns and timing of precipitation and changes in water supplies due to climate change is a threat to rural livelihoods, it increase uncertainties associated with traditional paths of livelihood generation (Lee *et al.*, 2008). Lack of

ownership and control over resources on which rural livelihoods are dependent is a challenge to sustaining rural livelihoods (Lee *et al.*, 2008). Poverty alleviation in rural areas is significantly related to women's increased access to productive resources (Parveen, 2008). Women's access and use of water and land is crucial for livelihoods and improved household food security (Khosla *et al.*, (2004) as access to natural resources is a key to determining the range of livelihood opportunities available for households (Lee *et al.*, 2008). Access to natural resources such as land and water allows households to diversify livelihoods to reduce risk (IFAD, 2010).

Rural women are more vulnerable to the impact of water scarcity than men. They are responsible for the maintenance of households and spend 1-6 hours fetching water which leaves them with less time for domestic work, education and income earning activities (Khosla *et al.* 2004). Rural water access is often limited to public standpipes or natural sources (Koolwal & van de Walle, 2010). Rural women collect water from distant rivers, streams, springs for domestic use (Sigenu, 2006) and rely on rain water for irrigation (Thamaga-Chitja *et al.*, 2010). The water collected is often of poor quality (Abayawardana & Hussain, 2002) which can lead to poor health and disease. More time and energy is spent during water search during dry seasons when usually water sources are depleted (Sigenu, 2006). Water is carried on the heads of women over a long distance and their health is affected especially for pregnant women. In some instances, women suffer permanent skeletal damage from carrying heavy loads of water over long distances day after day (Aguilar, 2009). Women also face the risk of drowning from floods (Brewster *et al.*, 2006).

Safety during the fetching of water is not guaranteed for women who travel in the early hours of the day or late at night. In some cases, children are left at home to look after one another as elders fetch water and children's safety is also at risk during this time. Girls drop-out of school to assist women in fetching water which perpetuates gendered poverty (Sigenu, 2006). Insufficient access to water and sanitation can be the reason why girls are kept out of school (Brewster *et al.*, 2006), particularly during their periods when they lack water to clean themselves (Burrows *et al.*, 2004).

Most water sources are not fenced against animals in rural areas. As a results livestock drinks from the same water source used for collecting domestic water thus polluting water

(Lubisi, 1997: 316). Lack or inadequate water-storing devices at home compounds the problem of water scarcity and long distances travelled during fetching of water. In cases where drums are used the water can be rendered unfit for consumption due to being uncovered and become breeding space for mosquitoes. According to Khosla *et al.* (2004), millions of people die from consuming unsafe water and the majority being poor women and children.

Unemployment exacerbates women vulnerability to water scarcity in cases where women have to pay to transport water or for repairs to existing infrastructure such as water taps. Rural women are also unable to use the government supplied water as they have to pay extra money in order to use water to irrigate, build, or for livestock watering (Sigenu, 2006). Cut-off of poor women's water supplies due to inability to pay leads to increased water-borne diseases and time spent by women searching for water supplies (Khosla *et al.*, 2004).

Water points nearer to the homestead lessen the time spent fetching water and allows women to use their time more productively (Brewster *et al.*, 2006). Women's self-help projects are now focusing more on availability and access of clean water as polluted water affects their livelihoods and health (VFA, 2009). Secure water access enables girls to go to school without interruption (Brewster *et al.*, 2006). Secure water improves the health of the family and reduces vulnerability to diseases. Access to water is therefore essential for improving the lives of poor people (Bruns *et al.*, 2005).

2.8 Summary

The rural poor make up the great percentage of the world's poor. Most rural households are headed by rural women. Rural household rely on land-based livelihoods such as crop production and livestock rearing amongst other for survival. They engage on rainfed or irrigated agriculture in the form of irrigation schemes to improve household food security. However lack and limited access to productive resources such as land and water coupled with poor infrastructure; limited knowledge of crop production; limited farmer participation in the management of water; ineffective extension; lack of mechanisation services; lack of reliable markets; and effective credit services has limited the success of these irrigation schemes that are aimed at improving household food security by rural women. Many authors argue that women empowerment is crucial for poverty and food insecurity reduction since they constitute a large percentage of the rural population and play a major role in reducing

household food insecurity through their knowledge of crop production and other land-based livelihoods. Women empowerment enables women to participate in the economic, political and social sustainable development of the rural communities as equal citizens. According to Women Empowerment in Agriculture Index by IFPRI, women are empowered when they: 1) can take decisions about agricultural production, (2) have access to and decision making power over productive resources, (3) have control over use of income, (4) are involved in community leadership, and (5) satisfied with time allocation for productive and domestic tasks and the available time for leisure activities. It is evident that women empowerment and gender equality are vital for the reduction of poverty, hunger and disease. Water and land provision are important for women to have access to water as proper use, access and management of water resources improves agricultural production which is important to achieve household food security and poverty reduction.

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Chapter 3

Area Description and Methodology

This chapter focuses on the description of the study area, and research methods used to collect and analyse the data. The study was conducted in three irrigation schemes in three different district municipalities in Limpopo province, South Africa. The first research site was Steelpoort irrigation scheme based in Ga-Malekane village, situated in the Sekhukhune District Municipality. The second research site was Mashushu irrigation scheme at Mashushu, a sub-village of Ga-Mampa under Capricorn District Municipality and the third site was Matshavhawe village situated at Rambuda under Vhembe District Municipality (see Figure 3.1.). A mixed research method approach was employed in this study, with quantitative and qualitative approaches being employed (Spratt *et al.*, 2004). Rural women involved in small irrigation schemes engaged in crop cultivation in and/or animal husbandry were sampled through purposive sampling. Data was analysed statistically using version 19 of the Statistical Package for Social Sciences (SPSS). Descriptive statistics was used to analyse the data and themes were identified through content analysis for the key informant interviews and focus group discussions

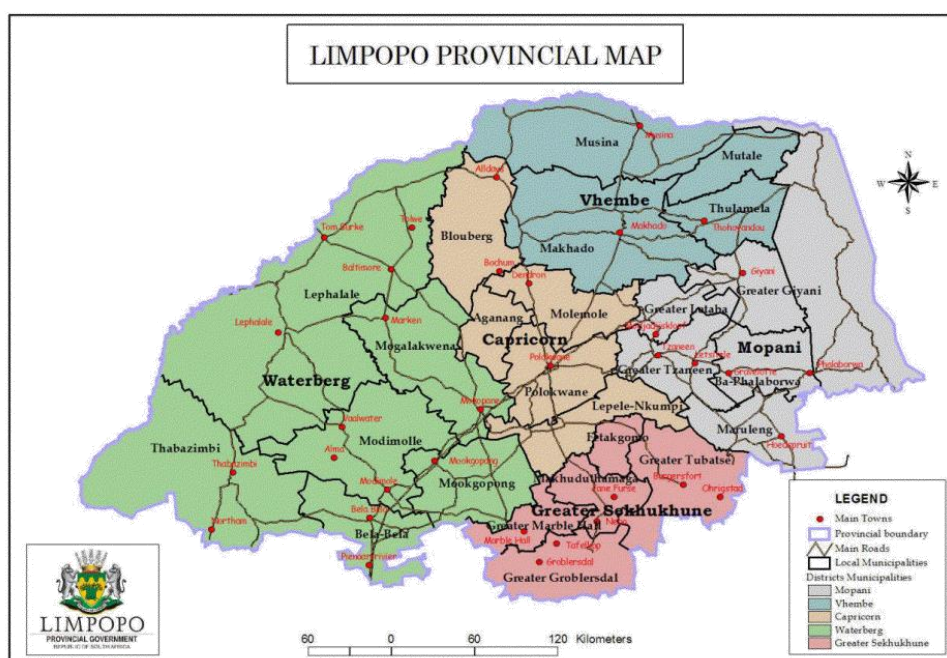


Figure 3.1 Figure showing different District Municipalities of Limpopo, South Africa (PMHC, 2011).

3.1 Description of the study area

The study was conducted in three different irrigation schemes at three district municipalities in Limpopo province, South Africa. The three study areas were investigated over a period of three weeks, where a week was spent at each site. The first research site investigated was Steelpoort irrigation scheme which was founded in 1972 for cash crops. It consists of 69 members, with 65 female members irrigating 1 hectare of land with a total hectare size of 72 with 69 hectares being arable. It is located near Steelpoort River at Ga-Malekane, a village situated at Steelpoort under the Greater Tubaste Municipality (GTM). GMT is largely rural with villages scattered throughout. It comprises of 175 farms of which 61 are under the tribal authority where Ga-Malekane falls (GTLM, 2011). According to the community survey conducted by Statistics South Africa in 2007 Greater Tubaste Municipality has the highest population, 31.4%, within the Greater Sekhukhune District Municipality (GTLM, 2009-2013). The total population of Greater Tubaste Municipality is approximately 343 468 with 66 611 households.

Blacks form a larger population group at Greater Tubaste Municipality followed by Coloureds, Indians, Whites and other population groups (GTLM, 2009-2013). The youth forms part of the larger population in the area (GTLM, 2009-2013). There are more women than men in the economical active age cohorts 19 – 65 which may suggest that more men seek employment in outside economic centres of Gauteng, Limpopo and Mpumalanga provinces (GTLM, 2009-2013).

Agriculture, mining, manufacturing, trade and tourism sectors contribute to the economy of Greater Tubaste Municipality. Steelpoort is comprised more of manufacturing industries and mining related suppliers (GTLM, 2006-2011). The main source of livelihood is mining and small-scale agriculture complemented by social grants and pensions. A very large proportion of the labour force (73%) in GTM is unemployed and 42.7% of the total households have no income (GTLM, 2007).

The second irrigation scheme studied was Mashushu irrigation scheme based at Mashushu, a sub-village of Ga-Mampa village which is a rural area located in the Mafefe tribal area of the Lepelle-Nkumpi Local Municipality of the Limpopo province in the Republic of South Africa. The scheme consists of 30 farmers using 40 hectares of land with each farmer using an average of 1 hectare of land. They use furrow as an irrigation system. Water is diverted

from Mhlapitse River to the lands at Mashushu. The main source of livelihood at Mashushu is small-scale agriculture complemented by social grants and pensions. Maize is the main crop grown under irrigation and in the wetland. It is estimated that 394 households (2758 people) reside in the 5 villages of Ga-Mampa (Adekola 2007). More than 80% of the households in the area are poor and vulnerable (Tingury 2006). It is estimated that over 55% of the economically active population (people between the ages of 15 and 64 years) are unemployed (CDM, 2008).

The third study sites visited was Rambuda irrigation scheme, found at Matshavhawe village, based at Mutale Local Municipality under Vhembe District Municipality (Nethononda & Odhiambo, 2011). The scheme has a total size of 160 hectares where 103 scheme members cultivate in land with an average of 1.25 hectares. The scheme uses furrow as an irrigation system. The water is diverted from Tshala River through concrete weir to the canal that transports it to the plots. The communities at Mutale Local Municipality are largely rural and the ownership of the land is under the leadership of the traditional authority. Approximately 26% of the population does not have access to clean potable water and the roads within the jurisdiction area of the municipality are in a poor condition and in dire need of upgrading from gravel to tar (MLM, 2007). The survey conducted by the Statistics South Africa in 2007 estimated the total population of Mutale Municipality to be 131 215 and has 24239 households with the average household size of 5 persons (MLM, 2007).

3.2 Methodology and Sampling

This section describes the research methods used to sample population, collect and analyse data. Rural women involved in irrigation schemes were sampled purposively. This was done to achieve the objectives of the research was to determine the dynamics under which rural women operate when accessing water to improve the land-based livelihoods that they engage in for improved household food security and to investigate the knowledge rural women possessed or lacked for empowerment to improve land-based livelihoods and household food security. Purposive sampling allows a particular case which illustrates or possesses features that are of interest to the research to be chosen and investigated (De Vos *et al*, 2002). A total of 98 participants was sampled and interviewed. It was made of 18, 33 and 47 rural women from Mashushu, Rambuda and Steelpoort irrigation schemes respectively. Major reason for sampling is feasibility as coverage of the total population is seldom possible (Sarantakos,

2000). Time and costs also makes it impossible to cover the total population (De Vos *et al.*, 2002).

3.3. Data collection

A mixed research methods was employed in this study to collect data where structured questionnaires, key informant interviews, focus group discussions and observations were used. Quantitative data was collected through questionnaires. Rural women from all study areas were visited in the fields where they worked and asked questions from the prepared questionnaires (Appendix A). Information on demographic characteristics of participants, land and water issues were sought.

Key informant interviews were conducted with leaders of the irrigation schemes, Field Extension Officers and Tribal Authorities in all study areas. According to Mudhara & Shoko (2003) key informant is “an individual who has knowledge, previous experience or social status in a community and has insights into how the society operates, its problems and needs”. Key informants live among the community and are familiar with the community conditions and experiences can therefore provide reliable and accurate information (Coates *et al.*, 2007). Key informants clarify issues, which assist the researcher to understand the context of the problem (Mudhara & Shoko, 2003).



Figure 3.2: Focus Group Discussions in one of the three study sites visited (Photo: Nkanyiso Gumede, 2011).

Qualitative data was collected through focus groups discussions (Appendix B). Rural women gathered in the fields where they worked and issues regarding land and water use were discussed (Figure 3.2.). Focus group discussions generate multiple viewpoints and responses in a shorter period of time than individual interviews (De Vos *et al.*, 2002). Rural women shared views and experiences with regards to land and water use. Dummon and Ensor (2001) argue that focus group discussions trigger thoughts from participants during discussions and extensive feedback can be obtained. Women confirmed and disagreed with the views expressed by other women until consensus on issues were reached. Focus group discussions also allow sharing and comparing of information among participants (Kelly, 1999). Focus groups are used as a quick and convenient way to collect data from several people simultaneously (Kitzinger, 1995). Collecting data for knowledge and skills women possessed or lacked observations were carried out on the farming techniques employed by the farmers by the researcher and questions were asked during focus group discussion and interviews. Combining quantitative and qualitative methods capitalise on the strengths of each approach, counteract their different weaknesses and provide more comprehensive answers to research questions and goes beyond the limitations of a single approach (Spratt *et al.*, 2004).

3.4. Data Analysis

Statistical Package for Social Sciences (SPSS) version 19 was used to analyse data. Data was coded manually and analysed using descriptive statistics. Key informant interviews and focus group discussions were analysed through identifying themes through content analysis. Water sources, water management and crop cultivation techniques were observed and recorded. Findings from different sources were triangulated as a way of cross-checking of results from different sources for validity and reliability of the information (Guion, 2002; Mudhara & Shoko, 2003).

Table 3.1: Study sub-problems, data collected, data collection tool and analysis used.

Sub-problems	Data collected	Data collection tool	Data analysis
How do rural women access water for land-based livelihoods to improve household food security and the constraints involved?	Water sources available	Questionnaires Focus groups Observations Key informants	Content analysis Descriptive analysis
What are the land-based livelihoods that rural women are involved in?	Land-based livelihoods Crops grown	Questionnaires Focus groups Observations Key informants	Content analysis Descriptive analysis
What knowledge do rural women possess for empowerment in order to improve household food security?	Farming techniques Water management techniques	Questionnaires Focus groups Observations Key informants	Content analysis Descriptive analysis

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Chapter 4

Investigating the challenges of water access by rural farming women for land-based livelihoods and implications for household food security

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4.1 Introduction and Background

High incidences of food insecurity and malnutrition are reported in rural areas of South Africa, particularly in Limpopo, Eastern Cape, Free State and KwaZulu-Natal (Department of Agriculture, 2007). Yet, over 80 per cent of the poorest households in rural areas rely on farming and agricultural labour for livelihoods (IFAD, 2011). Most rural households engage in land-based strategies of arable farming, livestock husbandry, and consumption and trade in natural resources (Shackleton *et al.*, 2001). These strategies form part of different forms of supplementary food production measures alleged to be employed by approximately 1.3 million South African households on at most 3.3 million ha of rain-fed and irrigated agricultural land (Backeberg & Sanewe, 2010). Irrigation has long played a key role in improving agriculture (Oni *et al.*, 2011). However, the growing water scarcity and competition stands as a major threat to future advances in poverty alleviation especially for the rural poor (Barker *et al.*, 2000).

Women are the majority of those involved in irrigated agriculture in rural areas (Machethe, 2004). This is mainly due to that women are providers for their families. Women collect and manage water in households and irrigate crops for household food security (Aureli & Brelet, 2004). However, women lack control and have limited access to resources such as land and water (Reddy & Moletsane, 2009). Faurès & Santini (2008) argue that since water is one of the most important production assets, securing water access, control and management by women is the key to enhancing rural livelihoods for poverty reduction. The Women's Empowerment in Agriculture Index of the International Food Policy Research Institute suggests that improving knowledge and skills and improving access to production resources

can empower women and enable their leadership skills (IFPRI, 2012). This can strengthen the fight against hunger, poverty and food insecurity which is prevalent in the rural areas mostly headed by women. The paper aims to explore the challenges that rural women encounter when accessing water for land-based livelihoods they engage in to improve household food security among three irrigation schemes.

4.1.1 Water use and Agriculture

Water is fundamental in poverty reduction and for developing sustainable rural livelihoods of the poor as it is the key input in agricultural and non-agricultural production processes (Bell, 2001; Abayawardana & Hussain, 2002). According to Fraser *et al.*, (2003), agriculture has a positive impact on poverty alleviation and food security. Proper use of water resources and management thereof improves agricultural production which is important to achieve household food security (Thamaga-Chitja *et al.*, 2010). While rural livelihoods are also derived from sources such as wages, remittances, state welfare grants and income from informal economic activities agriculture remains the mainstay for rural livelihoods (Andrew *et al.*, 2003; Sally *et al.*, 2003). Subsistence production increases household food security and reduces reliance on cash to feed the household (Baiphethi & Jacobs, 2009). According to Thamaga-Chitja *et al.*, (2010), water is the key element in women's land-based livelihoods.

Women are often the primary users of water in domestic consumption, subsistence agriculture, health and sanitation (Abayawardana & Hussain, 2002). They engage in productive water use for homestead food gardening and smallholder irrigation schemes (Backeberg & Sanewe, 2010). Domestic and subsistence production use of water is often associated with women and are often excluded from commercial use (Peters *et al.*, 2002). Women's opportunities for water-based income generation through gardening and farming, livestock, aquaculture, forestry, and other water-based enterprises are still limited (van Koppen, 2001). Brewster *et al.*, (2006), argue that, lack of land ownership by women may be the underlying cause of women's limited access to water. Water plays a pivotal role in economic activity and in human well-being for domestic use and production purposes such as irrigation and livestock farming (Crow & Sultana, 2002).

Schreiner *et al.*, (2004) argues that women's economic empowerment is essential to escape poverty as women play a vital role in household food security. Water provision for women to engage in water-based income generation activities becomes necessary for empowerment. Deprivation of access to water and food on the basis of gender deteriorate the level of food security (Rijsberman & Molden, 2001). Poverty is not only about lack of access to sufficient food but lack of access to productive assets, services and markets (Prakash, 2003). Secure access to land and its water resources for productive use by rural women in agriculture and livestock rearing is vital as land ownership can be a precondition for access to water (Brewster *et al.*, 2006). Irrigation systems are vital to rural livelihoods in providing water for livestock and fish production, domestic use, and many small enterprises which contribute to household food security. Access to enough water by poor people reduce poverty and create livelihood opportunities (Ziganshina, 2008).

Women depend on small scale or hand irrigation and have difficulties coping with drought. Secure tenure and access to water results in increased yields, diversified agricultural production and improved livelihoods for women (Quisumbing & Pandolfelli, 2009). Irrigated agriculture provides direct employment to millions of poor farmers and indirect opportunities to produce food for their own consumption (Ziganshina, 2008). Various studies show that unreliable supply of water for irrigation is related to poverty (Ziganshina, 2008). Therefore, water must be provided for agriculture purpose as improved access to water has a significant impact on improved yields for subsistence production (Baiphethi & Jacobs, 2009).

Water security allows women to be involved in water-related work such as women's processing and selling of food and beverages, crafts production and cleaning which eventually leads to improved household food security (Khosla *et al.*, 2004). Brewster *et al.*, (2006) concludes that equitable access to water for productive use can empower women, address poverty and gender inequality. Securing access, control and management of water is important to enhancing rural livelihoods.

Insecure access to water for consumption and productive uses is a major constraint on poverty reduction in rural areas. Water scarcity is a threat to rural livelihoods (Bruns *et al.*, 2005) as rural livelihoods are based on agriculture (Sally *et al.* 2003). According to Rijsberman & Molden (2001), water scarcity is when an area has little or no additional water

supplies to meet their needs. Water scarcity exists because of “inadequate rights, infrastructure, or management efforts to deliver water services to all people” (Rijsberman & Molden, 2001). According Aliber (2009), there is a decline in number of South African households that engage in subsistence agriculture as the main source of food and income. Lack of water greatly affects food production. It forces farmers to keep their land uncultivated during the agricultural season which perpetuates poverty and hunger (Ramdas *et al.*, 2001).

Rural women are more vulnerable to the impact of water scarcity than men (Sigenu, 2006). Women are responsible for the maintenance of households and spend 1-6 hours fetching water which leaves women with less time for domestic work, education and income earning activities (Khosla *et al.* 2004). Rural water access is often limited to public standpipes or natural sources (Koolwal & van de Walle, 2010). Rural women collect water from distant rivers, streams, springs for domestic use (Sigenu, 2006) and rely on rain water for irrigation (Thamaga-Chitja *et al.*, 2010). The water collected is often of poor quality (Abayawardana & Hussain, 2002) which can lead to poor health and disease. More time and energy is spent during water search during dry seasons when usually water sources are depleted (Sigenu, 2006). Water is carried on the heads of women over a long distance and their health is affected especially for pregnant women. In some instances, women suffer permanent skeletal damage from carrying heavy loads of water over long distances day after day (Aguilar, 2009). Women also face the risk of drowning from floods (Brewster *et al.*, 2006).

Safety during the fetching of water is not guaranteed for women who travel in the early hours of the day or late at night. In some cases, children are left at home to look after one another as elders fetch water and children’s safety is also at risk during this time. Girls drop-out of school to assist women in fetching water (Sigenu, 2006). Insufficient access to water and sanitation can be the reason why girls are kept out of school (Brewster *et al.*, 2006), particularly during their periods when they lack water to clean themselves (Burrows *et al.*, 2004).

Most water sources are not fenced against animals in rural areas. As a results livestock drinks from the same water source used for collecting domestic water thus polluting water (Lubisi, 1997: 316). Lack or inadequate water-storing devices at home compounds the

problem of water scarcity and long distances travelled during fetching of water. In cases where drums are used the water can be rendered unfit for consumption due to being uncovered and become breeding space for mosquitoes. According to Khosla *et al.* (2004), millions of people die from consuming unsafe water and the majority being poor women and children. This affects labour for the land-based livelihoods.

Unemployment exacerbates women vulnerability to water scarcity in cases where women have to pay to transport water or for repairs to existing infrastructure such as water taps. Rural women are also unable to use the government supplied water as they have to pay extra money in order to use water to irrigate, build, or for livestock watering (Sigenu, 2006). Cut-off of poor women's water supplies due to inability to pay leads to increased water-borne diseases and time spent by women searching for water supplies (Khosla *et al.*, 2004).

Water points nearer to the homestead lessen the time spent fetching water and allows women to use their time more productively (Brewster *et al.*, 2006). Women's self-help projects are now focusing more on availability and access of clean water as polluted water affects their livelihoods and health (VFA, 2009). Secure water access enables girls to go to school without interruption (Brewster *et al.*, 2006). Secure water improves the health of the family and reduces vulnerability to diseases. Access to water is therefore essential for improving the lives of poor people (Bruns *et al.*, 2005).

4.1.2 Area Description and Methodology

The study was conducted in irrigation schemes at three district municipalities of Limpopo province in South Africa. The first irrigation scheme studied was Steelpoort irrigation scheme which has 72 hectares of land in which 69 are arable. It was established in 1972 for cash crops. It has 65 female members from the total of 69 members. Each member use 1 hectare of land. It is situated near Steelpoort river where water is drawn for irrigation. It is located at a village called Ga-Malekane, under the Greater Tubatse Municipality (GTM) which is largely rural with villages scattered throughout. The GTM is made up of 175 farms of which 61 are under the tribal authority (GTLM, 2011). The main sources of livelihood are mining and small-scale agriculture complemented by social grants and pensions. Unemployment is high (73%) and 42.7% of the total households have no income (GTLM,

2007). The total population of Greater Tubaste Municipality is approximately 343 468 with 66 611 households. Africans form a larger population group at Greater Tubaste Municipality followed by Coloureds, Indians, Whites and other population groups (GTLM, 2009-2013). There are more women than men in the economical active age cohorts 19 – 65. The youth are a larger population in the area (GTLM, 2009-2013).

Mashushu irrigation scheme was the second study area to be studied. It is based in Mashushu, a sub-village of Ga-Mampa village which is a rural area located in the Mafefe which is the tribal area under the Lepelle-Nkumpi Local Municipality, in the Limpopo province of the Republic of South Africa. The scheme consists of 30 farmers using 40 hectares of land. Water for irrigation is drawn from Mohlapiitse river where it is diverted to the furrow irrigation system. The main source of livelihood at Mashushu is small-scale agriculture which is complemented by social grants and pensions. Maize is the main crop grown under irrigation and in the wetland. It is estimated that 394 households (2758 people) reside in the 5 villages of Ga-Mampa (Adekola 2007). More than 80% of the households in the area are poor and vulnerable (Tingury 2006). It is estimated that over 55% of the economically active population (people between the ages of 15 and 64 years) are unemployed (CDM, 2008).

The third study site investigated was Rambuda irrigation scheme, situated at Matshavhawe village. The irrigation scheme has 160 hectares of land. It has 103 members that grow crops on land with an average of 1.25 hectares each. Water is diverted from Tshala River to the furrow irrigation system that is used for irrigation. Matshavhawe village is based at Mutale Local Municipality under Vhembe District Municipality (Nethononda & Odhiambo, 2011). Mutale Local Municipality has an estimated population of 131 215 with 24239 households, 26% of the population does not have access to clean potable water (VDM, 2007). The communities are largely rural and under tribal authority. Roads within the municipality need to be upgraded from gravel to tar as its condition is very poor (VDM, 2007).

The study was aimed at investigating the water access challenges for rural women who engage in land-based livelihoods for household food security. Therefore, rural women involved in small irrigation schemes were sampled through the help of local authorities using

purposive sampling. According to De Vos *et al.*, (2002), purposive sampling allows a particular case which illustrates or possesses features that are of interest to the research to be chosen and investigated. Therefore, purposive sampling was applied to the population of the irrigation schemes. A mixed research method approach was employed to collect data in this study with quantitative and qualitative approaches being utilized (Creswell, 2009). Combining quantitative and qualitative methods provide more comprehensive answers to research questions. It counteracts the different weaknesses of each method and capitalise on the strength of each approach (Spratt *et al.*, 2004).

Data collection methods used included structured questionnaires that were administered through face-to-face interviews to 98 rural women who were from all irrigation schemes, Mashushu (18), Rambuda (33) and Steelpoort (47). Data was also collected through the key informant interviews, focus group discussions and observations. In all study areas, key informant interviews were conducted with leaders of the irrigation schemes, Field Extension Officers and Tribal Authorities. Focus group discussions generate multiple viewpoints and responses in a shorter period of time than individual interviews (De Vos *et al.*, 2002). Data was analysed statistically using version 19 of the Statistical Package for Social Sciences (SPSS). Themes were identified through content analysis for the key informant interviews and focus group discussions. Descriptive statistics was used to analyse the data. Resources and land and crop cultivation techniques were observed and recorded. Findings from different sources were triangulated as a way of cross-checking of results from different sources for validity and reliability of the information (Guion, 2002; Mudhara & Shoko, 2003).

4.1.3 Results and Discussion

Women farmers interviewed were involved in small-scale irrigation of horticultural crops such as maize, beans, spinach, carrots, cabbage, etc. They were organized into irrigation schemes of Mashushu, Steelpoort and Rambuda. A total of 98 women farmers were interviewed face-to-face in the field where they worked, as per the purpose of the research. Each woman represented a household. Household size ranged from 1 to 11 family members with an average of 6 members per family. Majority of the women farmers (68%) that were involved in irrigated agriculture were over the age of 50 while only 8% were under the age of 35 (refer to Table 4.1).

Table 4.1: Age of respondents per study area (n = 98)

Name of the irrigation Scheme				
Age range	Mashushu n=18	Steelpoort n= 33	Rambuda n=47	Total n=98
Below 25	0	0	1	1
25-35 yrs	3	1	3	7
36-50 yrs	3	9	11	23
Over 50 yrs	12	23	32	67

Table 4.1 shows that majority (67 out of 98) of respondents involved in the irrigation schemes were women over the age of 50. The 8% of the total respondents were women under the age of 35 who stated unavailability of formal job opportunities as the main reason for their involvement in the irrigation schemes as they have to complement other household livelihoods for household food security. The respondent from Rambuda who was the youngest of the total population said: *“I am only involved in the irrigation scheme because I am still searching for a ‘proper job’”*. This view and the absence of young people in these schemes somewhat confirmed the widely alleged view that rural youth are increasingly disinterested in small-holder farming which they perceive as dirty work (Bennell, 2007). Another mentioned reason for minimal youth involvement in small-holder irrigation schemes was little or low income returns due to lack of access to markets. Employment opportunities in the nearby mines also contributed to low youth participation in the irrigation schemes as mining industries offered better income compared to that generated in the irrigations schemes. This confirmed the view by Crosby *et al.*, (2000) that lack of markets and poor infrastructure affects the success of small irrigation schemes especially in generating meaningful income. The youth somehow do not recognise farming as an opportunity for entrepreneurship and source of income.

Women interviewed in the irrigation schemes had little (primary) (35.7%) or no formal education while 35.7% of the respondents had secondary education. All but Rambuda irrigation scheme had no respondents with tertiary qualification. The youngest women (below 25 years) respondent from Rambuda with tertiary qualification made the 1% of the total population that had tertiary qualification (see Table 4.2). This placed Rambuda at a

better chance to adopt new technologies and access information that can better enable them to improve their livelihoods for improved household food security. As education has the potential to enable farmers to adopt new technologies and take decisions and actions for increased future food production and improved household food security (Oni *et al.*, 2011; Backeberg & Sanewe, 2010).

Table 4.2: Education level of the respondents per study area (n = 98)

Name of the irrigation Scheme				
	Mashushu	Steelpoort	Rambuda	Total
Education Level	n=18	n= 33	n=47	n=98
No education	39 %	42.4%	29.79 %	35.7 %
Primary	22%	42.4%	36.17 %	35.7 %
Secondary	39%	15.2%	31.92 %	27.5 %
Tertiary	0%	0%	2.13 %	1.02 %

The above results (see Table 4.2) show that majority of rural women involved in irrigation schemes had low levels of education. High illiteracy was identified by Prakash (2003) and Moagi (2008), as cited by Thamaga-Chitja *et al.*, (2010), as a constraint to development of rural farm women. Hill (2011) argues that access to education by women increase their confidence and negotiation skills for income-generating opportunities and more decent work which subsequently lead to women empowerment. It also allows women to better adopt new technologies and methods for crop production and water irrigation management (Oni *et al.*, 2011). Indeed in this regard low literacy levels of women could deter independency, economic progression and empowerment and thus impact negatively to household food security.

Results showed that 44 % and 36 % of the households of the respondents from Mashushu and Rambuda Irrigation Schemes respectively were headed by women. However the situation was different in Steelpoort, as 66.7 % of households were headed by men while 33.3 % was headed by women. According to Bob (2002), half of the rural households are headed by

women in South Africa. Common reasons for female-headed households from all study areas were spousal death and labour migration by the spouse. Male migration to urban areas for employment search increases pressure on women by increased family responsibilities (Prakash, 2003). Fewer respondents mentioned divorce or separation as a reason for female-headed household. One respondent from Mafefe stated that the spouse stayed with another wife as she was in a polygamous marriage. However, this marriage arrangement never affected her in anyway as she had land that was registered in her name.

Common reasons for female-headed households from all study areas were spousal death and labour migration by the spouse. Male migration to urban areas for employment search increases pressure on women by increased family responsibilities (Prakash, 2003). Least respondents mentioned divorce or separation as a reason for female-headed household. What was common from all study areas was that in cases where household heads were female, their source of income was old age pension, while household heads from male-headed household were salaried workers, unemployed, retired or self-employed. Female household heads were involved in the irrigation schemes as crop cultivators despite their old age. Women are providers of food for their families while men search for jobs in distant cities (Prakash, 2003). Male household head that were self-employed as home builders, brick makers, sold chickens or owned a tuck shop. These finding confirm that rural women still have limited employment options compared to their male counterparts which imply that for the very poor communities where women have limited opportunities, household food insecurity is very likely to be high. Illiteracy, financial and time constraints disadvantage women more than men in starting up enterprises (UN, 2009).

During discussions most women mentioned that men were not involved in decision making with regards to scheme. Women decided on what to plough, when to harvest and other decisions related to the crop production. This showed great sign of women empowerment as IFPRI (2012) states that women are empowered when they have the ability make decisions on agricultural production. However, income generated was shared with their spouse willingly as their spouse also shared income generated from other livelihoods they engage in. This revelation shows that household food security was viewed as the women's domain but when income was involved men played a role.

4.1.4 Water sources and use

All irrigation schemes had access to more than one water source. Water sources available at Steelpoort (Ga-Malekane) were Steelpoort River, communal borehole, household standpipes (municipal taps) and a dam. At Mashushu Irrigation Scheme, sources available were Mohlapiitse River, communal taps and spring in the mountains. Tshala River, communal taps, and private taps and boreholes were available for Rambuda Irrigation Scheme farmers. However, household standpipes (municipal taps) were only available to those who could afford to install it (installation ranged from R1000.00 payable to the municipality). This caused some women to travel to nearby rivers, communal taps and boreholes. This confirmed the claim Sigenu (2006) stated that the majority of women in rural women areas of South Africa are dependent on rivers, streams and springs as water sources than to women in urban areas who depend on household standpipes. This means the available water sources in the rural areas must be used in a sustainable manner to prevent depletion.

Table 4.3: Water sources available per study area.

Community	Water Sources available
Steelpoort	Dam, river, private (municipal) taps, communal borehole
Mashushu	River, communal tap and mountain stream.
Rambuda	River, private taps and communal taps

River was a common source of water available to the farmers at these three different irrigation schemes (see Table 4.3). This shows that provision of water to rural communities needs to be accelerated in order to ensure that rural women have access to adequate and constant supply of water to use for their livelihoods. Multiple use of the irrigation canal water was acknowledged by the study participants. Water from the canal was used domestically for drinking, cooking, hygiene needs, sanitation and for other household needs. It was also used for productive activities such as crop cultivation and animal husbandry for the household that owned livestock. These findings confirmed the assertion by Van Koppen *et al.* (2006) that women may use water from infrastructure developed for agricultural purpose for multiple uses. Building of houses was also mentioned as an activity where

women used water but women regarded it as an infrequent activity. Brewing of *amahewu* (drink made from maize) and traditional beer was mentioned as an activity where considerable amount of water was used by women from all study areas. However, this activity was not engaged very often, only as per required cultural ceremonies. Building bricks as way of generating income was also mentioned as an activity where women from the rest of the community used water but no women claimed to be involved in this activity.

4.1.5 Water for use in productive activities

All Irrigation Schemes used canals as an irrigation system. At Mashushu and Rambuda Irrigation schemes, water for irrigation was accessed from the river. Water from a dam was used for irrigation at Steelpoort Irrigation scheme. Water was diverted by weirs (Figure 4.1) from the respective source to the fields through canals (Figure 4.2) to the furrows (Figure 4.3) in fields. Furrows are “narrow ditches dug on the field between the rows of crops in which water runs as it moves down the slope of the field” (Brower *et al*, 1985).



Figure 4.1: Showing weirs used to divert water from the river to the canal (Photo: Nkanyiso Gumedede, 2011).



Figure 4.2: Showing canal that directed water to the fields (Photo: Nkanyiso Gumede, 2011)



Figure 4.3: Showing furrows in the field (Photo: Nkanyiso Gumede, 2011)

At all the irrigation schemes, farmers took turns to irrigate and were each assigned days to irrigate. The farmers with the fields at the upper-end of the field irrigated first and those at the lower-end irrigated last. But all farmers irrigated on the day allocated by the Irrigation Scheme committees. To avoid inconvenience, women would arrange with other women to irrigate on their behalf when they had to attend to other matters on the day allocated for irrigation of their plot. All Irrigations Schemes never paid water or licence fees, water was used for free. However, at Steelpoort Irrigation Scheme members paid R20.00 per month to the scheme management committee which was used for canal maintenance but the other 2

irrigation schemes did not do so. This made the canal to have easier flow of water to the fields compared to those that were not maintained. At Rambuda, the maintenance canal was only about removing any material that blocked the flow of water but at Mashushu canal maintenance was a problem since it was not cemented. They only channelled water to the furrows whenever they needed water.

4.1.6 Water for production and technology challenges

All Irrigation Schemes used canals as an irrigation system. The majority of women at all irrigation schemes were satisfied with the canal as an irrigation system, commending the simplicity of its operation and simple flooding of water to the plots. At Steelpoort and Rambuda Irrigation Scheme, 97% and (97.9%) of the respondents, respectively, were satisfied with the canal and furrow as an irrigation system. At Mashushu Irrigation Scheme, only 72.2% of the respondents were satisfied with the canal because it is less labour intensive. However, their main concern was that the canal was not cemented and water was lost during transportation to the fields. Water was lost through seepage and to holes dug by rodents and frogs resulting in decreased water in quantity reaching the fields. This confirms the claim by Brower *et al* (1985) that water seeps into the soil and is always lost in canals and on the farmers' fields: *"Sometimes the canal is eroded when there are heavy rains and we have to dig (open) it up again"* one woman complained. Women at Steelpoort and Rambuda Irrigation Schemes complained about the fracturing of the canal that were both constructed during 1950's. This caused water to be lost during transportation. Breakage of the canal allowed plants to grow in the canal which led to blockage of water to the fields. Soil eroded to the canal also caused blockage of water to the field which affected water quantity reaching the fields.

Women lacked skills or even ability to deal with the challenges affecting the water flow at Mashushu Irrigation Scheme. Floods eroded the canals such that the canal was left to be on two different gradients with upper parts being lower than downstream, making water flooding difficult, especially during drier seasons. One woman complained that water could not reach some parts of her plot during irrigation as water move down the slope due to gravity to the fields. Fields at the slope higher than the source of water were not irrigated. This resulted in low yields in that part of the field. Lack of water greatly affect food production and forces

farmers to keep their land uncultivated during the agricultural season which perpetuates poverty and hunger (Ramdas *et al.*, 2001).

Informal users from the community drew water from the main canal before it entered the scheme. But this was not much of a concern to scheme members as they understood water problems facing their communities. However, a degree of tension between plot holders and members of surrounding communities was identified when community members did laundry in the canal as they felt the dirt and chemicals from the soap badly affected the crops. Women felt that there was nothing they could do about those who used water from the canal for other activities as water was scarce in their community. Their silence was not due to lack of voice or power but they ‘understood’ the situation since water was scarce in their community. This may confirm that women in rural areas have sense of community and share every little they have.

4.1.7 Water for domestic use and challenges

At Steelpoort, river water was the most preferred source for household consumption (87.9%) over household standpipes (municipal taps) and communal boreholes. The reason for preference of river over household standpipes (municipal taps) and communal boreholes for consumption was due to perceived salinity of the water accessed from these sources. Women choose sources according to accessibility, availability, distance, time, quality and use (Jena, 2005). Results show that most respondents (75.8%) had access to water sources, household standpipes (municipal taps) and communal boreholes, less than 200 meters (m) from their household. This met the RDP standards which state “water sources should be less than 200m from the household”. However, respondents complained about the reliability of water supply from the household standpipes (municipal taps): “*Sometimes we go for three weeks or even more without water in the taps.*” Unreliability of water in the household standpipes led to women spending more time on water collection for household use let alone for agricultural activities, thus affecting household food security negatively.

At Rambuda Irrigation Scheme, the respondents mentioned river, communal taps and private taps and boreholes as sources they used. Water for domestic use was accessed from the canal which transports water from the river to the fields. Water from the canal was the most

utilized source due to unreliability of water from the communal taps. 82.7% of the women agreed that they spent less than 30 minutes on collecting water when water from the communal taps was available as it is less than 200m from their households. However, the taps were not reliable which affected the availability of water, thus time spent on water collection increased when there was no water in the communal taps. Less time was spent on water collection when water was available at the household standpipes (municipal taps). This confirmed the assertion by Brewster *et al.*, (2006) that water points nearer to the homestead lessen the time spent fetching water and allows women to use their time more productively.

Farmers at Mashushu Irrigation Scheme accessed domestic water from communal taps. The water to the communal taps was pumped from the borehole into the tank by the municipality worker and then released to the communal taps. Results show that 88.9% of the respondents had access to water source less than 200m from their households. Some respondents connected pipes to the taps to collect water to their household due to proximity of the source to their households. This saved them time and energy spent on water collection. However, women complained that water was only available for three days in week. During focus group discussion women also complained that they were not allowed to use water from the tap for other activities such as household garden irrigation and building. This is in contradiction with the South African Constitution which provides for right to sufficient water to meet basic needs (RSA, 1996). The National Water Act declares water as means to promote social, economic development and poverty reduction (RSA, 1998). It is clear that these declarations could not be fulfilled as people's access to water was limited and unreliable.

It appeared that women and girls were the main collectors of water from all investigated communities. This was mostly the case when water supplies were interrupted. Most women from all Irrigation Schemes asserted that they had access to water sources for domestic use within 200m from their household. However, water interruptions caused them to travel much longer distances in quest for water. In some areas, fathers and sons would assist with water collection but were not frequent collectors of water. In cases where men and boys collected water, they used wheel-barrows or vehicle where as women and girls use their heads. Carrying heavy loads of water over a long distance may cause women to suffer permanent skeletal damage (Aguilar, 2009). The greater the distance, the more time women need to

fetch water and less time spent on by women on pursuing domestic farming activities. Walking these distance robs women their time to engage in economic activities. This placed more burden on women already burdened with household chores and as food producers for their families in the form of crop cultivation (Prakash, 2003). It can be seen that the unavailability of water of domestic water sources does affect agricultural activities for women thus limiting agricultural growth negatively and increase chances of food insecurity. This then requires empowerment of women by educating men to be supportive to women when it comes to household chores. It is also therefore important to provide reliable water sources for domestic use for women to use as unreliability of water supplies cost them time they would otherwise use on land-based livelihoods they engage in.

4.8 Conclusion and Recommendations

Women engage in land-based livelihood such as irrigated agriculture to increase household food security, reduce reliance on cash to feed their household and for sales. They also head a considerable number of households due to male migration and spousal death amongst other reasons. However, poor access to water affects their efforts to agriculture for improved household food security. It is therefore recommended that water should be made available to rural women for sustainable rural livelihoods which are strongly linked to agriculture which requires water.

Fractured canal and absence of cemented canal characterized the irrigation schemes studied. This affected the amount of water that reached the scheme fields. Cementation of Rehabilitation of irrigation systems by cementing the canals and provision of modern irrigation technologies can improve supply of water and the amount of water available to the fields which will result in improved agricultural production and household food security. Adequate amounts of water will also improve quality and diversity of food produced by rural households, create economic opportunities and consequently lead to reduced food insecurity and malnutrition.

Women from the small irrigation schemes studied had low levels of education. Education and extension training is essential for farmers to adopt new technologies. It is therefore vital

to provide agricultural extension services, on-field training on crop production and training in new irrigation technologies to ensure improved crop production for household food security and sales.

Women travel long distance and spend a lot of time in search of water for domestic use during water scarcity and thus likely to affect household food security negatively. Ensuring reliable supply of water for domestic use will therefore decrease the time rural women spend searching for water instead of engaging in productive activities. It will also deter the withdrawal of water by informal users from the main canal before it enters the scheme. Protection of water sources used for both domestic and agricultural purposes will ensure secure access to water necessary for improving rural livelihoods.

Old aged women were main participants at the small irrigation schemes with very few youth involved which was due to disinterest from youth. Little or low financial returns was mentioned as a major contributing factor to low youth participation. This warrants for increased access to markets by rural small-holder producers. Access to markets will improve income prospects, encourage rural women to enhance their productivity and employ more people. It can also attract more youth, especially as rural youth unemployment is rife and lessen the burden on rural women. Provision of adequate and reliable water for both domestic and agricultural purpose will improve household food security.

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Investigating land-based livelihoods and knowledge that rural women possess for empowerment to improve household food security.

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4.2 Introduction

In all developing country regions, women are major contributors to agriculture and rural economic activities (FAO, 2011). They engage in multiple land-based livelihood strategies of arable farming, livestock husbandry, and consumption and trade in natural resources (Shackleton *et al.*, 2001). Rural women engage in small irrigation schemes for food production and income generation to improve household food security (Perret, 2001). They use their knowledge of crop production to reduce household food insecurity (IFAD, 2007). However, lack of farmers' skills and knowledge on irrigation farming and market availability and market accessibility has been identified as a major constraint to the success of irrigation schemes that rural women are involved in for food production (Machethe, 2004). FAO (2011) argue that empowering women with knowledge and skills for the land-based livelihood they engage in can contribute vastly to poverty reduction as women head more than half of the rural household (Bob, 2002). Empowerment enables women to 'participate, as equal citizens, in the economic, political and social sustainable development of the rural communities' (Allahdadi, 2011). However, women have limited access to productive resources such as land and water. Poor women's land rights due to cultural constraints worsen the situation as some cultures forbid women from owning land (Thamaga-Chitja *et al.*, 2010). This affects economic empowerment of rural women as lack of ownership of land and other assets that can be used as collateral hinder women from accessing loans that can otherwise be used to improve agricultural productivity and household food security (Hill, 2011). Access to agricultural assets such as community gardens, irrigated plots and secure land tenure is crucial to rural women as it increases household food security (van Koppen 2000; Hope *et al.*, 2003).

High levels of illiteracy among rural women disadvantage women more than men in starting up enterprises (Hill, 2011). According to Oni *et al.*, (2011), education and extension training

enables farmers to adopt new technologies which empower human society with women included. Therefore, improving women's education is important to increase agricultural productivity and reduce poverty (Quisumbing & Meinzen-Dick, 2001). The aim of this paper is to explore the land-based livelihoods that rural women engage in, and the knowledge they possess or lack for empowerment when pursuing these activities. Understanding the land-based livelihoods that rural women partake to improve household food security and the knowledge and skills they possess or lack can contribute to formulation of appropriate interventions and policies that has potential to improve the agricultural activities by rural women and positively impact livelihoods and improve household food security.

4.2.1 Women and Land-based livelihoods

Fifty five per cent of the population in developing world still live in rural areas and are the worst affected by food insecurity and malnutrition (Sally *et al.*, 2003). In South Africa, thirty-five per cent of the population is vulnerable to food insecurity with more prevalence in rural areas (Dunne & Edkins, 2005). Over 80% of the poorest households in rural areas of the developing countries rely on farming and agricultural labour for livelihoods (IFAD, 2011). Poor rural households in South Africa resort to subsistence production as a coping strategy during high food prices (Bryceson, 2002). They also engage on arable farming, livestock husbandry, and consumption and trade in natural resources for household food security (Shackleton *et al.*, 2001). Baiphethi and Jacobs (2009) argue that subsistence production increases household food security and reduces reliance on cash to feed the household. Small-scale agriculture contributes to reduction of rural household vulnerability to hunger and poverty (Hope *et al.*, 2003).

Irrigated agriculture also remains as one of the land-based livelihood strategies that rural women employ (Machethe, 2004). Women engage in irrigated and rain-fed agriculture to produce food for household consumption and sale as individuals or schemes, however the success has been limited (Machethe, 2004; IFAD, 2007; Oni *et al.*, 2011). Poor performance of small-holder irrigation has been identified to be due to poor infrastructure, limited knowledge of crop production among smallholders, limited farmer participation in the management of water, ineffective extension and mechanisation services and lack of reliable markets and effective credit services (Crosby *et al.*, 2000).

Women also engage in animal husbandry. However, they look after small animals such as poultry and pigs (Bob, 2002). All of the above activities pursued by women need access to productive resources as land-based livelihoods that rural women engage in are critical to the survival and health of most rural households (Andrew *et al.*, 2003). Parveen (2008) argue that access to productive resources by women enhances knowledge on farm management, income generation, develops decision making power, improves children's schooling and health and increases networks. Irrigation increase crop yields, prolongs the effective crop-growing period in areas with dry seasons, thus permitting multiple cropping where only a single crop could be grown otherwise (Oni *et al.*, 2011). Therefore, water and land remains the key element in rural women's land-based livelihoods (Thamaga-Chitja *et al.*, 2010).

4.2.2 Knowledge and women empowerment

Women constitute a large percentage of the rural population and play a major role in reducing household food insecurity through their knowledge of crop production and other land-based livelihoods despite constituting two thirds of the world's illiterates (Bob, 2002; IFAD, 2007). They account for more than 50 % of world's food production and provide between 60 and 80 % of the food for household consumption as unpaid labourers on family plots in some sub-Saharan countries (Karl, 2009). Rural women play a major role in utilization and conservation of natural resources such as land, water, forests and wildlife to supply basic needs for their families (VFA, 2009). Abedi (2011) argue that it is impossible to develop rural societies without considering the rural women. Women empowerment accelerates the fight against hunger and extreme poverty which is more prevalent in rural areas (FAO, 2011). Women empowerment in agriculture is when women: 1) can take decisions about agricultural production, (2) have access to and decision making power over productive resources, (3) have control over use of income, (4) are involved in community leadership, and (5) are satisfied with time allocation for productive and domestic tasks and the available time for leisure activities (IFPRI, 2012).

Women empowerment and gender equality are vital for the reduction of poverty, hunger and disease (United Nations, 2010). Women empowerment allows women to realize their potential in all spheres of life by developing their capabilities and assets to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives

(NAAS, 2001; Narayan *et al.*, 2004). However, most rural women are poor and highly illiterate and have limited access to information and knowledge (VFA, 2009). Obidike (2011), argues that information and knowledge for agriculture are important for agricultural development and any constraints may lead to poor agricultural returns. Backeberg and Sanewe (2010) also argue that low levels of education worsen the challenge of investment in human capital and empowerment through knowledge that enables decisions and actions for increased future food production. Low levels of education also results in the inability of farmers to use written information which is a major constraint to extension services along with lack of funds for training purposes and remoteness of the areas where rural farmers are found (Machethe, 2004).

Women play a vital role as rural information sources despite low levels of education (Prakash, 2003). However, they are ignored by extension services which include advisory services, information and training, and access to production inputs such as seeds and fertilizers which are critical for increasing the productivity of farm activities. Devarajan (2004) argue that women must be provided with knowledge to empower them for survival, to produce food, provide for shelter or achieve control of their own lives. According to Abedi (2011), access to extension services improves agricultural knowledge which is necessary to improve household food security and empower human society. Responding to the needs of poor farmers requires detailed understanding local knowledge systems (Brewster *et al.*, 2006). Local knowledge, also referred as traditional or indigenous knowledge, is the large body of knowledge and skills acquired over time unique to a given culture, location and society (Boven & Morohashi, 2002). Local knowledge is recognized as a role player in sustainable resources use and development (Ramdas *et al.*, 2001). Pandey *et al.*, (2007) argue that local knowledge improves livelihoods and is vital for sustainability of natural resources such as water, forests and agro-ecosystems needed for agricultural production. Training and capacity-development for women enable them to take up leadership roles, to voice their concerns and to enhance their technical skills which subsequently lead to poverty reduction and improved livelihoods (IFAD, 2007). Access to knowledge by rural households enhances family well-being and sustainable use of resources (Parveen, 2008).

Diverse local water management and harvesting techniques have been used over the years to conserve water and still continue to survive (Pandey, 2002). Rainwater harvesting is the

collection and storage of rainfall water for use in meeting demands of human consumption or human activities (Barron, 2009). It improves water access for domestic and agricultural production (Baiphethi & Jacobs, 2009). Improving the management of water resources increase access to water for consumption and sanitation which improves health of rural households. Improving knowledge on water use and management is vital because practices that compromise water from streams, underground and rivers directly affect the welfare of women and their families (VFA, 2009). Protection of water is important for economic security and human well-being (Pietersen & Beekman, 2006).

According to FAO (2002), knowledge generation, dissemination systems and links among small scale farmers, agricultural educators, researchers, extension workers and communicators must be strengthened to improve food security and livelihoods. It increase capacity of farming communities and allows them to undertake their own development activities (Abedi, 2011). Rural men need to be engaged in empowering rural women, particularly in societies where the support of men for such initiatives is required (IFAD, 2007). Education and extension training enable farmers to adopt new farming methods and technologies (Oni *et al.*, 2011). Therefore this paper argues that access to productive resources such as land and water; provision of technical knowledge and skills, through extension services, on water management, harvesting and irrigation to small-scale women farmers can increase production, improve household food production and lead to women empowerment.

4.2.3 Area Description and Methodology

The study was conducted in three irrigation schemes from three district municipalities in Limpopo province, South Africa. The first research site investigated was an irrigation scheme called Steelpoort irrigation scheme which was established in 1972 for cash crops. The scheme consists of 69 members where 65 members are female. The total hectare size of the land they cultivate is 72 hectare, with 69 hectares being arable. Each farmer cultivates a plot with an average size of 1 hectare. It is located at Ga-Malekane, a village situated in Steelpoort, under the Greater Tubaste Municipality (GTM). The GTM is largely rural with villages scattered throughout. It comprises of 175 farms of which 61 are under the tribal

authority where Ga-Malekane falls (GTMW, 2011). The total population of Greater Tubaste Municipality is approximately 343 468 with 66 611 households and is the highest (31.4%) within the Greater Sekhukhune District Municipality (GTM IDP, 2009-2013). African people form a larger population group followed by Coloureds, Indians, Whites and other population groups (GTM IDP, 2009-2013). Agriculture, mining, manufacturing, trade and tourism sectors contribute to the economy of GTM. Steelpoort is comprised more of manufacturing industries and mining related suppliers (GTM SDF, 2006-2011). The main source of livelihood in the GTM is mining and small-scale agriculture complemented by social grants and pensions (GTM SDF, 2006-2011). A very large proportion of the labour force (73%) in GTM is unemployed and 42.7% of the total households have no income (GTM LEDS, 2007).

The second research site investigated was Mashushu irrigation scheme found at Mashushu, a sub-village of Ga-Mampa village which is a rural area located in the Mafefe tribal area in the Lepelle-Nkumpi Local Municipality of the Limpopo province in the Republic of South Africa. The total area size of the land used by the 30 scheme members is 40 hectares of land. Furrow irrigation system is used for irrigation with water that is diverted from Mohlapitse River to the lands at Mashushu. The main source of livelihood is small-scale agriculture which is complemented by social grants and pensions. Maize is the main crop grown under irrigation and in the wetland. It is estimated that 2758 people from 394 households reside in the 5 villages of Ga-Mampa with more than 80% of the households being poor and vulnerable (Tingury, 2006; Adekola, 2007). Over 55% of the people between the ages of 15 and 64 years of the Capricorn District Municipality are unemployed (CDM, 2008).

The third study site visited was Rambuda irrigation scheme, found at Matshavhawe village. The irrigation scheme consists of 103 members cultivating an area which is 160 hectares in size. Water is diverted from Tshala River to the furrow irrigation system that is used for irrigation. Matshavhawe village is based at Mutale Local Municipality under Vhembe District Municipality (Nethononda & Odhiambo, 2011). The communities are largely rural with land being under tribal authority like at Rambuda. The total population of Mutale Municipality is estimated at 131 215 with 24239 households with the average household size of 5 persons (VDM, 2007). Approximately 26% of the population does not have access to

clean potable water. Overall, the roads within the jurisdiction area of the municipality are in a poor condition and in dire need of upgrading from gravel to tar (VDM, 2007).

A total of 98 participants were sampled purposively. The sample was made up of 18, 33 and 47 rural women from Mashushu, Rambuda and Steelpoort irrigation schemes respectively. Purposive sampling allows a particular case to be chosen because it illustrates or possess features that are of interest to the research (De Vos *et al*, 2002). In this case, rural women involved in irrigation schemes were identified and targeted through the help of local authorities but only those willing to participate arrived and took part. A mixed research methods was employed in this study to collect data where structured questionnaires, key informant interviews, focus group discussions and observations were used. Key informant interviews were conducted with leaders of the irrigation schemes, Field Extension Officers and Tribal Authorities. A mixed methods research approach combining qualitative and quantitative tools was best suited to understand the problem being studies to be understood from many angles (Creswell, 2009). In addition, focus groups were also used because they are a quick and convenient way to collect data from several people simultaneously (Kitzinger, 1995) while it supplements the questionnaire as a source of data by providing in-depth and qualitative insight into survey issues (Kelly, 1999). Structured questionnaires were administered through face to face interviews. Observations were carried-out during transact walk where land and water resources available to the community were noted and recorded.

Data was analysed statistically using version 19 of the Statistical Package for Social Sciences (SPSS). The data was coded manually after themes were identified through content analysis from the key informant interviews and focus group discussions. Descriptive statistics was used to analyse data where frequencies and relationships between variable was sought using cross-tabulation. Results from all sources were triangulated to cross-check the results from different sources for validity and reliability of the information (Mudhara & Shoko, 2003).

4.2.4 Results and Discussion

The study aimed at investigating the land-based livelihoods that rural women engage in and the knowledge they possess or lack when pursuing these activities with the aim to improve household food security and livelihoods. Data that was collected through structured questionnaires, key informant interviews, focus group discussions and observation is presented and discussed in this following section.

4.2.4.1 Land-based livelihoods

Agricultural production was the most widespread livelihood activity, with all respondents (women) involved in crop cultivation as land-based livelihood activity in the irrigation plots (see Table 4.4). The findings show that 61.1% of the women from all study areas have been involved in irrigated agriculture for more than 20 years while 13 % have been involved for a period of between 0 and 5 years. Women who have been cultivating crops for less than 5 years praised the support received from those who have been involved in irrigated agriculture for more than 20 years. The knowledge they shared was on choosing right varieties of crops to be grown, choosing crops for different season, correct time for weeding and irrigation. These findings confirm the findings by Prakash (2003) that women continue to play an important role as rural information sources and providers of food.

Table 4.4: Land-based livelihoods rural women engaged in per study area.

Land-based livelihoods				
Irrigation Scheme	Crop cultivation		Animal husbandry	
	Number	Percentage	Number	Percentage
Mashushu (n=18)	18	100	16	88.9
Steelpoort (n=33)	33	100	21	63.6
Rambuda (n=47)	47	100	17	36.2

The above table shows that respondents from all study areas engaged in crop cultivation. They also engaged in animal husbandry which varied from area to area with more

involvement from Mashushu (88.9%) and 63.6% from Steelpoort. Only 36.2% of the respondents were involved in livestock husbandry in Rambuda.

Livestock husbandry was another land-based livelihood activity that the respondents engaged in (see Table 4.4). However, involvement in animal husbandry varied from area to area. Mashushu had the largest number of women (88.9 %) that engaged in animal husbandry. It was followed by Steelpoort with 63.6% and 36.2 % involvement of women in animal husbandry (see Table 4.4). However, animal husbandry was not the main land-based livelihood that women engaged in. They spent less time on animal husbandry compared to crop cultivation. Women from all study areas spent most of their time on crop cultivation. The livestock they owned was mostly poultry. For some households that owned cattle or goats it was mainly men's responsibility to look after them. These findings confirm the findings by Shackleton *et al.*, (2001) that rural households engage in land-based strategies of arable farming and livestock husbandry to sustain themselves. Lack of market for livestock led to poor engagement in animal husbandry with full engagement on crop cultivation (see Table 4.4) which was propelled by the need to produce food for their families. Livestock, mainly poultry, was sold at customer request. The market for crops was better than that of livestock and produce was bought more than livestock due to difference in costs and preference. This also caused most farmers to abandon livestock farming despite the knowledge they possessed for livestock rearing and the less effort required for livestock farming compared to crop production.

4.2.4.2 Land ownership and size

Respondents from all study areas engaged in crop cultivation in plots of land less than 1.5 hectares, which is not far from the average plot size in Limpopo province, one hectare (Shah *et al.*, 2000). Small land size affects the amount of crops produced and diversification of crops. Land ownership from all study areas was through Permission to Occupy (P.T.O.) as all the areas were under Tribal Authority. Women used land through ownership, borrowing or sharecropping. Land ownership in this context refers to a piece of land given and registered by Chief or Headman under the name of the individual concerned for use. Borrowing refers to the use of a piece of land registered on another person's name in the

Chief or Headman's land register. Sharecropping is the use of a plot of land by more than one people, the land registered on one person's name in the Chief or Headman's land register.

Results showed that in some study areas women owned land but some cultivated on the land that belonged to another person. For instance, at Mashushu, 61.1% of the respondents used land for crop cultivation owned by females and 38.9 % of land owned by males. At Steelpoort, 54.5 % of respondents used land owned by female and 45.5 % of respondents used land owned by males. At Rambuda, majority of land used was owned by males (57.4 %) while women owned 42.6% (see Table 4.5).

Table 4.5: Land rights by gender per study area

Area	Land rights by gender (%)	
	Female	Male
Mashushu	61.1%	38.9 %
Steelpoort	54.5 %	45.5 %
Rambuda	42.6 %	57.4 %

The above table shows that land rights by gender varied from area to area. Women had 61.1% of land rights for crop cultivation at Mashushu. At Steelpoort, women had 54.5% of land rights while at Rambuda, majority (57.4%) of land rights belonged to males while women had 42.6%.

Control of land rights by male was common mostly in households where the households were headed by males (Table 4.5). Females who were head of the household had secured land rights mainly due to spousal death or never married. In some cases land rights were registered in son's name when husband was deceased. In those cases women used the land, but without complete control of land. In some cases where parents were deceased, the land right belonged to male relatives who in most cases allowed women to use the entire land or allowed sharing of land through share cropping. This confirms the findings by Thamaga-Chitja *et al.*, (2010) that women in rural areas continue to access land through male relatives thus remaining vulnerable. Land rights belonging to females either belonged to respondent

(woman), biological mother or mother-in-law. Women also accessed land through borrowing where they would borrow land for use until the owner decides to take it back for use. Renting was never mentioned in any study area and during focus group discussions all respondents considered it inappropriate and inhumane. They felt that unutilized land should be allocated to another person who will use the land in the spirit of community and Ubuntu (*spirit of sharing without expecting payment*).

At Rambuda the size of the land used was highly skewed in terms of gender. For instance, men used a hectare of land while women only used less than half a hectare. However, widowed women used their husbands land for crop cultivation which sometimes was not registered to their name but that of their sons. There were some reported complaints about the quality of land allocated to women. The plot was characterized by poor soils with rocks. Water transferred through the canal never reached all parts of the field due to slope. Out of about one hectare, the respondent only used a third of the field due to poor soil conditions. This confirms the findings by Bob (2002) that land often allocated to women is “normally in marginal areas where soils are infertile and infrastructure is poor”. Women are still marginalized on land ownership and access. This further limits the fight against poverty reduction and food insecurity in rural areas where women are majority and providers for rural households.

4.2.4.3 Crops produced per study area

Winter and summer crops were planted from all study areas. Common crops planted across all irrigation schemes were maize and ground-nuts (see Table 4.6).

Table 4.6: Crops produced per study area

Community	Crops grown
Steelpoort	Maize, cabbage, spinach, beetroot, onion, sweet-potatoes, ground-nuts, carrot, chillies.
Mashushu	Maize, beans, ground-nuts, sorghum, tomatoes.
Rampuda	Maize, cabbage, onions, ground-nuts, sweet-potatoes, beans, garlic, Green-pepper, tomatoes, beans, pumpkin.

The above table shows that Steelpoort and Rampuda Irrigation Schemes produced diverse crops compared to Mashushu Irrigation Schemes. Maize and ground-nuts were common crops produced from all irrigation areas.

All farmers grew maize as the main staple food and required less irrigation water. Crops produced at Steelpoort were maize, cabbage, spinach, beetroot, onion, sweet-potatoes, ground-nuts, carrot and chillies. At Rambuda, crops grown were maize, cabbage, onions, ground-nuts, sweet-potatoes, beans, garlic, green-pepper, tomatoes, beans and pumpkin (see Table 4.6). Better access to water was mentioned as the drive behind diversified crop produce. Irrigation increase the yields of specific crops and permit multiple cropping where only a single crop could be grown otherwise (Oni *et al.*, 2011). Crops produced at Mashushu were only maize, beans, ground-nuts, sorghum and tomatoes. The respondents at Mashushu associated less crop variety to poor access to water due to debilitated irrigation system used, a canal, which was not cemented and water was lost through seepage to the soil. This affected the farmers negatively and resulted in less diversified produce. From the results, it is evident that access to water for irrigation improves crop diversification and production which results in improved household food security. It also allows farmers to have a number of crop varieties when accessing markets, which puts them at an advantage.

4.2.4.3 What is done with the produce?

Women from the all study sites engaged in crop cultivation for household consumption as a primary goal while supplementary produce was sold. At Mashushu, 72.2 % of the respondents were involved in agriculture to produce food for their families and to sell their produce to make profit. The remaining 27.8 % of the respondents at Mashushu produced only to feed their families. At Steelpoort, all respondents were involved in agriculture for both household consumption and to sell their produce. At Rambuda, 95.7% of women were involved in agriculture to produce food for their families and to sell the surplus produce, while 4.3% of the respondents produced only for household consumption. These results concur with the findings by Aliber and Hart (2009) that the main aim for rural population for engaging in subsistence agriculture was to supplement household food supplies while additional produce was sold.

Households involved in crop cultivation did not purchase additional vegetables, but used the savings to purchase other foods, such as oil and fat. The produce from the plots improved household food security and helped the households to diversify their nutrition. However, the income made had also to be split for other non-food activities such as health and education amongst other. This resulted in household relying only on the produce from the fields. At Mafefe the maize produced was processed into maize-meal by a milling company while at Rambuda the maize was processed by some of the farmers who had milling machine, mostly men. This allowed woman to buy less food products which allowed households to save money generated through cash sales of produce. It also allowed households to accumulate cash savings and invest in other assets. These finding supports the perception that access to water for irrigation enhances food security in rural areas (Crosby *et al.*, 2000).

Communities were primary customers for the farmers. However, the demand was sometimes low due to competition as farmers produced the same produce. At Steelpoort and Rambuda, the produce was sold also to hawkers passing by the road. At Mashushu, poor roads proved to be major constraint to accessing markets. A negligible number of respondents from all study sites sold produce to distant markets. However, transport and costs were a problem and prevented farmers to transport produce to distant markets. The limitations were attributed to lack of transport, poor roads and lack of market information amongst other. Poor access to markets coupled with small land size was mentioned as discouragement to crop production for sale. Van Averbek (2008) argued that access to produce markets is a critical factor in agricultural development. This necessitates the development and improvement of access to markets for rural small-holder producers in order to improve rural livelihoods for improved household food security.

4.2.4.5 Women empowerment and Knowledge

4.2.4.5.1 Access to productive resources

The furrow irrigation system was used from all study areas to apply water to the plots cultivated. Water was diverted from the river through weir to the fields, at both Mashushu and Rambuda, while water for irrigation at Steelpoort was channelled through canal to the furrows in the fields. All farmers including women farmers took turns to irrigate with each assigned an ‘irrigation day’ as per agreement between irrigation scheme members. One problem observed was the poor irrigation on plots at the lower-end of the field. This was

caused by what Van Averbek (2008) referred to as ‘front-ender and tail-ender phenomenon’ which is caused by unequal access to water by farmers at the end of the canal and those at the tail end. Poor maintenance of the scheme infrastructure was a major problem to irrigation. For instance at Mashushu, the canal was not cemented, water volume decreased before it reached the fields at the lower end due to seepage of water and into the holes dug by animals such as rodents, snakes, etc. Water loss was not the exception at the cemented canals of Steelpoort and Rambuda due to cracks in the canal. Women complained that though water was lost in small quantities into the cracks during the flow as it reached the lower-end of the field by that time the water loss is felt. . Van Averbek (2008) argued that ‘cleaning and repairing of canals is necessary to maintain optimum flow rate and to avoid distribution losses’ which affects water available for use in agricultural production. Women at Mashushu and Rambuda irrigation schemes stated lack of funds as the major constraint to improving the irrigation system which hindered them to purchase material needed for the said purpose. This was despite the knowledge they claimed to possess on fixing the canal.

Women at Rambuda hired labourers to help them flood irrigate their plots. This could be a problem to the women who cannot afford to hire labourers. Knowledge should be generated on how these women can irrigate their fields without hiring labourers. The knowledge generated can improve their irrigation skills. At Steelpoort, women irrigated fields with little or no assistance. They attributed the success in irrigation to extension service provided by the Extension Officers. The knowledge possessed by Steelpoort women need to be replicated to other study areas.

At Mashushu, in some plots water for irrigation never covered all parts of the plot due to slope. This also necessitates knowledge generation on how water can be transferred to the parts unreached by the furrow in the plots. During focus group discussion, women suggested that installing pumps can curtail this impasse. All study areas with the exception of Mashushu had storage ‘night’ dams. The dams were used to collect store water when not used. At Mashushu, water was not collected to a dam but flowed freely. Knowledge needs be generated on how farmers from Mashushu can store water and save water to increase its availability.

4.2.4.5.2 Leadership involvement, decision making over productive resources, control over income and time use for farming activities.

During the research, it was observed that women from all irrigation schemes were involved in management and decision making regarding water supplies. During focus group discussions women from all study areas stated that they were supported and encouraged by men to actively participate in management and decision making of water supplies. Rural men need to be engaged in empowering rural women, particularly in societies where the support of men for such initiatives is required (IFAD, 2007). These findings show an improvement in terms of rural women participation in management and decision making regarding water supplies. These findings are contrary to the perception that rural women were excluded from decision making roles and often did not have representation in local decision making bodies (Gupte, 2004).

During focus group discussions women declared that they were involved in leadership of irrigation schemes and took decisions regarding production without interference from male. However, men can suggest on what can be cultivated if the aim is to sell. They also stated that had control over the use of income. However, they shared income with spouses willingly because spouse also shared income generated elsewhere. Males view household food security as domain of women but are involved in the use of income generated from land-based livelihoods by women. Women further stated that decisions about time allocation for productive and domestic tasks lied with them and their husbands never dictated on how time can be used. According to IFRP (2012) women are empowered conditions allowed them to decisions regarding how they worked, spent income and time. Therefore, women from these study areas were somewhat empowered and can be empowered further.

4.2.4.5.3 Knowledge and training for agriculture

More than half (57.4 %) of the women who engaged in irrigated agriculture from all study areas never had formal agricultural training (Table 4.7). This however never stopped them from producing food for their families, because women are providers of food for their families (Prakash, 2003). Women from all irrigation schemes possessed vast knowledge on soil preparation, weeding and harvesting. Acquisition of formal agricultural training varied from study areas (Table 4). Steelpoort had the lowest number (21.2%) of women who had

received agricultural training. The remaining respondents (78.8%) had no agricultural training and attributed their success in agricultural production to indigenous knowledge obtained from their parents and family members and support from Agricultural Extension Officer. This supports Machethe *et al.*, (2004), when stating that access to reliable and good quality farmer support services is required to increase smallholder agricultural productivity.

Table 4.7: Agricultural training for rural women per study area

Area	Agricultural training (%)	
	Yes	No
Mashushu	55.6 %	44.4 %
Steelpoort	21.2 %	78.8 %
Rambuda	51.1 %	48.9 %
Average	42.6 %	57.4 %

The above table shows that majority (57.4%) of the respondents from all study areas had no agricultural training in average. Steelpoort had the highest number (78.9) of respondents that never had agricultural training. However, majority of respondents at Mashushu (55.6%) and Rambuda (51.1%) had agricultural training they received from Field Extension Officers.

More than half of the respondents at Rambuda and Mashushu, 51.1 % and 55.6 % respectively, had received training in agriculture (see Table 4.7). The training received from Field Extension Officers included soil preparation, manure application and irrigation. Despite low level of agricultural training amongst respondents from Steelpoort, more crops were produced (see Table 4.6). This could be due to better access to water that Steelpoort enjoyed over other study areas and the knowledge they acquired indigenously and from Extension Officers.

Poor application of water during irrigation was observed across all study areas in some of the plots. This was due to the irrigation system used, a canal. Farmers took turns to irrigate. One farmer directed water to the field while other waited for their turn. As a result when water was available for irrigation it was not applied according to crop requirements but as per the fact that ‘it was the farmers turn to irrigate’. As a result crops were irrigated even when

water was not needed. This showed lack of knowledge on water management. It is therefore important to generate knowledge on water management and application during irrigation as it prevents waste of the already scarce resource (water), and to prevent over-watering. Plants may be planted on the furrows in the field to benefit more from the limited water.

It was also observed that women from all study areas had vast knowledge of crop cultivation. This knowledge included planting, weeding and harvesting. They also exercised crop rotation which increases soil fertility. However, lack of knowledge was on pest management and accessing markets. Conflicts that normally arise when farmers take more than their share of water during irrigation were not reported in any of the study areas. The conflicts were avoided by assigning farmers different days to irrigate. During focus group discussions it was mentioned that farmers never missed their day of irrigation but in-case they were not around another farmer would irrigate for that farmer. Respondents from all study areas complained that waiting turns during irrigation affected crop production. The complaints necessitate knowledge generation on how water can be made more available to allow a number of farmers to irrigate simultaneous. At Mafefe, suggestions were made that government must help with construction of a dam to collect water from the near-by mountains to allow farmers to have access to enough water.

4.2.5 Conclusion and Recommendations

Rural women engaged in land-based strategies of arable farming in the irrigation schemes and animal husbandry insignificantly. Support should be provided to improve these livelihoods especially crop cultivation as majority of rural households cultivated crops to derive their livelihoods. Providing good quality seeds that mature early, resistant to drought and climate changes could be one of the interventions to be applied. It can allow farmers to fully use the available land and water which could result in diversified crops and improved household food security.

Women representation in the irrigation schemes committees was high. Women participation should be encouraged and supported to ensure women empowerment. Women possessed vast knowledge on soil preparation, weeding and harvesting. Knowledge and skills on water management and application during irrigation must be provided to rural women to prevent

wastage of water and over-watering. More knowledge needs to be generated for rural communities on agricultural production, markets, prices and alternative sources of income for agricultural development.

Insecure access to land by rural women is still prevalent. Secure access to land by rural women needs to be ensured to ensure that women are empowered as access to productive resources is one of the requirements for the empowerment of women. Access to land and improved tenure security for rural women is important, as lack of secure access to land can prevent access to other resources such as credit which are important for improving production.

Varieties of crops grown in rural communities were affected by water availability. Study areas that had better access to water produced more and diversified crops which advantaged farmers when crops were sold because they had more varieties to sell. Access to water for rural women must therefore be improved as irrigation increased crop production, led to diversified produce and improved household food security. Access to water can be improved by repairing the already existing water infrastructure as poor irrigation infrastructure contributes to modest performance of small holder irrigation. Canal irrigation systems must be replaced with modern irrigation technologies that will irrigate all parts of the fields and lead to improved agricultural production for rural communities. Provision of water harvesting technologies can also improve water available for irrigation.

Poor access to markets coupled with small land size discourages farmers to produce crops for sale. Lack of transport, poor roads and lack of market information prevented women from accessing markets. Rural infrastructure should be improved through provision of better roads, water, electricity and telecommunications to develop and improve access to markets for rural small-holder producers in order to improve rural livelihoods for improved household food security.

Education and extension training is essential for rural farmers, women in particular, to enable adoption of new water technologies. Sharing of knowledge amongst rural women needs to be intensified. Agricultural training and access to reliable and good quality farmer support services can increase smallholder agricultural productivity and reduce poverty. It is therefore

important to ensure that women have access to productive resources, are able to take decisions about agricultural production and income generated, take up leadership positions and have enough time to engage in economic activities for full empowerment.

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Chapter 5

Conclusion and Recommendations

This chapter consolidates conclusion and recommendations from TWO journal articles in the previous chapter, Chapter 4.

Rural women engage in different land-based livelihood such as irrigated agriculture to increase to reduce hunger and improve household food security and for sales. Majority of the rural households were headed by women households due to male migration and spousal death amongst other reasons. Poor access to water, distant water sources and unreliable water sources affected their efforts to improve household food security through involvement in productive activities such as crop production and animal husbandry. It is therefore vital that access to production resources such as water be improved through enabling policies that will ensure access to water and land.

Rural women engaged in land-based strategies of arable farming and animal husbandry therefore support should be provided to improve these livelihoods especially crop cultivation as majority of rural households cultivated crops to derive livelihoods. Smallholder farmers need access to production inputs. Providing good quality seeds that mature early, resistant to drought and climate changes could be one of the interventions to be applied. Providing credit facilities to small-holder farmers for inputs can allow farmers to fully use the available land and water for production for improved household food security.

Insecure access to land by rural women is still prevalent. Secure access to land by rural women must be ensured. Access to land and improved tenure security for rural women is important, as lack of secure access to land can in turn prevent access to other resources such as credit which is important for improving production.

Rural women engaged more on crop cultivation than on livestock husbandry. Women should be empowered to be involved more on livestock husbandry as livelihood strategy to further diversify their livelihoods. Providing livestock to rural women could encourage them to engage on this livelihood strategy and improve household food security.

Fractured canal and absence of cemented canal characterized the irrigation schemes studied. This affected the amount of water that reached the scheme fields. Rehabilitation of irrigation systems by cementing the canals and provision of modern irrigation technologies can improve supply of water and the amount of water available to the fields which will result in improved agricultural production and household food security. Adoption of new modern irrigation technologies, other than canal irrigation systems, that distribute water efficiently in the field and save water is important for improved agricultural production for rural communities.

Provision of water harvesting technologies can also improve water available for irrigation. Adequate amounts of water will improve quality and diversity of food produced by rural households, create economic opportunities and consequently lead to reduced food insecurity and malnutrition.

Women travelled long distance and spend a lot of time in search of water for domestic use during water scarcity. Ensuring reliable supply of water for domestic use will therefore decrease the time rural women spend searching for water instead of engaging in productive activities. It will also deter the withdrawal of water by informal users from the main canal before it enters the scheme. Protection of water sources used for both domestic and agricultural purposes will ensure secure access to water necessary for improving rural livelihoods.

Women from the small irrigation schemes studied had low levels of education. It is therefore vital to provide agricultural extension services, on-field training on crop production and training in new irrigation technologies to ensure improved crop production for household food security and sales. Education and extension training is essential for farmers to adopt new technologies for irrigation and crop production.

Disinterest in small irrigation schemes marked by the lack youth participation in the irrigation schemes need attention as majority of rural youth unemployment is prevalent. It is said to be due to low financial returns. This warrants for increased access to markets by rural small-holder producers as access to markets has the potential to improve income prospects, encourage rural women to enhance their productivity and employ more people. It can also

attract more youth, especially as rural youth unemployment is rife and lessen the burden on rural women who head majority of the rural households. Provision of adequate and reliable water for both domestic and agricultural purpose can improve household food security.

Poor access to markets coupled with small land size discouraged farmers to produce crops for sale. Lack of transport, poor roads and lack of market information also prevented women from accessing markets. Improving rural infrastructure through provision of better roads, water, electricity and telecommunications to develop and improve access to markets for rural small-holder producers is important to improve rural livelihoods for improved household food security.

Women participation should be encouraged and supported. Women representation in the irrigation schemes committees was high. Knowledge and skills on water management, conservation and application during irrigation must be provided to rural women to prevent wastage of water and over-watering. It is important to generate more knowledge for rural communities on agricultural production, markets, prices and alternative sources of income for agricultural development. Education and extension training are essential for rural farmers, women in particular, to enable adoption of new water technologies. Agricultural training and access to reliable and good quality farmer support services can increase smallholder agricultural productivity and reduce poverty.

Further research should be on strategies to strengthen information sharing on water management, soil management, farming techniques, pest management, disease management and markets between farmers as Field Extension officers are at times unavailable. Investigating strategies to attract youth into agriculture can contribute greatly to reduction of youth unemployment in rural areas and lead to improved rural livelihoods.

APPENDICES

Appendix A - Questionnaire

WRC- ACFS LIMPOPO PROVINCE STUDY, SEPT – OCT 2011

DEMOGRAPHIC and OTHER HOUSEHOLD DATA

1. Please tick district

A. Vhembe	B. Sekhukhune	C. Mopani	D. Other , specify
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2. Community name _____

3. Duration of stay _____

4. What is your home language? Please tick

A. Tshivenda	B. Sepedi	C. Xitsonga	D. Other, specify
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Please record responses for the respondent and household head in the following questions:

5. Sex of respondent and household head

	A. Male	B. Female
Respondent		
Household head		

6. Age ranges for the respondent and household head

	A. Below25yrs	B. 25-35 yrs	C. 36-50 yrs	D. Over50 yrs
Respondent				
Household head				

7. Respondent and household head's Marital status

	A. Never married	B. Married	C. Widowed	D. Divorced	E. Stay together not married
Respondent					
Household head					

8. If married please specify Marriage type

	A. Full traditional	B. Part of traditional	C. Church / court	D. Other, specify
Respondent				
Household head				

9. Respondent and household head's Education level

	A. No education	B. Primary	C. Secondary	D. Other, specify
Respondent				
Household head				

10. How big is your household _____

11. Are you living with your spouse? Yes ☐ No ☐

If No, where is the spouse?

12. Respondent's relationship to the household head? _____

13. Occupation of the household head

Occupation	Tick
A. Salaried employment	
B. Self-employment	
C. Retired	
D. Unemployed	
E. Other (specify)	

14. Please select all your household's livelihood activities

Livelihood activities	Tick	Number of household members involved
A. School		
B. Salaries / Wages		
C. Government Grants		
D. Remittances		
E. Casual employment		
F. Petty trade		
G. Self employed		
H. Other (specify)		

15. How much livestock and poultry do the household and respondent own?

Occupation	Household (number)	Respondent (number)
A. Cattle		
B. Goats		
C. Pigs		
D. Chickens		
E. Other (specify)		
F. Other (specify)		

LAND RIGHTS

16. What laws are used to allocate land in the area?

A. Chief	B. Local government	C. Other (specify) below
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17. How did the household get its land?

General Land access options	tick
A. Given by father	
B. Given by chief	
C. Buy	
D. Inherit	
E. Gift	
F. Rent	
G. Government programme	
H. Other (specify)	

18. What rights do you have over the land? Please tick relevant options

Land rights	Tick	Explain
A. Use		
B. Access		
C. Control		
D. Title		

19. How long have you used this land? Please tick relevant box

A. 0-5 yrs	B. 6-10yrs	C. 11-20 yrs	D. More than 20 yrs
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20. Please describe your Land's characteristics

Aspect	Description
A. Size of land	
B. Is household land joined to agricultural land?	YES
	NO
C. Distance from household in minutes	
D. Distance from water source in minutes	

21. What do you use the land for? Please tick all relevant

Options	Tick
A. Residence	
B. Household garden	
C. Livestock husbandry	
D. Farm (crops and grazing)	
E. Other (specify)	

22. What land preparation activities do you perform before planting?

A. Remove rocks	B. Turn the soil	C. Add fertiliser (manure)	D. Other specify

23. Do you think you have to perform more land preparation activities than other people in your community? Yes / No please explain

24. Is it good for women to own land? YES / NO. Please explain your answer

25. How can women access land for themselves in this community?

General Land access options	Please tick
A. Given by father, uncle ,husband, brother,	
B. Given by chief	
C. Given by mother-in-law	
D. Buy	
E. Inherit	
F. Gift	
G. Rent	
H. Government programme	
I. Other(specify)	

26. How many pieces of agricultural land does the household own? _____

27. Who makes decisions regarding the following in the household:

Household decisions	Decision maker
A. Land allocation to household members	
B. What to plant	
C. Time spent on land based activities	
D. What to do with harvest?	

LAND USE SECURITY

28. Who owns the land? _____

29. Is the land registered in the owner's name? YES or NO. If yes where?

30. How is land ownership recognised in this community for men and women? Please tick all relevant options for both?

Options	Men	Women
A. Title		
B. Register of land owners at local council		
C. Register of land owners at local chief		
D. It's family land		
E. Neighbours know each other		
F. Community elders know land owners		
G. Other (specify)		

31. Have any households in this community lost their land rights because of the following reasons in the last 5 years? Tick all relevant options

Options	Tick
A. If household moves to a new community	
B. If household sell the land	
C. If household does not use the land for a long time	
D. If household does not respect local laws	
E. Other (specify)	

32. Has the household abandoned, lost or got a new plot in the last five years?

Person	Tick	Reason
A. Abandoned land		
B. Lost land		
C. Got new land		

If yes, how did this affect your land use activities?

33. In your opinion can women use their land without threats of eviction or losing it? Explain.

34. What are the common causes of land disputes involving women? Tick all relevant options

Dispute causes	Tick
A. Boundaries	
B. Real Owner	
C. Family issues	
D. eviction threats from community members	
E. Other (specify)	

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35. When does a female household member lose land rights to household and other land in the community?

Option	Household land	Other Community land
A. Marries and moves to another family		
B. Gets a divorce		
C. Husband dies		
D. Someone else wants her land		
E. Has not used it for a long time		
F. Has a disagreement with family		
G. Other (specify)		

36. Who do you approach in a land dispute and why? Tick all relevant options

Person	Tick	Reason
A. Family members		
B. Local elders		
C. Local chief		
D. Ward councillor		
E. Other (specify)		

37. What role do the following play in solving land disputes involving women?

Group	Role
A. Marital family	
B. birth family	
C. Community leaders	
D. Local elders	

38. Please explain whether the following strengthen or weaken a woman's land rights?

Aspect	Strengthen	Weaken	explain
A. Marital status			
B. Education level			
C. Rich family			
D. Powerful friends and family			

39. Describe the security of land for the following women;

Woman	Secure	insecure
A. Single no children		
B. Single with children		
C. Married		
D. Married no children		
E. Married polygamous relationship		
F. Married migrant husband		
G. Widow		
H. Divorcee		
I. Stay-together not married (no children)		
J. Stay together not married (children)		

40. Whose land rights are more secure in marriage, husband or wife and why?

41. What are the following people's land rights when the male household head dies?

Family members	Land rights
A. Widow	
B. Children	
C. Extended family	

42. What happens to woman's land rights when a marriage ends? Please tick boxes below.

A. Stays on husband's land	B. Goes back to her family	C. Allocated new land in village	D. Other (explain below)
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43. Can sons and daughters inherit land equally? YES or NO. Explain below

44. How do the land rights you have affect your farming efficiency?

FOOD SECURITY

45. Describe women's local employment opportunities?

46. Why are you involved in agricultural activities?

47. What motivates you to continue year after year?

48. Are men involved in crop cultivation Yes ☐ No ☐

If yes, what level of involvement (in the production cycle) e.g. Planting, harvesting, etc?

49. How many times do you plant in a year? Please **tick** where applicable.

A. Once	B. Twice	C. All year round
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50. Does water availability affect the number of times you plant a year?

Yes ☐ No ☐

51. What do you grow and why?

	To eat	To sell
A. Vegetables		
B. Mealies and other cereals		
C. Root crops		
D. Beans		
E. Fruits		

52. How often in a week do you harvest from garden?

A. Daily	B. 3-4 times a week	C. Once a week	D. Never
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53. Please state how many bundles or buckets of produce you harvest in a week

Crop	Bundles/week	Buckets/ week
1.		
2.		
3.		
4.		
5.		
6.		

54. Do you have access to markets to sell your produce? Yes ☐ No ☐

55. What else do you harvest from land?

A. Firewood	B. Grass	C. Clay
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WATER ACCESS AND USE

56. What is the source of water you use? Please **tick** all applicable.

Water sources	Tick
A. River	
B. Communal tap	
C. Private tap	
D. Well/ spring/ borehole	
E. Other (specify)	

57. Who owns the water source?

Water sources	Tick
A. Government	
B. Community	
C. Individual	
D. Other (specify)	

58. Who collects water often? Please **tick** all applicable.

Person responsible for water collection	Tick
A. Mother	
B. Daughter(s)	
C. Father	
D. Son(s)	
E. Other (specify)	

59. How often do you collect water?

	Tick
A. Once a day	
B. Twice a day	
C. Thrice a day	
D. More than thrice a day	

60. What do you use water for?

	Tick
A. Domestic use (Drinking, cooking, hygiene, etc)	
B. Sanitation	
C. Crop production	
D. Livestock (including poultry)	
E. Other (Specify)	

61. How far is the source of water from the household?

A. Less than 200m	B. Greater than 200m
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62. How long does it take to collect water?

A. Less than 30 minutes	B. Greater than 30 minutes
--------------------------------	-----------------------------------

63. Are water sources reliable? Yes ☐ No ☐

64. How do you get to the water source? Please **tick** all applicable.

	Tick
A. Foot / Walk	
B. Animal wagon	
C. Own or hired vehicle	
D. Other (specify)	

65. Do you pay for water? Yes ☐ No ☐

66. How much do you pay for water? Please indicate if you pay weekly, monthly, etc

67. How do you have access to water for agricultural production?

68. Who decides about how water will be allocated in the household?

69. Do you feel your household have enough access to water? Yes ☐ No ☐

If No, please explain why do you feel so?

70. What problems do you encounter when accessing water?

71. What do you think is the solution to the problems you mentioned above?

KNOWLEDGE AND EMPOWERMENT

72. How do your land rights affect access to water and other resources?

73. Who manages water supplies?

74. Are women involved in management of water supplies? Yes ☐ No ☐

75. Are women involved in decision-making regarding water supplies? Yes ☐ No ☐

76. Are women encouraged and empowered about the importance of involvement?

Yes ☐ No ☐

77. Are meetings conducted in such a way that women are comfortable and understand? Yes

☐ No ☐

78. Do women support other women in decision-making positions? Yes ☐ No ☐

79. What can be done to encourage more women participation?

80. Do you collect rainwater? Yes ☐ No ☐

If yes, how do you collect rain water?

81. Do you use water technologies for water, such as pumps? Yes ☐ No ☐

82. Can women operate these technologies? Yes ☐ No ☐

83. Do you irrigate your crops? Yes ☐ No ☐

84. What methods of irrigation do you use?

	Tick
A. Furrow irrigation	
B. Manual using buckets or watering cans	
C. Drip irrigation, spray or micro-sprinkler irrigation	
D. Other (specify)	

85. Why is the type of irrigation method mentioned above used?

86. Are you satisfied with type of irrigation system used?

87. Are you aware that water is a scarce resource? Yes ☐ No ☐

88. Do you use waste water to irrigate your household gardens? Yes ☐ No ☐

89. How can water be conserved?

90. How can water be made more available than it is at present?

Section E: Management of water irrigation scheme

91. Is there any common plan for agricultural production within the area of the scheme?

92. **Yes** ☐ **No** ☐

93. If **Yes**, who decides on the agricultural production plan

94. Who is making the decisions concerning the fieldwork?

A. Men	B. Women	C. Both
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95. Are all the farmers involved in the planning? **Yes** ☐ **No** ☐

96. How many people are in the water scheme committee? **Yes** ☐ **No** ☐

97. How many women are in the committee? _____

98. Are women able (allowed) to attend meetings? **Yes** ☐ **No** ☐

99. How many times do you hold meetings in a month?

A. Once	B. Twice	C. Thrice	D. Other (specify)
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100. Who determines the water fees? _____

101. How much is paid by each water irrigation scheme member towards the water fee?

102. Who collects the water fees from the scheme?

103. What is the water fee used for?

104. Is there a difference between the tasks performed by women and men in the irrigation scheme? **Yes** ☐ **No** ☐

If yes state the different roles

105. Have you (or your household members) received technical training in agriculture or on water Management in the last 2 years? **Yes** ☐ **No** ☐

106. If Yes, what trainings were attended and indicate who provided the training?

107. Do you know what Water Users Association (WUA) is? **Yes** ☐ **No** ☐

108. Do you know how the WUA works? **Yes** ☐ **No** ☐

109. Are you aware of your water consumer rights? **Yes** ☐ **No** ☐

110. Has anyone from the Department of Water Affairs visited this area and what was discussed?

“IDEAL” LAND RIGHTS FOR RURAL WOMEN

111. What do you think should be the ideal option for the following women in land ownership?

Woman	Individual title	Joint title	Women's group
A. Single no children			
B. Single with children			
C. Married			
D. Married no children			
E. Married polygamous relationship			
F. Married migrant husband			
G. Widow			
H. Divorcee			
I. Stay-together not married (no children)			
J. Stay-together not married (children)			

112. In the table below, list cultural practices which in your opinion protect and threaten women's land access

Protect women's land access	Threaten women's land access

113. How could women's land rights be secured using traditional laws?

114. How could women's land rights be secured using statutory laws?

Appendix B: Key Informant Guide

Name of the area: _____

Occupation: _____

Gender: a. Female b. Male

Age range

- a. < 25 yrs
- b. 25-35 yrs
- c. 36-50 yrs
- d. >50 yrs

Water Access

1. What water sources are available in your area?

2. What do people use water for?

3. Who is responsible for management or maintenance of water sources?

4. What constraints do people face when accessing water? Are these constraints the same for males and females?

5. What is done to solve these constraints and concerns?

6. Do people pay for water? How does this affect poor households?

7. What can be done to improve water access?

8. What agricultural activities do women engage in?

9. Which water source(s) are used for agricultural activities and other land-based livelihoods? Why?

14. What income generation activities do women engage in that require water?

15. Do you ever experience water scarcity or interruptions? What do people do during these times?

16. Who are involved in decision making for water management? Are women involved?

17. Do people recycle water or use waste water for irrigation at household gardens (water generated from domestic activities such as laundry, dishwashing, and bathing)? What other techniques do they use?

18. Do people collect rain water? What techniques do they use?

19. How do people conserve water?

Appendix C: Focus Group Discussion Guide

Focus Group Discussions Questions

Name of the area: _____

1. What water sources are available in your area?
2. What do people use water for? Is it the same for men and women?
3. Who is responsible for management of water sources?
4. What are the constraints that people face when accessing water? Are they the same for males and females?
5. Which concerns affect women most? Why?
6. Which concerns affect men most? Why?
7. How can these constraints and concerns be solved?
8. Who is responsible for making sure that water is available for household use within the family? Why?
9. When is water collected? Why?
10. How is water allocated for activities within the household? Who allocate water? Why?
11. What are the costs and time involved in getting water?
12. How do the costs of accessing water affect poor households?
13. What agricultural activities do women engage in? Why?
14. What agricultural activities do men engage in? Why?
15. What other agricultural activities would people engage in if they had access to more water than they have at present?
16. Which water source(s) are used for agricultural activities and other land-based livelihoods? Why?
17. What other income generation activities do women engage in that require water?
18. Who are involved in decision making for water management?

19. Are women involved in water committees?
20. Do people recycle water (E.g. use grey water - wastewater generated from domestic activities such as laundry, dishwashing, and bathing)? What do people use it for?
21. Do people use rain water?
22. How can water be conserved?