



**AN INVESTIGATION OF SKILLS AND KNOWLEDGE OF WOMEN
PARTICIPATING IN WATER AND FOOD SECURITY PROJECTS IN THE
EASTERN CAPE PROVINCE: A CASE OF MBEKWENI VILLAGE, SIRHOSHENI
AND LUTENGELE VILLAGES**

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Science in Agriculture (Agricultural Economics)**

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DEDICATION

**To my parents Mr Samson Makeleni and Mrs Nobantu Pretoria Makeleni, and my
brothers and sisters.**

DECLARATION

I the undersigned declare that the work contained in this study is my own original work and has not been submitted and presented at any University for a degree. To the best of my knowledge, where use has been made of the work of others, it was duly acknowledged in the text.

Signature.....Date.....

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ACRONYMS

ADB: Asian Development Bank

AET: Agricultural Educational Training

AWDR: Africa Water Development Report

CIMMYT: International Maize and Wheat Improvement Centre

CRS: Catholic Relief Services

DWAF: Department of Water and Forestry

ECLAC: Economic Commission for Latin America and Caribbean

FAO: Food Agriculture Organization

GDP: Gross Domestic Product

GWP: Global Water Partnership

IFAD: International Fund for Agricultural Development

IFFS: Integrated Food Security Strategy

ILO: International Labour Organisation

MDG's: Millenium Development Goals

NEPAD: New Partnership for African Development

NGO's: Non- Governmental Organizations

RDP: Reconstruction and Development Project

SPSS: Statistical Package for Social Scientists Wildlife

UNDP: United Nations Development Programme

UNECA: United Nations Economic Commission for Africa

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNFPA: United Nations Population Fund

WESSA: Wildlife and Environment Society of South Africa

WRC: Water Research Commission

WRI: World Resource Institute

ABSTRACT

The South African government initiated programmes to ensure that women in agriculture are empowered with sufficient agricultural skills and knowledge to engage in agriculture in order to alleviate poverty for their families and communities. Studies argue that within the agricultural sector, women are not capacitated adequately enough in terms of the skills and knowledge they need to acquire, and particularly as this relates to their ability to have knowledge about more advanced technologies in farming. This includes the most up to date knowledge related to sustainable-development.

This study has attempted to investigate skills and knowledge possessed by women participating in water and food security projects in the Eastern Cape. Selected study areas were Mbekweni village located in Whittlesea, Sirhosheni village which is situated in Willowvale and Lutengele village in Port St Johns. The thesis was also aiming to find the skills/knowledge gap amongst the sample so as to come up with recommendations. The data was collected using two semi-structured questionnaires. The first questionnaire was for the main survey which mainly concentrated on the socio-economic information of the respondents. This data were collected from 163 households across three sites using systematic sampling. The second questionnaire was mainly used to gain more in-depth analysis. The data were collected from 30 households across three sites using purposive sampling. Both questionnaires were administered through face-to-face interviews.

The majority of respondents have stated that they have basic knowledge and skills in farming, however they need further training on appropriate planting methods for various crops, irrigation scheduling and frequency, application of pesticides and marketing skills. Econometric analysis, through the use of the binomial regression model revealed that education affects the level of knowledge of farmers in selecting appropriate planting methods as well as farmers' knowledge in determining seed depth of a crop. Gender influences the level of knowledge farmers have when selecting appropriate planting methods. Having extension assistance was recognised to affect farmers' knowledge in determining irrigation scheduling and intensity. All variables were statistically significant showing a 5% level. The thesis ultimately argues that encouraging support to agricultural extension that respects local-level indigenous farming will increase the food-security potential of residents within the Eastern Cape.

Keywords: Knowledge and skills, Food and water security, Smallholder farmers, KSC frameworks.

CHAPTER ONE: INTRODUCTION

1.1. Background Information

The South African government initiated programmes to ensure that women in agriculture are empowered with sufficient agricultural skills and knowledge to engage in agriculture, in order to alleviate poverty for their families and communities (Sadie and Loots 1998). While much attention has been paid on the development of small scale farming with special emphasis on support for farmers' organizations, the condition of women farmers remains that of resource poor farmers who are unable to attain access to markets, finance, technical knowledge and landownership. Women remain on the fringe of the agricultural sector, especially in decision making processes (Gurung, 2008).

According to a report released by the Ministry of Agriculture and Rural Development (2003:1 in Kehler 2001), it is argued that despite large numbers of women having good knowledge and production skills, they are nonetheless constrained in their endeavours and within the agricultural sector because they make less money than men, their co-workers. Moreover, within the agriculture sector, women are not capacitated adequately enough in terms of the skills and knowledge they need to acquire, and particularly as this relates to their ability to have knowledge about more advanced technologies in farming including the most up to date knowledge related to sustainable-development. Sadie and Loots (1998:5) point out that "the empowerment of women is therefore unlikely to take place, as substantive equal access is not provided and economic domination by males is apparently the norm". The empowerment of women is required at different levels from water to food security.

1.1.1. Issues related to water insufficiency

The water and food security debate has been a long-running one, specifically as it relates to water quality, water access, and as improvements are sought for the 'impoverished' to have food security. During the World Summit on Sustainable Development held in Johannesburg in 2002, issues related to water access and water quality were top priorities for the conference. The reason for this could be that water security has become the single greatest threat to human health, the environment, global food supply, as well as economic and social development (Sigenu, 2006). The high demand to utilize water is a major concern, involving both the quality and availability of water. According to projections by United Nations Food

and Agriculture Organization, more than 230 million live in 26 countries labelled as water deficient. Amongst those countries, 11 are from Africa. It is expected that by 2025 almost two thirds of the world's population is likely to experience shortages of water supply for up to 1 billion people; water shortages will no doubt be severe. The people most likely affected by the shortages are those living in rural areas in Africa (Ravenga and Cassar, 2002: 1).

South Africa is considered to be a dry country, with considerably low rainfall. South Africa has an annual average rainfall of 464mm compared to a world average 860mm (DWAF, 2002). South Africa depends mostly on rivers, dams, and underground aquifers for water supply. Because South Africa has low rainfall, government built dams to store water so as to make sure the country has enough water to drink, to grow food, and for industries (DWAF, 2002). For example, the Gariep dam which provides water to Eastern Cape and the Free State Provinces is one of the largest dams in the country. However a large number of rivers are shared with other countries as a result of existing water resource (rivers, wetlands, groundwater and estuary have therefor been over-used (de la Harpe, 1999: 7). The overuse of water has led the South African government to formulate a policy that will protect water resources against exploitation and to ensure that there is water for social and economic development and water for the future (de la Harpe, 1999: 7)

Before this Act, there was an old Act drafted in 1956 (which is now abolished) (de la Harpe, 1999). The Act was mostly replicating water rules of European countries adopting these to the South African situation. This was seen as inappropriate as countries in Europe had a lot of water, unlike South Africa which is dry with limited water. For example, according to de la Harpe (1999: 7) the 1956 Act mainly targeted a small dominant group that had privileged access to land and economic power. When the Act was drafted at the time, the population was smaller and there was much less pressure on the environment and water resources. This policy over water use was mainly targeting agriculture. Only those who owned the land had the right to use water in terms of farms and other property. De la Harpe (1999: 7) states that landowners could use ground water under their land and water from the rivers and streams on or next to their land. In that way water became a private good and government had limited control over it. By "private" it is meant those people who do not own the land and who have no easy or assured access to water are limited to what they can access. The subsequent result of such a policy is that it put the majority of the population at a disadvantage.

1.1.2. Concerns of Women's empowerment

Women play very significant roles as food producers, managing natural resources (such as water), income earners, and they are often caretakers of households managing the nutritional requirements and security of family members (Quisumbing and Meinzen-dick, 2001). Quisumbing and Meinzen-dick (Ibid) argue that giving women the same access to physical and human resources as men would increase agricultural productivity. It is therefore the opinion of these authors, and this study shares their opinion, that the empowerment of women is an important factor in helping them achieve more food secure realities. As this study understands it according to World Bank “empowerment is the process of increasing the capacity of individuals or groups to make choices into desired actions and outcomes.”

(Asian development bank, 2004; Hamdy *et.al*, 2006) have shown that women are often committed to local development concerning matters that have a direct impact on their households. Women are also well and able to handle water related matters including technical issues, operation and maintenance, collecting contributions for collective projects and can manage conflicts. Women are often the ones who resolve conflicts better in groups than most men (Asian development bank, 2004). The experience is evidently supported by the placement of women at the centre of the planning and management of water investments. Placing women in lead roles is suggested as both effective in producing good investments and significant in creating a wider process of empowerment (Economic Commission for Latin America and Caribbean, Undated). Placing women in lead roles therefore builds confidence amongst other women and helps communities as a whole to organize and enact more successful projects. Women leaders ultimately enable the success of projects and provide change within local communities (Hamdy *et al*, 2006).

1.1.3. Issues related to food security

The fact that agriculture uses more water than other water uses, provides evidence that food and water security are inextricably linked, meaning that there will be no food security without water security. According to Global Water Partnership (2009) in order to produce enough food for one person for one day, about 3,000 litres of water is required. It is therefore clear that food security is a critical issue as communities increase in size.

Many of the efforts that local South African communities engage in when it comes to conserving water are mainly done to enhance one's food security. For an example, the South

African National Department of Agriculture (2002) states that: “At national level, South Africa is food secure. It produces its main staple foods, exports its surplus food, and imports what it needs to meet its food requirements...” However, at household levels, the situation is far worse, to the extent that more than 35% of the population (about 14.3 million South Africans) is vulnerable to food insecurity. Among these, women, children and the elderly are particularly vulnerable (UNECA, 2006).

1.2. Problem statement

Women play a vital role in addressing hunger in their societies. Asian Development Bank (2004) argues that a large proportion of farmers in developing countries are female, but many lack voice and organization. Women’s contribution in food production is not recognized and yet they are the major participants in farming activities. Instead of acknowledging the role of women in farming, more praise is always given to men. NEPAD (2010) argues that the fundamental problem is that in the first place, particularly in Africa, women farmers are not even considered in the development of agricultural policies designed to improve their productivity. Hence, the fundamental problem of this study is the lack of necessary skills and knowledge possessed by women to participate in water and food security projects, which has limit them in their capacity to produce more in their gardens and fields.

Despite all the policies and programmes that have been put in place to empower women in agriculture, it seems that there is still a gap in terms of knowledge and skills in water and food security projects especially compared to men. Hence women are still struggling to improve their livelihoods. Since the bulk of agricultural production is undertaken by women, it only makes sense to empower women and incorporate programs that will meet their needs (James; 1995:16). The government should try to assist women in empowering them with more fundamental farming skills and knowledge (DWAF; 2002:10). With this in mind the study sought to investigate skills and knowledge women have to participate in food and water security projects. None of the previous studies attempted to interrogate

1.3. Research objectives

1.3.1. General Objective

The main objective of this research was to identify and assess the skills and knowledge of women participating in water and food security projects, in relation to their actual use of land available to them.

1.3.1. Specific objectives

The objectives of this study were to:

- Identify technical and organisational skills that women have to participate in water and food security projects.
- Identify perceived knowledge and skills gaps which could have an impact on food production skills.
- Make recommendations that can be useful in policy formulation and implementation on water and food security projects on skills development moving forward.

1.4. Research questions

The research seeks to address the following questions:

- What farming skills and experience (local knowledge) do women participating in water and food security projects have?
- What knowledge gaps do women farmers involved in food and farming projects identify with, as key to their progress?
- What are recommendations that can be drawn from, or are useful to, policy formulation and implementation on water and food security projects?

1.5. Hypothesis

It is hypothesised that women lack certain necessary skills and knowledge to participate in water and food security projects and they would likely find encouragement from more assistance and training.

1.6. Justification of the study

This research investigates the skills and knowledge of women participating in water and food security projects in three different sites across the Eastern Cape. The study focuses on the identification of skills and knowledge farmers need to undertake farming effectively. It seeks to identify skills and knowledge held by project beneficiaries comparing skills and knowledge held with the skills and knowledge required. The study also identifies how skills gaps can be addressed to the needs of training and/or professional development. Finally the study looks at what type of trainings or developments can be required and how they should be prioritized. The study will be carried out in Whittlesea at Mbekweni village, Willowvale at Sirhosheni village and also in Port St Johns at Lutengele villages, because these villages have high issues of land, water and food security.

Hart and Vorster (2006:1) argue that agricultural development projects in Africa have predominantly followed an input-output development model, which assumes a country's economic and social development are externally induced. Hart and Vorster (2004:1) further argue that that this assumption ignores the role of beneficiaries in the project in terms of knowledge and behaviour. Makhura (2001) states that after the 1994 elections a lot has been done in terms of agriculture structural changes, in an effort to promote increased production amongst smallholder farmers. Those changes include land reform and improved access to credit as they have benefited some formerly disadvantaged black farmers. However, these reforms have not been sufficient for knowledge generation particularly rural women farmers. According to Hart and Vorster (2006:1) emphasis was put on production, whereas little attempt has been made to empower the knowledge and skills of the future generations.

Few researchers have progressed on the subject. For an example, Kwaru and Gogela (2002) conducted a similar research on National Strategy on Education and Training in Agriculture and Rural Development, in the Eastern Cape. One of the purposes of the research was to assess training needs of agricultural stakeholders, both providers and clients of AET, in the Eastern Cape. Tshuma (2013) also interrogated the subject in an effort to evaluate the

knowledge and skills needs of the Marselle farmers. However, its unit of analysis was both commercial and small holder farmers irrespective of gender. It is therefore necessary to undertake this research as it is specific to women. This research ultimately seeks to understand ways in which women can be empowered in terms of what skills and knowledge they have and can improve upon when it relates to developing their crop production. This research aims to assist in knowledge production as it relates to reducing poverty levels in the Eastern Cape. It is therefore necessary to undertake this study in order to establish the gaps in knowledge generation as well as the critical factors affecting training needs. The results of this study are essential in contributing to the body of knowledge, which is scanty.

Information from this study will be vital to government, NGO's and other institutions in advising farmers and offering necessary training according to farmer's training needs. Policy makers can also use this information to create or amend policies in an effort to develop the empowerment of women in agriculture. Farmers can also utilise this information for their capacity development.

1.7. Outline of the Study

The study comprises of seven chapters. The first chapter includes the objectives of the study, including research questions. The second chapter is a literature review where a review is given as to the water and food security issues in South Africa, reviewing skills and knowledge of women in the context of them having such skills as related to agriculture. Chapter three specifically focuses on research methodology where it starts by the description of the study area of the three sites investigated for the purposes of this study, wherein three locations are investigated by review of a social profile that outlines cultural context. This chapter also describes the current agricultural resources and infrastructure in each of the site locations investigated. It also presents a methodology and analytical framework wherein research methods which have been used are explained. Chapters four and six are presented to offer descriptive results of the analysis, which also includes the econometric analysis. While Chapter five specifically presents the analysis of farmers' agricultural skills and knowledge. The final Chapter (seven) presents research findings and there is a summary provided indicating further recommendations and conclusions moving forward.

CHAPTER TWO:

REVIEW OF WATER AND FOOD SECURITY IN SOUTH AFRICA

2.1. Introduction

This chapter reviews literature in an effort to explore the current debates surrounding the issue of water and food security particularly of women in the three selected areas of study. The chapter will present an overview of water and food security in South Africa. Water and food security have become a global issue because water shortages and food insecurity have increased in many parts of the world. This therefore creates a whole lot of problems such as poverty, economic and political instability. Thus as water and food security discussions unfold, the following specificity of defining components of these issues are very important, for an example: water management, water and food availability, access to food and farming practices. This Chapter starts by defining water and food security. The importance of defining the terms with specificity helps to understand these contemporary and pressing issues. Better understanding of the current thinking and ways in which food security and water needs are defined will help in the discussion when it comes to identifying how to empower the skills and knowledge of women understudy. The research results (presented in subsequent Chapters) suggest that increasing food security is best approached by holistically conceiving of how to conserve water, train local residents, and share ideas.

2.2. Theoretical frameworks of analysis

2.2.1. Defining of knowledge

Winterton *et al.* (2005) define knowledge as something that is acquired and stored intellectually. It comes from learning or experience and is held in people's minds as a resource that one is later able to tap into. Knowledge is also viewed as an interaction between intelligence (capacity to learn), and as situations enable opportunities to learn. It includes underpinning theory and concepts, as well as tacit knowledge gained as a result of experience of performing certain tasks (Ibid.).

Warren (1991) stresses the importance of including Indigenous knowledge (IK) when investigating the knowledge gaps of rural people. IK is the local knowledge that is unique to a given culture or society and is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host of other

activities in rural communities (Warren 1991). IK contrasts with the international knowledge system generated by universities, research institutions, and private firms.

The World Bank (1997) stresses that in the emerging global knowledge economy a country's ability to build and mobilize knowledge capital, is equally essential for sustainable development as the availability of physical and financial capital. The basic component of any country's knowledge system is its 'indigenous knowledge'. It encompasses the skills, experiences and insights of people, applied to maintain or improve livelihoods.

Indigenous knowledge is also the social capital of the poor, their main asset to invest in the struggle for survival: to produce food, to provide shelter, or to achieve control over one's own life. Development agents (NGOs, governments, institutions, donors, local leaders, and private sector) need to recognize value and appreciate it as these groups interact with the local communities they work. But before incorporating IK into a methodology, they need to understand and critically validate it against the usefulness for their intended objectives.

On the other hand, 'skill' is defined as any combination of social practices which are useful and empowering to one's mental or physical quality of life, and as skills can be enhanced through considerable training (Witherton *et al.*, 2005). One's skill or skill-set, a combination of skills, may equally be acquired through practice without training. It is a combination of factors resulting in competent, expert, rapid, and accurate performance whereby that one gains proficiency over one's skills. For an example, problem analysis and problem solving, decision-making, collaboration and interaction, team work and mentoring, conflict management, creativity and innovation, analytical and reasoning, documentation and presentation are all skills that are acquired through training or practice. It is therefore essential that training is considered a highest priority to empower women's knowledge and encourage their farming practices as the project has moved forward.

2.2.2. Acquisition of Knowledge, Skills and Competencies (KSC)

Winterton (2005) has identified a theoretical framework that can be used as the mechanism through which knowledge, skills and competence (KSC) are acquired. Competence is a difficult concept to define but nonetheless useful in bridging the gap between education and job requirements. It is the ability to do the job and therefore includes proficiency by combining the knowledge and skills of a person to do certain jobs with respect and reward by others. Figure 1 shows how knowledge and skills are acquired and recognised. The process of

knowledge and skills acquisition ranges from tacit KSC informally gained and uncertified to qualified KSC gained through formal instructions and recognised by certification. Between these extremes are examples of formal instruction that is uncertified such as adaptive training, and informal experiential learning that is certified through some accreditation process. Winterton *et al.* (2005) argue that the majority of human learning does not occur in formal contexts. They distinguish between cognitive learning (related to the understanding and use of new concepts) and behavioural learning (related to the physical ability to act).

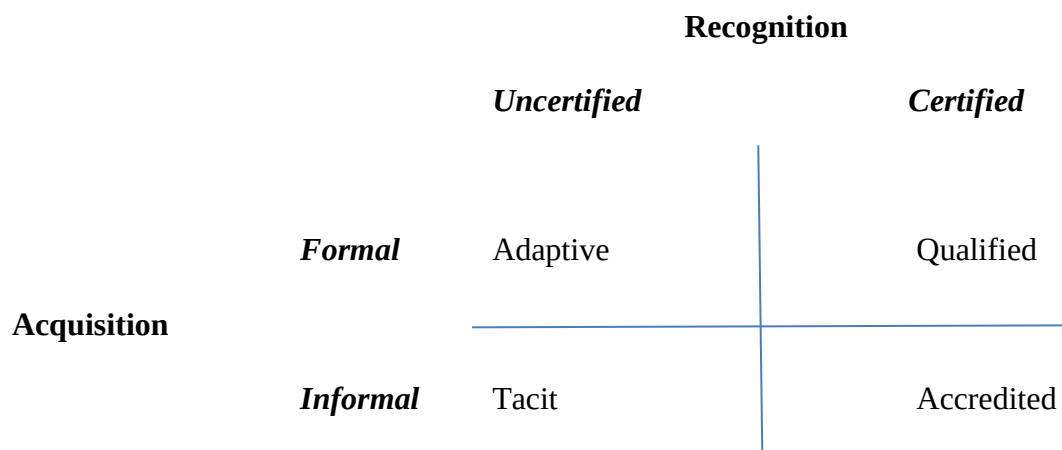


Figure 2.1: Formation and recognition of KSC, as noted by Winterton *et al.* (2005)

In an attempt to investigate the KSC of women in land and water projects in the study areas, this framework of analysis was applied. The underlying objective of the study is to identify gaps in knowledge and as outlined by the KSC framework above. By utilizing the framework above it was felt that this model could help to determine what the current proficiencies of farming activities there were. The framework has been used in conjunction with working with participants to determine how they themselves define their understanding about what knowledge and skills define as “formal” or “informal”. This includes considering what participants have identified as the skills and knowledge they desire. The framework is therefore used more as a guide than it is thought to be prescriptive in nature in determining the results and/or suggested research outcomes. The study ultimately identifies knowledge and skills acquired through so-called ‘formal’ and ‘informal’ processes (including IK). The study looks at three categories of KSC (see Table 2.1) namely: Technical, Management and Soft skills (of behavioural competences) required when undertaking farming. Again, such a type of categorical reference is utilised to help to define ones’ skill-set and is used as a guide.

Again, the research has been informed by the perceptions of participants and their own definitions of what they believe to value as important in their determination of strategies, skills, proficiencies, and knowledge in farming. There was an emphasis to understand those skills they (may) further require.

Table 2.1: KSC required for effective farming (Winterton et al, 2005)

CATEGORIES OF KSC TO BE INVESTIGATED		
Technical KSC	Managerial KSC	Soft skills of KSC
Crop production	Farm / project management	Communication
Plant nutrition	Human resource management	Conflict resolution
Soil preparation	Financial management	Negotiation
Disease and pest management	Business plan development	Strategic / critical thinking
Tillage operations	Record keeping	Problem analysis
Weed control	Accountability	Problem solving
Irrigation	Ability to read and write	Team building
Water and land management	Business etiquette	Positive attitude
Feeding	Time management	Desire to learn
Housing and handling	Meeting management	Motivational skills
Animal health care	Basic computer skills	Listening skills
Marketing	Market awareness	Self confidence
Value adding and packaging	Entrepreneurship	Co-ordination and facilitation
Maintenance and operation	Accessing information	

2.2.3. Skills Audit Framework

The utilization of a skills audit methodology is a common tool that is normally employed on skills analysis. It basically focuses on four components of data collection, namely: (1) skills analysis (or the identification of skills and knowledge farmers need to undertake their farming effectively); (2) a skills audit (or the identification of skills and knowledge held by project beneficiaries); (3) an analysis of skills gaps (comparing skills and knowledge held

which would help to determine an understanding of the relevant detail of what is needed overall, i.e. a skills audit); and lastly (4) an analysis of the training needs (or the identification over how skills gaps can be addressed within the training and/or as it relates to professional development, including what type of training or development may be required at later stages). A schematic diagram of the skills audit is represented in Figure 2, which has been sourced from Watson, 2004).

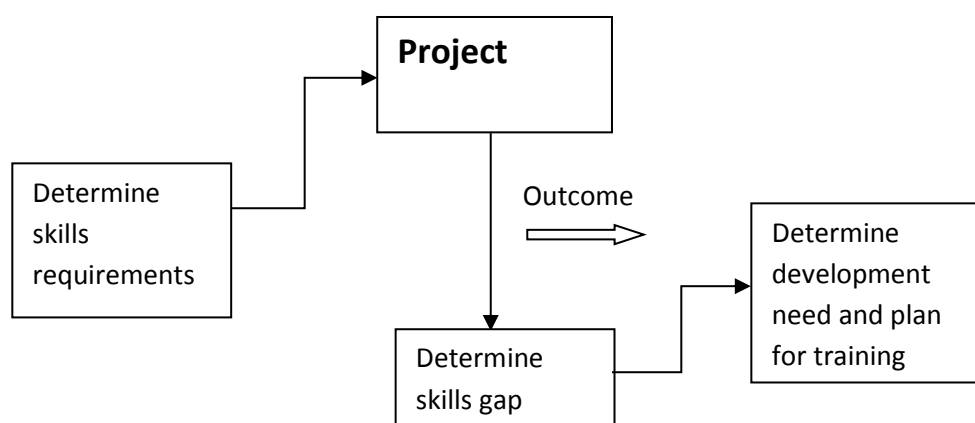


Figure 2.2: Skills audit framework (source: Watson, 2004)

It is felt that a skills audit methodology framework is very important when developing a comprehensive and effective development plan. The skills audit survey, for instance, is developed to measure the skills capacity and skills shortages amongst farmers and women. This will assist in identifying prevalent skills capacities and skills shortages held by rural women. The outcomes document will assist to address the shortage and gaps for effecting farming.

2.3. Defining food security

A new definition for food security emerged at the 1996 World food Summit in Rome. According to Food and Agricultural Organization (2002), food security “exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. FAO (2002) household food security is attained when the members are able to acquire and ensure adequate safe and nutritious food to meet their nutritional, social, and psychological requirements.

2.3.1. Current food security trends

Food security is one of the top priorities in South Africa where it is highlighted within Section 27 of the Constitutional rights (NDA, 2002) that food security takes priority. From

these rights, the Constitution clearly states that every citizen has the right to have access to sufficient food and water, and that government should make sure that by legislative and other measures within its available resources that rights to sufficient food are realized for the poor (NDA, 2002). The issue of food security became a priority more so after the 1994 elections to redress the issue of food insecurity which was becoming more prevalent, especially to low-income black and rural people. It therefore means that the need for food security was a result of historic factors and the political economy that drove people away from (subsistence) farming. Considering the history of South Africa and the decline in African farming practices, which displayed gradual loss of agricultural and rural capital, it's important to consider how current informal farming practices and wage labour investments interact in producing current opportunities for local-level farming practice.

Since 1994 many programmes have been put in place to deal with food security both at household and national level. For example Reconstruction and Development Projects known as RDP programmes included the 'Integrated Food Security Strategy', but others existed as well, aiming to improve peoples' lives. The main aim was to "maintain and to increase the ability of South Africa to meet its national food requirements...[and]...to eradicate the widespread inequalities and grinding poverty among the majority of households" (NDA, 2002). The National Department of Agriculture (2002) ironically states that:

"At the national level, South Africa is food secure. It produces its main staple foods, exports its surplus food, and imports what it needs to meet its food requirements. National food security indicators reveal that South Africa has been meeting the food needs of its growing population from domestic sources in the past 20 years."

At the household level and for the majority, situations are far worse and to the extent that more than 35% of the population (about 14.3 million) South Africans are vulnerable to food insecurity (Water Research Commission, 2011). Among these households, women, children and the elderly are particularly more vulnerable (United Nations Economic Commission for Africa, 2006; FAO, 2012). Table 2.2 gives better insight on current household food security trends in South Africa.

Table 2.2.: Measuring food insecurity according to different proxies and methods

Source	Date	Proxy used	Estimated level of food-insecurity
General household survey	2009	Household Food Security Access Scale (HFSAS)	20%
Nutrition indicators	2004	Stunting 1-9 years	21.6%
October Household Survey	1999	Household's ability to feed children	25-33%
General Household Survey	2007	Perceived hunger, incidence of child hunger	18%
Measuring Poverty, IFSS	2002	Household income and food basket expenditure	35%
Measuring Poverty, IFSS	2002	Daily energy intake	36%
Original source: Koch, 2011:21			

2.3.2. Challenges of food security

South Africa is faced with a number of food security challenges. At national level, the inadequate safety nets and weak disaster management systems make it difficult for South Africa to confront food security. NDA (2002) argue that these challenges have negative implications for vulnerable households, adding on to other challenges for households with food security concerns. Some of the challenges at household level include inadequate and unstable household production, lack of purchasing power, and poor nutritional status. The challenges highlighted in the previous paragraph are the same challenges that women face in food production in their everyday life. These are the people who are more vulnerable especially at the household level.

The FAO (2002) defines food security as a situation where “people at all times have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active healthy life.” Ludi (2009) however argues that such a definition has turned a blind eye on the question of, ‘are monetary and non-monetary resources sufficient at the disposal of the people to allow everyone access to adequate quantities and qualities food’? At the end of the day, it is monetary and non-monetary resources which are available that will help to enable everyone to have sufficient food (Ibid).

Therefore, if these issues are ignored the problem of food security will not be addressed properly. Food security is achieved at two different levels, both at the household level as well as at the national level. The most important level is at the household level, because in order for the country to be safe from violence as people struggle and fight to access food, opportunities for food security occur at the household level.

2.4. Defining water scarcity

This section discusses components involved in water security such as water supply and scarcity. The literature explicitly explains the state of water supply and scarcity in South Africa and abroad. A brief literature is provided on water policy frameworks in South Africa.

2.4.1. Water Policy Framework in South Africa

After 1994 South African government put in place many policy reforms, water policy reforms were amongst those laws. These water policy reforms were actually intended to rectify the disparities inherited from the prior segregation policies which had resulted in extreme inequalities between black and white communities in the face of access to water (Gowlland-Gualtieri, 2007:1; DWAF, 1999: 7). These policies include the following: the Constitution of the Republic of South Africa (Act 108 of 1996), the Reconstruction and Development Programme (RDP), the White Paper on Water and Sanitation (1995), the Water Service Act (1997), the White Paper on National Water Policy for South Africa (1997) and the National Water Act (1998). For the scope of this literature review the National Water Policy will be discussed.

2.4.2. Water Security

Grey and Sadoff (2007) define water security “as the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies”. However, Muller et al (2009) argue that this definition does not focus on issues which could pose a threat or war on water as our national security. For example ‘international contamination of water supplies or water related disputes against neighbouring states’ (Muller et al, 2009). The protection of water is very important for the country.

Biswas (2001:1) defines water as the basis for life and a basic need. Muller *et al.* (2009) describes water as the central body for economic growth and sustainable development of a country. That is why water cannot be separated from society. Muller *et al.* (2009:8) describes this relationship as symbiotic between water and society. Social and economic activities that are taking place in a society can actually affect the availability and use of water.

Conant (2005) defined water security as a human right issue to be protected by international law. The agreement called, 'General Comment 15', stipulates: "The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personnel and domestic uses. An adequate amount of safe water is necessary to prevent death from dehydration, to reduce the risk of water related disease, to provide for consumption, cooking, personal and domestic hygienic requirements" (Conant, 2005). It is argued and felt that this point is necessary and basic to what a country should have for its citizens.

2.4.3. Water supply scarcity

Water scarcity may generally refer to a situation in which there is insufficient water than required. Pelsler (2001:14) states that for a country to be considered water scarce, it must have internal renewable resources below 1000 m³ per capita per year. Therefore, if a country's water supply is less than 500 m³ per capita per year then that situation is considered as absolute scarcity. When there is water scarcity, the demand for water usually exceeds the supply of water.

However, globally there is an over- supply of water, but no country can easily access water because water sources and access is unevenly distributed among and within nations (Water Research Institute, 2002:1). South Africa is an example of this because most of its water resources are being shared with other countries like Lesotho and Mozambique (Backenberg and Viljoen, 2003). Another cause of water scarcity is the fact that if a country's ground water reserves are being depleted faster than they can replenished by precipitation, then that country will have a shortage of water.

Engelman *et al.* (2002:134) is of the opinion that access and supply of water depends on the existing infrastructure and the failure to supply and distribute services as these may have an adverse effect to people's lives and subsequent hindrance to sustainable development. It therefore means that lacking infrastructure is important to having adequate water supply. One of the villages, which will be described in articulating the findings, will highlight just how

important lacking water is to the inter-related point that having proper infrastructure is essential to delivery basic services. There is quite a number of prevalent causes of water scarcity such as low rainfall, high evaporation rates, an expanding economy and a growing population (Sigenu, 2006).

Sigenu (2006) classified causes of water scarcity into environmental and human induced causes. Such environmental and human induced causes of water scarcity are examples. Under environmental causes of water scarcity, drought and climate change are the main causes of water scarcity, for example (Sigenu, 2006).

- Drought is a period where there is no rainfall at all but usually expected within a geographic area. Drought results in water shortage because of a lack of precipitation and that may seriously interfere with water supply. In crop production when there is drought crops struggle to survive especially when there is no irrigation system in place. The smallholder farmers in rural areas suffer the most and may even lose their crops or livestock when there is a disease outbreak as they do not have alternatives (Sigenu, 2006).

To avoid the impacts of drought certain precautions can be taken in areas where drought is more prevalent. These may include the building of dams (reservoirs), educating farmers about avoiding over-cropping and over-grazing.

- Climate change vulnerability is also one of the main causes of water scarcity. Ludi (2009) states that the impact of climate change is on the followings: sea level rise, droughts, heat waves, floods and rainfall variation. Ludi (2009) argues that climate change vulnerability could, by 2080 result in 600 million people starving from malnutrition. Subsequently, the increase in the number of people facing water scarcity could rise to 1.8 billion. Apparently, climate change poses a threat to water availability and water supply because it encompasses all the environmental causes of water scarcity.
- There are also human induced causes of water scarcity that include human population growth, levels of consumption and poor farming practices. Population growth contributes towards water scarcity in the sense that when the population increases

water usage also increases and yet water supply decreases. For an example in the past 70 years the world's population has literally tripled, and water use has grown six-fold (UNESCO, 2010). WRI (1999) reported that in the next 30 years the global water situation will get even worse if there are no major improvements, especially in the way water is being supplied and used. It is also argued that population growth and socio-economic development are the main driving forces of this rapid increase in water demand, especially from industrial and household sectors (World Resources Institute, 1999)

- Socio-economic developments are also a contributing factor towards water supply and water scarcity. For example, a rise in consumption increases the demand for water and ultimately increases per capita consumption (UNFPA, 2001:1). This may be caused by the fact that people, especially those from developed countries are getting high incomes. Sigenu (2006) argues that rising incomes in the last decade have caused an increase in meat consumption in many countries. If there is a high demand for meat, a high supply of water is also needed for agriculture to supply feed for livestock. This requires substantial additional inputs of grain and water use, as about 40 percent of food supply comes from irrigated land. This means that a high supply of food requires high water usage.
- According to FAO (2010) about 3.8 billion tonnes of freshwater is withdrawn for human use. The globally agricultural sector captures 70 percent of all water withdrawals. While irrigation is one of the best tools in agriculture, the methods used turned out to have severe drawbacks, such as over-exploitation of existing fresh water reservoirs (Swanson, 2001:2). The degradation and land use conversion of watersheds and catchments may reduce the amount of usable water available downstream, especially if there is greater run-off (e.g. temporary floods), which cannot be captured. The construction of dams in the past has, for an example, resulted in environmental disruption, displacement of long settled populations, loss of agricultural land, silting and denial of water to downstream areas where people require water as a resource. These same processes can reduce the existing water storage capacity, as an example, silting reservoirs (National Population Unit 2000: 33).

- In the three villages identified human impacts on the environment have been considered when identifying local response to meeting food security needs.

2.5. The skills and knowledge of women as it relates to water and food security

In this section, the skills and knowledge that women have in order to participate in water and food security projects, will be discussed. Farming skills and knowledge that women possess will be reviewed under the following aspects: water management practices, the level of education and the farming systems that they use. The farming skills and knowledge will be reviewed under these aspects.

2.5.1. Water Management Practices

Understanding and improving the management of water for agricultural production is very essential for women participating in water and food security projects, especially in the Eastern Cape, as water is regarded as one of the scarce resources. It is therefore important for women participating in these projects to have control over the water needed for crop production, be it rain water, groundwater or surface water so as to be able to manage the surrounding watersheds in order to control runoff and erosion and manage groundwater recharge (International Food for Agricultural Development, 2011). According to World Bank (2006:15) “.....Agricultural water has helped to meet the rapidly rising demand for food, and has contributed to the growth of farm profitability and poverty reduction.....” Innovative information and knowledge support systems will be needed to capture and disseminate synergies between improved technologies, improved water management, institutional support, human capital development and improved markets.

2.5.2. Irrigation and Water Harvest System

Irrigation can be simply defined as an artificial application of water into the soil. In agricultural terms, it is used as a technique of watering crops. Irrigation systems differ greatly according to their use. They range from the simple hand watering method used in most home gardens (igadi) to huge flood and furrow irrigation systems mostly found in large-scale production (Ali, 2011). Surface (gravity-driven surface irrigation), sprinkler, drip/micro, and subsurface are types of irrigation methods that are used by farmers to irrigate various crops. For an example, the drip irrigation system decreases no water to runoff, deep percolation, or evaporation. In short water is used more efficiently in irrigation techniques. It is also used as a way of saving water where there is little rainfall. There are other irrigation systems that are

being used by farmers. Irrigation is a skill that requires knowledge to enhance productivity in the farm. Therefore water management decisions strongly influence how uniform water can be applied through different irrigation methods to provide optimal soil water conditions for crop growth and marketable yields.

The rain water harvesting system is the technique used to accumulate and store water for later use. This water can be used to provide drinking water, water for livestock or for irrigation. There are a number of systems to harvest rain water ranging from the simple to the complex industrial systems.

2.5.3. Homestead gardens

Subsistence production is mainly practiced for household production and income generation. This production approach is based on lower-risk methods, using manure, composting, mulching, family labour, aiming for consumption and some cash. Baiphethi and Jacobs (2009) argue that subsistence farming has got high potential in improving household food security and to reduce dependency in buying food by cash. Historically, people used to produce their own food with less dependency on cash. However recent studies have proved that rural people are more dependent on cash in purchasing food (Baiphethi and Jacobs, Ibid).

In as much as rural people depend on cash economy, many households access food mainly through three sources such as markets, subsistence production and transfers from public programmes or other households (Van Averbek, 2007; Baiphethi and Jacobs; 2009). According to the General Household Survey of 2006, the main sources of income for rural households are social grants and pensions. This gives clear evidence that most households have moved from subsistence production. Aliber and Hart (2009) argue that there is no clear evidence why rural people either participate or do not participate in agricultural production. While Stimie *et al.* (2010:1) argue that government authorities believe that a lack of water prevents many farmers from practicing crop production. Backeberg and Sanewe (2010), emphasize the point that “for productive water use, access to land must at least be accompanied by land and water security, as well as knowledge and practical skills for farming”. This triggers the empowerment of women with such knowledge and skills in farming to achieve household food security.

A homestead garden is a small portion of land within a homestead used to grow vegetables and limited crops. To achieve homestead gardening one needs basic skills and knowledge,

such as irrigation (water harvesting), manuring, crop rotation, composting, mulching and family labour (Catholic Relief Services; 2008).

Table 2.3 : Farming practices

Practice	Description
Composting	Composting is a cheap alternative to fertilizer that converts kitchen waste and other organic matter into nutrients for the soil. It is a natural process in which micro-organisms and earthworms convert organic matter from plants or animals into a rich plant food called humus. Humus when complete looks like soil that is rich in vital nutrients such as carbon and nitrogen.
Manuring	Manuring is a practice of adding nutrients to the soil in the form of organic matter. Manure is normally taken from livestock and chickens more like compost. It is primarily concentrated, decayed matter. Nutrients from manure are easily dissolved and absorbed by soil and transferred to plants. This practise requires a particular skill or knowledge for crops to get high nutrients. Should it be applied incorrectly into the soil, the plants will die.

(Original source, CRS: 2008)

These practises require a particular skill or knowledge for crops to get high nutrients. Should, they be applied incorrectly plants will die and thereby yields will be affected.

2.5.4. Crop production

Crop production is the one of the main contributors in GDP to South Africa's economy which comprises of major and minor crops, vegetable and fruit production (SA. Gov. info; 2012). Crop production is a gender activity, participated by both male and female. In some cases the rural female participation (79.4%) is much higher compared to rural men, which is given as a percentage of 68.8% (UNDP; 1997).

Crop production is the largest sub-sector in agriculture followed by non-crop production, namely livestock production and forestry (SA. Gov. info; 2012). The main vegetable crops produced are beetroot, cabbage, carrots, onions, spinach and pumpkin. Field crops grown include sorghum, potatoes and mono-cropping of maize. There is a vast number of skills and knowledge that farmers need to acquire when it comes to crop production. These include genetic improved varieties, crop management practices, soil and water management practices, cropping system, crop protection, and indigenous knowledge.

The knowledge on genetically improved varieties is important as they play a major role in increasing the productivity, helping farmers to meet the food, feed, and other demands of a rapidly rising world population, while saving water and forest lands. The use of GM crops for nearly two decades has consistently increased harvests, saved farmers money, and reduced the use of pesticides (Zhonghu and Bonjean, 2010). First generation GM crops featured input-conserving traits, like insect resistance and herbicide tolerance.

2.6. Skills Development in Agriculture

Nguyen (2009) stated that international experts commonly understood the concept of skills development as developing some practical skills that enable people to deliver a specific performance. Nguyen (2009) further argues that skills are often analysed and compared to or contradictory concepts such as knowledge and theory. In a number of cases, skills are considered a component of competency, knowledge, skills and attitude.

This chapter reviews literature in relation to skills development needs and skills development approaches. Under skills development needs, reasons for the international development community to intervene will be explored. Approaches towards skills development will be discussed.

2.6.1. The Rational for Skills Development

The Skills development has been prioritized by the international development community such as the World Bank, FAO/UNESCO-IIEP and ILO. McGrath (2005) outlined a few reasons for these multi-faceted interventions. Firstly, it could be to motivate the fact that improved skills and improved agricultural development can work mutually to assist with the realisation of MDGs. Secondly, some agencies are of the view that a major commitment should be put forward to attack rural poverty. Hence, skills development is an integral part of strategies to address such issues. Thirdly, McGrath (2005) brings forward an argument that a rise in agricultural productivity and innovation has been a major engine of overall economic growth and development, particularly in Africa. If this is true, McGrath (2005) argues that there are real possibilities for significant productivity increases that are easily achievable and sustainable. He concludes by saying if that is the case, such a breakthrough will require improvements in skills and knowledge.

Rural skills development is needed for different number of reasons. For example in the Sub-Saharan Africa, enhancement of productivity is necessary to fight food security challenge. To win that fight agricultural skills are needed. McGrath (2005) states that economic and social challenge require different set of skills for different purposes. For example on economic challenge the skills should contribute on ‘economic growth and international competitiveness of the agricultural sector’. While on social challenge the skills should contribute on ‘poverty reduction, employment generation and social capital creation’.

McGrath (2005) identified a number of elements necessary for skills development in rural areas, including the following below:

- the importance of both technical and generic transferable skills, including social and communication skills, self-organisation, bargaining, and entrepreneurial skills .
- the importance of developing the political and organisational skills of farmers organisations.
- the need to support and build on existing skills, innovation and knowledge systems of farming/rural communities.
- the need to build capacity: for individual farmers and their organisations, for skills providers and other service organisations, for national departments and agencies, and for international organisations.

- skills development needs to be seen in conjunction with a set of other inputs, such as micro-credit.
- the importance of offering flexible training delivery in the proximity of rural households.

2.6.2. Skills Development Approaches

FAO (2010) articulated that “skills development is key to improving rural productivity, employability and income-earning opportunities, enhancing food security and promoting environmentally sustainable rural development and livelihoods” According to the debate held in Rome on skills and development by many stakeholders in the international development community, McGrath (2005) states that across several inputs contributed by participants there is a sense of need to support the innovation and knowledge systems of farming/rural communities. Thus, the emphasis becomes how to build on existing skills and knowledge of communities and individuals, in order that they can access new ways of working. Such an approach is more akin to certain traditions in literacy and adult education, than it is to the traditional approaches of vocational education and training.

McGrath (2005) emphasizes the point that “Through the efforts of the United Nations Development Programme (UNDP) and through recent reports such as the Commission for Africa and *Investing in Development*, the need to build capacity has become a major element of current skills thinking”. Such capacity development is seen as being necessary at all levels: for individual farmers and their organisations, for skills providers and other service organisations, for national departments and agencies, and for international organisations (McGrath, 2005).

According to FAO (2010) “Education and training are powerful tools against poverty and hunger, and for women’s empowerment”. Notwithstanding the fact that rural women play a major role in agriculture and other rural activities, higher barriers in education and training limit their participation in the development of their communities in terms of productivity, remunerative work, performing managerial and leadership roles (FAO; 2010). There is a general consensus that if women are educated, they are likely to be healthier have high incomes and exercise greater decision-making powers within the household. FAO (2010)

argues that when women receive the same level of education, experience and farm inputs as the men, there are no significant differences between male and female farmers' productivity.

2.6.3. Formal Education and Training

The development of relevant skills and knowledge amongst farmers is a major instrument for improved productivity. The International Labour Organization (2000) argues that basic life skills such as numeracy, literacy, problem solving and management, communication and negotiation; skills improve confidence and capacity to explore and try new income earning opportunities. Formal education refers to education which occurs in formal institutional settings, both as compulsory basic education (primary) as well as in secondary and tertiary education. Education is seen as activities aimed at acquiring general knowledge, attitudes and values, and training is defined as the acquisition of occupational or job-related skills. However, as Singh (2000) points out, the 'division [of education and training] needs to be seen as a purely analytical one as the two are interrelated dimensions within the domain of learning'.

The number of years spent in education is an important determinant for technology adoption. Formal education acts as a catalyst in the flow of information and thus makes it easy for farmers to accept new technology or new knowledge. Sikwela (2008) reports that the number of years spent in education is an important determinant of increased agriculture. Formal education makes it easy to interpret agricultural information and thus plays an important role in skills and acquisition learning.

2.7. Summary

The acquisition of skills and knowledge can only be obtainable in the form of training and education. However, the literature states that most rural women are not educated, which makes it difficult to adapt to changing environments. However, there should be ways of accommodating these women in terms giving them necessary skills. For an example, the language barrier could be a problem. Therefore training should be as flexible as possible. Government should align local women's indigenous knowledge systems with other strategies to deal with water scarcity. This will ensure that women's needs are catered for and that water projects fully capitalise on the existing knowledge base of the women.

From the literature it is quite obvious that the role of women on water and food security is important. As these are the people who are able handle water and food related matters or even technical issues such as operation and maintenance, collecting contributions and conflicts resolution. That is why the literature has emphasized on the idea of placing women at the forefront of planning and management of water investments to create a much broader picture in defining what empowerment, confidence building and what organizational capacity entails.

South Africa is considered as being food secured at national level and food insecure at household level. Challenges faced by South Africa on food security are inadequate safety nets and weak disaster management systems, which have negative implications for vulnerable households thereby adding on to other challenges of household food security. Hence the emphasis is on rural women who have the potential to change things.

South Africa is also facing a water supply crisis caused by the following factors of low rainfall, high evaporation rates, an expanding economy and a growing population. Drought and climate change are considered as the main causes of water scarcity. South Africa has small rivers compared to other countries. It also shares big rivers with other countries. To control the use of water, government introduced policies to protect water resources against exploitation to ensure that there is water for social and economic development and water for the future.

As broad as farming is, it is very important for women to have the following farming skills and knowledge: water management practices that include irrigation and water harvesting systems, crop production practices, organisational skills and other farming skills.

For these women to be empowered, the question of skills development needs to be explored. Skills development has been seen as key to rural productivity and thereby enhancing food security. Education and training are regarded as powerful tools of empowering women.

It has been found that women play a major role in agriculture and in other rural activities, but are still not capacitated enough to improve agricultural productivity hence there is the need for skills development. The shortage of farming skills and knowledge makes it difficult to realize all of this. To deal with this problem some authors have introduced a concept of the need for 'skills development'.

The study investigates the skills and knowledge of women participating in water and food security projects. The lack of necessary skills and knowledge needed by women to participate

in water and food security projects is established as the main problem in this study. However, women still play a major role in food production. Without farming skills and knowledge on food and water security their role will not make much difference.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter gives an overview of the methods used for sampling, data collection and analysis that were followed during the course of the study. The chapter starts by explaining the conceptual framework used in the study. The chapter describes different tools that were used in order to achieve the specific objectives identified for the study. The analytical framework used in the study is also described in this section. This section concludes by explaining the model used in the study in detail.

3.2. Description of the study area

This section is mainly devoted to descriptions of socio-economic and physical contexts of the three municipalities and villages selected. The study was conducted in three villages drawn from three district municipalities of the Eastern Cape.

3.2.1. Introduction

The field study was conducted in the selected areas of the Eastern Cape Province of South Africa. Eastern Cape Province is the traditional home of Xhosa people from the Xhosa tribe. The Eastern Cape as a South African Province came into being in 1994, when the democratic government came into power and incorporated areas from the former homelands of the Transkei and Ciskei, as well as what was then the Cape Province. The selected research sites were Lutengele village, Sirhosheni village, and Mbekweni village. The research sites were described according to their location, social profile, cultural context and agricultural infrastructure and resources.

3.2.2. Location of the study areas (WRC-Umhlababa consulting, Deliverable 1, 2011:14-17)

Lutengele villages are clustered and are located inland of Port St Johns, in the OR Tambo District Municipality. The distance from Mthatha is 80km. The GPS co-ordinates are -31° 37' south 29° 32' east. While Sirhosheni village is situated near to Willowvale town in the Mbashe Local Municipality, which is in the Amathole District, the co-ordinates were - 32° 16' south 28° 19' east. Mbekweni is situated next to Oxton dam and located in Chris Hani District Municipality, under the jurisdiction of Lukhanji Local Municipality. It is 5km from

Whittlesea which is a small town about 40km west of Queenstown and 140km from East London. There was good access to the site on gravel roads. The GPS co-ordinates were - 32° 14'24.99" south 26° 43'40" east

3.2.3. Social Profile and cultural context

Port St Johns is inhabited by the people of the amaMpondo Clan (a Xhosa speaking subgroup) who have a strong and independent cultural identity, but like much of the former Transkei, are also characterised by substantial poverty. The area is classified as ultra-poor with 59% of the households in an income bracket of less than R400 per month. Female headed households are typically 50% poorer than male headed households (SALDRU, 1995). Infrastructure and basic services are poor, unemployment is high and male migrancy to the commercial centres is common. Although gender inequality is traditionally entrenched, collaborative groups have been established within the agricultural sector, predominantly comprising women. Traditional leadership plays an important role in decision making processes, but this is balanced by strengths of local civic organisations and an increased practice of balanced representation in local governance and development-related structures.

The villages around Willowvale and Centane are known for the cultural richness and their strong adherence to amaBomvana traditional practices (one of the Xhosa-speaking clans). Similarly to other sites, Sirhosheni has a socio-economic make-up characterised by high population density, unemployment (80%), underdevelopment and substantial poverty. Homesteads tend to populate the upper ridges of the landscape dominated by topography of narrow valleys and low elevation ridges. Infrastructure and basic services are poor. Traditional leadership is hierarchical, male dominated and influential. Gender inequality is entrenched and traditional authorities routinely make decisions for the community on development issues, which is both the norm and is generally accepted by men and women alike.

Mbekweni is a relatively rural community, with people living in a well formed (thought to be) villagization. The language is purely Xhosa. The area used to have a low unemployment rate as there were irrigation schemes actively working (such as the Shilo irrigation scheme). Unemployment is estimated at 72%, and male migrancy to the commercial centres is common. Over half the households are women headed and in an income bracket of less than

R 600 per month. 81% of residents are grant dependant and the majority of those seeking local economic opportunities are women. Although agriculture is the dominant economic activity, it is not an employer of significance and does not produce the bulk of the food consumed in the area. Women play a vital role in sustaining livelihoods and carry many of the socio-economic and homestead responsibilities of the area. Women have shown a willingness to work for the improvement of the community and hold increasingly higher community and political portfolios.

3.2.4. Agricultural infrastructure and resources

Household food gardens play an important part in livelihoods, with the homestead food production contributing substantially to family food needs. While Port St Johns itself experiences more than 1600mm of rainfall per annum, the project area is in a rain shadow and typically experiences 650mm of rainfall, with 3 – 5 dry months a year. Food production over this period is impossible without supplementary irrigation. Securing household water often requires considerable human energy, mainly women or girls, obtained from untreated sources which include small dams, springs and the Mzimvubu river located 500m-800m below settlements.

Agrarianism and subsistence agriculture is widely practised. Aerial photography shows that a high percentage of households have garden plots. Surplus produce sales from household gardens are negligible. Government investment into the region's infrastructure (recent electricity and road development) has led to hope that the agrarian sector will similarly receive support and that farming can be re-invigorated in the area. Water security remains a concern for both household consumption and agricultural uses. The scoping visit obtained feedback that collection of roof runoff has become more widely practised, primarily for household use as it relieves the women of some of their traditionally allocated roles. Despite this increase in tanks being evident, water for homestead use is routinely transported by ox sledges from the deeply incised rivers. But water-harvesting for food production has not been introduced nor observed locally. There is some irrigation activity in small stand-alone irrigated farming initiatives in fields adjacent to rivers, with some electrified pumps reportedly recently installed. The implementation of bulk water supply from Butterworth to Willowvale is underway and this will enhance domestic water security to the area by providing Free Basic Water (in communal tap stands) to homesteads.

Despite irrigation schemes around the area, food production is marginal in meeting consumption needs. Most foods and fresh produce is purchased in Whittlesea, grown by neighbouring large scale commercial farmers. Mbekweni is situated in an extensive fertile land adjacent to Oxton dam which has good agricultural potential. Beyond this, the area is surrounded by three dams. The annual average rainfall of Mbekweni is 399mm with most of the rainfall occurring during summer. The area is semi-arid. Infrastructure, especially concerning water reticulation, is unreliable. Households have an average size of land (50m X 50m) for garden use. Many of these gardens are not productive for a range of reasons, including scarcity of water, a lack of skills, a lack of resources and poor fencing. One peculiar thing about Mbekweni is that their fields have irrigation including their home gardens. Drought, winter cold and frost periods place a further challenge on household food production.

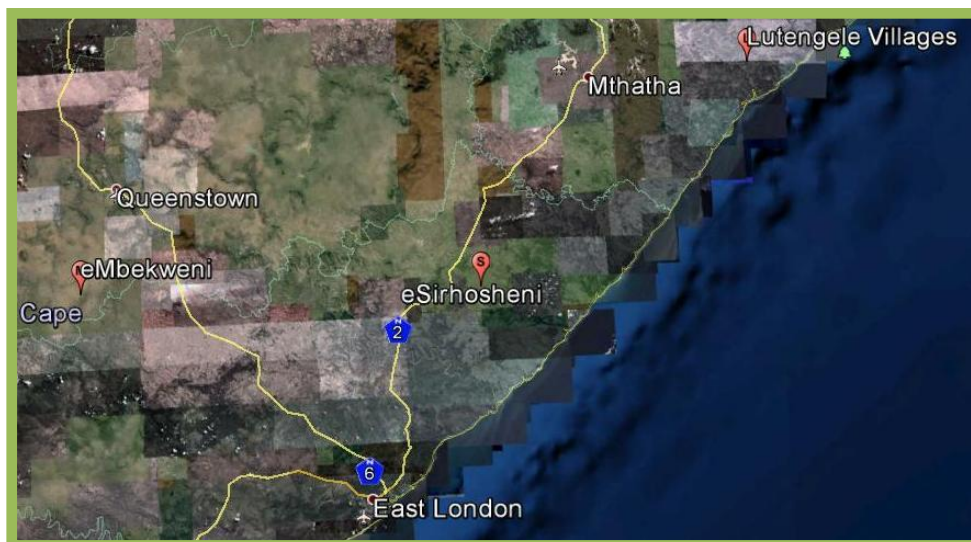


Figure 3.1: Project sites in relation to major towns in Eastern cape

3.3. Methods of data collection

This section reviews research methods that were used in collecting and analyzing data from women who are participating in water and food security projects in the proposed study area highlighted above. It is specifically intended to show how the research tools were used in the study. It begins by explaining the sampling procedure and sampling size from which the data were collected. The section will further describe the sample size used.

3.3.1. The Sampling Procedure

Sampling is a process of selecting units from a desired population such that the results obtained from studying the sample may be generalized from the population (Bless et al, 2006). Thus, the characteristics obtained from the sample should reflect (approximately if not exact) characteristics of the population from which the sample had been drawn from. The way the sample units are collected should be done carefully because the sample should represent the population; therefore, the sample size should be large enough to conduct reliable statistical analysis. According to Bless et al. (2006), a sample size should be at least 30% of the population to get reliable statistics.

The unit of analysis in this study was the household with special emphasis on female headed households in the selected three villages, because the study aims to investigate the farming skills and knowledge of women in food and water security. Thus the farmer in that particular household was targeted as she is thought to have the accurate information on issues related to household farming. Bless *et al* (2009) defines unit of analysis as “the major entity that is being analyzed in the study”. In conducting the study both probability and non-probability sampling were used. The type of non-probability sampling that was used is purposive sampling. The probability sampling was used in the scoping survey across three sites, whilst, non-probability sampling was used in the in-depth survey. Under probability sampling, random and systematic sampling was employed. Under non probability, purposive sampling was used. This sampling technique is defined as a method of choosing subjects or respondents based on the knowledge of a population because of some specific characteristics. (Bless *et al*, 2006). The representative sampling of the study was based on certain characteristics required by the researcher. The main advantage of purposive sampling is that it gives a better understanding of studying certain behavior, and helps to reach the targeted population quickly. This type of sampling is normally chosen when the researcher wants to study certain characteristic in a population.

3.3.2. Sampling frame

A sampling frame is defined as the “actual set of units from which a sample will be drawn” (Bless et al, 2006). The sampling frame consisted of a total of 164 farmers across three sites. It is from this sampling frame that 30 farmers were interviewed for the in-depth study. The sampling frame helped in ensuring that time is not wasted in finding farmers who best

represent the population. To get the sample frame relevant people like extension officers were consulted and prior arrangements were made.

3.3.3. A sampling approach for the village scoping survey

Obvious stratifications of relevance to the study were identified from available pre-survey and prior work of partnering organisations in the area. At Lutengele village there is a group of women who farm independently, but interact routinely in an organized way around gardening and food production. Other people grow food but are not actively part of what they call the “working group”. In the case of Mbekweni village agricultural activities and interests were identified. Sampling within these observed strata were approached differently as the population sizes are different. According to Bless and Higson-Smith (2000), a larger sample size of 30 to 50 percent should be used for smaller populations such as a 100 households. A sample should be representative and large enough to conduct reliable statistical analysis. However, other studies in the former homelands and with an agricultural emphasis in particular (McAllister, 1998; Fay 2005) were based on a smaller purposively selected sample of as little as 7 households (McAllister, 1998).

Given the initial stratifications and that these have different population sizes; sampling percentages are not consistent across the strata. The sampling requirement for the larger populations was set at a minimum of 15% or 20 households, whichever the larger number of households. A total of 164 households were interviewed across three sites, a clear stratification is shown clearly on Table 3.1

Table 3.1: Study area population and sample size for stratified groups in selected villages for Round 1 of surveys (Village scoping survey)

Initial stratification	Mbekweni			Sirhosheni			Lutengele		
	Pop	No	%	Pop	No	%	Pop	No	%
Group 1	380	60	15	263	51	19	203	31	15
Group 2	None			None			71	22	30

Table 3.2.: Sample overview

Site	Number of Respondents selected
Lutengele	53
Mbekweni	60
Sirhosheni	51
TOTAL	164

A systematic sampling technique was used to draw the sample of project members where the full population was not surveyed. This was done using Google Earth maps of the villages to identify household heads (HH), counting within sub-villages, to achieve the percentages required. Systematic sampling is probability sampling, which is used so that each element of the population has equal chances of being drawn as an element of the sample (Bless and Higson-Smith, (2000). The sampling method ensures a good coverage of the study area since the sampling units are evenly spread (Sarantakos, 2005).

For an in-depth survey a sampling size of 30 farmers was interviewed to represent the population of farmers across selected villages highlighted above. The sampling was extracted from the main survey purposively. The sample focused on both male and female headed households, those who have *igadi*¹ or *isitiya*².

This research was attached to a Water Research Commission (WRC) project, which was the funder. Therefore, the sampling size was discussed and determined by the funders based on the following factors:

- the person of interest
- resources available e.g. time given to complete research project and keeping in contact with the participants.
- multiplicity of variables in the entire project
- the need to gain in-depth insight into a range of factors

¹ In this study *igadi* is referred to as a food plot where only rain-fed crops are planted such as maize, pumpkin, beans and potatoes.

² While *isitiya* is referred to as an irrigable food plot in which vegetables are grown like cabbage, spinach, carrots, etc.

- practical considerations
- determined number of interviews to produce the desired outcomes
- convincing analytical narrative, based on richness, complexity and detail.

3.4. Data collection

For data collection, a consolidated semi-structured interview questionnaire was used as a tool for primary data collection. The questionnaire was designed in order to collect both qualitative and quantitative data. A developed questionnaire was developed in such a way that it captures the intended information. Amongst others, the questionnaire was to encompass the gendered baseline socio-economic data, as well as a preliminary set of information on skills and capability. Before interviewing the individual farmers group discussions were held with relevant people to get background information and general information about the project. It is during that first meeting that farmers were informed in details about why and how the interviews were going to take place.

The questionnaire was administered through face-to-face interviews. There are other ways in which questionnaires can be administered; such ways include self-administered questionnaires, telephone surveys and online questionnaires (Jari and Fraser, 2009). However, face-to-face interviews were chosen because they have several advantages over other methods. An interviewer-administered interview is an important tool of data collection because it reduces the omission of difficult questions by respondents (Bless *et al* 2006). Jari and Fraser (2009) indicate that interviewer administered interviews reduces the problem of word or question misinterpretation (misunderstandings) by respondents and can be administered to farmers who can neither read nor write. A face-to-face kind of administering interview is the best suitable way of administering a questionnaire (Ntsonto, 2005). Some of the dependent variables used to extract information included obtaining information on the following:

- Technical skills (crop production, seedbed preparation and the irrigation management)
- Traditional skills

3.4.1. Variables collected

The questionnaire was designed to capture a number of socio-economic factors that might have an effect on the identified knowledge and skills and that may consequently influence

smallholder farmers across three sites to enhance their productivity or food security. Some of the variables that were collected are summarized in the table below:

Table 3.3: Definitions and units of measurements of the variables modelled.

Dependent Variable	Definition	Value
Farming skills and Knowledge	Farmer being able to carry out farming activities	Coded 1 if farmer has knowledge and skills and 0 if otherwise
Independent Variable	Definition	Value
Age	Age of the head of the household in years	Actual age in years
Education	Level of education obtained	Actual grade obtained
Gender	Whether the household is male headed or female headed	Coded 1 if the farmer is a male and 0 if the farmer is a female
Household size	The number of the members of the household.	Actual number of the household.
Farming experience	Years of farming of the head of household	Actual number of years the farmer has in farming
Land size	The size of igadi or isitiya	Actual size of isitiya or igadi
Extension contact	Extension services rendered by an extension officer	A dummy variable coded 1 if the farmer is being assisted by an extension officer; 0 if otherwise
Training	The acquisition of knowledge and skills by the head of the household	A dummy variable Coded 1 if the farmer attended any training; 0 if not attended any training
Input	Technical inputs	A dummy variable = 1 if the farmer gets all the necessary technical inputs in time; 0 if otherwise

3.4.2. Variable Specification

A dependent variable for skill/ knowledge acquisition is whether farmers have the knowledge and skills or not. Failure to have farming skills and knowledge in this study has been hypothesized to be primarily as a result of constraints in independent variables as shown in Table 3.3. The dependent variable was coded with a value of 1 if a farmer possessed the skills in question and 0, if not. The dependent variables considered include technical skills, and marketing skills.

3.4.3. Age of a farmer

Age is a continuous variable; it measures the actual age of the household head in years. Younger farmers are less experienced than older farmers. And therefore it is hypothesized that older farmers are more skilled and knowledgeable than younger farmers. This is supported by an observation by Sikwela (2008) that older farmers usually relatively have richer experiences of the social and physical environments with greater experiences of farming activities which they acquire over time. The same conclusion was reached by Tshuma (2013) who viewed the relationship between age and the level of knowledge as being positive.

3.4.4. Gender

It is expected that male headed households are agriculturally more skilled in crop production than female headed households. Women are perceived to be economically inactive in many sectors including the agricultural sector and they are the champions in unpaid duties at home. These duties include cooking, looking after the children, collecting wood and water and making fire. Men have more advantage in acquiring skills and knowledge in farming as they are the majority in the agricultural sector

3.4.5. The level of education

The relationship between education and farmers' skills and knowledge is expected to be positive as education enhances farmers' skills. Education can make farmers aware of the new existing skills and be able to adopt new technologies. This is supported by Sikwela (2008) that the number of years spent in education is an important determinant for technology

adoption. Education therefore acts as a catalyst in the flow of information, and thus makes it easy for farmers to accept new technology or new knowledge.

3.4.6. Farming experience

This variable is measured by the number of years the head of the household has been doing farming. The longer the number of years the farmer has been in farming the greater the chances of attaining more skills and knowledge, hence the relationship is expected to be positive between farming experience and the level of knowledge and skills the farmer possesses.

Land size

The size of the land is measured by the actual number of square metres of *isitiya* or *igadi*. This variable measures the intensity of land available to farmers. The relationship of land size and the level knowledge and skills is expected to be positive as bigger land can give the farmer many options of working the land, planting different crops and therefore getting more knowledge and skills.

3.4.7. Extension contact

This variable is measured by extension services rendered by an extension officer. Extension officers disseminate information to farmers so that farmers can be knowledgeable about agricultural practices. The relationship is therefore expected to be positive as more information delivered to farmers will increase their level of skills and knowledge.

3.4.8. Access to training

This variable is measured by the acquisition of knowledge and skills by the head of the household. Whether informal or formal training the farmer has to indicate whether he attended the training or not, as training is the source of information.

3.5. Methods of data analysis and interpretation

The first stage of data analysis was to prepare the raw data and transform it into a machine-readable format. A database was created on the basis of the information collected, in the form of spread-sheets and in MS Excel.

In analysing the collected data, descriptive statistics were be used. The main descriptive indicators that were employed are frequency and mean values as they are known to be useful in analysing the characteristics of households and the ability to analyze the relationship between variables. Excel and Statistical Package for Social Scientists (SPSS) were used to run the data collected from the farmers at the proposed study area.

3.5.1. Data interpretation

The Binomial logistic regression model

The Binary logistic regression model was used to test the skills and knowledge women have in order to participate in food and water security projects. It is actually used to investigate the effect of socio-economic factors on the identified skills and knowledge that may influence women's participation on water and food security projects to enhance productivity. The Binary logistic regression model is normally preferred because of its simpler mathematical structure and the dichotomous nature of the data which is going to be collected (Gujarati, 1992). Trenmer and Elliot(n.d: 6) argue that socio-economic variables are often categorical, rather than interval in scale and that in many cases research focuses on models where the dependent variable is categorical.

The Binary logistic regression model is normally referred to as binary choice because it gives a relative probability of falling into one of the two categories on some variable of interest, which has only two categories in the response variable (Gujarati, 1992).

As indicated above, the model for this study is a binary choice model requiring the estimation of the probability that women participating in water and food security have skills and knowledge. Since the aim of the study is to establish whether women participating in these water and food security projects have the skills and knowledge to undertake farming, there are only two options available, namely “farming skills and knowledge” or “no farming skills and knowledge”. A binary model is set up which defines $Y=1$ for situations where the women have farming skills and knowledge, and $Y=0$ for situations where some or all do not have farming skills and knowledge. Assuming that x is a vector of explanatory variables and p is the probability that $Y=1$, the dependent variables assessed in this study include skills on vegetable production such as soil preparation, water conservation, marketing skills etc. The study only assessed crop and vegetable production skills, as the main focus of the study is on crop production.

Model specification

$$\rho(Y=1) = \frac{e^{\beta'x}}{1+e^{\beta'x}} \dots\dots\dots 1$$

$$\rho(Y=0) = 1 - \frac{e^{\beta'x}}{1+e^{\beta'x}} = \frac{1}{1+e^{\beta'x}} \dots\dots\dots 2$$

$$\log[\theta(x)] = \log \left[\frac{\theta(x)}{1 - \theta(x)} \right] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots \beta_n x_n \dots\dots 3$$

θ = logit transformation of the odds ratio

α = the intercept term of the model

β = the regression co-efficient or slope of the individual predictor (or explanatory) variables modeled

x_i = the explanatory or predictor variables.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1. Introduction

This chapter presents the socio-economic profile of the beneficiaries. The findings are presented per District Municipality in various sub-sections sampled in the survey. It begins with the Chris Hani District Municipality with Embekweni chosen as the study site in Whitlesea, followed by the Amathole District Municipality with Esirhosheni selected as the study site in Willowvale and lastly the OR Tambo District Municipality with Lutengele in Port St Johns.

4.2. Profile of beneficiaries

4.2.1. Demographic characteristics of Mbekweni villages (Stopini, Injini, Siqingqini Mthini)

This section summarises the basic sample statistics of the sample population from the above three villages as summarized in Table 4.1. A sample population of 60 households was considered for face to face interviews. The average household age was 57 years with a minimum of 16 and a maximum of 90 years negatively skewed.

Table 4.1: Basic sample statistics of households at Embekweni (n = 60)

Statistics									
		Age	Gender	Marital Status	Education	Employment Status	Occupation	Time at home	Household size
N	Valid	60	60	60	60	60	60	60	60
Mean		57.05	1.51	2.00	5.41	.31	1.32	1.08	5.46
Median		60.00	2.00	2.00	6.00	.00	.00	1.00	4.00
Std. Deviation		20.737	.537	.891	4.355	.969	1.467	.385	2.836
Skewness		-.900	-.380	1.213	.203	4.396	.398	4.640	.501
Minimum		16	0	1	0	0	0	1	0
Maximum		90	2	5	12	3	4	3	11

(Survey, 2012)

On average, the household heads were educated up to grade five with a majority of them classified as unemployed. The commonly reported occupation status from the study area

was 1, suggesting that most respondents were classified as farmers who would spend most of their time at home. On average a household size of five family members was common in the study area.

With reference to a possible relationship between gender and education Table 4.2 indicates that there was no evidence of association as suggested by the Chi-Square test.

Table 4.2: Estimated association between gender and education at Mbekweni (n = 60)

Gender * Education Cross-tabulation															
Count															
		Education													Total
		0	1	2	3	4	5	6	7	8	9	10	11	12	
Gender	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	1	5	3	2	1	3	0	3	3	1	1	0	0	5	27
	2	6	2	3	2	2	1	3	2	2	2	4	2	1	32
Total		12	5	5	3	5	1	6	5	3	3	4	2	6	60
Chi-Square Tests															
				Value	df	Asymp. Sig. (2-sided)									
Pearson Chi-Square				12.553	24	.973									
Likelihood Ratio				14.082	24	.945									
N of Valid Cases				60											

(Surveyed: 2012)

With reference to gender and employment Table 4.3, summarises the estimated association. No evidence of association was obtained between the two variables as suggested by the Chi-Square test.

Table 4.3: Estimated association between gender and employment at Mbekweni (n = 60)

Gender * Employment Status Cross-tabulation						
Count						
		Employment Status				Total
		0	1	3	6	
Gender	0	1	0	0	0	1
	1	23	3	1	0	27
	2	26	3	2	1	32
Total		50	6	3	1	60
Chi-Square Tests						
		Value	df	Asymp. Sig. (2-sided)		
Pearson Chi-Square		1.218	6	.976		
Likelihood Ratio		1.734	6	.943		
N of Valid Cases		60				

(Survey: 2012)

In Figure 4.1, a summary of the observed distribution of households sample population by age group is presented. The distribution indicates that most households had family members between the ages of 15 – 64 years (63%), followed by children under the age of 14 years (27%).

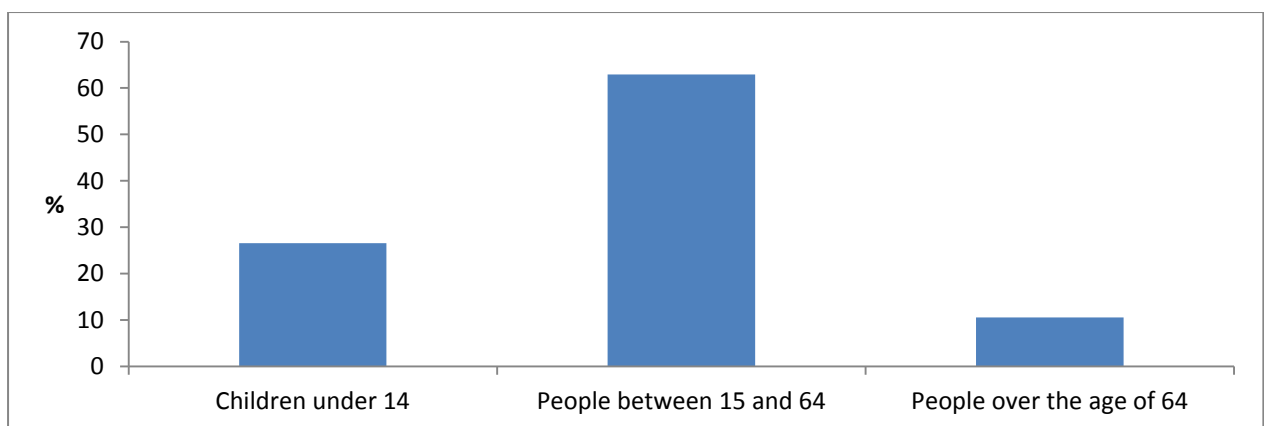


Figure 4.1: Distribution of sample population by age group (n = 60)

Figure 4.2 presents a summary of the observed distribution of gender by age group. Males dominated the category of children under 14 years, with a 50:50 dominance of both sexes for the age group of 15-64 years and the category over the age of 64 years.

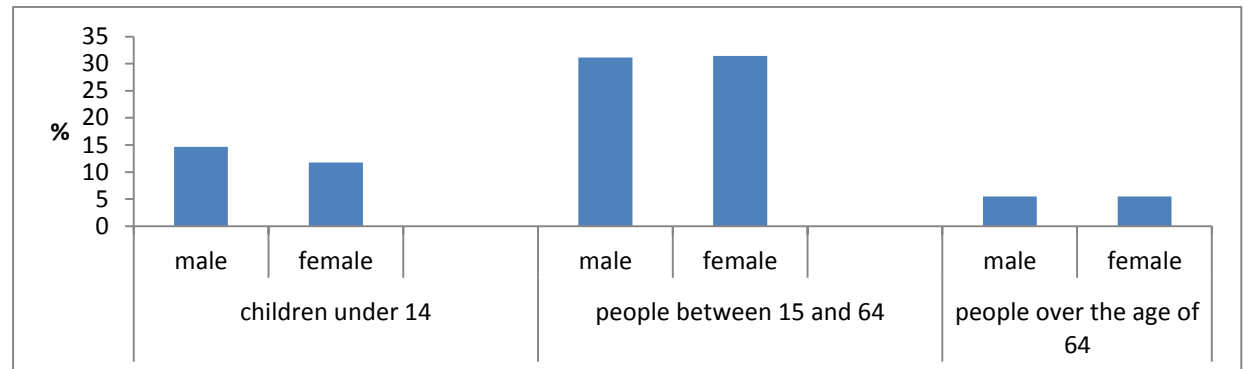


Figure 4.2: Distribution of gender by age group (n = 60)

4.2.2 Demographic characteristics of Sirhosheni village (including parts of Rhosha, Lamla, Nzoto, Komkhulu, Choma and Ngqwesha)

The basic sample statistics of the sample population in the study area is summarized in Table 4.4. A sample population of 51 households was considered for face to face interviews. The mean age for the household head was 58 years with a minimum of 27 and a maximum of 83 years, negatively skewed.

Table 4.4: Basic sample statistics in eSirhosheni (n = 51)

Statistics									
		Age	Gender	Marital Status	Education	Employment Status	Occupation	Time at home	Household size
N	Valid	51	51	51	51	51	51	51	51
Mean		57.84	1.74	2.74	4.11	.32	.95	.95	5.51
Median		60.00	2.00	3.00	3.00	.00	.00	1.00	4.00
Std. Deviation		13.777	.452	1.327	4.241	.946	1.433	.229	2.760
Skewness		-.423	-1.170	-.256	.626	2.798	.862	-4.359	.639
Minimum		27	1	1	0	0	0	0	0
Maximum		83	2	5	13	3	4	1	12

On average the household heads were educated up to grade four. The mean reported occupation from the sample population was 0.95 (1), indicating that most respondents were classified as farmers. Respondents spent most of their time at home. The household size on average was almost 6 family members.

This section estimates any possible association between gender and education as summarised in Table 4.5. No evidence of association was obtained as indicated by the Chi-Square test.

Table 4.5: Estimated association between gender and education Sirhosheni (n = 51)

Gender * Education Cross-tabulation															
Count															
		Education													Total
		0	1	2	3	4	5	6	7	8	9	10	11	12	
Gender	1	6	0	1	0	3	2	2	0	0	2	0	1	2	19
	2	0	2	1	4	6	1	4	3	3	4	3	1	0	32
Total		6	2	2	4	9	3	6	3	3	6	3	2	2	51
Chi-Square Tests															
						Value	df	Asymp. Sig. (2-sided)							
Pearson Chi-Square						14.348	13	.350							
Likelihood Ratio						18.025	13	.157							
N of Valid Cases						51									

(Survey: 2012)

With reference to gender and employment Table 4.6, summarises the estimated association. No evidence of association was obtained between the two variables.

Table 4.6: Estimated association between gender and employment at Sirhosheni (n = 19)

Gender * Employment Status Cross-tabulation						
Count						
		Employment Status				Total
		0	1	2	3	
Gender	1	13	3	3	0	19
	2	25	2	4	1	32
Total		38	5	7	1	51
Chi-Square Tests						
		Value	df	Asymp. Sig. (2-sided)		
Pearson Chi-Square		4.072	3	.254		
Likelihood Ratio		4.005	3	.261		
N of Valid Cases		51				

(Survey:2012)

Figure 4.3 presents the distribution of households sample population by age group. The distribution indicates that most households had family members defined in the young age group category (48%) followed by the active age group (44%).

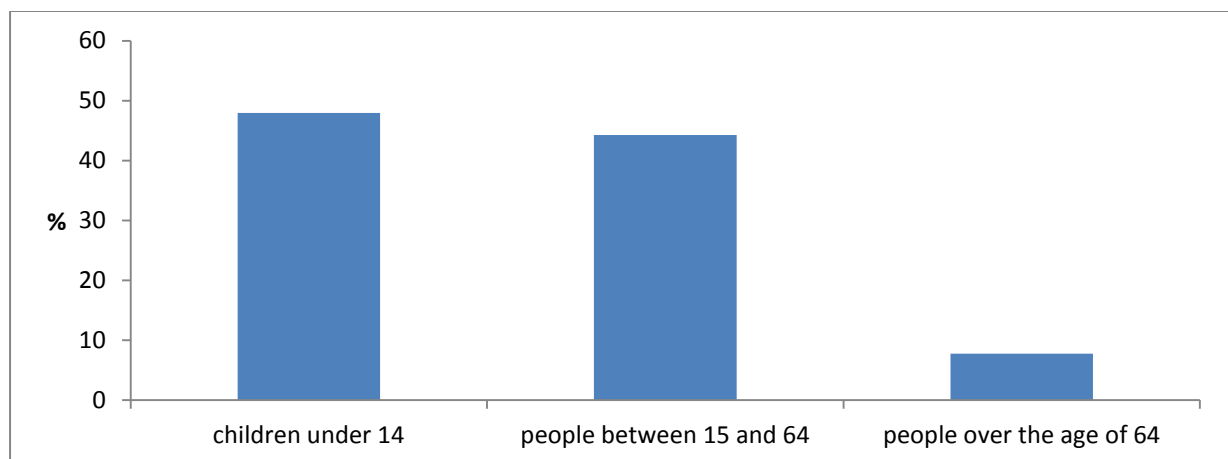


Figure 4.3: Distribution of sample population by age group n = 51)

Figure 4.4 summarizes the observed distribution of gender by age group. For all age categories females dominated as shown in Figure 4.4.

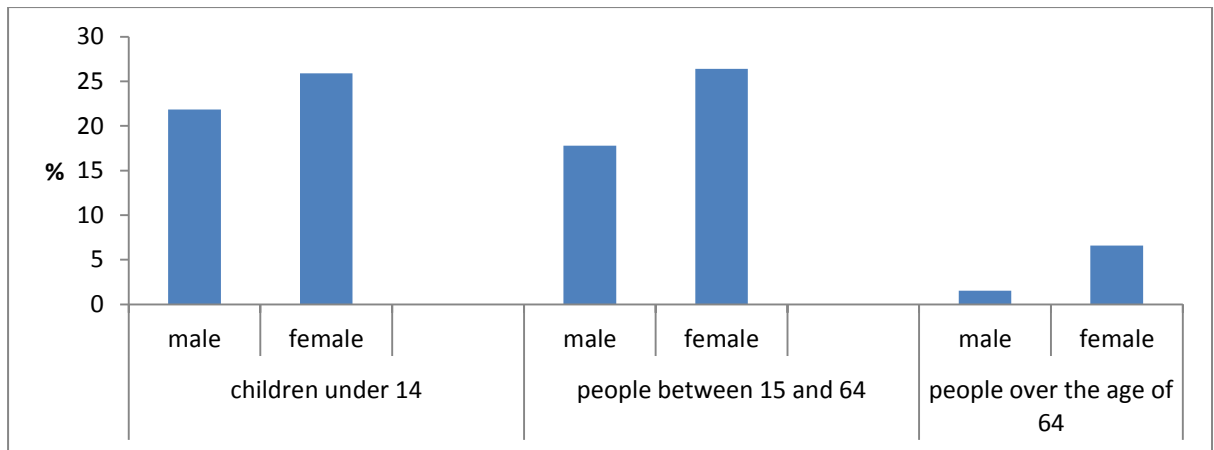


Figure 4.4: Distribution of gender by age group (n = 51)

4.2.3 Demographic characteristics of Luthengele villages (Qhoboshendlini and Tyityane) in Port St John's.

The summary of the basic sample statistics of the sample population in the two villages is presented in Table 4.7. A sample population of 53 households was considered for face to face interviews. The mean age for the household head was 54 years with a minimum of 21, and a maximum of 86 years, negatively skewed. The average household size in the study area was 5.9 people per household.

Table 4.7: Basic sample statistics in the study area at Luthengele (n = 53)

Statistics									
		Age	Gender	Marital Status	Education	Employment Status	Occupation	Time at home	Household size
N	Valid	53	53	53	53	53	53	53	53
Mean		53.26	1.74	2.35	4.36	.36	.87	1.21	5.92
Median		56.00	2.00	2.00	4.00	.00	.00	1.00	5.00
Std. Deviation		13.852	.445	1.101	3.701	.710	1.428	.661	3.407
Skewness		-.136	-1.101	.913	.296	1.699	1.147	2.241	.522
Minimum		21	1	1	0	0	0	0	0
Maximum		86	2	5	12	2	4	3	16

(Survey:2012)

On average, the household heads were educated up to grade four. The mean reported occupation from the sample population was 0.87 (1), indicating that most respondents were

classified as farmers. Respondents spent most of their time at home. Statistics further indicates that on average a household size of almost six people was common in the study area.

The possible association between gender and education was estimated and the results are presented in Table 4.8. No evidence of association was obtained as indicated by the Chi-Square test.

Table 4.8: Estimated association between gender and education at Lutengele (n = 53)

Gender * Education Cross-tabulation															
		Education													Total
		0	1	2	3	4	5	6	7	8	9	10	11	12	
Gender	1	4	0	1	0	3	1	2	0	0	1	0	1	1	14
	2	11	2	1	2	6	1	4	2	3	4	2	1	0	39
Total		15	2	2	2	9	2	6	2	3	5	2	2	1	53
Chi-Square Tests															
					Value	df	Asymp. Sig. (2-sided)								
Pearson Chi-Square					8.927	12	.709								
Likelihood Ratio					11.385	12	.496								

(Survey: 2012)

With reference to gender and employment, Table 4.9 summarises the estimated association. Again, no evidence of association was obtained between the two variables.

Table 4.9: Estimated association between gender and employment at Lutengele (n = 53)

Gender * Employment Status Cross-tabulation					
Count					
		Employment Status			Total
		0	1	2	
Gender	1	8	3	3	14
	2	33	2	4	39
Total		41	5	7	53
Chi-Square Tests					
		Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square		4.880	2	.087	
Likelihood Ratio		4.436	2	.109	

(Survey:2012)

Figure 4.5 presents the distribution of households sample population by age group. The distribution suggests that most households had family members defined in the active age group (63%) followed by the young age group (29%).

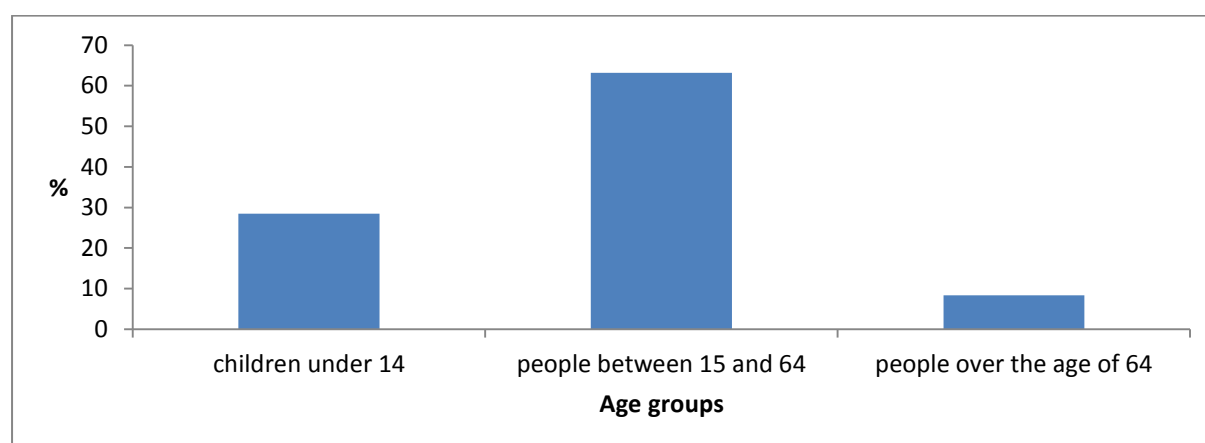


Figure 4.5: Distribution of sample population by age group (n = 53)

Figure 4.6 summarizes the observed distribution of gender by age group. For the active and old age groups females dominated as shown in Figure 4.6.

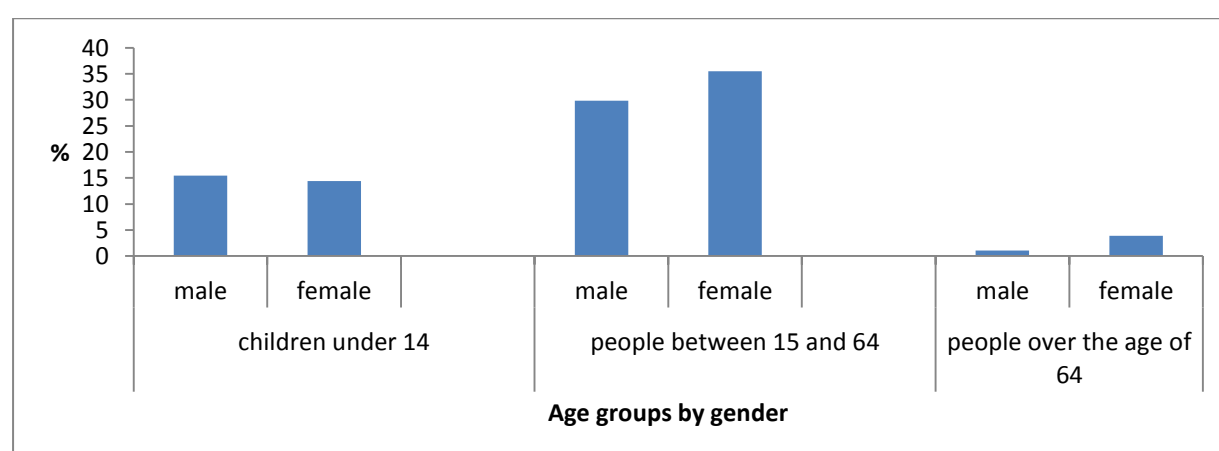


Figure 4.6: Distribution of gender by age group (n = 53)

4.3.Livelihoods in the study areas: Sirhosheni, Mbekweni and Lutengele villages

Recent studies on rural livelihoods (Hebinck and Monde, 2007; Hebinck *et al*, 2007) show that agriculture makes a modest contribution (<10%) to household incomes. A number of socio-economic factors contribute to this state of farming in rural areas. Swift and Hamilton (2001) defined a livelihood as capabilities, assets (both material and social) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover

from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base (Swift and Hamilton, 2001).

This section presents results on livelihood sources, it begins by giving an analysis on income sources across three sites that include income in farming/agriculture, remittances and non-farm income such as the government's grants and off farm salaried labour.

4.3.1. Income sources of the households

An analysis of income sources adds insight into the income generation processes of the three villages, Sirhosheni (Willowvale), Mbekweni (Wittlesea) and Lutengele (Port St Johns). Household income was calculated from the summation of all sources of income i.e. income coming from crop sales, remittances, child support grant, old pension grant, disability grant and non-agricultural labour. The Average total household income is an addition of off-farm income and on-farm income. On-farm income is only one category i.e. income from the sale of crops produced and off-farm income included income from salaries, remittances, child support grant, disability and the old pension grant. Table 4.10 below shows the different sources of income for the average households. Table 4.10 classifies the incomes according to the various income groups, so that a comparison can be made between different sources of income across three sites.

Table 4.10 Distribution of total household income by the category of farmers

(ZAR00 000 per for the year 20011-2012) ³						
VILLAGES	SIRHOSENI (n=10)	I	LUTENGELE (n=10)		MBEKWENI (n=10)	
CATEGORY	AMOUNT	%	AMOUNT	%	AMOUNT	%
Farming/Agriculture	2.024	100	2.018	100	0.33	100
Total on- farm income	2.024	100	2.018	100	0.33	100
Remittances	0.16	0.9	0.05	0.4	1.852	9
Off farm salaried labour	1.08	6	0.08	0.6	0.84	4
Child support grant	5.325	29	8.238	64	3.612	17
Old pension grant	9.84	54	4.32	33	14.4	67
Disability grant	1.92	10	0.288	2	0.924	4
Total off farm income	18.325	100	12.926	100	21.628	100
Total Income	20.349	100	14.944	100	21.958	100
Average household income	2.0349	-	1.494	-	2.196	-

Table 4.11 Mean total income, adult equivalent income and size of household of Esirhosheni, Lutengele and Mbekweni

Site	Mean Total household income	Mean AE Income	Mean household size
	(R Month ⁻¹)		
Esirhosheni	1696	394	5.92
Lutengele	1245	343	5.51
eMbekweni	1830	426	5.46

³The 2011-2012 year had an inflation of about 5.5%, the figures above are Ten thousands rands. Farming/Agriculture *-include crops and vegetables such as maize, onions, spinach, cabbage

4.3.2. Income from Farming/Agriculture

The income from farming includes crops and vegetables such as maize, beans, pumpkin onions, spinach, cabbage, potatoes, carrots etc. Maize is a summer crop; it is grown on summer because there is a lot of rain during the summer season. Most vegetables are planted throughout the year because they are planted in small plots or gardens and are therefore easy to manage in terms of irrigation. Table 4.10 shows that farming contributes about 10% and 14% percent to the total income of the household at Sirhosheni and Lutengele respectively while Mbekweni contribute only less than 2%. The contribution reflected is only of the sales of crops and vegetables by farmers. At Lutengele it is not surprising to see farming contributing this much, as the results from this study show that the majority of respondents from Lutengele produce for food security and to make money. Most of the vegetable produce was marketed at the farm gate i.e. farmers sold their products directly to the customers including maize. Vegetable crops had a high income because they are grown twice or more times per year. Maize was sold at R150/ bag. One respondent from Lutengele explained a good marketing strategy for maize in that she sells one 5kg bag of maize at R35.00 indicating that you can make a lot of profit that way. Farmers from Lutengele were keen to sell outside of their areas or in town, but distance and transport were the major challenges. The results suggest that respondents from Sirhosheni realized that most of their profits were from the sale of maize and beans which are dominant in the area. Mbekweni contributed less to the total income simply because the majority of the produce only for consumption purposes. Respondents from Mbekweni indicated that one of the major blows in that year was drought.

4.3.3. Remittances

Remittances for farmers from Mbekweni were higher than that of Sirhosheni and Lutengele. Both of these two villages had less than 1% of income coming from remittances while Mbekweni had 9%. The high figure for Mbekweni could be the fact that the area is surrounded by commercial farmers around, and the fact that most of the family members are employed in big cities like Cape Town and some are working in Wittebaai. They are therefore able to send money to their families and also bring groceries from time to time. However, remittances being less than even 10% across three sites indicate a level of poverty and a lack of jobs in urban areas. Mushunje (2005) stated that a low percentage for remittances is an indication of poverty levels in urban areas, such that people in urban areas contribute very little to the income of households in the communal areas.

4.3.4. Off-farm income

4.3.4.1. Off farm salaried labour

Table 2.1 shows that Lutengele receives less than 1% of income relative to the total income, while Sirhosheni and Mbekweni receive 5% and 3% respectively. The low figures are an indication of high levels of unemployment in these villages. However, respondents indicated that they do get temporary jobs sometimes from the EPWP programme. The Expanded Public Works Programme (EPWP) is one of the many programmes offered by South African Government. The EPWP aims to provide poverty and income relief through temporary work for the unemployed to carry out socially useful activities at the EPWP. Casual labour is another source of income in communal areas. Some farmers indicated that they receive income for working in other people's fields or homesteads. They also indicated that from the little income they get from these part time jobs they buy agricultural inputs. Low levels of income from casual labour could be the age of respondents across three sites that mostly derive income from government support grants. Very few people are employed as skilled labour in these areas. It is not surprising to find that most of the smallholder farmers are poor. This is because the total household income is not the net household income (Mushunje, 2005). "Ilima" (exchange of labour) is still common in other villages like Sirhosheni where people work in each other's fields during the period of weeding.

4.3.4.2. Government Support grants

Approximately 80% of the households across three sites indicated that their major income source is the government grant (child, disability and old age grants). From this income farmers derive their subsistence money, money for agricultural inputs. An independency from government reveals high levels of poverty in these areas. Across three sites an average household income is approximately R20 349.00 per annum which means per month an average household receives about R1695.75 per month. This money is too little for an average household size of 5 people. It simply means that each person is living on just more than R10.00 per day or just above poverty \$1 US\$ per day which is nearly the below poverty line. For an example in Table 4.11 a mean total income at Sirhosheni is R1696.00 with an average household size of 5.92, which gives an adult on equivalent income of R394.00. Comparing the three sites there is not much difference in terms of their adult equivalent income.

4.4. Farming systems of the study areas: Sirhosheni, Mbekweni and Lutengele villages

The situational analysis identified one of the variable characteristics of the respondents across the three sites as owning a home garden (*igadi*), or irrigated food plot (*isitiya*), some have both *igadi* and *isitiya* whilst some also have a field (*intsimi*); but they are not used for a reason. The section below presents the results on the sizes of *igadi* and *isitiya* and crops planted in these gardens and irrigated food plots.

4.4.1. Land sizes

Table 4.12: Home gardening sizes (M²) of respondents in Sirhosheni, Lutengele and Mbekweni

	Sirhosheni (M ²)	Utilized land (M ²)	Lutengele (M ²)	Utilized Land (M ²)	Mbekweni (M ²)	Utilized land (M ²)
1	6035.00	6000.00	1652.92	1600	810.00	793.00
2	3291.60	3198.00	2067.00	2000	528.00	512.00
3	6120.00	6093.00	7150.00	6150.00	290.50	260.00
4	3561.30	3500.00	340.00	0	690.00	612.00
5	9924.00	9756.00	2670.00	2000	253.00	241.00
6	3420.00	3387.00	3663.22	3600	250.00	245.00
7	5364.00	5223.00	4600.75	4000	2500.00	231.00
8	9894.00	9694.00	4391.00	4300.00	1071.00	1065.00
9	4851.00	4698.00	1014.00	1000.00	442.00	413.00
10	18000.00	14000	341.00	335.00	1300.00	1284.00

This section presents results on homestead gardens, their size, and crops planted into those gardens. The home garden (*Igadi*) sizes have been measured by a tape measure in m². The results demonstrate that farmers from Sirhosheni have quite bigger homes as compared to Lutengele and Mbekweni (in terms of their sizes). It has been found that the larger the size of the homestead (*umzi*) the larger the garden (*igadi*). Mbekweni has smaller gardens (*isitiya*), with the smallest being 250 sq. metres. This could be as a result of its historic background in terms of improvement in that area. The biggest home garden in the sampled population has 18000 sq. metres at Sirhosheni.

Whether they are known as home, mixed, backyard, kitchen, farmyard, and compound or homestead gardens, family food production systems are found in most regions of most

countries worldwide (Catholic Relief Services, 2008). Homestead gardens act as highly effective production systems and may be the oldest production system known (Ibid, 2008). Their persistence is proof of their intrinsic economic merit and towards providing nutritional benefit to household members' merit. From the findings, people still practise agriculture at subsistence level in their homesteads.

Most importantly, the utilization of land from the results across three sites, show that all the gardens are being utilized to their full potential. Only a few of those have not been fully utilized. Interrogating reasons for this especially in Mbekweni, cited by respondents are challenges such as a lack of water, drought, labour, agricultural support. However, some respondents aspire to have more land (given the resources) to increase their production.

Table 4.13: Irrigated food plot gardens (M^2) of respondents in Sirhosheni, Lutengele and Mbekweni

	Esirhosheni(M^2)	Utilized land(M^2)	Lutengele (M^2)	Utilized Land(M^2)	Embekweni (M^2)	Utilized Land(M^2)
1	503.00	490.00	-	-	-	-
2	573.00	551.00	739.50	700.00	-	-
3	-	-	2170.00	2100.00	-	-
4	848.40	802.00	198.00	150.00	-	-
5	330.00	329.00	299.92	290.00	-	-
6	-	-	442.00	411.00	-	-
7	164.85	160.00	583.35	561.00	-	-
8	120.00	110.00	368.55	313.00	-	-
9	-	-	120.00	102.00	-	-
10	551.00	532.00	209.00	198.00	-	-
Average	441	425	570	536		

From the results above Lutengele has relatively bigger plots (isitiya) with an average of $570m^2$ compared to other areas. They were all utilized up to their maximum capacity. From the study, it has been established that most of Lutengele households have been involved in agriculture support programmes, notably water-harvesting and intensive food production initiatives. It is this reason that Lutengele village has been motivated by such initiatives to have more plots. The biggest plot at Lutengele is $739.50 m^2$ while the smallest is $120 m^2$.

Sirhosheni village had quiet bigger plots and they were utilized to their maximum capacity. Few households did not have distinct or isolated food plots or isitiya. The isitiya is inside the garden and it was not easy to measure them because the plots were inside the garden and some did not have plots at all. The largest plot at Sirhosheni is $848.40m^2$ with $802m^2$ being utilized to plant vegetables. The smallest is $120m^2$ with $110m^2$ being utilized to plant vegetables. Mbekweni village was totally different from other sites in that its plots were not

separated or isolated from the gardens (*Igadi*), which made it difficult for the researcher to measure them. Some gardens did not have plots at all.

Table 4.14: Home garden crops (n=30) of respondents in Sirhosheni, Lutengele and Mbekweni (n=30)

Crops	Sirhosheni %	Lutengele %	Mbekweni %
Maize	100	100	93
Potato	10	16	5
Pumpkin	63.3	52	41.33
Butternut	-	-	-
Beans	46.	32	29
Peas	-	-	-
Cabbage	4	7	30
Spinach	10	10	40
Carrots	-	-	-
Beetroot	-	-	-
Onion	-	-	-
Cauliflower	-	-	-
Garlic	-	-	-
Green/red pepper	-	-	-
Tomato		-	-
Other	3.33	3.33	3.33

In most homesteads, the study has found that a home garden (*Igadi*) is separated from a small irrigated food plot (*isitiya*). *Igadi* tends to be larger in size than irrigated food plots. From the results, home gardens are mainly characterized by the planting of maize. All the sampled households from Lutengele and Sirhosheni reported that they grow maize in home gardens (*igadi*). Other major crops, grown included pumpkin, beans, cabbage, and potatoes. In South Africa maize is the staple food for most people. This implies that maize crop plays an important role in food security for many South Africans. Even though the Eastern Cape Province is not a traditionally maize producing area, smallholder farmers in the province produce it mostly for subsistence purposes and some sell the surplus on the local market or use it to secure other goods through barter trading and also for livestock feed.

Respondents indicated that they choose to use both *igadi* and *isitiya* mainly because they want to diversify their crops. Most of the respondents stated that they plant maize, beans and pumpkins in their home gardens (*igadi*) and vegetables in *isitiya*. Additionally, respondents reported that they mainly utilize home gardens during the summer season when there is a lot of rain. Home gardens are mainly dependent on rain-fed irrigation as they do not have irrigation infrastructure, unlike at Mbekweni where most respondents reported that they do

have irrigation infrastructure for their home gardens except problems and challenges to access water.

Table 4.15: Crops and vegetables planted in isitiya of respondents in Sirhosheni, Lutengele and Mbekweni. (n=30)

Crops	Sirhosheni %	Lutengele% %	Mbekweni %
Maize	5	2	4
Potato	30	40	10
Pumpkin	2	5	1.5
Butternut	30	60	2
Beans	10	20	15
Peas	10.5	65	3
Cabbage	90	95	80
Spinach	70	90	75
Carrots	40	75	15
Beetroot	8	20	2
Onion	46	65	30
Cauliflower	-	10	-
Garlic	-	5	-
Green/red pepper	3	10	10
Tomato	10	19	2
Herbs	2	30	2

The most produced vegetables are cabbage and spinach which are produced by 90% and 70% of the sampled population from Sirhosheni, 95% and 90% from Lutengele and from Mbekweni is 80% and 75%. Carrots and onion are the second most produced crops followed by other crops. Lutengele is the only site where about 30% of the respondents indicated that they plant herbs for food and also for medicinal purposes. The respondents reported that they use *isitiya* to mainly plant vegetables. Farmers reported that that they plant vegetables on *isitiya* mainly because it is small and manageable in terms of taking care of it and irrigation. The vegetables are so diversified. The study has found that cabbages are mostly produced as a source of income, though they can also be used to supplement nutrition requirements of households. The number of respondents planting crops may indicate the need, suitability, and adaptability of crops of particular area.

4.4.2. Main Reasons for engaging in home gardening

The results show that, all the respondents interviewed at Lutengele village indicated that they produce food and sell their surplus. At Sirhosheni 70% responded that they only produce for home consumption and the remaining 30% indicated that they sell their surplus, especially maize, as the area is dominated by maize production. At Mbekweni 90% is producing for home consumption as well.

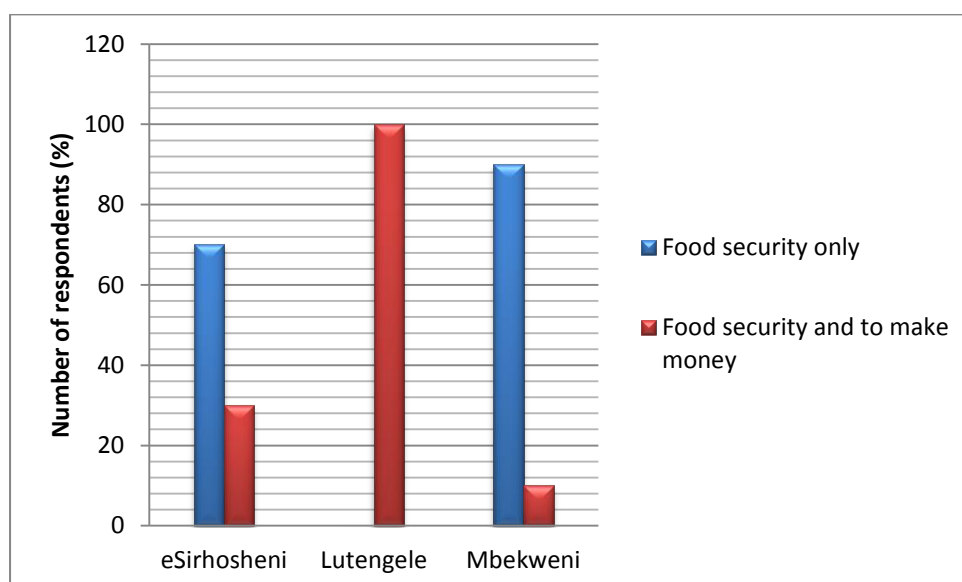


Figure 4.7: Reasons for engaging in home gardening by respondents at Sirhosheni, Lutengele and Mbekweni (n=30)

Source: Survey, 2012

The majority of households stated that they engage in farming mainly for food security across three sites, basically for household food security. Household food security plays an important part in livelihoods, with food production contributing substantially to family food needs.

When the farmers were asked if they achieve their objectives in farming, the majority of respondents (86.7%) indicated that in as much as they are farming at a small scale, they have managed to achieve their objectives in farming across three sites. A small number of respondents (13.3%) have pointed out that it is difficult to achieve their objectives because of many problems, citing one of them as water scarcity.

4.4.3 Soil conservation, fertility and water conservation

Soil conservation techniques are aimed at preventing or minimizing the loss of soil including nutrients. However, in order to do this, proper land utilization together with agricultural practices should be adopted.

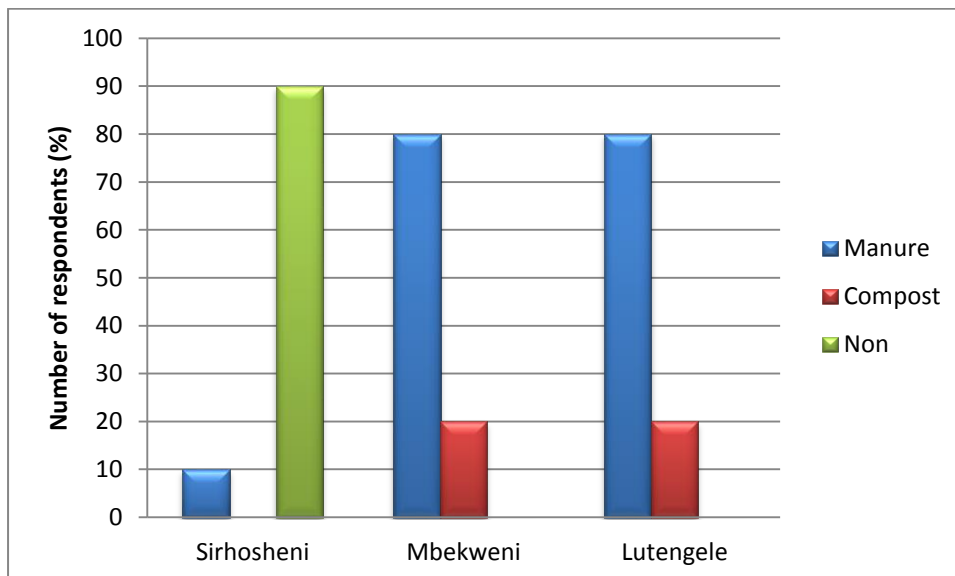


Figure 4.8.: Soil conservation technique

Mbekweni (80 percent) and Lutengele (80 percent) mostly use manure to enhance the quality of their soil and ultimately their produce, while at Sirhosheni respondents (10%) reported that they also use manure. While the remaining 90 percent of respondents do not apply any form of soil conservation except kraal manure. Few respondents at Mbekweni and Lutengele (20%) reported that they use compost to keep their soil conserved.

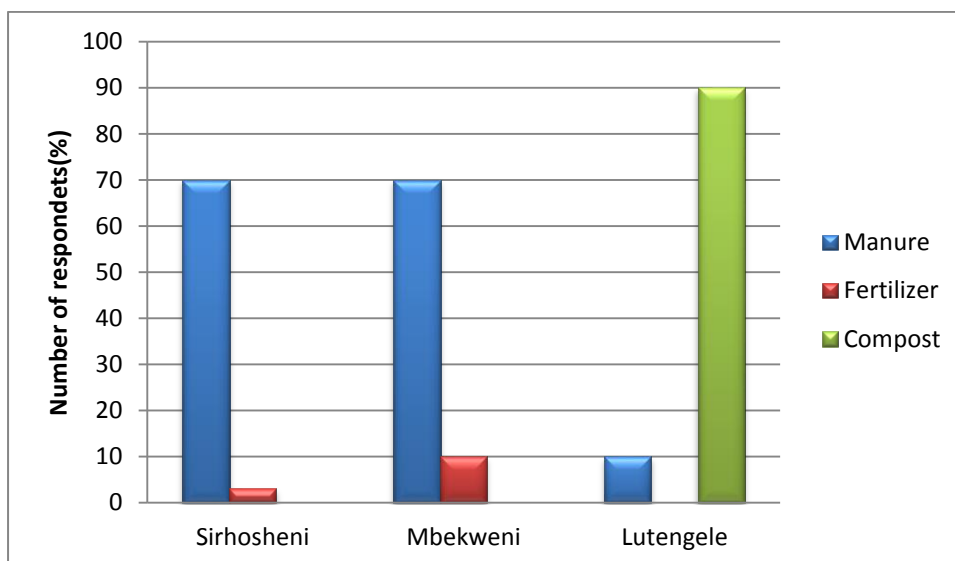


Figure 4.9: Soil Fertility

Ideally, soil should be managed to supply high nutrients to crops. The method of applying such nutrients can be organic or inorganic. Figure 3.3 shows that the majority of respondents from Sirhosheni and Mbekweni (70%) use manure and just about 10% apply fertilizer (guana) to their crops. At Lutengele 90 percent of respondents use compost to keep their soil more fertile. None of the respondents from Lutengele reported that they use inorganic fertilizer into their gardens. This could be the influence from a woman's group who use natural farming methods. They use organic methods by applying compost and manure to their crops because they are cheap alternatives.

Respondents were asked if they have knowledge on the application of fertilizer across three sites. The majority of respondents reported that they do not have knowledge about the application of fertilizer according to nutrient requirements in their garden. About 52% responded that they do apply fertilizer according to nutrient requirements. Less than 50 percent do have knowledge about nutrient requirement. The reason for this could be that they cannot read instructions on the packet of the fertilizer as to how to apply it. It could be that they do not have knowledge at all on nutrient requirement. However, this is dangerous as the farmer may over use fertilizer and damage the crops.

The respondents were asked whether they irrigate their gardens sometimes across three sites. The majority (63%) answered yes, and a few of them (36.7%) do not irrigate their gardens at all. This could be due to the scarcity of water in the area or inadequate access to water for irrigation. Their gardens are dependent on rain- fed irrigation for them to be sustained, which is normal for home gardens in most rural areas. The majority answered yes because they use irrigation for small food plots.

The respondents were asked whether they know about water requirements or not when they irrigate their crops across three sites. About 55.2 percent of respondents know the water requirements when they water their crops, while 44.8 percent do not have any knowledge about water requirements of the crops they grow, which is quite a big number. The risk in lacking knowledge of water requirements for the crops is that crops might not get enough water which may lead to crops wilting and eventually dying or water can be wasted.

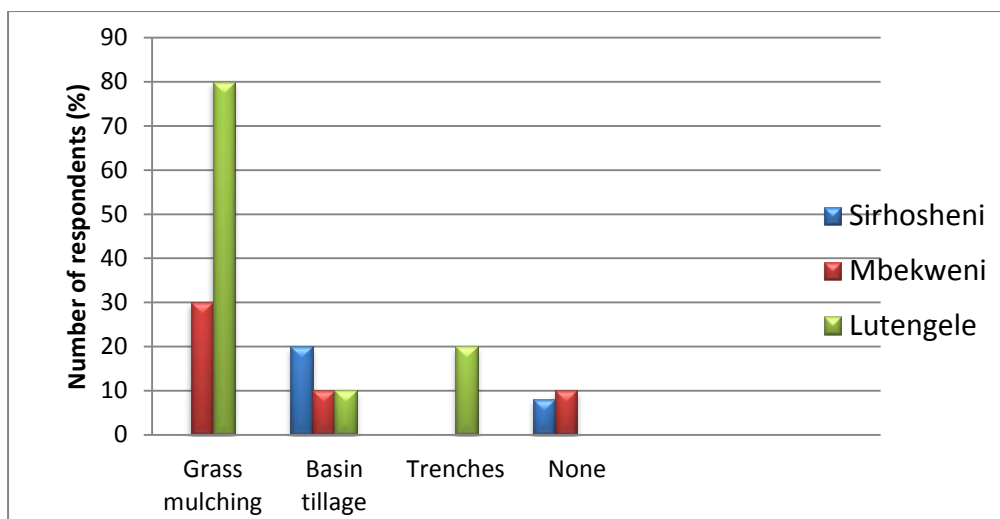


Figure 4.10.: Conservation measures used to conserve water in gardens

Land and water for agriculture are scarce natural resources hence the promotion of good land management has to be taken seriously. To conserve water in the garden therefore requires a great deal of knowledge. There are measures or methods used to conserve water. The figure above shows some measures used to conserve water in the garden/field/ food plot. The results show that respondents from Lutengele used different measures of water conservation such as grass mulching, basin tillage and trenches. 80 percent of respondents use grass mulching. Very few respondents from Sirhosheni and Mbekweni conserve water. Across three sites water is seen as a limited resource in garden production, therefore measures like these help to conserve water. Respondents also stated that they conserve water because it is not easy to fetch water from the river for irrigation. They said it is time and energy consuming especially to elderly people.

4.4.4. Pests and diseases

Table 4.16 show methods or techniques used by farmers to control pest and diseases in their gardens. The results suggest that the majority of respondents at Sirhosheni and Mbekweni use pesticides and insecticides (70%) and (100%) respectively to do away with pests and insects in their gardens. Lutengele does not use any kind of pesticides.

Table 4.16: The Control of pests and diseases in the home garden/ plot/field

Pest/disease control	Sirhosheni %	Mbekweni %	Lutengele %
Pesticides and insecticides	70.0	100.0	.0
Indigenous pesticides	30.0	.0	100
Other	.0	.0	.0

The whole population sampled at Lutengele uses biological control or indigenous pesticides. This could have been motivated by women's group in the area that supports natural farming. It is considered cheap and cost effective.

CHAPTER FIVE

ANALYSIS OF FARMERS' AGRICULTURAL SKILLS AND KNOWLEDGE

5.1. Introduction

One of the main objectives of the study is to determine the knowledge and skills gap of farmers at Lutengele villages (Port St Johns), Sirhosheni (Willowvale) and Mbekweni (Whittlesea). This section therefore presents results on the knowledge and skills on crop production that these farmers have.

5.1.1. Knowledge and skills possessed

Table 5.1 shows a number of skills and knowledge necessary for crop production for farmers and also for those who are interested in farming business across three sites. The results show that the majority of respondents are not happy with the level of knowledge they have, like knowledge in marketing and other technical skills. However, they are competent in basic skills such as determining the seed depth (63.3%), determining inter and intra row spacing (93.3), irrigation scheduling and frequency (53.3), determine nutrient deficiency (60%) and selecting appropriate planting methods for various crops (53.3%) However, some respondents have shown interest in marketing skills and that they can be able to sell and make profits. From the number of respondents interviewed 70% are not competent in determining the amount of fertilizer for various crops, which is a bit shocking. As the application of fertilizer above, its measure can be detrimental to other crops. It was not surprising to find that the majority of respondents (90%) do not keep records. Tham-Agyekum *et al* (2010) argue that it is smallholder farmers' behaviour not to keep records

Table 5.1 Knowledge and Skill

Knowledge/ Skill	Not competent %	Competent %	Very competent %
Determining seed depth	33.3	63.3	3.3
Selecting appropriate planting methods for various crops	46.7	53.3	0
Determining inter and intra row spacing	6.7	93.3	0
Irrigation scheduling and frequency	46.7	53.3	0
Application of herbicide and fungicide	86.7	13.3	
Planning and carrying out harvesting appropriately for various crops	40	60	0
Determining the amount of fertilizer for various crops	70	30	0
Soil and water conservation measures for specific farm lands	90	10	0
Farm record keeping	90	10	0
Packaging of produce	83.3	16.7	0
Determine nutrient deficiency symptoms in crops	40	60	0
Calibration and use of spray	96.7	3.3	0
Maintainance of water pump	96.7	3.3	0
Storage of produce	86.7	13.3	0
Financial management	96.7	3.3	0
Knowledge of marketing contracts	96.7	3.3	0
Price determination of your produce	83.3	16.7	0
Knowledge of the market of your produce	83.3	16.7	0
Mean	70.8	29.1	0.2

In most of the knowledge and skills where respondents have indicated that they are not competent are those where most of the respondents do not normally utilize such as calibration, the use of spray and the maintainance of the water pump. The fact that

respondents are all producing for subsistence does not expose fully them to other skills and knowledge such as financial management, knowledge of marketing contracts, price determination of the produce. However, if they were producing for commercial purposes it was going to be easy to conclude that they lack marketing and business skills.

The knowledge and skills which are lacking relate to many of the technical aspects of water-management, small-farm equipment (i.e calibrating and operating sprayers, maintaining watering systems, operating tractors or pumps), financial management, knowledge of marketing contracts, pricing and the determination of what produce costs what depending on what the season of the year it is. It was found that most households have real interest to increase their sales within and outside the village and were keen to learn more on marketing and business strategy. Also, most of the respondents have specified that they want to diversify their crop mix

It was observed that there are more integrated agricultural techniques and practices including runoff farming, water and soil conservation in the Lutengele village cluster. In this village WESSA (Wildlife and Environment Society of South) has been supporting local food production knowledge systems for approximately 8 years in schools and various village networks, including a small number of households in a pilot-programme with investment in 20,000 litres of RWH storage inside the *Umzi boundary*. Winter production has been sustainably supported from surface runoff stored in the tanks.

At Sirhosheni, use of more industrial-methods of farm management included common use of chemical sprays for pest management, although weeding is largely done by hand within the *igadi*. At all 3 sites residents combine manure from their kraals to gardens, and compost food waste and other organic matter to supplement the nutrients (particularly in the *isitiya*). Soil conservation techniques varied from the sites, but there were similarities and significant interest in respondents across the three sites that they would like to have more training to learn about better and more appropriate soil-conservation methods and approaches.

5.1.2. Acquisition of skills and knowledge

Respondents were asked whether they attended any formal training or not. It has been found that 73.3 percent of respondents were never exposed to any formal training in farming such as agricultural workshops. Some respondents at Sirhosheni indicated that farmers were willing

to acquire knowledge, but that there were no institutions available probably because of their location. As Amani (2004) emphasized, agricultural workshops are one of the essential instruments to convey knowledge to farmers.

The respondents were asked whether some of the members of the family have been trained or not. From the results 90% of the respondents responded by saying no, none of their members have ever attended training in agriculture whether formal or informal. It is not surprising that the head of the households never attended trainings in farming themselves. Only 3 percent have attended, and it is likely that those who attended are from the same households as the heads of the households who attended.

5.1.3 Training Areas

This section summarizes results on training areas preferred by farmers, methods of training and preferred training service providers. Water is a scarce resource which needs to be fairly handled to avoid waste or mismanagement because it comes with cost and energy. Adequate knowledge on irrigation will not only minimize costs but will also improve productivity. Most of the respondents have specified that they want to diversify their gardens, in terms of crops. In order to diversify crops or vegetables one needs knowledge about each and every crop or vegetable because their planting methods are not the same. Hart and Vorster (2006) indicated that African smallholder farmers are actively practicing intercropping and multi-storey cropping rather than monocropping, mainly to spread the risk in case one crop is lost due climatic or soil conditions.

Fig 5.1 presents knowledge and skills farmers need training on. Even though most respondents have stated that they have basic knowledge and skills in farming, they need further training on appropriate planting methods for various crops, irrigation scheduling and frequency, the application of pesticides and marketing skills. Across three sites, the majority of respondents would like to be trained more on appropriate planting methods for various crops about 70% at Sirhosheni and 40% percent at Mbekweni. At Sirhosheni, 30% of respondents have shown an interest in training about irrigation scheduling and frequency.

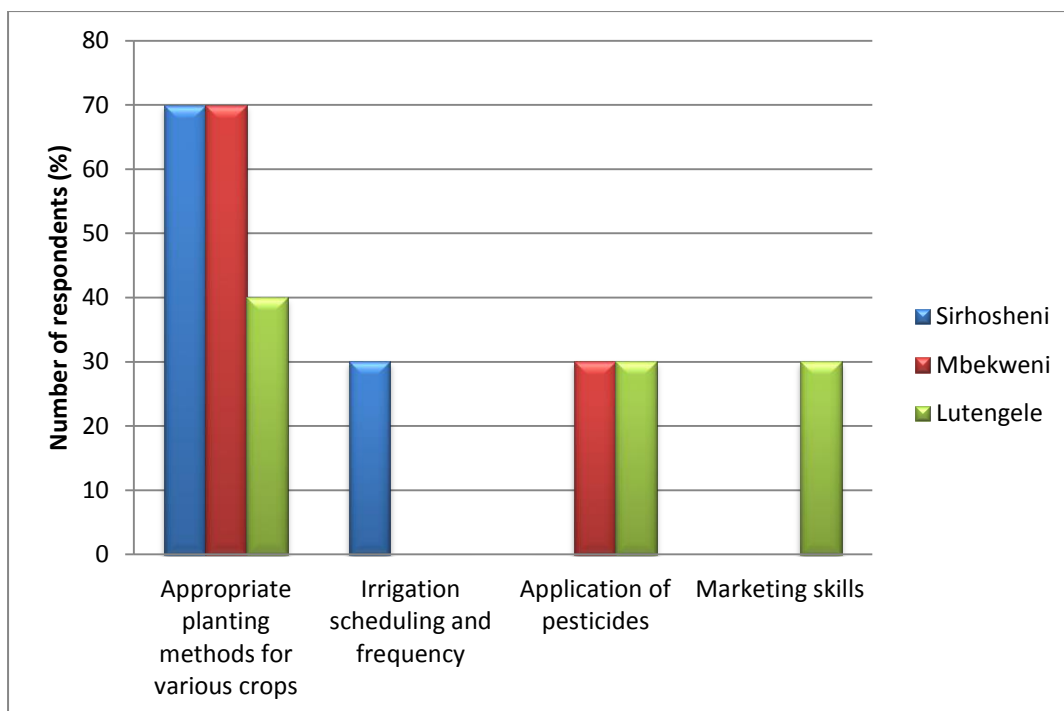


Figure 5.1.: Farming skills and knowledge preferred by farmers

There were also respondents (7.1%) who were interested in marketing skills at Lutengele village. Even though the majority of respondents produce for home consumption (food security) they also produce for cash needs. However, for any farmer to produce competitively he/she needs marketing skills.

In figure 5.2. The majority of respondents from Lutengele (80%) and Mbekweni (90%) would like DVD's to be used for training, citing many advantages that it would be easier for them because they will use them at any time they want and they can be able to repeat watching should the need arise.

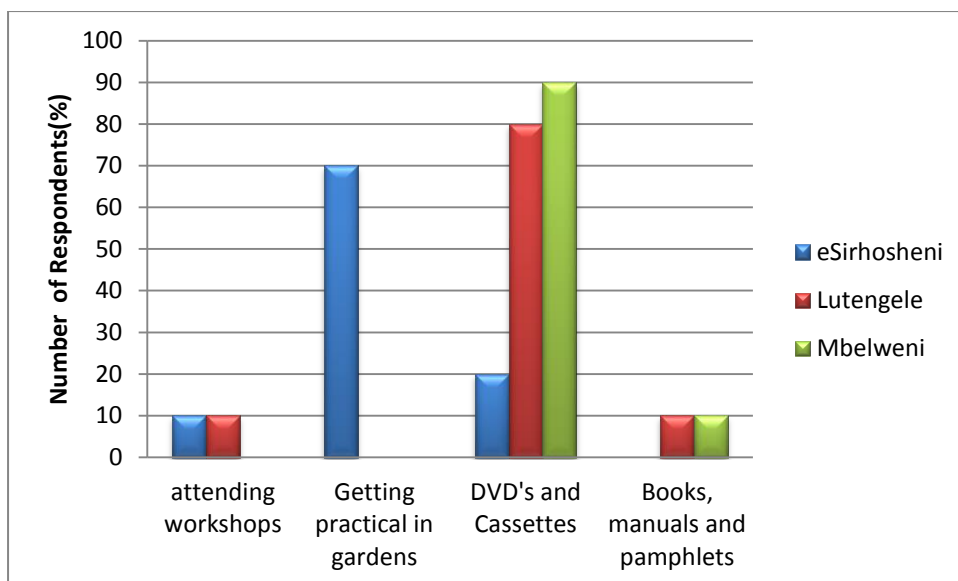


Fig 5.2.: Preferred Method of training in the study areas

Some respondents from Sirhosheni prefer training in the form of practicals in their gardens. They cited that they want to be hands on in training and that it is not easy to forget when you are getting trained practically. Very few from all three sites (about 10%) wanted trainings in the form of attending workshops, books, manuals and pamphlets.

It is always good for farmers to choose their own method of training. It is therefore imperative that targeted beneficiaries should first be consulted or studied on which methods of training they need. The training tool becomes relevant in addition to keeping the farmers in question motivated during the training. The same applies with the skills or knowledge that they need most, farmers need to be consulted (ILO, 2001).

The results take us back to the notion of non-formal training. ILO (2001) states that “Appropriate approaches to training in the informal sector have to be therefore designed differently according to the situation of each particular group of workers to a particular region”. Meaning, training needs have to be relevant with a particular audience.

Table 5.2 presents results of what farmers were thinking with regard to service providers in terms of their training. The majority of respondents from Sirhosheni (80%) and Mbekweni (100%) prefer government to provide training. Assuming farmers were tasked to identify service providers of their choice in undergoing training, the purpose of the whole exercise

would be to come up with a list of organisations and individuals they are comfortable with in working with.

Table 5.2. Preferred service provider in training

Pest/disease control	Sirhosheni %	Mbekweni %	Lutengele %
Government	80.0	100.0	40
NGO's	.0	.0	50
Private sector	20	.0	10

It was likely that many people would prefer government to supply the training, especially in a rural community, where the people only know the government as an existing organisation. They prefer (government) local extension officers because they are the people they already know and have been working with most of the time. At Lutengele the majority of respondents prefer NGO's and the private sector. This could be due to the fact there are already known organisations working in the area whom the people in the village are familiar with and have been working with in the past.

5.2. Analysis on indigenous knowledge acquired by farmers

According to Hart and Vorster (2006) Indigenous Knowledge (IK) involves new external knowledge as well as traditional knowledge. Hart and Vorster (2006) argue that the mixture of the two and the manner in which they are manifested mainly depends on local circumstances and requirements. This section gives a brief analysis on indigenous knowledge acquired by farmers across three sites.

Across all three sites respondents have indicated that they got indigenous knowledge from their parents and the transfer of knowledge from neighbours. When farmers were asked about the type of knowledge they learned from their parents, the majority of respondents indicated that they learnt basic farming like removing weeds (hoeing), planting, ways to improve soil structure, nutrient availability, water availability, and pest control without using artificial inputs such as chemical fertilizers, pesticides and herbicides across the three sites.

Respondents were asked whether they are still learning new knowledge in farming. The majority of respondents indicated that they still learn new farming knowledge from other people. Some respondents indicated that the new knowledge they learn requires them to use artificial inputs such as chemical fertilizers and genetically modified seeds.

5.3. Summary

This chapter summarises the analysis of farmer's agricultural skills and knowledge. In an effort to make the results easy to understand, schematic diagrams and tables were drawn. Furthermore, these results were presented in such a way that knowledge and skills possessed by farmers can be separated from the acquisition of skills and knowledge in order to give a clear picture of the skills gap analysis.

The chapter began with the analysis of skills and knowledge possessed which showed that farmers are competent in basic farming skills such as determination of seed depth, while there is still a lot to improve on knowledge and skills relating to many of the technical aspects of water management, financial management, and knowledge of marketing contracts.

The analysis of agricultural skills and knowledge provided evidence that the majority of the farmers interviewed were never exposed to formal training. They prefer government to provide training services.

CHAPTER SIX

ECONOMETRIC RESULTS

6.1. Introduction

This chapter presents results based on an econometric analysis using the Binomial logistic regression model which seeks to determine the relationship between socio-economic factors and the knowledge and skills needed by women to participate in food security and water security projects. This chapter also seeks to answer the hypothesis presented in Chapter one. The model is based on the socio-economic characteristics of the farming population as given in Table 6.1. The results below show that there is not much difference between the mean and the median. Gujarati (1992) interprets such situations as one whereby none of the socio-economic characteristics were outliers.

Table 6.1.: Socio-economic characteristics of selected respondents (N=30)

Variables	Mean	Median	Std deviation	Kurtosis
Age	53.2667	56.000	15.27886	-.856
Gender	1.7667	2.000	0.43018	-.257
Education	6.367	6.000	3.8995	-1.216
Size of the land	3549.5097	2585.000	3873.37515	5.732
Formal training	1.7333	2.000	0.44978	-.824
Extension support	2.8667	3.000	0.50742	12.207
Technical inputs	9.1765	5.000	9.580116	4.109

6.2. Parameter Estimates determinants of farmers' knowledge in selecting appropriate planting methods for various crops.

It was stated in Chapter two that the diversification of crops is advocated in home gardening so as to minimise the risk. As Muchara (2011) also pointed out planting different vegetable crops in the home garden or *isitiya* can be used as a strategy to plant according to crop seasonal requirements in terms of consumer and climatic conditions. However, to carry out these farming activities requires one to have a set of skills and knowledge for each and every type of crop or vegetable to be planted.

However, the acquired or existing knowledge can be affected by socio-economic factors on the Table 6.2 below. Table 6.2 presents estimated parameters whose influence on farmers' knowledge in selecting appropriate planting methods for various crops was assessed. From the table *Nagelkerke* R^2 value of 0.412 was obtained which suggests at least 41% of the variation in the dependent variable (selecting appropriate planting methods for various crops) was explained by the selected independent variable, with an overall prediction percentage of 68%. Out of eight independent variables analysed gender, education and farming experience was found to be significant in the model

As shown in Table 6.2 the findings confirm the priori expectations that gender bias in terms of knowledge in selecting appropriate planting methods of various crops towards females than males. This is shown through a significant p-value of 0.029 and a negative beta value of -2.267. This could be as a result of the high female involvement in water and food security projects in the areas under study. These findings are in line with Hart and Vorster (2006) argument that knowledge of different plants (fruit and vegetables) is available to both males and female. However, vegetables tend to be on the women domain that is mainly grown by women.

Table 6.2. : Estimates of determinants of farmers' knowledge in selecting appropriate planting methods for various crops.

Variables	B	S.E.	Wald	Sig.
Gender	-2.627	1.206	4.745	.029*
Age	-.008	.033	.053	.818
Marital status	.281	.572	.242	.623
Education	.051	.172	.088	.045*
Farming assets	.041	.049	.721	.396
Extension contact	.757	1.020	.551	.458
Size of the land	.000	.000	.419	.517
Farming experience	1.663	1.250	1.772	.033
Constant	7.884	3.940	4.003	.045
Nagelkerke R ²	.413	Overall percentage (-		67.6
LR Chi-Squared (df=8)	12.572	2) log likelihood		34.445

NB: * and ** indicates significance at $p=0.05$ and $p=0.01$ probability level respectively. The dependent variable is normally distributed.

A positive (0.051) and significant ($p=0.045$) relationship between education and farmers' knowledge in selecting planting methods for various crops is presented in Table 6.2. The positive relationship is explained by high number of farmers who have education and are able to read and write. The results on Table 6.2 suggest that the greater the number of farmers who have better education the greater there is a chance for them to acquire knowledge or information through different sources. However, Overwien (1997) expresses the view that non-formal and formal education does not often reach the same level of significance as a learning-by-doing approach. In this study findings suggest that farmers prefer practical training rather than theoretical based training (chapter 5).

The farming experience is the number of years the farmer had been involved in crop production. The farming experience and the farmers's knowledge in selecting appropriate planting methods of various crops indicates a significant relationship ($p=0.033$). The results simply suggest that those who have been farming for long have better knowledge in selecting appropriate planting methods. For an example, they have a better understanding of the time of seeding, planting systems, or as plant spacing for different crops and seeding depth for different crops is important.

Table 6.3.: Estimates of determinants of farmers' knowledge in determining seed depth of a crop

Variables	B	S.E.	Wald	Sig.
Gender	-1.691	1.204	1.973	.160
Age	.078	.043	3.257	.071
Marital status	-1.187	.756	2.466	.116
Education	.296	.182	2.645	.041*
Farming assets	.056	.059	.910	.340
Extension contact	9.974	8673.201	.000	.999
Size of the land	.000	.000	1.712	.191
Farming Experience	.574	1.669	.118	.011**
Constant	-33.748	26019.601	.000	.999
Nagelkerke R ²	0.495	Overall percentage (-2)	71	
LR Chi-Squared (df=8)	14.984	log likelihood	29.165	

NB: * and ** indicates significance at $p=0.05$ and $p=0.01$ probability level respectively
The dependent variable is normally distributed.

The results in Table 6.3 show a positive (0.296) and a significant relationship ($p= 0.041$) between independent variable (education) and dependent variable (the farmers' knowledge in determining seed depth). This means that across all three sites in this study more educated

farmers have better knowledge in determining seed depth of a crop than those who are less educated.

As anticipated the fact that farmers had been farming for a long time with some experience gave them sufficient knowledge in determining the seed depth of a crop. This has proved to be significant (0.11) statistically. The results on Table 6.3 show that the longer farmers work in their gardens the greater the opportunities of knowing seed depth of different crops through different sources of information. It could be from neighbours and extension officers.

Table 6.4.: Estimates of determinants of farmers' knowledge in determining irrigation scheduling and intensity of crops

Variables	B	S.E.	Wald	Sig.
Gender	-1.537	2.383	.416	.519
Age	.050	.073	.472	.492
Marital status	.004	1.697	.000	.998
Education	-.215	.443	.235	.628
Farming assets	-.266	.183	2.106	.147
Extension contact	1.143	1.680	.463	.046*
Size of the land	.000	.000	2.708	.100
Farming Exp	2.991	2.461	1.478	.224
Constant	-4.236	6.417	.436	.509
Nagelkerke R ²	.659		Overall percentage	91.2
LR Chi-Squared (df=8)	17.342		(-2) log likelihood	14.346

NB: * and ** indicates significance at $p=0.05$ and $p=0.01$ probability level respectively. The dependent variable is normally distributed.

Findings of the association between extension contact and the level of knowledge on irrigation scheduling and intensity indicate a significant ($p=0.046$) and a positive (1.143) relationship between the two variables. The results in Table 6.4 show that extension assistant has contributed positively to smallholder farmers in the sample in acquiring knowledge in irrigation scheduling and intensity. According to Pote (2006:67) extension service is an important source of farming advice which is given to smallholder farmers. However,

Groenewald *et al* (2003, 8) in their findings state that extension services in South Africa are not enough. Smallholder farmers who get extension services from extension officers adequately are likely to realise high productivity and production in their farming as knowledge exchange encourages differing beneficial using farming techniques.

6.3. Summary

This chapter provides empirical evidence of socio-economic factors influencing knowledge and skills of women participating in water and food security projects at Sirhosheni, Mbekweni and Lutengele villages. These socio-economic factors were defined and tested using the binomial logistic regression model. The statistically predictor variables at 5% significant level are as follows: education affects the level of knowledge of farmers in selecting appropriate planting methods and farmers' knowledge in determining the seed depth of a crop, gender influences the level of knowledge farmers have when selecting appropriate planting methods, extension assistance affects farmers' knowledge in determining irrigation scheduling and intensity. At 1% significant level was only farming experience which influences a farmers' knowledge in determining the seed depth of a crop.

Based on the results of this study, several suggestions can be made on how women can acquire knowledge and skills to enhance their farming production and productivity. With a desire to understand how the acquisition of skills and knowledge affects farming practice, it was necessary to assess socio-economic factors that have reasonable influence on farmers' skills and knowledge. The results suggest that any planned intervention programmes ought to be designed in such a way that farmers' socio-economic characteristics are also considered.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1. Introduction

Smallholder agriculture has potential to contribute to food security, reduce poverty, and hence contribute to economic growth. However, the Republic of South Africa has not exploited this opportunity to its full potential. The literature argues that smallholder farmers need to engage in meaningful agriculture, thereby contributing to economic growth and development in the rural areas. Nevertheless, this can be achieved when farmers are empowered with necessary skills and knowledge to participate on water and food security projects

This chapter attempts to summarize the most important findings of this study and to discuss their implications as well. It also seeks to provide conclusions and recommendations drawn from the data analysed on skills and knowledge that women have on water and food security projects. The chapter discusses the objectives of the study, so that conclusions and recommendations can be drawn.

7.2. Aim of the Study

The purpose of the study was to investigate skills and knowledge of women participating in water and food security projects in the three selected sites. The study was set to investigate existing skills and knowledge, skills gap and training interventions that could be undertaken if recommendations are adopted.

7.3. Socio-economic description of farm households

Three sites studied show similar tendencies on many different socio-economic aspects. These include livelihoods, land and agriculture practices, with the exception of Lutengele on farming systems and the level of knowledge and skills they have.

As discussed in Chapter 6, there were a number of socio-economic variables which had some significant influence on skills and knowledge of women participating on water and food security projects. These factors have to be taken into consideration when developing training

intervention approaches. Education, for example, was found to have a significant influence on acquiring knowledge of women participating in on water and food security projects. Across all three sites, most of the farmers received formal education both primary and secondary, meaning that they are literate. The level of education farmers have could predict the level of existing skills relevant to agricultural production. Education can make it even possible for farmers to notice the most important information. Literacy is very important because one can take up new technologies or easily accept or adapt to new information. In the study, a small proportion of farmers did not go to school. This therefore highlights the importance of education in acquiring knowledge and skills in farming. Therefore, as a recommendation, interventions should be designed in such a way that the intended outcomes can also be achieved even by those respondents with less education.

Age is one aspect that is so important when considering farmer's training. Considering that the average age for respondents in this study is 60 years. With this in mind training interventions should cater for old people. However, youth should not be left out as they are the next farming generation. Training interventions should also incorporate youth, so that the transferred skills can be used in future.

The majority of respondents indicated that they prefer government or extension officers when it comes to acquiring knowledge about farming. They also indicated that advice on better practices was sought from the extension officers. However, it is important for extension officers to provide relevant training to relevant people.

This study found out that farmer's livelihoods across three selected sites are mainly depended on government grants. In addition, even though farming contributes the least amount to contributing to one's overall income, respondents have stated that without farming, conditions could have gotten far worse for them. Farmers stated because of their farming practices they are able to get foodstuffs and even cash to buy other small things from the sales of produce. Respondents made it clear that the income they get from government does not last the whole month and agriculture often acts as a supplement to their food needs.

Farming systems used by three sites are not the same, with Sirhosheni and Mbekweni being the combination of traditional and conventional farming, and Lutengele practising only 'natural/traditional' farming. Therefore the study had an opportunity of studying the two

systems leaving other factors constant in these villages comparably in relation to knowledge and skills. The styles of farming range from the management of resources such as soil and water, to pesticides.

Mbekweni and Sirhosheni use a combination of two styles of farming that is traditional farming using indigenous knowledge and conventional farming (using conventional farming methods). For the soil fertility Mbekweni and Sirhosheni both used fertilizer and manure (guano) while Lutengele residents used compost and kraal manure. The farming system used by Lutengele farmers use low external inputs that mostly rely on exclusively local available resources. Hart (2005) describes this system "... as practices that are intrinsically interwoven within farmers and local community member's and cultural systems". Hart (2005) argues that the high cost of external inputs that were generally developed for a uniform suitable environment (where irrigation and other resources are readily available) does not fit to inhabited by African farmers, and this is the primary reason for the failure of a green revolution on the African continent.

Initially the study hypothesised that from the three sites studied women would lack the necessary skills and knowledge to participate in water and food security projects. While this was true to some degree, more complex conditions of poverty and the lack of resources (both social and economic) also impacted on women's ability to participate in water and food security projects. However, women also reported having knowledge of indigenous farming practices, which included best practice and more formal agriculture training achieved at times through government support and Non-Governmental Organisation (NGO) aid. Having government support via social welfare grants has meant that many women in the study buy seedlings because of this financial support. This was the case across the three sites studied. At one of the sites, the villages of Lutengele, the NGO support by Wildlife and Environment Society of South Africa (WESSA) gave the strongest support to the women of the villages by promoting more nature-organic farming such as mulching, water conservation, and to provide training on natural ways to control pests.

In all three sites there was a desire for and aspirations of expanding on ones' current agricultural endeavours. Despite some authors who argue that aspirations away from farming have occurred (especially those citing a pattern of de-agrarianisation), findings discovered by this current work suggest that strong sentiments to cultivate gardens and fields remain high

regardless of the challenges they normally face. Respondents interviewed felt that empowerment as an idea was rooted in aspirations for farming and increasing upon one's farming capabilities. Many of the current limitations for interviewees included: (1) limitations to access and have an abundance of water was an issue, albeit different conditions and realities were expressed at each of the sites; (2) a lack of farming skills and practical farming know how was reported as a limitation, particularly at Mbekweni and Sirhosheni; (3) agric-inputs such as seeds and seedlings, fencing, agricultural tools, and fertilizers, to cite a few examples was also acknowledged as limiting desires for increased production; (4) at Lutengele villages the topography of the land was an issue because of the high slopes and difficulties this caused to farm with oxen and a sled, (5) at those households were persons of old age, while desires remained to continue to carry out agrarian lifestyles, one's age permitted the ability of one to farm, and therefore this was deemed to be a limitation, particularly for some in Mbekweni.

Overall, respondents expressed a more complex relationship to the manner in which problems related to farming occur and as these factors impinge upon respondents in different ways and uniquely to each of the sites. It is felt that the answer to empowering those desires expressed by the respondents to increase upon their farming practices requires a certain strategizing which ought to be made to increase production and upon the scale of what respondents currently have. This includes the need to build on current infrastructures related to the storage and collection of water. In Sirhosheni, there is the need to think about and develop on the potentials of bore holes to supplement the current piped water articulation entering this village, which occurred as of March, 2013. In Lutengele villages and Mbekweni, there is a need to support the installation of water tanks at household level. Government support needs to effectively introduce programs that can move past the inefficiencies and conflict between municipalities and provincial and national programs aimed at supporting people domestically when it comes to their agricultural aspirations.

There ought to be more focus on building relationships between agricultural extension officers and what services these officers can provide to the people, particularly as it builds on aspects of expanding and retaining indigenous/natural farming knowledge and technique. It is felt that more collaboration between NGO's/NPO's and civil society and private business willing to work within the scope of agriculture and the work of agricultural extension officers ought to be supported. However, there is a disconnect between what people currently practice, often reflective of indigenous knowledge passed down to them by their parents, and

what current agricultural extension officers are taught to promote. Agriculture officers are often taught to promote commercial-type farming methods (non-organic farming), such as the applications of fertilizers, chemicals and to use Genetically Modified Organism (GMO) seed, which is often only able to be used once versus organic and regenerating seeds (cf. Shiva 2001). Therefore, it is argued that a more rigorous engagement ought to seek the cost-benefit and what appropriate methods could be used given the context. There is potential to strike a balance between learning what aspects of commercial farming and its methods could be applied to indigenous knowledge. However, the choice of how to farm ought to remain one for the village and those engaged in the agriculture to decide. Ultimately, choices within farming ought to come from those who farm but there is more to be done by the agricultural extension officer to promote the benefits, strengths and weaknesses of farming either indigenously or commercially, or as the two have potential benefits to offer one another. Current training by agricultural extension officers ought to acknowledge that many people practice aspects of indigenous knowledge, but that extension officers are limited by the commercial aspects and drive of government to promote more commercial farming methodology, such as applying fertilizer, using GMO, spraying with chemicals, etc. There is much more potential to systematically find out what works to synergize these methods, given the contexts and willingness of farmers and as these methods could be understood via training that embraces collaborative learning and outcome based results to best-practice farming.

Across all three sites the lack of formal education has limited skills transference and therefore the type of training needs to be done as aligned to the current needs of people but as it is practical and within local cultural understandings. This does not discount the need to provide formal agricultural training but that it should be done with an emphasis that fits into current land-use practices. It is argued that given the appropriate access to resources such as water and agricultural inputs and necessary training (potentially via the extension officer) the peoples of the villages studied have a chance to improve upon their agricultural production and therefore a better chance to live more well-off, in both social and economic terms.

7.4. Policy implications

Based on the results from the study, it has been found that one way to enhance food security at household level is to empower the vulnerable with the necessary skills that can make them stand on their own and produce for themselves. With increased agricultural production from adequate skills and knowledge, food security at household level can be easily achieved given

that the farmers get all the necessary support from the government, NGO's and other parastatals. Smallholder farmers need different kinds of support such as improved infrastructure which includes roads, information, extension services and agricultural inputs. Improved infrastructure can play a very important role in the livelihood of smallholder farmers, like building a reliable water source. Constructing roads can help farmers to reduce transaction costs and be able to get inputs in town easily. From the study the case of Lutengele people are very enthusiastic about farming in that area but the infrastructure they have is limiting them from participating in farming in cash economy or market oriented agriculture. They get water from the river, which is far from the homestead. The roads are not conducive especially when it is raining and the long distance from town to get agricultural inputs poses a challenge

Government, Non-Government Organization, private companies, parastatals should stop giving food hand outs to communal areas as they are discouraging farmers to be independent. Farmers must be supported in such a way that they can be able to produce their own food. Government can impose policies that will allow input suppliers to provide inputs at affordable prices, and to increase production. The establishment of nurseries in communal areas could be a solution to avoid the problem of the high transaction costs of getting seedlings in town.

The study at Lutengele, Sirhosheni and Mbekweni reveals that the main goal of residents is to engage in farming activities in order to produce for household consumption. From the results it has been found that less than 10 percent of the respondents indicated selling as their main goal in farming. This has an implication that there are farmers who have an interest in marketing or selling their produce. Therefore, support programmes can also aim to fulfil this objective. However, there should be strategies to first assist residents' capabilities that increase their surplus production as a way of influencing farmers' participation in the cash economy.

The study has revealed that agricultural training is essential for farmers so that they are able adopt new methods of farming. The majority of farmers in this study have primary education. The study has also revealed that the majority of farmers are comfortable with informal training with more practicals. Therefore, training programmes either from government, private companies or NGO's should be based on farmers' needs.

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APPENDIX 1

HOUSEHOLD SCOPING SURVEY

SECTION 1: DEMOGRAPHIC INFORMATION

(Consider putting the following table as it will provide answers from 1.1 to 1.12.9. Not sure if we have to ask 1.9. as these are likely to be lodgers who have their own income, who do not sleep under one roof as the main household, and do not share resources with the main household)

1.1. Please provide the following information about your household

Name	Relation to hh head	Age	Gender (m/f)	Marital status	Highest Education	Employment status	Occupation	Field of employment	Time home

CODES: Relation to head Head = 1; Spouse = 2; Son/daughter = 3; Grandchild = 4; Niece/nephew = 5; Grandparent = 6; Aunt/uncle/brother/sister = 7; Not related = 8. **Age:** Enter number. **Gender:** Male = 1; Female = 2. **Marital status:** Single = 1; Married 2; Divorced = 3. **Education:** No educ = 0; Creche = R; Sub A = 1; etc. **Empl status:** Unemployed = 0; Full time = 1; Part time = 2. **Occupation:** Teacher = 1; Farmer = 2; Pensioner = 3; Housewife = 4; etc. **Field of empl:** Education = 1; Agriculture = 2; etc. **Time home:** Always = 1; weekends = 2; holidays = 3

1.2. Household size = enter no

1.3. Active population (15 to 64 years) = enter no

1.4. Children (define – less than 15 years?) *(important when calculating adult equivalent income)*=enter no

1.5. Adults (define) *(important when calculating adult equivalent income)*=enter no

(Note: you don't ask respondents 1.2 to 1.5; you get it from the table above)

SECTION 3. LAND AND FARMING (I have added a number of questions here!)				
3.1.	Do you have a garden (igadi okanye isitya) on your site?	1 = Yes 2 = No		
3.2.	What type of garden do you have? 1=small salad garden 3=herb/medicinal garden 2=crop/vegetables 4=other	Enter no(s):		
3.3.	What is the size of your garden? (Interviewer to pace it)	Enter no		

3.4.	Did you grow crops, vegetables and or herbs on it during 2011/12 cropping season?	1 = Yes 2 = No		
3.5.	If No to 3.4, when last did you cultivate your garden? 1=Two years ago 3=More than 10 years ago 2=five years ago 4=never 5=Other, specify	Tick and enter no:		
3.6.	What are your reasons for not cultivating the garden? 1 = No money 3 = Not fenced 2 = No one to help 4 = Other, specify	Tick and enter no:		
3.7.	If yes to 3.4, which main crops/veges/herbs do you grow in your garden? 1 = maize 2 = potatoes 3 = dry beans/peas 4 = pumpkin/ butternut 5 = cabbage 6 = spinach 7 = onions 8 = Other			
3.8.	Do you sometimes irrigate the crops grown in your garden?	1 = Yes 2 = No		
3.9.	If yes, what is the main source of irrigation water? 1=River 2=Stock dam 3=RDP water 4=Underground water 5=Rainwater tank	Tick and enter no:		
3.10.	What are your reasons for growing crops mentioned above? 1=Home consumption 4=1 and 2 2=Marketing 5=1, 2 and 3 3=Donations 5=Other, specify	Tick and enter no:		
3.11.	What method of cultivation is used in your garden? 1=Hand ploughing 2=Animal traction 3=Tractor traction	Tick and enter no:		
3.12.	Who in the household undertakes the following activities in your garden? Activity Who (e.g. wife, husband, children, hired labour, etc.) Who 1=Ploughing 2=Planting 3=Weeding 4=Collecting water 5=Irrigating 6=Harvesting			

3.13.	Do you have access to a field?	1 = Yes 2 = No		
3.14.	If Yes, does the field you have access to belong to this household?	1 = Yes 2 = No		
3.15.	If the field does not belong to your household, how did you get access to it? 1=Rent 2=Borrowed 3=Sharecropping			
3.16.	If it belongs to the household, who in the household owns the field? 1=Husband 2=Wife 3=Brother 4=Father 5=Other, specify			
3.17.	How did s/he get the field? 1=Inherited 2=Bought	Enter no:		
3.18.	How big is the field you own or have access to? Size in Morgans / Acres / Hectares	Enter no:		
3.19.	Did you grow crops on it during 2011/12 cropping season?	1 = Yes 2 = No		
3.20.	If not, please provide an explanation (s). 1= No money to cultivate 2= Drought 3= No one to assist with farming activities 4= Field is not fenced 5= Other, specify			
3.21.	If yes, which of the ff crops did you grow on your field? 1=Maize 2=Pumpkins 3=Beans/peas 4=Potatoes	Enter no:		
3.22.	What are your reasons for growing the crops identified above? 1=Home consumption 2=Marketing 3=Feed animals 4=1 and 2 5= 1, 2 and 3			
3.23.	Who in the household undertake the ff activities in the field? (e.g. Wife, husband, children, hired labour, etc.) 1= Ploughing 2=Planting 3= Weeding 4=Harvesting			
3.24.	What method of cultivation is used in the field? 1= Tractor traction 2= Animal traction			

3.25.	Which of the ff implements / equipment do you use when undertaking farming activities? Please state whether owned, borrowed or hired.			
	Implement (tick)	Owned=1	Borrowed=2	Hired=3
3.25.1	Ox plough			
3.25.2	Donkey (ox) cart			
3.25.3	Hand tools (Hoe /Gaba /Panga /Axe/ Machete/ Slasher/ Pick etc.)			
3.25.4	Wheelbarrow			
3.25.5	Crop Sheller			
3.25.6	Tractor			
3.25.7	Bakkie			
3.25.8	Trailer			
3.25.9	Plough			
3.25.10	Disc plough			
3.25.11	Planter			
3.25.12	Irrigation equipment			
3.26.	Do you have any intentions of increasing your scale of production in future?	1=Yes 2=No		
3.27.	If yes, please provide reasons for wanting to do that. 1= Want to take farming as a business and make money from it 2=Want to obtain household food needs from own production 3=Other, specify			
3.28	Do you have access to extension services?	1=Yes 2=No		
3.29	If yes, what kind of advice do you get from extension officers? 1= Marketing 2= Pest and disease management 3= water management 4= Weed control 5 = Fertiliser application 6= Other, specify			
3.30.	Which of the ff livestock do you own? State number as well. 1= Cattle 2= Sheep 3= Goats 4= Pigs 5= Dual purpose chickens 5= Broilers 6= Layers 7= Geese 8= Ducks 9= Horses 10= Donkeys	Animal	No	

3.31.	What are your reasons for keeping the animals identified above? (reason for each animal mentioned above) 1=derive an income 2=source of food 3=investment for future 4=ritual purposes 5=Other, (combination of two or more of the above)	Animal	Reason
3.32.	What are your most important household needs? 1=Food 2=Employment 3=Money for school fees 4=Land 5=Luxury goods (i.e. tv's,furniture) 6=Unsure/don't know 7=Other (list)	Enter no(s) or list:	

SECTION 4. Measuring household food security			
4.1	Does your household have enough food to eat all times?	Yes= 1 No= 2	
4.2	If No, when does your household experience hunger? 1= Everyday 2= Towards the of the months 3= Winter 4= Other, specify		
4.3	When food is enough, how many meals does this household eat per day? 1=Three meals 2=Two meals 3= One meal	Enter no:	
4.4.	When food is not enough, how many meals does this household eat per day? 1= Two 2= One 3=Other, specify		
4.5.	Who is conceived as needing more food in your household? 1= Women 2= Men 3= Children under five years old 4= Other, specify		
4.6.	Do these people get more food than others?	Yes = 1 No = 2	
4.7.	In times of food shortages, are there members of the family who sacrifice their food for the needy ones?	Yes = 1 No = 2	
4.8.	If yes, who are these family members? 1= Women 2= Mother 3= Father 4= Children 5= Other, specify		

4.9	What is your typical household meal at different meal times? Please indicate the main ingredients as well. <table><thead><tr><th>Meal</th><th>Ingredient</th></tr></thead><tbody><tr><td>Breakfast (e.g. porridge and bread)</td><td>M/ meal; flour</td></tr><tr><td>Lunch (e.g. Umngqusho)</td><td>Samp; beans/peas</td></tr><tr><td>Dinner (e.g. Umvubo)</td><td>M/meal; amasi</td></tr></tbody></table>	Meal	Ingredient	Breakfast (e.g. porridge and bread)	M/ meal; flour	Lunch (e.g. Umngqusho)	Samp; beans/peas	Dinner (e.g. Umvubo)	M/meal; amasi									
Meal	Ingredient																	
Breakfast (e.g. porridge and bread)	M/ meal; flour																	
Lunch (e.g. Umngqusho)	Samp; beans/peas																	
Dinner (e.g. Umvubo)	M/meal; amasi																	
4.10	Please indicate the main source of these ingredients at different times of the year. <table><thead><tr><th></th><th colspan="4">Source</th></tr><tr><th>Ingredient</th><th>Winter</th><th>Spring</th><th>Summer</th><th>Autumn</th></tr></thead><tbody><tr><td>E.g. M/meal</td><td></td><td></td><td></td><td></td></tr></tbody></table> (Codes: Own production =1; Bought from s/markets = 2; Bought from local shops = 3; Bought from local producers = 4; Donations = 5; Other = 6)		Source				Ingredient	Winter	Spring	Summer	Autumn	E.g. M/meal						
	Source																	
Ingredient	Winter	Spring	Summer	Autumn														
E.g. M/meal																		
4.11	For purchased foods, who in the family decides which foods to buy? 1= Everybody 2= Wife 3= Husband 4= Other, specify																	
4.12	Who in the household responsible for preparing meals? 1= Wife 2= Children 3= Other, specify																	
4.14	How often do you eat vegetables? 1= Everyday 2= Three times a week 3= Once a week 4= Once a month 5= Other, specify																	
4.15	What kinds of vegetables do you normally eat? 1 = Cabbage 2= Spinach 3 = Butternut 4= Indigenous veges 5= Other																	
4.16	What is the main source of these vegetables? 1= Own production 2= Purchased 3= Other																	
4.17	How often do you eat meat/ fish? 1= Never 2= Once a week 3= Once a month 4= Other, specify																	
4.18	In times of crisis (drought, loss of income), what do you do to feed your family? (coping strategies) 1= Do odd jobs for others to earn money 2= Sell some of my assets (animals or household items) 3= Make use of preserved foods 4= Other, specify																	

4.19	Are there any social programmes (e.g. food aid; school feeding scheme) you can access at these times?	Yes = 1 No = 2 Don't know = 3	
4.20	Are there any government food security programmes / projects introduced in your village?	Yes = 1 No = 2 Don't know = 3	
4.21	If Yes, what are the names of these programmes / projects? (Give names.)		
4.22	Is your household participating in some of these programmes/projects?	Yes = 1 No = 2	
4.23	If yes, which programmes do you participate in? (Name them.)		
4.24	What has been the impact of these FS programmes/projects on your household? 1= No impact = 1 2= Negative impact 3= Positive impact 4= Not sure		
4.25	Please provide an explanation for your answer. 1= Still where I was before the programme / project 2= More food insecure 3= Improved food security		
4.26	Do you preserve some of the products obtained from own production?	Yes = 1 No = 2	
4.27	If Yes, what methods of preservation do you do? 1= Drying 2= Bottling (jams) 3= Other, specify		
4.28	Who in the household responsible for preserving foods? 1= Wife 2= Children 3= Other, specify		
4.29	Are there members of the household suffering from chronic diseases (high blood pressure, Diabetics, Asthma, Obesity, HIV/AIDS, etc)?	Yes = 1 No = 2	
4.30	If Yes, What kind of diseases is s/he suffering from? Name it or them.		
4.31	Do these people have a special diet?	Yes = 1 No = 2	
4.32	Do they have medication for their illnesses?	Yes = 1 No = 2	
4.33	Prevalence of malnutrition Children <5 years stunted (height for age) Children <5 year underweight (weight for age) Indicate sex of child as well.		

SECTION 6. Livelihoods and Expenditure patterns

6.1 Please state the sources of income available to your household as well as the amounts received from each source per cycle.

6.1.1. External sources of income

Source	Cycle (Monthly, bimonthly, quarterly, etc.)	Income per cycle (R)	No. of cycles per annum	Net income/a (R)
Remittances (Cash)	e.g. Monthly	R500	12	(calculate later)
Remittances (Kind)				
Child support from parent outside household				
Salaries & Wages				
Old age pension				
Disability grant				
Child support grant				
Other government grants, specify				

6.1.2. Local sources of incomes

Source	Cycle	Income per cycle (R)	No. of cycles per annum	Net income/a (R)
Hawking (Food)				
Hawking (Other)				
Spaza shop				
Selling liquor/shebeen				
Taxi business				
Lending money				
Carpentry				
Plumbing				
Building houses				
Crops kinds				

Crops cash				
Animals kind				
Animals cash				

6.2. How much money does your household spend on the following items per month or per year?

Item	Cycle	Exp/cycle (R)	No. of cycles per annum	Total exp/annum (R)
Food				
Electricity				
Clothing				
Furniture				
Medical expenses				
Educational expenses				
Transport				
Agriculture inputs				
Maintenance/building of residence				
Hiring of labour				
Telephone and postage				
Subscription and membership fees				
Church contributions				
Entertainment				
Interest on loans				

APPENDIX 2

AN INVESTIGATION OF SKILLS AND KNOWLEDGE OF WOMEN PARTICIPATING IN WATER AND FOOD SECURITY PROJECTS IN THE EASTERN CAPE PROVINCE: A CASE OF SHILOH IRRIGATION SCHEME (Whitlesea), eSHIRHOSHENI (Willowvale) AND LUTENGELE (Port St Johns) VILLAGES

An In-depth household survey Questionnaire

Date of interview	
Name of Municipality	
Ward name	
Village name	
Name of enumerator	
Name of respondent	
Questionnaire number	

A: PROFILE OF BENEFICIARIES

A1. Please provide the following information:

Race.....Gender.....Age.....Marital status.....Education.....

A2. What is your mother language?

(a) Xhosa (b) Sesotho (c) Isizulu (d) Other

A3. Can you read and write your home language? Yes/No

Language	Read	Write
Xhosa		
SeSotho		
IsiZulu		

A4. Can you speak, read and write the following languages? Yes/No

Language	Speak	Read	Write
English			
Afrikaans			

A5. What are your sources of household income? Please indicate amounts per month/yr.

Source of income	Amount of income (R/month/year)
Salaries and wages	
Old age pension	
Retirement pension	
Disability grant	
Child support grants	
Cash remittances	
In kind remittances	
Farming/agriculture	

Trade (off farm activities)	
Other (please specify)	

(The researcher will have to take measurements)

A6. Please state the size of your food plot in the scheme or community garden.

.....

A7. What is the exact size of your home garden?

.....

A8. How big is your arable field?

.....

A9. How many cattle do you have?

.....

A10. How many donkeys do you have?

.....

A11. How many horses do you have?

.....

A12. Do you own a bakkie?

(a) Yes (b) No

B: FARMING SYSTEMS AND ACTIVITIES

B1. Which of the following crops/vegetables do you grow in your garden? Please state the area, yield, amount consumed and sold as well as estimate unit price during 2011/12 cropping season.

Crop/Vegetable	Area planted (m ²)	Yield (kg/bags)	Amount consumed	Amount sold	Price/kg/bunch/bag (R)
Maize					
Potatoes					

Pumpkin					
Butternut					
Beans					
Peas					
Cabbage					
Spinach					
Carrot					
Beet					
Onions					
Cauliflower					
Green/red pepper					
Garlic					
Tomatoes					
Other, specify					

B2. Which of the following crops do you grow in your field? Please state the area, yield, amount consumed and sold as well as unit price during 2011/12 cropping season.

Crop	Area planted (m2)	Yield (kg/bags)	Amount consumed	Amount sold	Price/kg/bunch/ bag (R)
Maize					
Potatoes					
Pumpkin					
Butternut					
Dry Beans					
Dry Peas					
Other,					

specify					
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B3. Which of the following crops/veges do you grow in your irrigated plot or community garden? Please state the area, yield, amount consumed and sold as well as unit price during 2011/12 cropping season.

Crop/Vege	Area planted (m2)	Yield (kg/bags)	Amount consumed	Amount sold	Price/kg/bunch/bag (R)
Potatoes					
Pumpkin					
Butternut					
Beans					
Peas					
Cabbage					
Spinach					
Carrot					
Beet					
Onions					
Other, specify					

B4. What are your main reasons for engaging in home gardening? Name them in order of priority.

(a) Food security (b) make money (c) both

B5. What are your main reasons for engaging in field cropping? Name them in order of priority.

(a) Food security (b) make money (c) both

B6. What are your main reasons for engaging in irrigated crop production? Name them in order of priority.

(a) Food security (b) make money (c) both

B7. Would you say you are in the right track in achieving these objectives?

(b) Yes (b) No

B8. If yes, please provide explanation.

.....
.....

B9. If not, identify three most important reasons (in order of importance) that prevent you from achieving your goals.

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

B10. How can these barriers and challenges be addressed?

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

C: ASSESSMENT OF FARMING KNOWLEDGE AND SKILLS

C1. Do you have formal training in any of the major farming activities you are involved in?

(a) Yes (b) No

C2. If yes, please specify the farming activity you've been trained on.

.....

C3. When did you acquire this training?

(a) This year (b) Last year (c) Two to five years ago (c) More than five years ago

C4. Who provided the training?

(a) Extension officers (b) Municipality officials (c) NGO (d) Academic institution (e)
Other, specify.

C5. Is the training you acquired accredited (recognised elsewhere)?

(a) Yes (b) No

C6. Do you have a formal certificate for it?

(a) Yes (b) No

C7. What is the NQF level of the formal qualification you have?

.....
C8. How would you describe the type of soil in your garden?

(a) Sandy (b) Clay (c) Loam (d) Don't know

C9. How would you describe the type of soil in your field?

(a) Sandy (b) Clay (c) Loam (d) Don't know

C10. How would you describe the type of soil in your food plot?

(a) Sandy (b) Clay (c) Loam (d) Don't know

C11. If your soil is sandy or clay, what soil conservation techniques do you apply?

(a) Manure (b) Compost (c) None (d) Other, specify

C12. Do you experience water logging in your garden/field/food plot?

(a) Yes (b) No

C13. If yes, how do you deal with this problem?

(a) Drainage trenches that takes water to non-cultivated areas (b) Apply manure or compost to loosen the soil structure (c) Other, specify (d) No measures are taken

C14. How do you improve fertility of soil in your garden/field/food plot?

(a) Manure (b) Compost (c) Fertiliser

C15. If you use manure/compost, how do you apply it?

.....
.....
C16. When applying fertiliser, do you apply it according to nutrient requirements of the crops grown?

(a) Yes (b) No

.....
C17. Do you sometimes irrigate crops grown in your garden?

(a) Yes (b) No

C18. If yes, what irrigation equipment do you use in your garden?

(a) Bucket / watering can (b) hosepipe (c) pumps and pipes

C19. What irrigation equipment do you use in your garden / food plot?

(a) Bucket / watering can (b) hosepipe (c) pumps and pipes

C20. What problems do you experience with each irrigation equipment used?

.....
.....

C21. How do you deal with these problems?

.....
.....

C22. Do you know the water requirements of the crops you grow?

(a) Yes (b) No

C23. If yes, do you irrigate according to their water requirements?

(a) Yes (b) No

C24. What conservation measures do you apply to conserve water in your garden/field/plot?

(a) Grass mulching (b) Stone mulching (c) basin tillage (d) trenches (e) None

C25. How do you control pests and diseases in your garden/field/plot?

(a) Pesticides and insecticides (b) Integrated pest management control (c) Indigenous knowledge (d) Other, specify

C26. If chemicals are used, how do you apply them?

.....
.....

C27. How do you control weeds in your garden/field/plot?

(a) Chemical control (herbicides) (b) Mechanical control (hoeing)

C28. If herbicides are used, how do you apply them?

.....
.....

C29. Is there any member of your family who is trained or has knowledge in farming?

(b) Yes (b) No

C30. If yes, what farming knowledge do they have?

.....
.....

C31. Do they help you with this knowledge on the farm?

(a) Yes (b) No

C32. Have you attended any training workshop in the past year?

(a) Yes (b) No

C33. If yes, were you involved in the developing of the training content?

(a) Yes (b) No

C34. What kind of support do you have for farming?

.....
.....

C35. In relation with what you do, which areas of farming you need further training on (name them in order of importance)?

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

C36. What is your preferred method of provision for such training?

.....
.....

C37. Who is your preferred service provider for such training?

.....

C38. Why do you prefer this service provider?

.....
.....

D. INDIGENOUS KNOWLEDGE IN FARMING

D.1. Where did you get this knowledge about farming?

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.....

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.....

D.2. When did you get the knowledge?

.....

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.....

D.3. What knowledge and skills did you learn?

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.....

D.4. Who gave you skills and knowledge in agriculture

.....

.....

.....

D5. Are you still learning new agricultural practices or skills?

.....

.....

.....

Section B : Agricultural skills

Please tick next to each skill

Skill	Not competent	Competent	Very competent
Determining seed depth			
Selecting appropriate planting methods for various crops			
Determining inter and intra row spacing			
Irrigation scheduling and frequency			
Application of herbicide and fungicide			
Planning and carrying out harvesting appropriately for various crops			
Determining the amount of fertilizer to apply for various crops			
Soil and water conservation measure for specific farm lands			
Farm record keeping			
Packaging of produce			
Determine nutrient deficiency symptoms in crops			
Calibration and use of sprayer			
Maintenance of a water pump			
Storage of produce			
Financial management			
Knowledge of marketing contracts			
Price determination for your produce			
Knowledge of the market for your produce			