

**THE ROLE OF SMALLHOLDER IRRIGATED AGRICULTURE IN  
PROMOTING LIVELIHOODS AND POVERTY ALLEVIATION: THE  
CASE OF TAUNG, SOUTH AFRICA**

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## **DECLARATION**

I Esther. N. Chiyaka hereby declare that this dissertation submitted by me for the degree of Masters in Development Studies (MDS) at the Centre for Development Support, Faculty of Economic Management Sciences, at the University of the Free State (UFS), is my own independent work with the exception of the references duly cited. This dissertation has not been previously published or submitted by me or any other person to the UFS or any other university. I furthermore cede copyright of the dissertation in favour of the University of the Free State.

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February 2016

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## **DEDICATION**

I dedicate this piece of work to my three Angels, Tafara, Chantel and Anesu Chimbunde. This is to prove it to you that if mommy can do it, you can do more! The sky is the limit for you my Angels.

## ABSTRACT

Finding a lasting solution to poverty in the developing world remains a daunting task in our time. Most developing countries acclaim the role of agriculture and other agricultural activities as the main providers of employment in the rural areas. In South Africa, dry land crop production is limited in most parts due to high evaporation as well as low and inconsistent rainfall patterns. The conditions create a need to look at alternatives. Irrigated agriculture has proven to be successful in other parts of the world especially where there has been adequate support from governments, NGOs and other private organisations.

The significance of smallholder irrigation schemes arises as a result of their location in the former homelands areas. These areas continue to be characterised by poverty. However, in South Africa, most irrigation schemes which were previously supported by government have been abandoned since the handing over of their management to the farming communities. Although there has been research into the reasons for the abandonment of the schemes, the problems were found to be unique to each particular scheme. Not enough research has been done to ascertain the linkages between irrigated agriculture on smallholder schemes and livelihoods.

This study links smallholder irrigated agriculture to the livelihoods of smallholder farmers. It determines whether irrigation is an option for alleviating poverty by exploring the livelihood strategies at present on the smallholder irrigation schemes. Irrigated agriculture has the potential to contribute to poverty alleviation and livelihoods. Livelihoods strategies affect farmers on smallholder irrigation schemes but they have received little attention.

The study, using Taung as a model examined how smallholder irrigated agriculture could contribute to livelihoods and poverty alleviation. Taung irrigated scheme is situated in South Africa. A case study design and mixed methods were used to obtain data from the research participants. Semi-structured interviews, a group discussion, field observations and literature were used. Generic purposive sampling was used to select interviewees from the Taung irrigation scheme. 76 participants were purposively selected from the 8 cooperatives currently operational in the irrigation scheme. A focus group discussion was held with 4 key informants who were the extension officers from the Department of Agriculture and Rural

Development. In this study a thematic analysis of data was conducted. The quantitative and qualitative data collected from the primary and secondary sources were analysed using qualitative methods and descriptive statistics.

Livelihoods of smallholder irrigating farmers were found to be diverse. The smallholder farmers plots ranged between 7, 5 to 10ha in size. This was an improvement from the 2 hectares that were too small and hence were farmed solely for subsistence. The intensification and diversification of crop production facilitated the linkages between farmers and input suppliers. The increase in farm income created high demand for modern agricultural farm inputs such as improved seeds, fertilizers and pesticides. Thus, irrigation development has led to higher production, which implies increased consumption of inputs, as well as higher production receipts for the farmers. Apart from production linkages there are also consumption linkages because of the higher income from irrigation agriculture. Crop intensification, diversification, and market-oriented production provide food to producers as well as to consumers. The forward consumption linkage is the increased supply of products for the local and national markets.

Similar to other irrigation schemes in South Africa, a lot of challenges characterise the irrigation system in Taung. These range from financial problems, mismanagement to irrigation system maintenance. Government is the major supporter providing seed, fertilizers, and pesticides. Although the private sector also provides support there is need for monitoring to avoid manipulation of vulnerable farmers. Extension services need to be improved so as to be effective. Other sectors should also be encouraged to support the smallholder irrigating farmers.

To improve the economic and environmental performance of small scale-irrigation schemes institutional support (input supply, output marketing and credit services), training of farmers on improved crop and water management issues, regular supervision and monitoring of scheme activities are crucial.

## ACRONYMS

ACIAR:	Australian Centre for International Agriculture Research
ADRI:	Agricultural Rural Development Research Institute
ATTRA:	Appropriate Technology Transfer for Rural Areas
DFID:	Department for International Development
FAO:	Food and Agriculture Organisation
GDP:	Gross Domestic Product
IFAD:	International Fund for Agriculture Development
IRWI:	Internal Renewable Water Resources
IWMI:	International Water Management Institute
MDG:	Millennium Development Goals
MPI:	Multidimensional Poverty Index
NGO:	Non-Governmental Organisation
NPC:	National Planning Commission
OPHI:	Oxford Poverty and Human Development Initiative
RESIS:	Revitalisation of Smallholder Irrigation Schemes
UNDP:	United Nations Development Programme
ZIS:	Zanyokwe Irrigation Scheme

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# CHAPTER 1

## 1.1. INTRODUCTION

The United Kingdom's Department for International Development (DFID) approach to agriculture is based on the premise that this sector has a direct impact on poverty reduction. Evidence from the National Planning Commission (NPC, 2011), Backeberg and Sanewe (2010), Water Research Commission (WRC, 2008), Letsoalo and Van Averbek (2005), shows that increasing agricultural productivity benefits multitudes through higher income, food security and employment creation. The benefit is not only for rural communities but also urban areas. It also contributes to economic development outside agriculture through growth and job creation as well as higher wages (DFID, 2005).

Finding a lasting solution to poverty in the developing world remains a daunting task in our time. According to Machethe (2004) rural development literature supports the view that agriculture is the best solution for reduction of rural poverty. Agriculture in many African countries remains the main livelihood strategy for the poor rural communities (Van Averbek, Denison & Mnkeni, 2011). Agricultural activities in most developing countries are the main providers of employment in the rural areas. In South Africa, dry land crop production is limited in most parts due to high evaporation as well as low and inconsistent rainfall patterns.

This study attempts to answer the following questions: Is irrigated agriculture an option for alleviating poverty and enhancing livelihoods in South Africa? What is the contribution of irrigation to livelihoods and poverty alleviation? What are the livelihood strategies of people in Taung at present? Are previously established irrigation schemes by the South African government still meeting their intended objectives using Taung as a model? What can be done to ensure that irrigated agriculture leads to sustainable livelihoods in South Africa?

In this study, the contribution of smallholder irrigated agriculture to livelihoods and poverty alleviation is examined. Taung irrigation scheme the chosen case study is situated in South Africa.

## 1.2. BACKGROUND

During the 20<sup>th</sup> century, most social segregation policies in South Africa benefited the whites (Van Auerbeke *et al.*, 2011). The establishment of schemes as a result of the irrigation development initiative benefited the whites even more. The plots occupied by white farmers were 10 times larger than those allocated to black farmers. The term 'smallholder irrigation scheme' is commonly used to refer to the small size of plots allocated to black farmers in South Africa (Machethe, 2004).

Smallholder schemes are significant because of their location in the former homelands areas. According to Vink and Van Rooyen (2009), these areas continue to be characterised by poverty. Irrigated agriculture has the potential to contribute significantly to poverty alleviation and livelihoods. Van der Stoep (2011) observed in a study conducted in 2010, that smallholder irrigation schemes covered 47 667 ha, compared to the 1 675 822 ha of registered irrigation land in 2008, of which 1 399 221 ha was irrigated annually. Vink & Van Rooyen (2009) in another study also reported that the population of smallholder farmers on irrigation schemes was small at 34 158 compared to the number of homesteads that had access to land for cultivation which was 1.3 million homesteads.

Taung irrigation scheme according to Tekana & Oladele (2011) was established in 1939 in the Northwest province by the South African government. It was incorporated into the Bophuthatswana homeland during the independent homeland era from the period 1970 until the 1990's. According to the ARDRI Report (2000), the scheme was initially developed as 1.7 hectares, 2 plots per farmer using flood irrigation. Nearly 200 plot holders farmed mainly for subsistence, growing maize and pumpkin.

The initial objective of establishing the scheme was to improve the standards of living of the people living in Taung (see Figure 1.1 below). This was to be achieved through creation of employment, improving food security and promoting sustainable agricultural practices. This was an important component for the economic development of the area. The Bophuthatswana government controlled and supervised the scheme with uniform regulations relating to maintenance, credit facilities, water rates, as well as organisation of settlements. The 1.7 hectares of irrigated holdings were sufficient in sustaining a family whilst all family members



could work on the farm. Close to 2 500 hectares is under centre pivot system and about 1000 hectares is irrigated by sprinkler system.

The new government took over some schemes which had been abandoned after independence in 1994 so farmers had to devise their own plans on how to run those schemes. Government support to the Taung irrigated scheme was reduced and as a result most of the farmers could not sustain themselves. Due to these preceding events, it is crucial to assess whether the initial objectives of establishing the scheme are still being achieved (Tekana & Oladele, 2011).



**Figure 1.1: Map of Northwest Province**

Source: De Jager (2011).

### **1.3. PROBLEM STATEMENT**

The relationship between smallholder irrigated agriculture and livelihood strategies was investigated in this study. The study investigated whether irrigation was an option for poverty

alleviation by exploring the current livelihood strategies present on the smallholder irrigation schemes. The findings determine if the livelihood strategies can be adapted for effective utilisation of the irrigation schemes. In this circumstance, Taung which is a smallholder irrigation scheme was used as a case study.

Irrigated agriculture has proven to be successful in other parts of the world especially where there has been adequate support either from governments, NGOs and other private organisations (Backeberg and Sanewe, 2010). Irrigated agriculture to contribute effectively to poverty alleviation in South Africa, should aim to provide a sustainable livelihood. This can be done through investments in affordable technology in irrigation systems or attaining adequate support from government, NGOs and the private sector. Mangisoni (2011) adds that the goal of irrigated agriculture is to enhance food security in poor communities and provide sustainable livelihoods.

In South Africa, most irrigation schemes which were previously supported by government have been abandoned since their management was handed over to the farming communities (Tekane & Oladele, 2011). The lack of access to markets or their knowledge thereof has made it difficult for smallholder irrigators to compete with large scale irrigators. Unable to compete with large scale operations, smallholder farmers resort to subsistence farming or neglect of their schemes altogether. The systems set up to maintain these schemes collapse due to inefficiencies (Van Averbeke *et al.*, 2011). There is evidence of schemes in Limpopo, Kwa-Zulu Natal, and Eastern Cape that have been abandoned. This may be one of the reasons why urban migration has been on the increase leading to urban poverty as people seek alternative means to sustain their livelihoods. Lankford & Gillingham (2001) state that although there has been research into the reasons for their abandonment, the problems were found to be unique to each particular scheme. Further research has to be done to ascertain the linkages between irrigated agriculture on smallholder schemes and livelihoods (Van Averbeke *et al.*, 2011).

## **1.4. MOTIVATION FOR THE RESEARCH**

Poverty remains a mammoth task especially in the developing world and is most prevalent in the rural areas. There is a need to either find or modify existing sustainable agriculture programmes to help the poor to change their livelihoods for the better. The reason for focusing on Taung, South Africa is that the area hosts the biggest irrigation scheme in the country. As such, results obtained from it may be used to replicate studies or projects on other irrigation schemes in South Africa. There is need to examine the linkages between irrigated agriculture and livelihood strategies.

Smallholder irrigated agriculture can contribute immensely to livelihoods and poverty alleviation in South Africa if there is adequate support from government, NGOs and the private sector. Results from this study are valuable to members of the community, subsequent researchers, the Department of Agriculture and Rural Development as well as NGOs and other private organisations.

## **1.5. AIM**

The study establishes the linkages between irrigated agriculture and livelihood strategies of the smallholder farming community. It determines whether irrigated agriculture is an option for sustainable livelihoods and poverty alleviation in South Africa.

## **1.6. OBJECTIVES**

1. To examine livelihood strategies that benefits the poor.
2. To assess the impact of technology on smallholder farmers.
3. To examine the marketing behaviour of smallholder farmers.
4. To recommend interventions for effective poverty alleviation in Taung, South Africa.

## **1.7. RESEARCH QUESTIONS**

This study answers the following questions: Is irrigated agriculture an option for alleviating poverty and enhancing livelihoods in South Africa? What is the contribution of irrigation to

livelihoods and poverty alleviation? What are the livelihood strategies of people in Taung at present? Are the irrigation schemes previously established by the South African government such as Taung still meeting their intended objectives? What can be done to ensure irrigated agriculture leads to sustainable livelihoods in South Africa?

## **1.8. DEFINITION OF CONCEPTS**

### **1.8.1. Understanding Poverty**

Grewal, Grunfield & Sheehan (2012) support the notion that poverty is a multidimensional concept that encapsulates deprivations in several dimensions. It limits opportunities for a happy, healthy and productive life. The key deprivations include income poverty, hunger, malnutrition, gender bias, social exclusion, lack of access to education, health services as well as housing. In addressing the issue of poverty, the following perspectives of poverty i.e. income, basic needs, inclusion, sustainable livelihoods as well as human development are considered. Max-Neef (1991) suggests that poverty alleviation henceforth refers to the betterment or reduction of any or all of these dimensions. In this study, poverty is also viewed as a multidimensional concept therefore its reduction encapsulates the betterment of any or all of these dimensions.

### **1.8.2. Agriculture**

In some cases agriculture is viewed as a simple activity that ends with placing the seed in the ground and waiting for it to grow before harvesting. According to the Webster dictionary (1961), agriculture entails the science, art or practice of cultivation of the soil, as well as the production and harvesting of crops, raising livestock and the preparation and marketing of the end products. In this study agriculture is viewed as a process which involves crop production, processing and marketing the end product.

### **1.8.3. Irrigation and Irrigation scheme**

Irrigation refers to the boosting of crop production through artificial administration of water to the land. Water for irrigation purposes can be extracted from its source to the field by individual farmers or in a group in the form of an irrigation scheme. The term “smallholder irrigation” has come to include systems that draw water from various sources, and use different access and distribution technologies to irrigate different types of crops under

different management practices. It is critical to understand the specific functionality of a given irrigation system.

Van Averbeké *et al.*, (2011) define an irrigation scheme as “*an agricultural project involving multiple holdings that depend on a shared distribution system for access to irrigation water and, in some cases, on a shared water storage or diverse facility*” These irrigation schemes are a common phenomenon amongst smallholder farmers, who are mostly black farmers benefiting from the agriculture BEE programme.

#### **1.8.4. Livelihoods**

Livelihood refers to the strategies people engage in, in order to survive and improve their standard of living. Manyatsi & Mwendera (2007) revealed that they are a consequence of the means and reasons people manipulate the environment in order to meet their needs using technology, power, labour, social relations, as well as knowledge. In line with the Sustainable Livelihoods framework, a livelihood is defined here as “*the activities, the assets, and the access that jointly determine the living gained by an individual or household*” (Carney, 1998).

### **1.9. OUTLINE OF THE DISSERTATION**

Chapter 1 introduces agriculture and its role as the main proponent in poverty alleviation and livelihoods in Africa. It also outlines the background of the study, problem statement, motivation for the study, aim and objectives, research questions and definition of concepts.

Chapter 2 provides a brief overview of relevant literature from various scholars that focused on smallholder irrigated agriculture in the world. It looks at smallholder irrigated agriculture as a tool for poverty alleviation.

Chapter 3 outlines the research methodology used in the study. The chapter also outlines the research design, population sampling methods used, as well as data collection methods and instruments. The chapter also explains how data will be analysed and discusses the ethical considerations and limitations of the study.

Chapter 4 presents the empirical findings and summarises the results. The chapter discusses and analyses the findings of the research and provides interpretation of the results.

Chapter 5 concludes with the implications of the findings and recommendations.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1. INTRODUCTION**

In this chapter, the relevant literature on smallholder irrigated agriculture is explored taking into account various scholars that targeted this sector in the world. The purpose is to explore its application in identifying the impact to Taung irrigation scheme. Of particular interest is the fact that irrigation is used as a tool for alleviating poverty. Smallholder irrigated agriculture as a tool for alleviating poverty is debated in the literature.

### **2.2. SMALLHOLDER IRRIGATED AGRICULTURE AS A TOOL FOR POVERTY ALLEVIATION**

The Multidimensional Poverty Index (MPI) launched in 2010 by the United Nations Development Programme (UNDP) and the Oxford Poverty and Human Development Initiative (OPHI) at the University of Oxford are the latest among several multidimensional measures of poverty. Ravallion (2003) concluded that making relevant contribution to poverty reduction is related to the composition of and growth in economic sectors (agriculture, industry, services) in developing countries. Most studies, for example Agholor & Obi (2013), Barnes (2010), Bhorat, Van der Westhuizen & Jacobs (2011) also come to the conclusion that growth in agriculture is highly beneficial for poverty reduction.

The importance of agriculture in industrial development, job creation as well as a source of food for both humans and animals is acknowledged. Many scholars for example, Eicher (1994), Scoones (1998), Shah (2000), and Agholor & Obi (2013) agree that agriculture remains the mainstay of most African economies and a livelihood source for their poor rural communities. Irrigated agriculture presents an attractive alternative where crop production demand is limited due to conditions of low and erratic rainfall as well as high evaporation. The artificial application of water to land for the purpose of stimulating plant production reduces or removes water deficit as a limiting factor in plant growth. This enables crop growth to increase crop yields in dry climates for part or all of the growing season (Van Averberke *et al.*, 2011).

The experience of other countries that have used irrigation as a poverty reduction strategy among them, India, Pakistan, Morocco, Uganda and Zimbabwe are recorded. Its role in enhancing food and nutrition security in the world's poorest regions is acknowledged by many scholars for example Burney & Naylor (2011). Asia's Green Revolution demonstrates that irrigation, when combined with the availability of inputs (fertilizer) and improved crop varieties, can result in year-round cultivation and increased yields. Most significantly, irrigation facilitates the introduction of new crops in regions where they could not be sustained by rainfall alone. Excess local demand (that is, elastic local markets) means that markets are not prone to saturation. Prices for such crops remain relatively high year-round, and farmers can cultivate numerous high-value crops and tailor their cropping calendars in response to local conditions (Jayne *et al.*, 2010).

In linking irrigation and poverty, a number of studies in various countries reveal that irrigation is the key driver for growth in agricultural production and in improving household income and alleviating rural poverty. Lipton *et al.*, (2004) state that irrigation can contribute to poverty reduction through increased production, income as well as reduction of food prices. This enables very poor households to meet the basic needs associated with improvements in household overall economic welfare. Households can be protected against risks of crop loss due to erratic, unreliable or insufficient rainwater supplies, promotion of greater use of yield, enhancing farm inputs as well as the creation of additional employment. These together, enable people to break the poverty cycle.

A smallholder irrigation system can be visualized as an aggregate of three components which are, a water access technology, a water distribution technology, or a productive (use) water application (Burney & Naylor, 2011). Water access technologies include all pumps ranging from human-powered rope and treadle pumps to liquid fuel engine-driven systems to solar-powered pumps. Water access technologies enable access to water where it was previously unavailable. Distribution technologies facilitate distribution of water and fertilizer to plants at the plot level, and include simple furrows, watering cans, micro-sprinkler systems, and drip irrigation systems both low-cost and conventional. Access and distribution technologies can increase returns to labor, and can provide direct cost savings in cases where farmers pay for energy services and water.



Productive applications of water include the use of higher-yielding varieties with inputs (for example, fertilizers) for crop diversification and production of high-value crops. These water use technologies increase returns to land and irrigation investments. The term “smallholder irrigation” includes systems that draw water from various sources, and uses different access and distribution technologies to irrigate different crops under different management practices. It is therefore mandatory to understand the specific functionality of a given irrigation system.

Another way of assessing the contribution of smallholder irrigated agriculture to poverty is to look at its contribution to total household income. In a study involving 138 smallholder irrigation farmers in Limpopo Province by Machethe (2004), household income sources were divided into two broad categories of farm and non-farm sources. Farm income included income derived from the sale of farm produce (livestock income is not included as the households did not have any livestock). Non-farm sources included old-age pension, remittances, wages, family business and other sources. Table 2.1 outlines the various household income sources and the contribution of each to total household income.

As reflected on Table 2.1, non-farm income sources combined contribute more to household income than farming. Close to 60 percent of total household income is from non-farm sources. This shows that diversification is an important part of livelihood among the smallholder farming community.

**Table 2.1: Sources of income and contribution to total household income**

<b>Income source</b>	<b>Average monthly income (R)</b>	<b>Contribution as % of total household income</b>
Farming	545	41.0
Pension	329	24.8
Wages	258	19.4
Remittances	165	12.4
Family business	19	1.4
Other non-farm income	13	1.0
<b>Total</b>	<b>1329</b>	<b>100</b>

Source: Machethe, 2004.

Categorising the households into “poor” and “rich” and analysing the contribution of the various sources of income to total household income also provided some interesting results.

This is done in Table 2.2 using the median income to divide the households into “poor” and “rich”. “Rich” households include those with total household income above the median income for all households while those whose income falls below the median income are considered to be “poor”.

**Table 2.2: Sources of income and contribution to total household income for poor households (using median income for categorisation)**

<b>Income source</b>	<b>Average monthly income (R)</b>	<b>Contribution as % of total household income</b>
Farming	62	27.7
Pension	53	23.6
Wages	52	23.1
Remittances	37	16.5
Family business	19	8.2
Other non-farm income	2	0.9
<b>Total</b>	<b>225</b>	<b>100</b>

Source: Machethe, 2004.

These results are similar to those presented above for all households as they also indicate that combined non-farm sources of income contribute more to household income than farm sources. However, farming contributes more to household income than all individual non-farm sources of income. This shows that in linking irrigated agriculture to livelihoods, diversification should also be considered and incorporated into poverty alleviation programmes.

Another study involving 1031 households by May *et al.*, (FAO, 2004) conducted in KwaZulu-Natal confirms the important role of agriculture in poverty alleviation. The study concludes that households engaging in agricultural activities tend to be less poor compared to those not participating in agricultural production. Furthermore, the study notes that the level of farm income increases with total household income. This suggests that agriculture remains an important source of income even for households deriving a significant proportion of their income from non-farm sources. The study also found that some households that were engaged in informal activities moved to agriculture suggesting that agriculture was a better option as a source of income for these households than informal activities.

### **2.2.1. An analysis of the benefits of the strategy**

The role of agriculture in the economy is generally acknowledged. However, there is no consensus as to whether agriculture is the most appropriate way to fight poverty in developing countries. One school of thought argues that since the majority of people in most developing countries are in rural areas and most of them are engaged in agricultural production or agriculture-related activities, agriculture is the most effective way to reduce poverty. The second school of thought recognises the contribution of agriculture to poverty alleviation but attaches more importance to non-agricultural activities (e.g. rural non-farm enterprises and social services).

McIntosh & Vaughan (1996) are of the view that it is inappropriate to build a policy framework that is designed to improve livelihoods based on the premise that a broad based smallholder agricultural system can be created. Furthermore, the policy framework is assumed to have the ability to transform the agricultural production system's character in South Africa. Noting these divergent views on the role of smallholder agriculture in poverty alleviation, the following section outlines the positive contribution of agriculture, especially smallholder agriculture, in poverty alleviation.

The importance of smallholder agriculture to employment, human welfare, and political stability in sub-Saharan Africa according to Delgado (1998) is far too important to be either ignored or treated as just another small adjusting sector of a market economy. During the 1960s, many African governments paid more attention to large-scale farmers with the encouragement of donors (Eicher, 1994). Middle or 'progressive' and smallholder farmers were not given any attention. Due to the high failure rate of these schemes, many donors turned their attention and financial support to smallholder agriculture in the 1970s. Eicher (1994) argues that middle farmers should be viewed as a positive force in moving agriculture forward. Eicher (1994) suggests that African governments should give priority to the development of both smallholder and middle farmers. With adequate support, smallholder farmers have the potential to produce a marketable surplus. According to Lele & Agarwal (1989) smallholder farmers in Kenya with farms of less than two hectares increased their share of national agricultural production from four percent in 1965 to 49 percent in 1985.

Zimbabwe's remarkable increases in maize production by smallholder farmers in the 1980s is another example and is often referred to as Africa's green revolution success story (Eicher,

1994). Smallholder farmers in Zimbabwe tripled maize production between 1980 and 1987 and increased their share of the national marketable maize surplus from ten percent in 1980 to 40 percent in 1987 (Eicher, 1994). This success was attributed to the launch of a government programme to boost maize and cotton production and development of hybrid maize varieties. This shows that agriculture contributes to poverty alleviation at rural, urban and national levels in four ways which are: (a) reducing food prices; (b) employment creation; (c) increasing real wages; and (d) improving farm income. Studies conducted in several countries reveal that the “pro-poor” role of agricultural growth can be dramatic, and much more effective compared to other sectors at reducing poverty and hunger in both urban and rural areas (FAO, 2004). Agricultural growth therefore has a strong and positive impact on poverty often significantly greater than that of other economic sectors.

Irz *et al.*, (2001) in their analysis of the relationship between agricultural growth and rural poverty observed the strong effects of agricultural growth on poverty alleviation. For instance, a one-third increase in yield was expected to reduce the number of poor people by a quarter or more. With regard to food security, the studies conclude that growing the agricultural sector is the primary channel for achieving household food security. The results from these studies also show that unless agriculture reaches some degree of commercialisation, the impact of agricultural growth on food insecurity and poverty alleviation is limited. Furthermore, the studies shows that households (in the rural sector) engaged in agricultural activities tend to be less poor and have better nutritional status than other households. A study conducted in Indonesia found that agricultural growth reduced the level of poverty by 50 percent in rural areas while the percentage for urban areas was 36 percent (FAO, 2004). The above analysis presents a strong case for agriculture’s role in reducing poverty.

Other scholars focus on the positive linkages between irrigation and poverty reduction such as increased cash generation, local multiplier effects, multiple-uses of irrigation (livestock, laundry), benefits to vulnerable groups such as female headed households and forward linkages in the wider economy through job creation (Van Koppen, 1995, Shah, 2000). Chambers (1988) cites several empirical studies which show that irrigation directly raises employment for landless labourers. A World Bank evaluation (1997) identifies improved food security and increased income associated with its irrigation projects which are estimated to have benefited some 46 million farming families. Furthermore, Hope, Gowing & Jewitt

(2008) observed that, global studies unfailingly document evidence of lower poverty rates when land is under irrigation rather than rain fed production.

An important advantage of irrigation is that less land is required to provide the same amount of food and fibre to the same number of people. According to Barker *et al.*, (1999), failure to meet food production needs through efficient implementation and expansion of irrigated agriculture will increase the pressure on land resources and hasten the process of environmental degradation. The present service delivery strikes in the townships in South Africa are evidence of this. However, irrigation development strategies have been hampered by a lack of understanding of the links between water scarcity, food production, food security and environmental sustainability (Mangisoni, 2011).

#### **2.2.2. An analysis of the shortcomings of the strategy**

Sadly, not all types of irrigation help low income farmers. For example, although farmers in Northern Ethiopia practice traditional irrigation, they are unable to achieve sustainable food security because they use a combination of poorly designed and inappropriate extension approaches. The approaches do not result in the expected outcome (Awulachew *et al.*, 2005). Similarly, smallholder irrigation in Zimbabwe is also given high priority but few of the schemes realise a reasonable profit margin. The farmers in those schemes face numerous constraints that include limited cash for input purchases, unreliable water supplies for winter cropping, limited market outlets and poor road infrastructure (Mangisoni, 2011).

Shumba & Maphosa (1996) observed that in order for the benefits of irrigation to reach the irrigators, the schemes should be accessible to outside markets. Therefore, rural roads need to be upgraded, and government operation and maintenance costs need to be reduced by letting the farmers gradually take over these costs. Similar problems beset smallholder irrigation schemes throughout Africa, thereby reducing their potential contribution to poverty reduction and agricultural growth (Shah *et al.*, 2000).

Small-scale, micro-irrigation technologies are known to maintain environmental quality, sustain livelihoods and support biodiversity. However, these have been discarded due to failure to realise their expected production potential in South Africa. An integrated approach to water management that focuses on small-scale irrigation technologies can increase water use in agriculture and water flows to sustain ecological functions that provide critical

ecosystem services to humans (Bhatt *et al.*, 2006, Van Koppen, 1998). In India, micro-AWM techniques are increasingly seen as a means of addressing the growing problem of scarce water resources. Consequently, these technologies contribute to the sustainability of agricultural crop yields, incomes and food security of households, more so than traditional irrigation practices such as flood irrigation (Mangisoni, 2011). In South Africa, most of the small scale irrigation technologies have been replaced by large scale commercial overhead systems.

### **2.3. A GLOBAL VIEW OF SMALLHOLDER IRRIGATED AGRICULTURE**

The Green revolution in South Asia highlighted the contribution of smallholder irrigated agriculture to the livelihoods of poor farmers. High yield wheat varieties, fertilizers, irrigation as well as considerable policy support led to India's yield growth of 3% in wheat and 2.2% for rice between the 1960's and mid 1990's (Erenstein & Thorpe, 2010). This transformed the Indo-Gangetic plains into India's granary benefiting millions of poor farmers and consumers. As a result, India moved from a state of deficiency in these staple grains to self-reliance. The Green Revolution boosted cereal production well above population growth in South Asia. The Green Revolution transformed the Indo - Gangetic Plains (IGP) spreading from Pakistan, through northern India and the Nepal Terai region to Bangladesh into the cereal basket of South Asia, with rice-wheat systems now covering an estimated 14 million ha in the region. The technological packaging of improved wheat and rice seed, chemical fertilizer, and irrigation in an overall supportive environment for agricultural transformation led to rapid growth.

According to Erenstein & Thorpe (2010), in Northwest Mexico, the main focus has been in the Yaqui Valley located in the state of Sonora. This valley encompasses about 255,000 ha of irrigated land using primarily gravity irrigation systems fed from canals (over 80% of irrigation water) and deep tube wells (around 20% of irrigation water). Farming is mechanised but operational farm size can range from less than 10 ha to several hundred hectares or more. In the past farmers planted all their crops on the flat with flood irrigation. However, over the past 25 years more than 95% of the farmers including smallholders have changed to planting all crops, including wheat, the most widely grown crop, on raised beds spaced at 70 – 100 cm, bed centre to bed centre. Irrigation water is applied in the furrows between the beds. Wheat yields for the Yaqui Valley have averaged over 6 t/ha over the past

several years. Farmers growing wheat on beds obtain about 8% higher yields with nearly 25% less operational costs and irrigation water use as compared to those still planting conventionally on the flat, using border/basin flood irrigation. Irrigation has thus been seen to improve crop yields. However, South Africa cannot afford the use of furrow irrigation as compared to Yaqui valley as it is a water scarce country. Rice growing needs paddy or furrow irrigation thus South Africa is not a rice growing country as water availability is a major challenge.

In Pakistan, Morocco and Sri Lanka, more integrated small-scale multiple-use water supply schemes (including irrigation) provide health benefits, increase incomes and reduce the workloads for women and children (IWMI, 2006d). Such integrated small-scale approaches are sustainable because the farmers derive more benefits from them, have a greater stake in them and are more willing and better able to pay for them.

## **2.4. TRENDS IN SMALLHOLDER IRRIGATION IN AFRICA**

In West Africa, sustainable informal or smallholder irrigation in urban and peri-urban areas underpins the rapid expansion of cities. It provides benefits to urban agriculture such as food and employment through vegetable production without reliance on an unsustainable large-scale irrigation infrastructure. In addition, the year-round farming in the urban and peri-urban areas is sustainable because it maintains a continuous soil cover. This helps to stop soil erosion, helps to diversify the livelihoods and diets of poor urban and peri-urban dwellers, and contributes to urban biodiversity and greening. Irrigated urban agriculture is therefore an important livelihood strategy that has helped to maintain urban food supplies during political and economic crises in West Africa (Drechsel *et al.*, 2006, IWMI, 2007).

The World Bank and the International Food Policy Research Institute (IFPRI) (2006) noted that, in sub-Saharan African countries, the greatest contribution to poverty reduction is achieved through improvement in the productivity of staple food crops than concentrating on livestock or the export of agricultural crops. Since irrigation currently plays a minor role in the staple food production of the region, investment in small-scale irrigation will contribute more to the sustainability of agricultural production than any investment in conventional or large-scale irrigation (Mangisoni, 2011).

According to Tuinhof *et al.*, (2011) and ADB (2010), groundwater is increasingly advocated as a potential source for augmentation of irrigation in sub-Saharan Africa as part of the larger goal to increase food production and overall irrigation in Africa. In particular, it is viewed as an important measure for livelihood enhancement, food security, poverty alleviation and drought mitigation through small-scale smallholder irrigation in semi-arid rural areas where food insecurity and general vulnerability is prevalent (Allaire, 2009). Villholth, Ganeshamoorthy, Rundblad & Knudsen (2013) support the notion that groundwater holds particular benefits such as availability on demand, relative drought resilience, as well as farmer control, making it a reliable supplement to surface-water irrigation. However, despite recognised advantages, facts show that sub-Saharan Africa lags far behind, e.g. relative to India, in terms of groundwater development for irrigation. Only five percent of irrigated area is served by groundwater in sub-Saharan Africa, while the corresponding figure for India is 60 % (Siebert *et al.*, 2010).

Burney and Naylor (2011) in their study of smallholder irrigation as a poverty alleviation tool in sub-Saharan Africa concluded that the poorest population resides in rural areas and these depend on rain fed agriculture for their livelihoods. Yields are low as a consequence of erratic rainfall patterns as they are limited to the rainy season which is only 3 to 6 months in a year. Due to their reliance on rain fed agricultural production, smallholder farmers are faced with the challenge of having to store their crops for consumption until the subsequent harvest. Such dependency on seasonal staple production leads smallholder farmers to face multi scale poverty traps. In this case the smallholder farmers survive on less than R12,50 per person per day and suffer from a decrease in nutrition. Most of their income is spent on food and there is no surplus.

National as well as regional level estimates suggest that Internal Renewable Water Resources (IRWR) are underutilised in most of sub Saharan Africa. Frenken (2005) observed that Coastal West Africa uses 1.3% of its IRWR. Household consumption surveys conducted for example by Smith, Alderman and Dede, (2006) revealed that most rural areas face shortages in fruits and vegetables during the dry season. Irrigated agriculture may foster the production of new crops in areas where they could not be sustained by rainfall. Markets for such crops are not saturated and the prices for such crops remain high all year. According to Jayne *et al.*, (2010), smallholder farmers can plant numerous high value crops and manipulate their crop



calendar to suit their local conditions. Focusing on high value crops may lead to a reduction in poverty and sustainable livelihoods in sub Saharan Africa.

## **2.5. AN OVERVIEW OF SMALLHOLDER IRRIGATION SCHEMES IN SOUTH AFRICA**

A number of authors have reported about the irrigation situation in South Africa from different viewpoints. Rutherford (2010), in the report on an assessment of rain fed crop production potential in South Africa's neighbouring countries, revealed that South Africa uses 60% of its scarce water resources on irrigated agriculture of which a significant amount is used on crops that can be rain fed. This suggests that if there is efficient use of available water resources, more water resources can be channelled towards irrigation in areas where it is needed most.

The Water Research Commission showed interest in smallholder irrigation from 1990 after realising the importance of developing homelands in the face of the new political dispensation. It consequently enlarged its agricultural focus to encompass water as a livelihood resource in South Africa. Many people perceive poverty to be more prevalent in rural areas but this may not be the case as urban poverty has been revealed to be on the increase (United Nations, 2011). If agriculture can aid in alleviating rural poverty through providing sustainable livelihoods, urban poverty may also be reduced.

The Limpopo Provincial Department of Agriculture set aside R224 million to fund the Revitalisation of Smallholder Irrigation Schemes (RESIS) programme. It focused on the existing 126 irrigation schemes and aimed at re-building profitable agribusiness through a comprehensive programme to structure, train and capacitate smallholder farmers to operate their schemes in a sustainable and profitable manner (Tapela, 2008). Apart from the RESIS programme attempting to reverse the adverse impact of government decisions, the programme is also in response to an international drive to enhance efficient water usage and reduce the transaction costs of operating state-sponsored irrigation schemes. This is done by transferring irrigation management to farmers and implementing agricultural commercialisation.

Van Averbeke *et al.*, (2011) in their study of small holder irrigation schemes in South Africa observed that irrigated agriculture was an attractive alternative given the erratic rainfall patterns in South Africa. Irrigation development has received considerable support from the South African Government through subsidies to state irrigation schemes as well as irrigation board schemes. Backeberg and Groenwald (1995b) in Van Averbeke *et al.*, (2011) observed that the intention of government was to increase food security, insure agriculture against drought, provide rural employment as well as establish new owners and settlements in the farming sector. This was largely a consequence of the global irrigation development initiative which according to Turrall *et al.*, (2010) in Van Averbeke *et al.*, (2011) also saw an increase in the area under irrigation in South Africa. It increased from 0.23 x106 ha in 1909 (Scotney & Van der Merwe, 1995) to 1.2 x106 ha in 1991 (Bruwer & Van Heerden, 1995), when 30% of irrigated land was located in state irrigation schemes, 30% in schemes controlled by irrigation boards and 40% in private irrigation farms (Vaughan, 1997). Public funds were utilised in the payment for capital requirements of state schemes, whereas those under the irrigation boards received 30% of the capital cost as a subsidy.

In South Africa smallholder schemes are not of significant importance according to the land area and participation of farmers. Van der Stoep (2011) points out that in 2010, smallholder irrigation schemes covered 47 667 ha, compared to the 1 675 822 ha of registered irrigation land in 2008, of which 1 399 221 ha was irrigated annually. Vink & Van Rooyen (2009) observed that the population of smallholder farmers on irrigation schemes was small at 34 158 compared to the number of homesteads that had access to land for cultivation which was 1.3 million homesteads. This shows that there is no agreed number of smallholders in South Africa.

According to Van Averbeke *et al.*, (2011), the evidence available indicates that in 2010 there were 302 smallholder irrigation schemes with rivers being the principal source of water. In 2010 not all schemes were operational or fully functional though the data available on provinces with the exception of Limpopo Province, did not allow for estimates of the extent to which operational schemes were functioning. Table 2.3 shows the operational status of the schemes by province in relation to irrigation method.

**Table 2.3: Operational status of South African smallholder irrigation schemes by province and irrigation system**

Province	Number of operational schemes by irrigation system				Number of non-operational schemes by irrigation system				Total
	Gravity-fed surface	Pumped surface	Overhead	Micro	Gravity-fed surface	Pumped surface	Overhead	Micro	
Limpopo	49	9	30	13	12	5	41	11	170
Mpumalanga	3	0	4	0	1	0	11	0	9
North West	0	2	0	0	0	0	0	0	2
Kwazulu-Natal	5	0	30	0	0	0	0	0	35
Free State	0	1	0	0	1	0	0	0	2
Northern Cape	0	2	0	0	0	1	0	0	3
Eastern Cape	4	0	46	1	0	0	16	0	67
Western Cape	6	0	1	0	0	0	1	0	8
<b>Total</b>	<b>67</b>	<b>14</b>	<b>111</b>	<b>14</b>	<b>14</b>	<b>6</b>	<b>59</b>	<b>11</b>	<b>296</b>

Source: Van Averbeke et al. (2011).

Note: The operational status of six schemes, five in the Eastern Cape and one in Kwazulu - Natal, was not known, bringing the total to 302.

Most of the existing command areas of smallholder irrigation schemes were found to be under overhead irrigation. In 2010, 206 schemes were operational whilst 90 were not. The status of one gravity fed canal scheme in KwaZulu Natal and five overhead irrigation schemes in the Eastern Cape could not be established. Previous research established that the likelihood of schemes to be operational was 81% for gravity fed canal schemes, 70% for pumped surface irrigation schemes, 65% for overhead irrigation schemes and 56% for micro-irrigation schemes (Van Averbeke *et al.*, 2011).

Among the primary constraints identified by extension staff on 164 of the 302 smallholder schemes, poor management topped the list (50% of the cases); infrastructural problems followed at (15%); water inadequacies (13%); conflict (12%); and theft (7%). This suggests that human capacity and social institutional resource problems were the main causes of the below expected performance of smallholder irrigated agriculture in South Africa. The development of smallholder schemes in South Africa dates back to the 1950s but in 2010, such schemes no longer existed in their original form and Taung in the Northwest Province is one example established as far back as 1939 (Bembridge, 1997). The original canal irrigation

system has been replaced with an overhead centre pivot system (see Figure 2.1 below).



**Figure 2.1: Centre Pivot (overhead system)**

When looking at the frequency distribution of the command area of smallholder irrigation schemes in South Africa it was observed that the majority of schemes (65%) had a command area that did not exceed 100 ha. All but 18 schemes had a command area that did not exceed 500 ha. Only 6 schemes were larger than 1 000 ha. These included Majeje (1 169 ha) and Middle Letaba (1 730 ha) in Limpopo Province, both not operational. Ncora (2 490 ha) and Qamata (2 635 ha) in the Eastern Cape and Makhatini (2 620 ha) in KwaZulu-Natal, all operate at a fraction of their capacity; and Taung (3 500 ha) in North-West Province, was the only large project that was operating reasonably well (Van Averbeke *et al.*, 2011). Therefore this showed the dominance of small schemes.

According to the frequency distribution of plot size among plot-holders on smallholder irrigation schemes, one of the peaks represented plots not exceeding 0.5 ha. These could be regarded as food plots, because farming on these small plots was shown to serve primarily as a source of food for plot-holder homesteads (Vaughan, 1997, Van Averbeke *et al.*, 2011). The other peak represented plots that were between 1 ha and 2 ha in size. The use of plots between the 1 ha and 2 ha category has been shown to vary among schemes and within schemes, with some allotments being used mainly to produce food for own consumption and

others primarily for commercial purposes. The size of the land area shows that it is too small for commercial purposes.

## **2.6. MARKETING BEHAVIOUR OF SMALLHOLDER FARMERS**

The position of the scheme in relation to markets is seen as the key determinant of the balance between subsistence and commercial production on 1 ha to 2 ha plots (Bembridge & Sebotja, 1992, Kamara *et al.*, 2001). In some of the cases, the position of the scheme in relation to markets was purely a spatial factor, with distance to the nearest urban centre and state of the roads linking the scheme to that centre as the key factors. This was due to the fact that marketing of produce was done mainly by street traders and 'bakkie' traders (Van Averbeke *et al.*, 2011). Schemes that were located next to a major road, aided farmers to trade directly with customers and this was a variation of this spatial factor (Laker, 2004).

The position of schemes in relation to markets was a function of institutional arrangements in other cases. This applied to projects where agencies provided a marketing services such as in the case of sugar cane (Bembridge, 2000), and also to projects where farmers marketed their produce as an association instead of individually. Within schemes, the purpose of farming on plots of 1 ha to 2 ha was shown to be dependent on the role irrigation played in the livelihood of individual plot-holder homesteads (Van Averbeke & Mohamed, 2006). The importance of farming in their portfolio of livelihood activities, other sources of income besides farming, as well as stage of life of the smallholder farmers, affected the way and reason plot holders farmed at Dzindi Canal Scheme (Van Averbeke & Mohamed, 2006).

The farming style as well as the objective of farming for several plot holders changed over a period of 2 years. This was important as the changes were in response to developments that affected the structure of their livelihoods. This notion was supported by Aliber & Hart (2009) who noted that changes in the livelihood structure of black rural homesteads was affected whether or not they engaged in farming. As a result, the variability in productivity among smallholder farmers with 1 ha to 2 ha plots should be considered as a characteristic. This implies that interventions meant to increase productivity of farm enterprises will be significant to only a portion of the smallholder farmers.

It was reflected by Bembridge (2000) that commercial orientation of smallholder irrigated agriculture was mostly restricted to plots that were larger than 2 ha. In 2010, there were only 2 925 plots that were larger than 2 ha on smallholder schemes. Farming on these large plots involved the production of specific crops. These farms were supported by a wide range of services including, specialised production advice, access to production loans, reliable markets and delivery inputs. Examples of such arrangements were the production of sugar cane on schemes in Mpumalanga, barley at Taung and raisin grapes at Eksteenkuil in the Northern Cape (Van Averbeké *et al.*, 2011).

## **2.7. THE DECLINE IN SMALLHOLDER FARMING IN SOUTH AFRICA**

Researchers like Van der Stoep *et al.*, (2011) studied South African smallholder irrigation schemes and came to the conclusion that the performance of the majority of these projects was well below potential. This poor performance was attributed to poor infrastructure and equipment maintenance; high costs of energy for pumping; lack of institutional support in terms of credit; marketing and draught power; lack of extension and farmer training; conflict; as well as weak local organisations (Bembridge, 2000). What happened to the once successful and financially viable smallholder irrigated farming enterprises which were identified 60 years ago by the Commission for the Socio Economic Development of the Bantu Areas within the Union of South Africa (1955)? The explanation comes from two related trends according to Van Averbeké *et al.*, (2011).

The first trend is the steady decline in black homestead agriculture, cultivation in particular. In 1950, most black rural homesteads were still farming with the majority not meeting their subsistence requirements while a few produced a surplus. Income generated from other livelihood activities, mainly earned by male migrants working in mines and cities, was used to maintain the rural homestead and its agricultural activities (Houghton, 1955, Lahiff, 2000, Hebinck & Van Averbeké, 2007, Van Averbeké, 2008). Since 1950, black rural homesteads have gradually discontinued the cultivation of their smallholder farms. Recent case studies in the Ciskei region of the Eastern Cape showed that only about 10% of the fields were ploughed annually. At present, crop production occurs mostly in home gardens, explaining why farming now only serves as a supplementary source of food for the large majority of black households (Vink & Van Rooyen, 2009, Aliber & Hart, 2009).

The second trend is the rise in the competitiveness and sophistication of commercial agriculture and the food supply system in South Africa. Machethe (2004) observed that commercial farming overcame the challenges imposed by the liberalisation of agriculture during the last decade of the 20th century as it benefited from state support. Consequently, there has been an establishment of a national food production and distribution system that provides relatively cheap food of good quality almost anywhere in the country. This has made it difficult for smallholders to compete leading to their poor performance (Laker, 2004, Van Averbeké *et al.*, 2011). However much can still be done to improve their performance.

## **2.8. IMPACT OF IRRIGATION SUPPORT ON SMALLHOLDER FARMERS**

Algholor & Obi (2012) observed that smallholder farmers did not have adequate expertise to keep up with the technological advancements in agricultural equipment. After studying the report from the Department of Agriculture (2008) it shows that extension services are insufficient and this needs to be addressed if smallholder farmers are to adapt to new technology. This may be an indication of a shortage of qualified staff to render adequate extension services to the farming community.

Zwane & Kekana (2014) observed that in order for extension services to be effective there is need for such services to be guided by a specific planned framework. They recommended a new strategy for mobilising farmers in cooperatives in Limpopo. This showed some of the key benefits such as increased irrigated areas and increased crop yields.

Jordaan & Grove (2013) in their investigation of the behaviour of smallholder farmers who obtained the highest income for their cabbage produce relative to the water used in irrigating their crops found out that the quality of crops produced determined their marketability. They also observed that the availability of irrigation water alone is not enough to take smallholder farmers out of poverty. Adequate technical support is needed in terms of training and maintenance of equipment as well as assistance in marketing of products. In Taung there is a hub currently under construction at Taung College of Agriculture and this is a potential avenue for marketing smallholder farmers produce.



## **2.9. IMPACT OF TECHNOLOGY ON SMALLHOLDER FARMERS**

Shah, Alam, Kumar, Nagar & Sing (2000) studied the impact of irrigation schemes. There is agreement that small scale technologies can assist in diversification among the poor and improve returns through minimising risk in production and providing access to multiple markets. However, there is a lot of evidence of smallholder irrigators failing to realise the benefits of irrigation technologies. In a study in Asia, low cost technologies that were targeted at low income earners were adopted by those who were not so poor.

It has been observed that even Aid organisations have not been able to get to the poorest households as intended by their projects. The possible reason for this could be the fact that the project is prescribed without consulting the beneficiaries to establish their preferences. It may be because agricultural support services do not really get to the poor. The poor also need to be adequately trained in order for them to realise the full benefit of small scale irrigation technologies. According to Burney & Naylor (2012), if irrigation is to improve the livelihoods of the poorest agricultural producers it is important to improve access, distribution and use technologies as well as their linkages and institutional dependencies to establish what works and what does not. In addition, it is also necessary to incorporate the local people's indigenous knowledge in devising the appropriate systems.

Mangisoni (2011) studied the impact of treadle pump technology on poverty alleviation in Malawi. Mangisoni (2011) observed that micro-irrigation in the form of treadle pump technology has contributed immensely to the livelihoods of the poor farmers in Malawi who often lack resources. Micro-irrigation has given smallholder farmers some level of empowerment financially. Empowerment is one of the indicators on the multidimensional poverty index (Max-Neef, 1991). There are however certain conditions that should be met in order to achieve empowerment. These include: increased involvement of the poor including women, firm control and ownership by the farmers, employment generation, potential for growth and demand of the market, increased yields and income, food security, social inclusion, and support from government, NGOs and other Donors.

Small-scale, micro irrigation technologies have been proven to maintain the environmental quality by preserving soil nutrients. They have also shown their ability to sustain livelihoods.



According to Bhatt, Bosso, Enfors, Gordon, Kongo, Kosgei, Makurira, Masuki, Mul, & Tumbo (2006), there is need to look at more investments in water resource development so that irrigation water can be accessible to more poor people. Irrigation also offers more yields on a small piece of land if irrigation water is managed appropriately.

Wichelns (2013) concluded that investment in small, private irrigation technology can increase production; enhance livelihoods and food security for millions of poor smallholder families. This enables the poor to access irrigation water leading to an increase in yields and subsequently incomes in the face of uncertain production as well as marketing environments in Asia and Africa.

Shumba & Maphosa (1996) recommended the need for government to maintain infrastructure in the rural areas so that markets are accessible. They also encouraged government to let farmers gradually take over the responsibility. However, this handover should be closely monitored to ensure the same problems of abandonment which occurred in the 1990s do not re-occur.

The evidence from Asia on the impact of irrigation on poverty reduction is compelling (Hussain, 2002). Success stories in poverty alleviation through irrigation can be found in eastern India and Bangladesh where low-cost tube well irrigation spurred poverty reduction and a growth in food production. In addition, the introduction of the treadle pump, the adoption of cheaper and smaller pump engines, the creation of water markets and the development of credit schemes have allowed poor households to access irrigation water to improve their livelihoods in both countries (Barker *et al.*, 2006, Shah *et al.*, 2000, Van Koppen & Mohamed, 2006). In contrast, a low uptake of irrigation technologies and a lack of development of water resources for irrigation have undermined poverty reduction efforts in sub-Saharan Africa (SSA). This low uptake is mainly due to the high cost of treadle pumps and other irrigation equipment in the region (Van Auerberke *et al.*, 2011). The International Water Management Institute (IWMI, 2006a) confirmed that the costs are indeed a lot higher for the entire SSA region because of a few failures that have distorted the results. From this, it could be argued that if the provision of irrigation pumps and equipment is done correctly, there is no reason why the costs could not be reduced in SSA (Mangisoni, 2011).

It is important to note that irrigation water is also subject to impact from climate change. Use of irrigation technologies need to be accompanied by other crop management practices such as cultivation of crops that can use water more efficiently. Important management practices that can be used include: efficient management of irrigation systems, growing crops that require less water, and optimising of irrigation scheduling and other management techniques that help reduce wastage (Nhemachena & Hassan, 2007).

## **2.10. AN EXPLORATION OF THE LIVELIHOODS FRAMEWORK LINKING LIVELIHOODS AND SMALLHOLDER IRRIGATED AGRICULTURE**

The research done by the WRC, observed that the livelihoods of plot holders are central to farming on smallholder irrigation schemes but they have received little consideration. In preceding reports plot holders are exposed as poor, old, uneducated, mostly female and are not capable of dealing with the sophisticated requirements of irrigated farming. They are also depicted as victims of dependence on the state and aid agencies (Van Averbeke *et al.*, 2011, Bembridge, 2000, iSeneke Developments, 2004, Mnkeni *et al.*, 2010). Mohamed (2006) on a study of the Dzindi Canal Scheme demonstrated the agency dependency of farmers as well as illustrating how irrigated farming featured in their livelihoods over time. Water is depicted as a crucial resource in rural livelihoods. Table 2.4 summarises the findings of studies by Bembridge (1984), Van Averbeke *et al.*, (1998) and Mnkeni *et al.*, (2010) on schemes in the Eastern Cape and Machete *et al.*, (2004) and Van Averbeke (2008) on schemes in Limpopo Province.

**Table 2.4: Gross farm income and total income of plot holder homesteads at selected South African smallholder irrigation schemes adjusted to 2010 rand values**

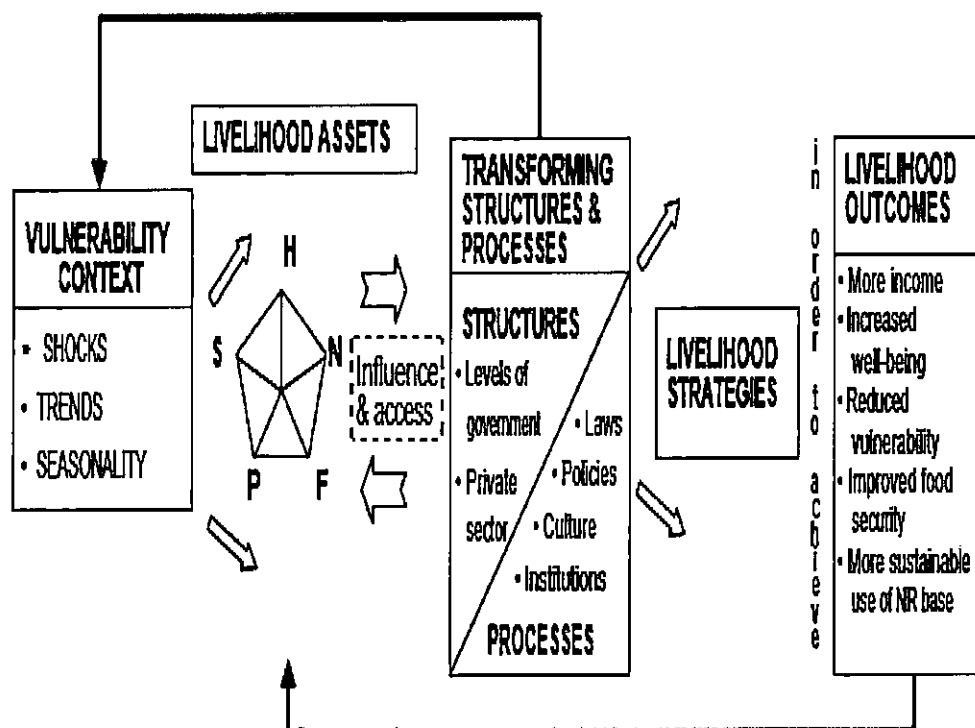
Scheme name	Plot size range (ha)	Year of data collection	Total homestead income	Gross farm income	Contribution of gross farm income to total homestead income (%)
			(2010 rand values)		
Tyefu food plots	0.16-0.25	1995	12 024	452	3.8
Zanyokwe food plots	0.20	1995	8 481	1 074	12.7
Keiskammahoek (Upper Gxulu)	0.25	1995	14 937	420	2.8
Shiloh food plot	0.25	1995	11 496	741	64
Hertzog Agriculture Coop	1.00	1995	25 623	7 017	27.4
Qamata	1.28	1997	17 045	3 443	20.2
Dzindi	1.28	2003	36 110	7 136	19.8
Horsehoe	2.00	1995	22 540	12 822	56.9
Elandskraal	0.7-5.0	2000	28 499	11 867	41.0
Zanvokwe	2.0-11.0	2007	21 501	17 454	81.2

Adapted from Van Averbeké et al., (2011)

All monetary values shown in Table 2.4 were adjusted to 2010 rand values using the Consumer Price Index published by Statistics SA (2011). The table reflects that plot holder's livelihood strategies included other livelihood activities apart from farming. Income from farming was positively related to plot size. Of significant value for rural economic development policy was the fact that both overall homestead income and the proportion of homestead income that was derived from irrigated farming tended to increase as plot size increased. The data in Table 2.4 shows that irrigated farming on a plot of 1.28 ha no longer provided homesteads with adequate income, as had been the case in 1952 (Commission for the Socio-Economic Development of the Bantu Areas within the Union of South Africa, 1955). Virtually no information has been generated on livelihoods that are linked to farming on smallholder schemes, but evidence presented by Van Averbeké *et al.*, (2011) suggests that in some cases the number of linked livelihoods could be substantial. The Limpopo Department of Agriculture referred to livelihood linkages and other social and economic benefits as the sphere of influence of smallholder irrigation schemes during the early phase of its RESIS programme. This was aimed at revitalising these schemes but according to Van Averbeké *et al.*, (2011) this view has received little research attention.

### **2.10.1. Livelihoods Analysis**

According to Ellis (1999), the 'assets/processes/activities' framework is utilised in various different guises by researchers concerned with poverty reduction, sustainability, and livelihood strategies. In recent times this has come to be called the Sustainable Livelihoods (SL) Framework (Figure 2.2), and is viewed as equally applicable to urban as to rural survival strategies. Assets in this framework include: human capital (the education, skills and health of household members); physical capital (e.g. farm equipment or a sewing machine); social capital (the social networks and associations to which people belong); financial capital and its substitutes (savings, credit, cattle, etc.); and natural capital (the natural resource base). In pursuing livelihood strategies, both the access to assets and the use to which they can be put are mediated by social factors (social relations, institutions, organisations) and by exogenous trends (e.g. economic trends) and shocks (drought, disease, floods, pests). The framework provides a checklist by which constraints on livelihood success can be prioritised for action to eliminate them as well as identifying the links between them.



#### Key

S= Social Capital      N=Natural Capital  
 P=Physical Capital      F= Financial Capital  
 H= Human Capital

**Figure 2.2: DFID Sustainable Livelihoods Framework**

Source: DFID (1999) Sustainable livelihoods guidance sheets

The livelihoods framework can be utilised as a tool for enhancing the understanding of livelihoods, particularly the livelihoods of the poor (Carney, 1998). The framework groups particular components of complex livelihoods together (vulnerability context, capital assets, transforming structures and processes, strategies and livelihood outcomes). The sustainable livelihoods framework reflects the main tenets influencing people's livelihoods and typical relationships between these. It can be used in planning new development activities as well as in assessing its contribution to livelihood sustainability made by existing activities. The framework provides a checklist of important issues and the linkages between the different capitals. It also draws attention to core influences and processes as well as emphasising the multiple interactions between the various factors which affect livelihoods.

The analysis of livelihood assets reveals much information about the asset status of particular groups and the subsequent changes (Ellis, 1999). Participatory assessments of people's livelihoods objectives should yield a picture of not only people's aspirations but also what they feel are the major constraining forces or factors (including how structures and processes affect their livelihood options). If people appear to be lacking in any of the five capital assets, it will be necessary to establish the extent to which this factor prevents them from moving forward (or whether it is relatively unimportant given their choice of livelihood strategy). Likewise, if people are particularly well-endowed in one area (e.g. natural capital) but are still unable to achieve positive livelihood outcomes (improved incomes, reduced vulnerability, etc.), it is important to understand what the critical missing assets or undermining structures and processes are. Therefore there is a strong emphasis on institutional analysis. It is good practice to draw up an inventory of existing structures and processes (both informal and formal) which impact upon people's livelihoods.

The tendency for rural households to engage in multiple occupations is often remarked upon, but few attempts have been made to link this behaviour in a systematic way to rural poverty reduction policies. In the past it has often been assumed that farm output growth would create plentiful non-farm income earning opportunities in the rural economy via linkage effects. In Ellis (1999) view, this assumption is no longer tenable; for many poor rural families. Farming on its own is unable to provide a sufficient means of survival, and the yield gains of new technology display signs of levelling off, particularly in those regions where they were most dramatic in the past.

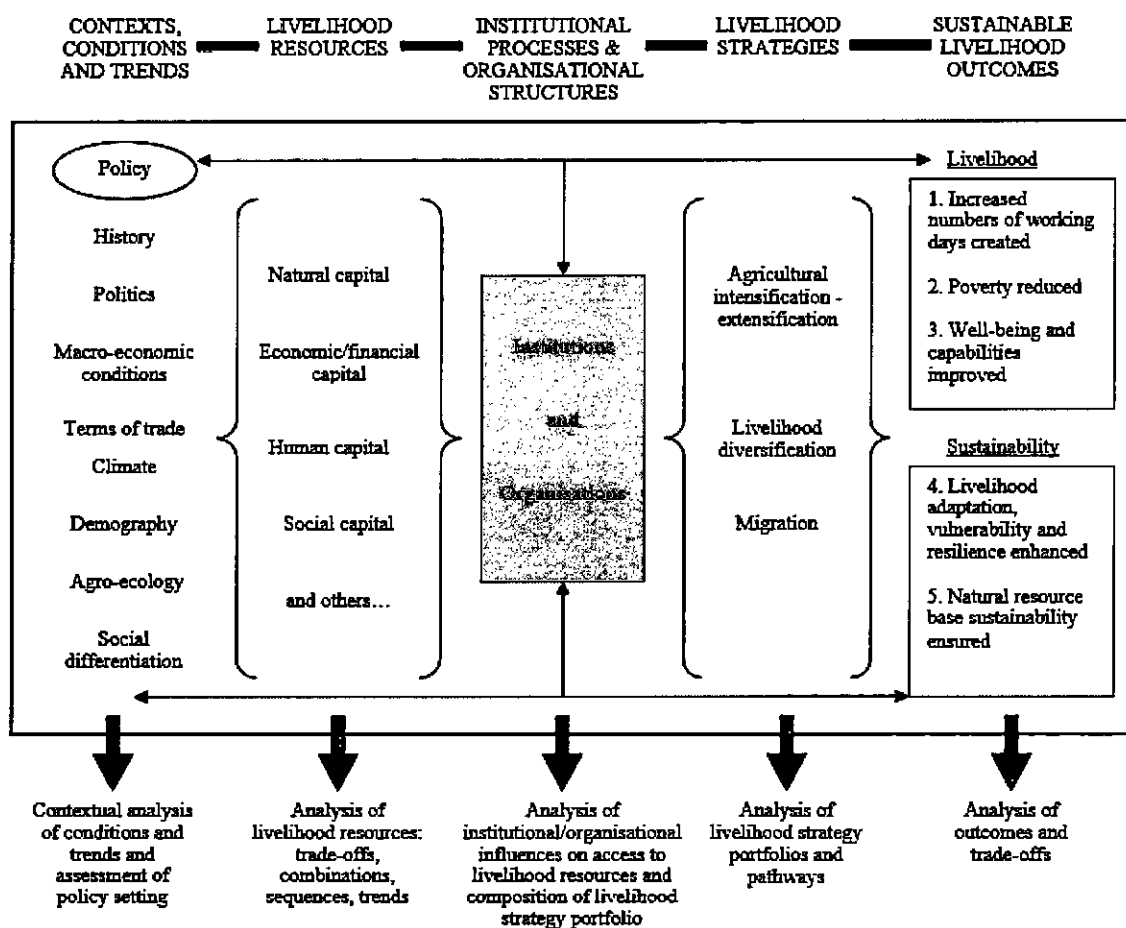
Ellis (1999) expands further that the reasons behind the adoption of diversified income portfolios by rural families are better understood than the policy implications. Considerations of risk spreading, consumption smoothing, labour allocation smoothing, credit market failures, and coping with shocks can contribute to the adoption, and adaptation over time, of diverse rural livelihoods. However, livelihood diversity results in complex interactions with poverty, income distribution, farm productivity, environmental conservation and gender relations. These interactions are not straightforward, are sometimes counter- intuitive and can be contradictory between alternative pieces of case study evidence.

Subsequent rural poverty reduction policies need to be better informed on the nature of these interactions (Ellis, 1999). For example, it is fairly well known that the poor diversify in less

advantageous labour markets than the better-off, i.e. in casual, part-time and unskilled work compared to full-time work or solid self-employment. These findings are related to the asset status of the poor (e.g. low human capital) and barriers to entry resulting from low assets (need for skills, ability to navigate bureaucratic hurdles, etc.). Facilitating the poor to gain better access to opportunities (or to create their own opportunities) is more cost effective for poverty reduction than attempting, artificially, to support particular sectors or sub- sectors of rural economic activity.

## 2.10.2. Parameters within which the Department of Agriculture and other stakeholders can utilise the Livelihoods framework

Scoones (1998) adapted DFID's Sustainable Livelihoods Framework by Carney (1998) and came up with the Sustainable Rural Livelihoods Framework (Figure 2.3 below).



**Figure 2.3: IDS Sustainable Rural Livelihoods Framework**

Source: Scoones 1998

### ***2.10.2.1. Policy priorities***

There is wide scope within existing rural development policies for the support of diversification (Scoones, 1998). Such an action does not mean increasing the role of the state in particular economic sub-sectors, nor does it mean manipulating prices and costs in order to achieve specified outcomes. Rather it is about improving the institutional context of private decision-making. This can be done by, reducing risk, increasing mobility, minimising barriers to entry (e.g. licensing regulations), and ensuring fairness and transparency in the conduct of public agencies. The poor can be helped to improve their assets, and to make use of those assets to best effect. The appropriate mix of policies is highly context-specific, but the following general principles are likely to hold.

#### **2.10.2.1.1. Human capital**

The significance of education, both formal academic education and workplace skills, for improving livelihood prospects is established by a great number of studies. Poverty is closely associated with low levels of education and lack of skills (Ellis, 1999). There is little doubt that rural education is under stress in many countries. The demand made on educational systems by rising populations is one important factor, the cost of updating educational materials another. Parental contributions to the upkeep of schools are increasing, with inevitable implications for differential access that excludes those unable to meet such contributions. This makes innovative approaches to educational delivery at village level a priority in the future.

#### **2.10.2.1.2. Infrastructure**

Infrastructural facilities improve poverty reduction by contributing to the integration of national economies, improving the working of markets and speeding the flow of information. They also increase the mobility of people, resources and outputs. As with education, future infrastructural provision will require innovative approaches for provision and maintenance. Ellis (1999) and Scoones (1998) concur that relying on central government and ad hoc project finance from donors cannot be depended upon to keep existing infrastructure in good repair or to make heavy investment in new infrastructure. Decentralisation may, arguably help to bring the prioritisation and the financing of rural infrastructure closer to rural communities themselves. Privatisation of infrastructural suppliers like electricity and telephone companies may help to reach remote rural areas more than under government monopolies.



#### **2.10.2.1.3. Credit**

Credit is already a priority area of micro-policy in the rural sector of developing countries. The recent emphasis has been on small-scale group lending schemes, enabling individuals and households to widen their income earning options (Ellis, 1999). There are now many different models and experiments in micro-credit provision from which to adapt and to choose appropriate elements for local solutions. Credit policy is not only, however, about micro-credit schemes, of which many depend heavily for their sustainability on the continued involvement of NGOs. There is need to facilitate the spread of rural financial institutions that are self-sustaining on the basis of savings and loans organised according to conventional banking criteria. This requires central governments to put in place the appropriate regulatory and guarantee provisions that would encourage the formation of such institutions and ensure confidence in them in the long term.

#### **2.10.2.1.4. Enabling environments for grassroots initiative**

Even after nearly two decades of market liberalisation, it is a mistake to assume that an environment that facilitates small-scale enterprise is now in place. The local level policy context often remains unfavourable for self-employment and start-up business. According to Ellis (1999) local enterprise often arises 'outside' the regulations, i.e. as an unrecognised informal sector activity. They depend on paying off local officials to allow continued operation. Any business wishing to register formally therefore faces widespread bureaucracy and red tape. While reform (in terms of efficiency, effectiveness, transparency and fairness of state operations), is proceeding at different speeds in different countries, it is still in its early stages. One of the biggest challenges is to secure the switch from antipathy to supportiveness in the relations between public administration at local levels and private, non-farm, productive activity in rural areas.

#### **2.10.2.1.5. Targeting and safety nets**

According to Scoones (1998), targeting provides safety-net support for those rural social groups that are most vulnerable to 'shocks' that could lead to insufficient food or destitution. Indicator targeting works by identifying the social groups (landless, old, disabled, etc.) that are most likely to require support. Self-targeting works by providing wages or food in return for work. This enables the poor to survive, but not as high as to be interesting for the better-off. In effect, self-targeting provides a diversification option for those needing to diversify to survive. A lot of work has gone into the conceptual basis of targeting, as well as into practical

targeting policies in some countries, with India having a particularly interesting historical record in this respect.

The five policy areas highlighted above are not by any means the only policy themes worth pursuing in relation to promoting sustainable rural livelihoods. Nevertheless, some combination of them is likely to feature in any current list of micro-policy priorities, and other policy themes are often found to overlap or involve extensions to one or other of these areas (Ellis, 1999).

There is little doubt that past neglect of the diversified nature of rural livelihoods has sometimes resulted in local level policies and projects that are insensitive to local priorities. They are usually mistaken in their assumptions about the availability of time, wrong in their understanding of the key income sources of poor people, and inadvertently misdirected towards the better-off rather than the rural poor. It follows that reference to livelihood criteria that capture diversity could result in projects that are more attuned to the livelihood strategies of the poor, and therefore more accurate in reaching them.

### **2.10.3. Livelihood Criteria**

The Department for International Development (DFID) SL framework (Carney (ed)., 1998) emphasises a focus on people, their assets and their activities, rather than on sectors and their performance which is the conventional point of entry to policy. The framework can be utilised to yield a number of generalised statements about the livelihoods of the rural poor. This permits the formulation of a set of 'livelihood criteria' to be taken into account in evaluating the merits of alternative project proposals, and for seeking to strengthen the poverty reduction content of policies or projects. A preliminary list of diversity-related points contributing to such livelihood criteria is as follows:

#### **2.10.3.1. Remoteness**

Remoteness is typically associated with greater poverty and few livelihood options. Therefore, it may be valid to target remote locations rather than those places already well integrated into diverse economic activities. However, remoteness may also mean fewer poor people so this is not an unambiguous criterion (Ellis, 1999).

#### **2.10.3.2. Assets**

Assets or the lack of them, are fundamental to livelihood strategies. Policies and projects that target individuals or families that already possess assets, are likely to improve the incomes of those who are already better-off. Farm policies may have this effect due to the not always correct suppositions (i) that the poor are mainly poor farmers, and (ii) that there are multiplier effects of rising farm income beneficial to the asset less poor (Carney, 1998).

#### **2.10.3.3. Substitution**

Substitution between assets and between activities is a key attribute of Sustainable Livelihoods. Substitution between assets is facilitated by the possession of a diverse range of assets rather than just a few, and by working-markets that enable one type of asset to be converted into another. Substitution between activities makes livelihoods more resilient, and thus better able to adapt to unforeseen trends and hazards (Carney, 1998).

#### **2.10.3.4. Options**

Options are important. Being poor is often a case of being trapped with no options. Therefore poverty reduction requires facilitating the widening of choices and options, by taking action to improve information, encourage mobility and reduce regulatory restrictions.

These livelihood criteria can be summarised under the four headings of location, assets, substitution, and options. To this should be added knowledge about the livelihood strategies of the constituency that a policy or project is designed to help (Carney, 1998). One of the key conclusions to emerge from livelihood research is that untested assumptions about the survival attributes of rural families cannot be made. For example, it cannot be assumed from appearances that a particular rural social group is mainly dependent on the production of a particular crop or farming system for survival. Investigation is likely to show that livelihood strategies are a great deal more complicated than that. Most importantly, there will certainly be big differences between the poor and the better-off in relation to the sources of income that feature most strongly in their respective livelihood strategies.

The diversity of livelihoods is an important feature of rural survival but often overlooked by the architects of policy (Ellis, 1999). Diversity is closely allied to flexibility, resilience and stability. In this sense, diverse livelihood systems are less vulnerable than undiversified ones. They are likely to prove more sustainable over time because they allow for positive

adaptation to changing circumstances. The benefits of diversity are more apparent in contexts of high seasonality, high risk, absent markets, poor infrastructure, declining farm size, and similar adverse factors.

## **2.11. SUMMARY**

Agriculture is a livelihood source for job creation and food security for rural communities. Households engaging in agricultural activities tend to be less poor than those not involved in agriculture. Farming remains an important source of income even for households deriving a significant proportion of their income from non-farm sources. The Green Revolution in South Asia highlighted the contribution of smallholder irrigated agriculture to livelihoods of poor farmers. Even though it has not been as widely studied as the green revolution in South East Asia, the increase in small, private irrigation in Africa has improved the livelihood status of many households. When looking at the contribution of irrigation to household income, farming contributes more individually but less than non-farm activities combined. Diversity is an integral part of livelihoods of the poor but has been side lined in devising aid programmes. Irrigated agriculture enables growth throughout the year hence it can sustain a livelihood.

Irrigation development strategies have been hampered by a lack of understanding of the links between water scarcity, food production, food security and environmental sustainability. Poorly designed and inappropriate extension approaches hamper sustainable food security. Inadequate support led to failure in smallholder irrigation in Zimbabwe and Western Ethiopia. An irrigation system is composed of 3 components which are; a water access technology, a water distribution technology and a productive use application technology. Governments should consider investing in small scale affordable irrigation technologies that farmers can afford to maintain before embarking on large scale technologies. In South Africa small scale irrigation technologies have been replaced by large scale commercial overhead systems.

In order to benefit from irrigation, markets should be accessible. Poor roads and infrastructure characterise most smallholder irrigation schemes in Africa. The quality of the

crops determines their marketability. Lack of information about available markets was one of the reasons that led to the collapse of many irrigation schemes.

Agriculture contributes to poverty alleviation in four ways: reducing food prices, employment creation, increasing real wages and improving farm income. The importance of irrigation is that less land is required to provide the same amount of food to the same number of people. There is need to collaborate with farmers when devising aid programmes. Irrigation is an attractive alternative where rainfall patterns are inconsistent and dry spells persist. Most irrigation systems in South Africa were found to be underperforming for various reasons. The sustainable livelihoods framework reflects the main tenets influencing people's livelihoods and typical relationships between these. It can be used in planning new development activities as well as in assessing its contribution to livelihood sustainability made by existing activities.

## **CHAPTER 3: RESEARCH METHODOLOGY**

### **3.1. INTRODUCTION**

This chapter explains the research method used in carrying out this research. It provides a detailed description of how the research was conducted, the type of research design used and why. It then sketches the area of study, the sample population and sampling technique, data collection strategy as well as the instruments that were used and why. The data analysis strategy is also outlined. The research study method is defined by the purpose of this study, which is to determine whether irrigated agriculture is an option for alleviating poverty by providing a sustainable livelihood in Taung, South Africa. This section also tackles validity, research ethics and limitations of the study.

### **3.2. RESEARCH DESIGN**

The research design employed in this study was the case study design. It enabled the researcher to foresee the relevant research decisions to be made in order to increase the reliability and validity of the results.

#### **3.2.1. Case Study design**

This entailed the detailed and intensive analysis of a single case (Bryman, 2012). The aim was to seek explanations as well as gaining awareness and deeper understanding of social realities in the smallholder irrigating farming community. An in-depth study of Taung, South Africa was undertaken to explore people's feelings, views and perceptions concerning poverty alleviation strategies that are appropriate for their community. The case study was appropriate as the research explored whether irrigated agriculture is an option for sustainable livelihoods and poverty alleviation. The research sought to determine the livelihood strategies of smallholder farmers by exploring the livelihoods of the farming community on the Taung irrigation scheme. The study also investigated ways of supporting institutions and organisations of smallholder irrigation scheme communities.

The focus on a single case study was relevant in order to get a deeper view of the effect of irrigated agriculture on the smallholder farming community. Furthermore, a single case increases the accuracy of the results since effort was concentrated in one area.

### **3.2.2. Mixed Method**

The research method chosen for this study was a mixed method. This is an integration of both qualitative and quantitative methods. The research method was chosen to enable the researcher to bring together a more comprehensive account of the area of enquiry.

According to Welman, Kruger & Mitchell (2005), qualitative research is an umbrella term covering an array of interpretive techniques seeking to translate, describe, decode, and otherwise come to terms with the meaning of naturally occurring phenomena in the social world. The qualitative method was chosen because it seeks to understand human experiences and their behaviours.

In Creswell's view (2007), a case study research is a qualitative research method whereby the researcher explores a bounded system or multiple bounded systems overtime. This is done through an in-depth, detailed, data collection involving multiple sources of information, and reporting a case description and case based themes.

Qualitative methods were used since this research was exploratory as well as inductive hence its findings are beyond the researcher's anticipation. In Welman *et al.*, (2005), the main objective of a qualitative research is to establish the social nature of reality. In the process the relationship between the researcher and the participants is emphasised and the importance and nature of the enquiry established.

Quantitative methods were also employed in order to explain phenomena by collecting numerical data that were then analysed using mathematically based methods in particular statistics.

### **3.2.3. Research format**

Yin (1993) identifies three forms of case studies which are exploratory, explanatory and descriptive. An exploratory study seeks new information from the study; an explanatory

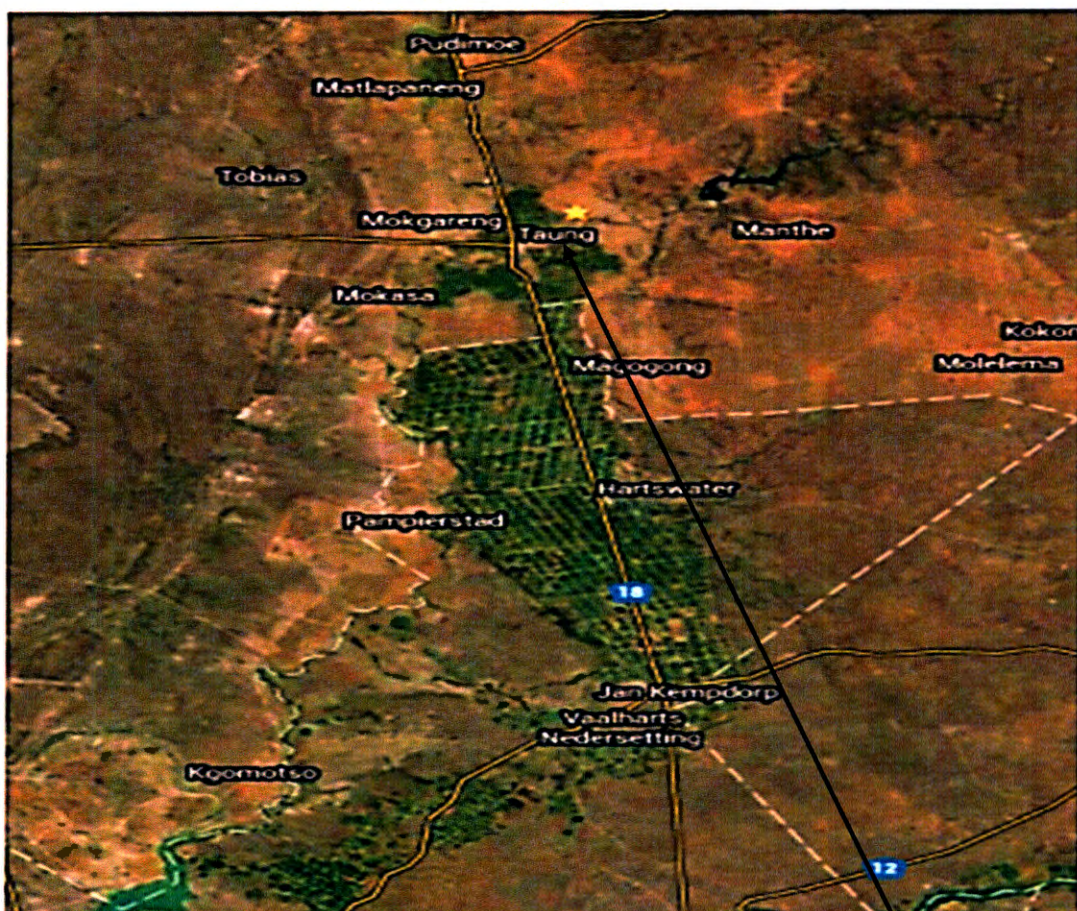
study seeks to explain a certain phenomenon. A descriptive study seeks to bring an understanding between variables.

This study was explorative and descriptive because it allowed for more insight on the role of irrigated agriculture in livelihoods and poverty alleviation. It also led to an understanding of the linkage between the variables under study. According to Babbie & Mouton (2001), exploratory studies usually lead to insight and comprehension; hence the choice for this research. The research explored in-depth the livelihoods of the smallholder farmers on Taung Irrigation Scheme to gain an understanding of whether irrigated agriculture has contributed to poverty alleviation on the project.

### **3.3. DESCRIPTION OF THE STUDY AREA**

Taung (see Figure 3.1 below) is situated in the western part of the North West Province in the area of jurisdiction of Dr Ruth S. Mompoti District Municipality. The municipality is one of the six local municipalities in Dr Ruth S Mompoti District Municipality. The municipality covers an area of 5 639 km<sup>2</sup>, which accounts for 11.8 % of the total area of Dr Ruth S Mompoti District Municipality.





**Figure 3.1: Map showing Taung irrigation scheme in Northwest Province, South Africa**

Source: De Jager (2011).

Taung

The area highlighted in green in Figure 3.1 above is the Taung Irrigation Scheme. The main towns in the municipal area are Reivilo, Pudimoe and Taung Central. About 95% of the municipal area is predominantly rural. There are about 106 widely scattered villages in the municipal area. The Greater Taung Local Municipality area has an interesting and ancient geological heritage that is rich in minerals and palaeontological artefacts. It is dominated by formations of the ancient igneous volcanic rocks dating back to the Ventersdorp age (more than 2 000 million years). The area is of strong agricultural significance in the South African economy. The area has uniform terrains that consist of slightly irregular plains and pans, hills and escarpments. It lies between an altitude of 1100m –1300 m above sea level and has a slope factor of between 0-9 percent. The area is characterised by semi- arid conditions and is located inside a summer rainfall area with a mean annual rainfall of between 300 – 400 mm per annum. Temperatures experienced in the area vary between – 9°C and 42°C with an average of 18°C (De Jager, 2011).

### **3.3.1. Population**

The target population consisted of 417 smallholder irrigating farmers who participate in the Taung irrigation scheme. Their plot sizes ranged between 7.5 and 10 hectares. The Taung Irrigation Scheme was being resuscitated and undergoing restructuring. It was composed of 417 farmers who were organised into secondary and primary cooperatives. There were eight primary cooperatives namely Tsidhiso with 56 members, Ipelegeng (35), Penelopele (11), Bosele (94), Rethuseng (136), Reaitloma (64), Kgositsile (6) and Tshenolo (15). Each cooperative was run by a committee led by a chairman. The sample was selected from these smallholder farmers for the purpose of this study. This population was used to establish the linkage between irrigated agriculture and livelihoods. The sample was selected on the basis of its significance to the study and its accessibility to the researcher.

## **3.4. SAMPLING DESIGN**

### **3.4.1. Sampling Type**

Case study research is not sampling research (Yin, 1993, Bryman, 2012), however, selecting cases must be done to maximise what can be learned in the period of time available for the study. Non probability sampling was used in this study as generalizability may not be achieved given the unique nature of each case on the smallholder farming community. Non probability sampling is whereby units of the sample may not have an equal chance of being selected (Bryman, 2012). Probability sampling may not be feasible given the spatial distribution of the smallholder farms. There is also need to reach as wide a range of participants relevant to the research as possible in order to focus on many different perspectives and range of activities.

In this case a generic purposive sampling procedure was used whereby participants were selected according to their relevance in the study. Information was sourced from the Department of Agriculture and Rural Development on the smallholder projects in Taung and a case was selected purposively.

### **3.4.2. Sampling techniques**

This study had a sample of 76 participants who were the project participants. Generic purposive sampling was used to select participants from the population of smallholder farmers in Taung. According to Bryman (2012), this is whereby sampling is carried out to

develop theoretical categories as well as inferences. It may be conducted in a sequential or fixed manner. When using generic purposive sampling in selecting cases or participants, the researcher established a criterion concerning the kinds of cases needed to address the research questions, identified the appropriate cases and then sampled from those cases that had been identified.

After learning about the irrigation systems in Taung and finding that there are two systems in operation, the researcher purposively chose one cooperative under centre pivot and another under sprinkler. Rethuseng was under the centre pivot system whilst Tsidhiso used the sprinkler system. 76 Participants were randomly selected from these cooperatives for the interviews.

### **3.5. DATA COLLECTION STRATEGY**

The data collection strategy that was employed in this study included both secondary and primary data.

#### **3.5.1. Secondary data**

Secondary data and information was obtained from the Department of Agriculture and Rural Development on the procedures involved in the application for these smallholder irrigation schemes. Secondary data was used to gain a general picture of the case under study and how they acquired the land necessary for the projects. The secondary data was also acquired from sources such as the Agriculture Rural Development Research Institute Reports and The Institute of Water Management Reports.

#### **3.5.2. Primary data**

Primary data was the new information collected from participants. In-depth semi structured interviews, participatory observations, and focus group discussions were used to collect data. Using multiple sources of data is termed data triangulation and is an essential means of improving reliability of data and information. Conversations with participants were not recorded as participants were not comfortable with it.

### **3.5.2.1. In-depth semi structured interviews**

In-depth semi structured interviews were conducted with 76 smallholder farmers from the Taung Irrigation Scheme. This is an inductive approach to theorising and conceptualisation whereby questions in the interview are expressed in a non-explicit form (Bryman, 2012). Such questions were designed in order to allow the interviewer to keep an open mind concerning the constructs of what needs to be known. This was necessary to allow for concepts and theories to emerge from the data. The questions in a semi structured interview were geared towards answering the research questions.

A questionnaire (attached in the appendix) was used to guide the interviews. De Vos *et al.*, (2005) describes an interview schedule as a questionnaire compiled in order to guide interviews. The major purpose was to provide anticipated questions that were used as an appropriate instrument to engage participants and set the platform. The interview schedule enabled the researcher to think clearly about what he or she hoped the interview might cover. According to De Vos *et al.*, (2005) and Welman *et al.*, (2005) the interview schedule forces the researcher to foresee possible challenges, for example in terms of sensitive issues and sentence construction.

In this study, semi-structured interviews were used to avoid limiting the information that could be obtained from the interviewees (Bryman, 2012). An interview guide was designed and formed the basis of the interviews. The interview guide contained questions on specific topics but did not limit the interviewee in terms of the amount of detail required in answering the questions. The interview guide sought answers to the research questions.

Both open and closed ended questions were written in the interview schedule. This type was preferred to strictly closed questions as it placed no limit to the respondents in expressing their feelings about development agents or government operations within their communities. The questions in the interview schedule were divided into themes ranging from simple to complicated ones.

The in-depth interview refers to a one on one interview or a “conversation with a purpose”, to merely extend and formalise the conversation. This type of an interview was chosen because of its appropriateness for understanding the livelihood experiences of the people of Taung and the meaning they make out of that experience. The in-depth interview can be used to

determine people's perceptions, facts, opinions, and their reactions to the initial findings and potential solutions (De Vos *et al.*, 2005). The exercise generated a cumbersome amount of data but the extracted information is valuable.

#### **3.5.2.2. Participatory Observation**

The researcher attended cooperative meetings held by the smallholder farmers. The researcher first attended a mass meeting for all cooperatives on Thursday 1 October 2015. From there it was arranged that the researcher attended individual cooperatives meetings every Tuesday on four occasions on 6 October 2015 (Tshidiso), 13 October 2015 (Rethuseng), 20 October 2015 (Ipelegeng) and 27 October 2015 (Bosele). Participant observation involves the researcher being seen as part of the group, while simultaneously observing the characteristics of the research subjects from the point of view of the participants (Babbie & Mouton, 2001). The researcher also used this opportunity to visit the farmers at their plots.

#### **3.5.2.3. Focus Group discussions**

Focus group discussions were also used to obtain data from participants. A focus group discussion was held with four Agricultural Extension Officers from the Department of Agriculture and Rural Development. The extension officers were chosen as the key informants since they work with all the farmers in the irrigation scheme. Focus groups refer to a research technique where by information is collected through group interaction on a topic designed by a researcher. Focus groups are suitable when multiple viewpoints or responses are needed on a specific topic (De Vos *et al.*, 2005). Focus groups also help to gain perceptions and opinions of participants.

The focus group provided rich data through direct interaction between the researcher and the participants. Focus group discussions were also not restrictive but spontaneous as the respondents were not required to answer every question but were also able to build on one another's responses. Recording of the discussion allows respondents to confirm their participation but in this case respondents were not comfortable with being recorded. Focus groups were chosen because they are relatively easy to assemble, flexible and inexpensive in their structure and in getting the desired results (Welman *et al.* 2005 and De Vos *et al.* 2005).



## **3.6. DATA ANALYSIS STRATEGY**

In this study a thematic analysis of data was conducted.

### **3.6.1. Thematic analysis**

Main themes were identified from recurrences and were then used to summarise all collected views. According to Patton and Cochran (2002) a thematic analysis looks across all the data in order to articulate the issues that are common. The stages in a thematic analysis are as follows:

#### ***3.6.1.1. Reading and annotating transcripts***

This is the initial stage whereby preliminary observations were made. This is when an initial feel of the data was obtained from reading the transcripts. Little detail was required for this stage.

#### ***3.6.1.2. Identifying themes***

The following step was to look at the data in detail in order to start identifying themes. Notes were made in the margins for each of the transcripts or notes to summarise what the interviewee was saying. A list of themes was then obtained.

#### ***3.6.1.3. Coding scheme development***

A coding scheme was developed from these initial themes. This was when all themes were listed and then a code was assigned for each and was then applied to the data. Codes were in numeric form. Each code could also have a number of sub codes. A coding scheme was developed as soon as the initial data had been collected according to Patton & Cochran (2002). This helped to determine whether the right questions were being asked to the right people. This happened early enough so as to assist in shaping future data collection. Individual bias was kept in check by giving feedback to interviewers and developing a coding system together.

#### ***3.6.1.4. Coding of data***

These codes were then applied to the whole data set. This was done by writing notes in the margins of the transcripts and notes or marking text on the computer. The whole set of data

was coded so as to get a detailed analysis. After coding all data codes were cut and pasted in groups according to the codes. This was done using a computer. Patterns and relationships of data were then obtained from these themes and became the basis of the report.

### **3.7. VALIDITY AND TRIANGULATION**

The researcher triangulated the interview data with the literature review. Triangulating data enabled the researcher to compare the data collected with the literature review thereby gaining a greater perspective about the data. The concept of triangulating data is important in qualitative research since validity cannot be tested and research cannot be replicated.

According to Bryman (2012), validity signifies the issue of whether an indicator (or set indicators) devised to gauge a concept really measures that concept. The validity concerns the integrity of the conclusions derived from the research in order to increase confidence in the results. Triangulation on the other hand entails using one or more sources of data in the study to cross-check the findings.

Comparing one data source with another enabled the researcher to double check the process for bias or potential problems with the data. It is further argued that triangulating data also helps the researcher to interpret data in a way that is more insightful. Therefore, using triangulation in this study helped the researcher to see connections in the data collected through different tools and to confirm the emerging categories and themes (Creswell, 2007). Triangulation helped the researcher to guard against the accusation that a study's findings are simply an artefact of a single source or a single investigator's bias.

### **3.8. RESEARCH ETHICS**

Ethical issues cannot be ignored since they relate directly to the integrity of research. Ethics are the generally accepted norms and values in a community. The community itself decides what behaviour is morally acceptable. This arises from the interactions between different people, other species and the environment especially where there is conflict of interest. This results in a trade off between the rights and interests of different groups (Bryman, 2012).

The body of research also has its ethics which involve the obligation of scientists to the practice of science, the society, the subject of science, and the environment. The ultimate goal is the search of truth and knowledge. The researcher adhered to the research ethics and considered her obligation to the research practice which includes: objectivity and integrity, recording of own data, ethical publishing practices and non-fabrication or none falsifying of data. Some ethical considerations followed during the research which Diener & Crandall (1978) cited in Bryman (2012) are categorised as: safety of participants, consent, confidentiality and transparency. These were also considered by the researcher and are explained briefly in the next section.

#### **3.8.1. Safety of participants**

According to Bryman (2012) research should not harm participants in any way. Harm according to Diener and Crandall (1978:19) can be in various forms e.g. harm to participant's development, physical harm, stress, loss of self-esteem, or subjecting participants to reprehensible acts. During the research, the researcher did not endanger the participants in any way and considered the safety of participants.

#### **3.8.2. Consent**

Participants were given as much information as possible concerning the research so that they could make informed choices of whether or not they wanted to take part in the research. The researcher obtained a signed consent form from participants. The nature of the research and its implication was explained to participants.

#### **3.8.3. Confidentiality**

It is not always possible to measure the danger to a given population or individuals hence it is crucial for information like the identity and records of participants to be kept confidential. The researcher safeguarded the data obtained from participants by protecting their identity and using information obtained only for the purpose of this study. Respondent's names were not written on the questionnaire in order to protect their identity.

#### **3.8.4. Transparency**

Deception occurs when researchers withhold the truth from participants. The researcher did not prejudice the participants in any way. The purpose of the study was well explained to the participants and feedback will also be given to them on the findings.



### 3.9. LIMITATIONS

The researcher is not a member of the Taung community and is also not a citizen of the country under study (South Africa). Due to this fact, since the researcher comes from a different country with different livelihoods this may have led to bias which was unintentional. The researcher was inclined to compare the people's livelihoods with the livelihoods of people in her country. The fact that the researcher comes from a different country was however an advantage as it helped the researcher to observe certain characteristics that may not be easily detectable by someone from within the same community.

There may also be an unclear distinction between small-scale farmers and smallholder farmers given the community within which the research was being conducted and this may pose problems when analysing data. The interviewees needed to be educated on the distinction beforehand so that coding was done uniformly.

Gathering participants together in a single meeting posed a challenge given the farm activities and other commitments. The researcher tried to overcome this by taking note of the dates farmers held their cooperative meetings and attended these to meet the farmers. The extension officers also assisted in mobilising the farmers for meetings so that they could be interviewed. However, the meetings were characterised with poor attendance as farmers are frustrated with holding meetings which to them have not been helping to change their circumstances. Sometimes the researcher had to be patient as the extension officers were reluctant to meet the farmers on some occasions because of bad relations between them. This led to delays in collecting data. Due to the spatial distribution of the farmers, it was more convenient for the researcher to meet them at a single point in order to minimise transport costs.

The researcher also faced challenges in terms of language as she speaks a different language from that of her respondents. This was overcome by soliciting the help of a translator. The researcher was also assisted by three students from the Taung College of Agriculture. These were trained by the researcher and participated in the research as research assistants.

## **CHAPTER 4: RESULTS AND DISCUSSION**

### **4.1. INTRODUCTION**

This chapter outlines the empirical findings and summarises the results of the research study. The chapter discusses and analyses the findings of the research and provides interpretation of the results. The results which were obtained through interviews with 76 participants (smallholder irrigating farmers) will be presented with the aid of graphs and tables for more clarity. The literature presented in chapter two will also be compared with the findings. The results are presented in categories which answer the research objectives and research questions in categories which are general demographics, potential of the scheme, involvement of other sectors, production capacity and marketing, poverty and livelihood strategies and institutional arrangements.

### **4.2. GENERAL DEMOGRAPHICS**

This part was divided into sections as follows:

#### **4.2.1. Age**

Age plays an important role in farming, especially considering the fact that farming is a labour intensive enterprise which requires someone with a lot of energy in order to deal with some of the pressing activities involved. Participants were asked to indicate their age range and it was found that most smallholder farmers (39%) were above the age of 60. This shows that most of the farmers were elderly. These are the farmers who have been there since the establishment of the irrigation scheme. 21% were between 51 and 60 years of age, whereas 29% fell within the 41 to 50 years age group. Only 11% were found to be in the 31 to 40 years age range. Hope *et al.*, (2008) also drew the same results in their study of the Khumbe Irrigation Scheme. As the age group decreases, the number of smallholder farmers also decreases. There are no farmers below the age of 30 showing that youth are not involved in the irrigation scheme. This shows that youth look down on agriculture as a source of livelihood.

#### **4.2.2. Education**

The aspect of education of farmers covered two main elements which were, highest education level attained and agricultural training. Farming among the black community was usually depicted as characterised by high levels of illiteracy as observed by Machethe (2004) and Burney & Naylor (2011). The lowest income adopters of irrigation technologies were seen to reap lower returns to their investments in irrigation as a result of low education.

##### **4.2.2.1. Highest level**

The general situation was that the majority of farmers were educated that is, 95% had undergone primary to tertiary education. Half of the respondents had secondary education whilst 37% completed primary school. This shows that most farmers were literate hence they could read and write. 8% had obtained tertiary education. However, the fact that 5% had no formal education is something which is worrying. The significance of education, both formal academic education and workplace skills, for improving livelihood prospects is established by a great number of studies including Ellis (1999) and Machethe (2004). Poverty is closely associated with low levels of education and lack of skills.

##### **4.2.2.2. Agricultural training**

Agriculture is taken as common science because any person can throw a seed in the ground and it germinates. However, taking care of the crop needs application of science. Therefore a person who attempts farming without the necessary training may at times experience crop failure due to failure to observe farming principles. According to Jayne *et al.*, (2010) trained farmers have a positive impact on production which subsequently translates to profit. In order to establish whether the smallholder irrigating farmers had some knowledge of agricultural practices it was necessary to ask them whether they had received any training in agriculture.

Most respondents (84%) received agricultural training though the majority (68%) of these received informal training in the form of workshops. Whilst a few farmers had neither received formal nor informal agricultural training, they were literate and could be capacitated through training. Fortunately, there are some farmers who have undergone formal agricultural training in colleges hence they can assist others by sharing information. However, almost all farmers expressed a need for additional training on irrigation practices. The training needs identified include the areas of irrigation methods and system maintenance, management,

marketing skills as well as farming skills. Van Averbeker *et al.*, (2011), observed that training programmes provided by tertiary institutions are not designed to equip farmers adequately.

#### **4.2.3. Gender**

Gender is an integral component of rural livelihoods (Scoones, 1998) and feminisation of poverty is regarded as one of the main hindrances to effective poverty alleviation. Burney & Naylor (2011) came to the conclusion that gender imbalances hinder the optimal allocation of inputs to irrigated land among the poor. Therefore, respondents were classified according to their gender and it was found that more than half (53%) were females. Men and women have different assets, access to resources as well as opportunities (Ellis, 1999). It shows that women are still trapped in customary roles while men are given more opportunities for diversification in their livelihoods.

#### **4.2.4. Marital status**

Married people tend to have more opportunities for diversification as they can share responsibilities (Ellis, 1999). It is common for men to go look for work in the cities while women stay behind taking care of the farm and children. Most of the respondents were married (37%). The rest were single (34%) and widowed (29%). Women were more involved in farming whilst the men were formally employed elsewhere in order to supplement their income. Those who are widowed and single are more vulnerable as they solely rely on irrigated agriculture for their livelihood.

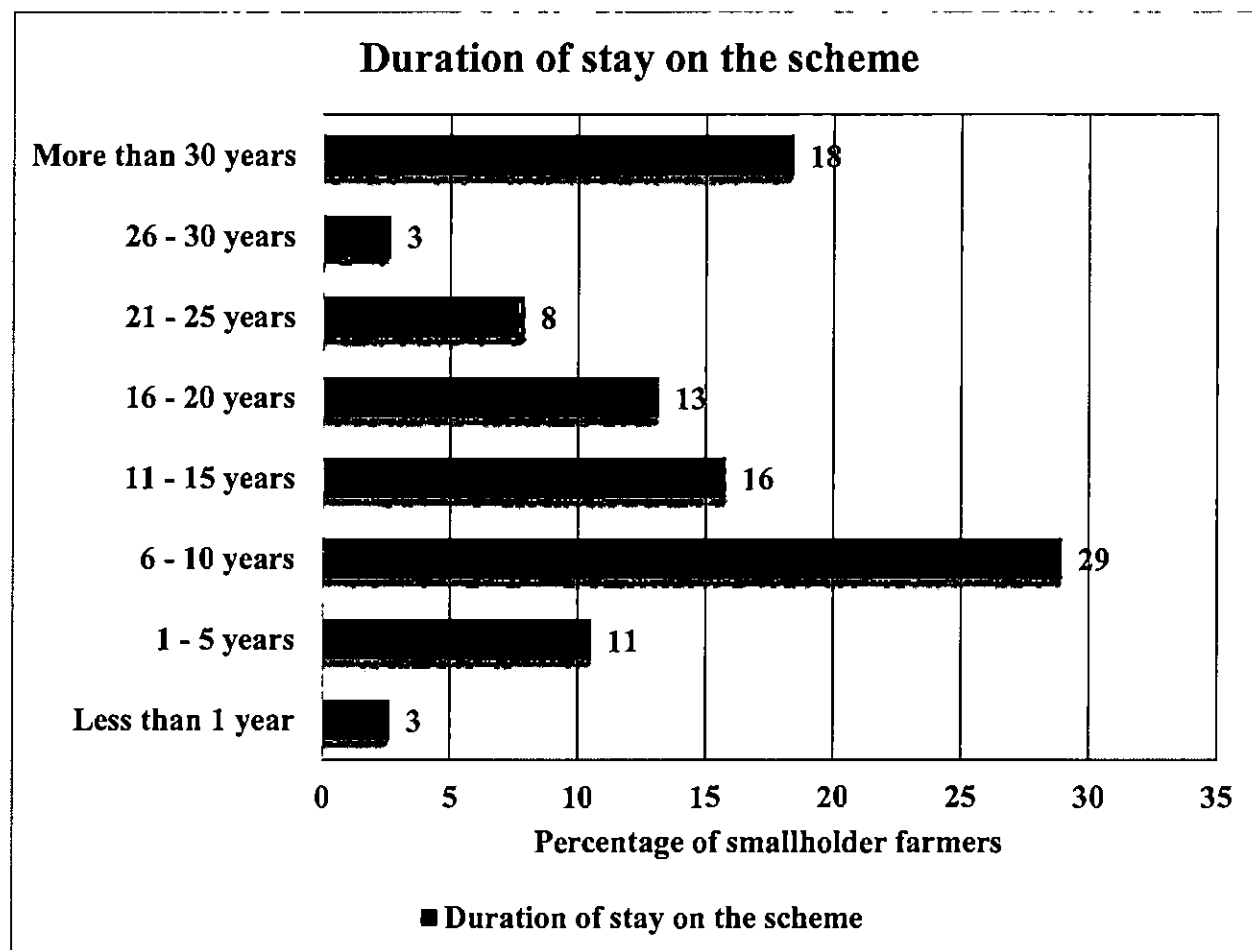
#### **4.2.5. Dependents**

In order to find out the potential contribution smallholder irrigated agriculture has on individual households it was necessary to ask them how many dependents the respondents have. Most respondents (84%) have up to 10 dependents. Of the respondents 16% have more than 11 dependents. Respondents aged 60 and above have fewer dependents. Hope *et al.*, (2008) made similar observations regarding the issue of dependents for farmers who are older than 60 years. Irrigated agriculture promotes diverse livelihoods due to the fact that it is not labour intensive.

#### **4.2.6. Duration of stay**

The smallholder farmers participating in this study were asked the duration of their stay on the irrigation plots. This was necessary to get insight into their experiences in the practice of

irrigated agriculture. It is believed that the more experience the farmers have, the more likely they are to sustain their livelihoods through agriculture. Results are presented in Figure 4.1 below.



**Figure 4.1: Duration of stay on the scheme**

Most respondents (59%) have been on the scheme for less than 15 years. A small percentage (3%) had been on the scheme for less than 1 year. A total of (18%) of the farmers have agricultural experience because they have stayed on the farm since it was established. Most of the active smallholder farmer's on the scheme inherited the land from their parents. Although there are farmers who have been there since the establishment of the scheme, the fact that the scheme has undergone and is still undergoing a lot of restructuring shows that they still need support from external agencies for them to be successful.

#### **4.2.7. Acquisition of land**

Since most respondents had been on the scheme for less than 15 years, it was necessary to ask them how they acquired the land. This can indicate the potential for expansion of the scheme to accommodate more farmers. Most respondents (50%) inherited the land from their parents. The land was originally allocated by government. At least 3% of the respondents were on lease agreements whilst the other 3% acquired the land from the tribal authority. The smallholder irrigating farmers were asked whether they had title deeds for the land. The issue of ownership affects their access to credit facilities. From a legal perspective, tenure on irrigation schemes is ambiguous because the legislation that applied when plots were first allocated has since been revised (Manona *et al.*, 2010).

Yet, it was found on many schemes that plot-holders felt secure about crucial tenure rights, such as who the plot belonged to. They felt less secure about other rights, for example the right to rent out land, mainly because previously renting out land was forbidden by the conditions of occupation (Van Averbekke *et al.*, 2011). Smallholder irrigating farmers do not have title deeds, but they have permission to occupy. They cannot use this to acquire credit from commercial banks. Machethe (2004) states that the tenure system that applied on nearly all schemes precluded farmers from using their holding as collateral to access loans from registered financial service providers.

#### **4.2.8. Irrigated land area**

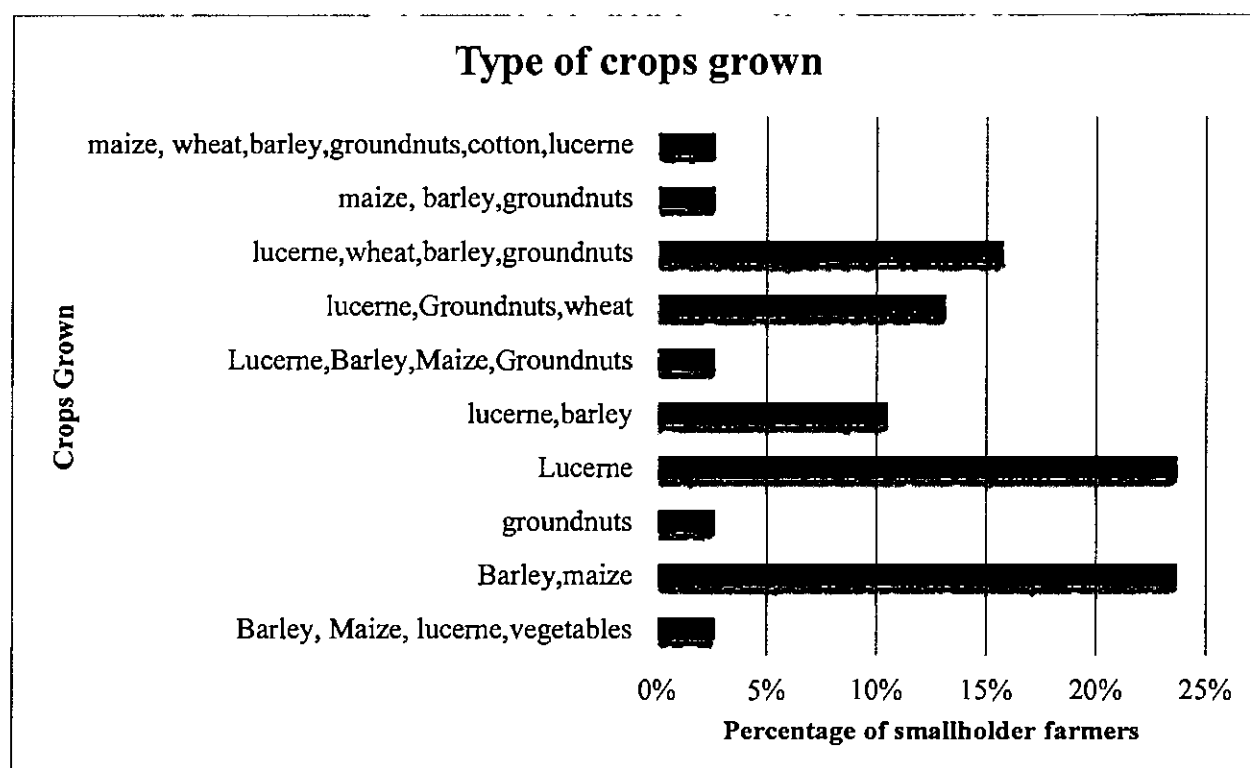
The size of the land holding according to Jayne *et al.*, (2010) is inversely related to the trend in diversification in several parts of Southern and Eastern Africa. To establish the size of the land area which smallholder irrigating farmers are irrigating they were asked about the size of their plots. The plot sizes ranged between 7, 5 to 10 hectares. On average, most of the farmers were irrigating on 10ha of land. The size of the land was still too small for commercial purposes although this was an improvement from previous studies which revealed that on average farmers irrigated on 2ha (Van Averbekke *et al.*, 2011). The average 2ha meant most farmers could only farm for subsistence and not for commercial purposes.

### 4.3. POTENTIAL OF THE SCHEME

The importance of smallholder schemes arises primarily from their location in the former homelands, which continue to be poverty nodes according to Vink & Van Rooyen (2009). In these areas, irrigated farming has the potential to contribute significantly to food security and income of participating homesteads. Direct and indirect employment can be created through forward and backward linkages to primary production. Examining the potential of the scheme will help to identify areas that require support. The choice of crop cultivar, irrigation system, access to resources as well as potential for employment creation was examined.

#### 4.3.1. Types of crops grown

According to Mangisoni *et al.*, (2011) irrigation facilitates the introduction of new crops in regions where they could not be sustained by rainfall alone. The graph (Figure 4.2) shows the combination of crops grown by the smallholder farmers in the Taung Irrigation Scheme.



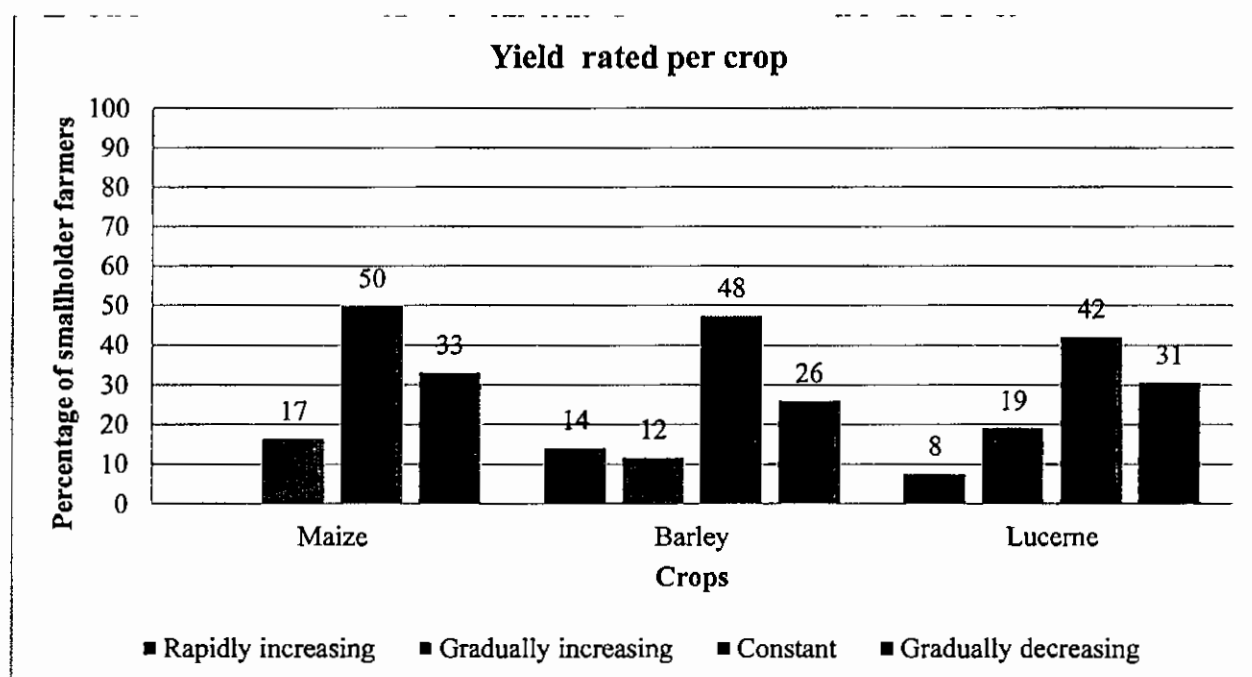
**Figure 4.2: Types of crops grown on the scheme**

Farmers on the Taung Irrigation Scheme grow Lucerne, barley, groundnuts, wheat, maize, vegetables and cotton. Figure 4.10 shows the combination of crops grown by the farmers.

Most smallholder farmers grow Lucerne, barley and maize (24%). The crops grown are those that have a high earning potential if they are sold to the right market. Hope *et al.*, (2008) agrees that the types of crops grown are consistent with an income generating livelihood strategy.

#### 4.3.1.1. Yield rated per crop by smallholder farmers

To assess their potential, farmers were asked to rate their yield per crop since they started irrigating. The results are presented in Figure 4.3.



**Figure 4.3: Yield rated per crop**

The yield was mostly constant for maize (50%), barley (48%), Lucerne (42%), groundnuts (30%), wheat (33%) and cotton according to their perceptions. The yield for vegetables is gradually increasing for the farmers who are growing them. The farmers are assured of a good yield because of the irrigation. The yield for Lucerne and barley is also increasing rapidly. This shows that the problem for irrigating farmers is not with production but with marketing information. Lack of marketing information forces them to sell all their crops at a cheap price since they also do not have storage facilities for their surplus produce. To support the findings, the yield per crop in tonnes per hectare for the main crops i.e. Lucerne, maize and barley in 2014 were obtained and are presented in Table 4.1 below.



#### **4.3.1.2. Yield per crop in 2014**

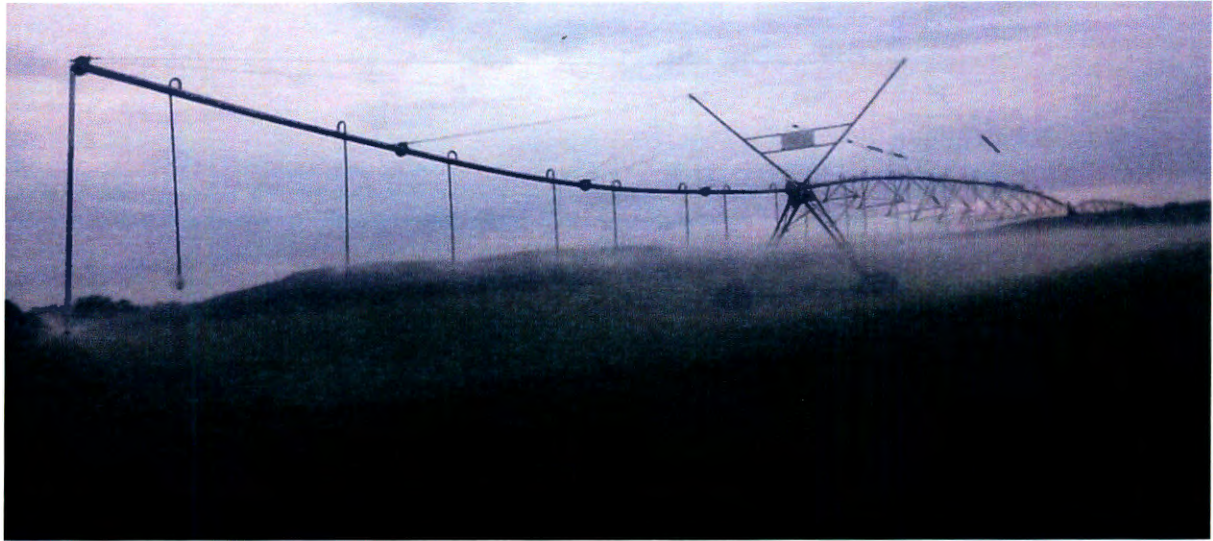
**Table 4.1: Yield per crop in 2014 in Tonnes per hectare**

	<b>Average</b>	<b>Highest</b>	<b>Lowest</b>
<b>Lucerne</b>	11.6t/ha	40t/ha	1.5t/ha
<b>Barley</b>	16.06t/ha	40t/ha	6t/ha
<b>Maize</b>	7.83t/ha	11t/ha	2t/ha

Lucerne which is the major crop grown by the smallholder farmers in the Taung Irrigation Scheme had an average yield of 11,6t/ha with the highest yield being 40t/ha and the lowest yield being 1,5t/ha during 2014. Barley yielded an average of 16,06t/ha the highest yield was 40t/ha and the lowest was 6t/ha. Average maize yield for the 2014 year was 7, 83 t/ha. The highest yield was 11t/ha whilst the lowest for maize was 2t/ha. The smallholder farmers sold all their crops harvested in 2014 because they were no storage facilities for surplus produce. The same results were reported by Jordaan & Grove (2013) in the Zanyokwe irrigation scheme.

#### **4.3.2. Irrigation system**

A smallholder irrigation system can reduce poverty if its adopters can reinvest the substantial cost and labour savings arising from the significant efficiencies. According to Burney & Naylor (2011), an irrigation system is composed of access, distribution and productive use technologies that are used by the farmers. To investigate the impact of technology on smallholder irrigation is one of the objectives of this study. The type of water application (distribution) methods is reflected in Figure 4.4 and Figure 4.5 below.



**Figure 4.4 Centre pivot system**



**Figure 4.5 Sprinkler system**

Centre pivot system is used by 53% of the respondents (see Figure 4.4 above) whilst 47% make use of the sprinkler system (see Figure 4.5above). A water distribution and a water access technology create opportunity for water use which might have been impossible. It can result in improved efficiency and translates into labour and cost savings. The smallholder farmers who use the Centre pivot system use the motor pump to abstract water from the Vaal

harts dam whilst those who use the sprinkler system use gravity. The sprinkler system does not pump at the desired rate due to blockages in the pipes. A productive application technology increases returns to land through higher yields or crop values. Farmers using the centre pivot system have better quality crops than those using the sprinkler system. An irrigation system is likely to be abandoned if the adopter is unable to realise the efficiencies afforded by access, delivery and use technologies (Burney & Naylor, (2011).

#### **4.3.3. Access to resources**

With regards to access to water resources two issues were examined i.e. its availability and affordability. The issues are important because it is not enough to have resources if people cannot afford them.

##### **4.3.3.1. Water availability**

Water is an important resource in livelihoods especially to those that depend on agriculture as is the case with smallholder farmers in the Taung irrigation scheme. It constitutes natural capital on the livelihoods framework (Carney, 1998). It is therefore important to consider its access and quality and how it is changing.

Most farmers indicated that they do not receive enough water when they need it. The sequence of water use is determined by Vaalharts owners. Barker *et al.*, (1999) in their studies reported that the growing scarcity and competition for water is putting the poor in irrigated areas at a risk. In Wichelns (2013) view, crop yields and farm incomes have been increased through gaining access to irrigation water. The gains are despite the risky and uncertain marketing and production environments that characterise smallholder farming in Africa and Asia.

##### **4.3.3.2. Affordability of water**

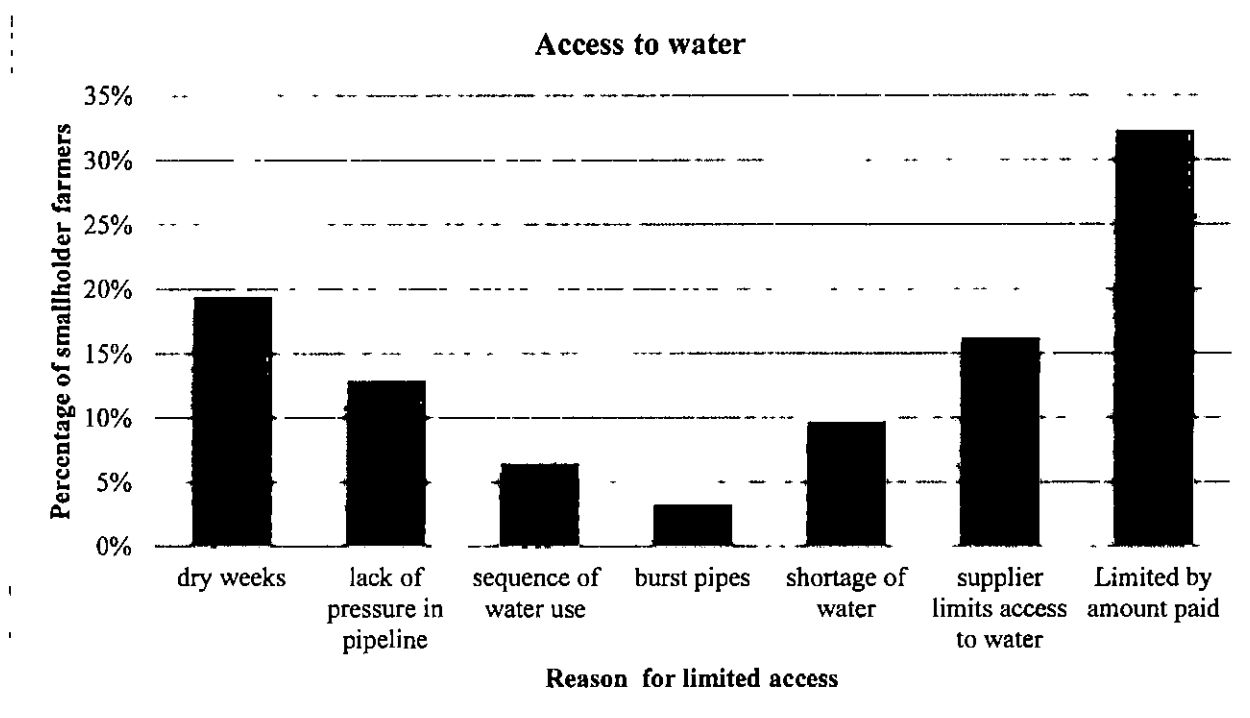
Wichelns (2013) observed that farmers who are able to access affordable irrigation water can manage the production of crop growth more effectively and they can ensure that soil moisture is adequate when it is critical. Smallholder farmers were also asked about the affordability of irrigation water. Most farmers (55%) found irrigation water to be unaffordable. The remainder (45%) agreed that it was affordable. This is in line with the results of several studies e.g. by Van Auerberke *et al.*, (2011), Yokwe (2009) and Speelman *et al.*, (2011)

which indicated that smallholders would face financial difficulties if they had to pay for the water themselves. Smallholder farmers in the Taung Irrigation Scheme are faced with financial difficulties as they incur high energy and water costs.

#### **4.3.4. Effects of limited access to resources**

Smallholder irrigating farmers are affected by their limited access to resources. Access to water limits the area cultivated by farmers; this is reflected on the graph as 82% of the respondents said that they were affected. The reasons for limited access to water are highlighted in Figure 4.6 below. Only 18% said they were not affected negatively. Most farmers (66%) do not sow their crops in time according to their sowing date. The method used by most farmers to harvest their crops in the 2014 season was mechanical (97%). Of the respondents 3% said they used both handpicking and mechanical methods. Only 5% of the respondents own harvesting machinery, the rest do not own any harvesting machinery. Due to the high capital cost of harvesting and planting machinery, smallholder farmers cannot afford to buy their own. As a result, smallholder farmers hire machinery from neighbouring commercial farmers and this delays them in planting and harvesting. For those farmers who are leasing their plots to contractors, the contractor provides the machinery. Few farmers source implements from the cooperative and from other farmers within the scheme.

#### 4.3.4.1. Reasons for limited access to water



**Figure 4.6: Reasons for limited access to water**

The reasons for farmers having limited access to water are varied. Most farmers (32%) mentioned that their access to water is limited by the amount they pay. If they are in arrears they do not get water. Sometimes they do not have access to water due to dry weeks (19%), this is when the dam is being cleaned and the water is closed. The supplier (Vaalharts) according to 16% of the smallholder farmers limits their water and this affects the area they are cultivating. Other smallholder farmers cited lack of pressure in the pipeline (13%). There are impurities in the water which cause blockage of pipes in the sprinkler system because there are no filters. Water does not pump at the desired rate for those farmers using the sprinkler system as it uses gravity. Some farmers also cited general shortage of water (10%) in the region due to drought as their limiting factor. Six percent of the farmers attributed their limited access to water to the sequence of water use. They said that those with 10ha plots and using the centre pivot system are given preference over those with smaller plots during water allocation. Three percent of the smallholder farmers blamed slow maintenance as burst pipes take too long to get repaired.

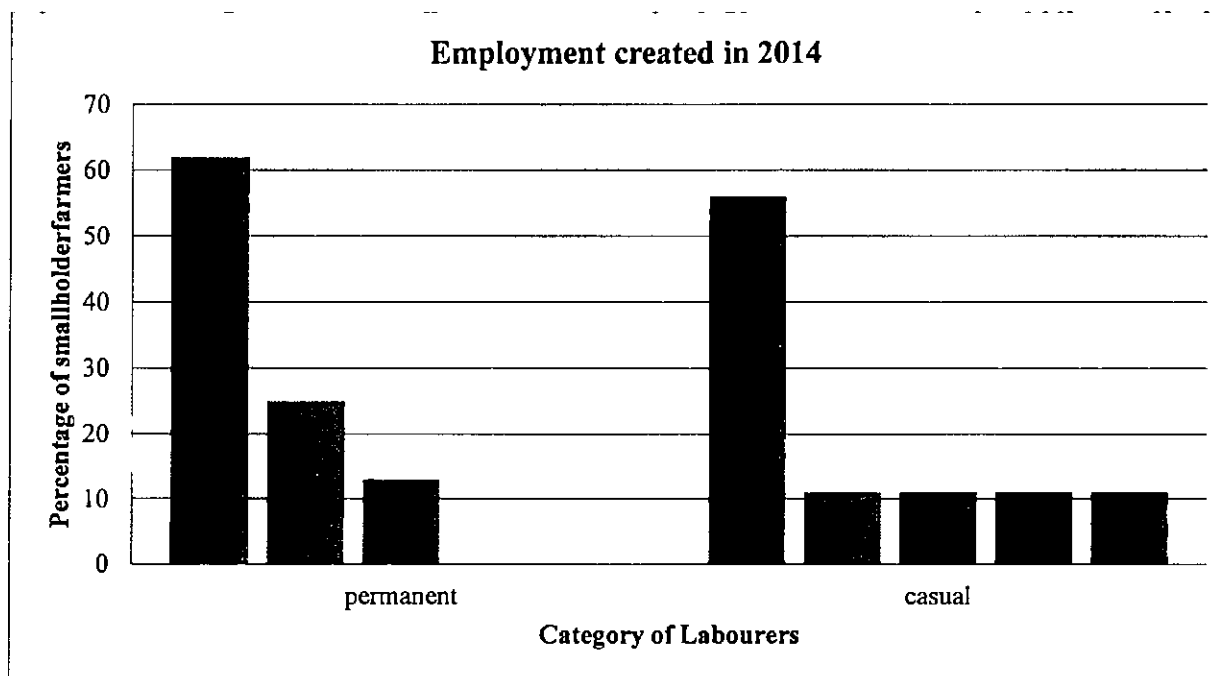
Access to good irrigation water enables poor people to increase their production and incomes. It enhances their opportunities for diversifying their income base, as well as reducing the vulnerability caused by seasonality of agricultural production and external shocks. Irrigation increases employment opportunities not only for landholders but also for the landless. Hussain *et al.*, (2002) agrees that access to good irrigation has the potential to contribute to poverty reduction through improving people's welfare.

#### **4.3.4.2. Reasons for sowing late**

The major problem for the farmers was the lack of machinery (54%). Due to highly mechanised and expensive machinery, smallholder farmers cannot afford their own planting and harvesting equipment. A significant number (42%) of the farmers who did not sow in time faced delay in the delivery of inputs. Similar problems were also cited by Van Averbeker *et al.*, (2011) among irrigation schemes. Some farmers feel that the Department of Agriculture gives preference to farmers with 10ha plots who are using the centre pivot system of irrigation compared to those with smaller plots and using the sprinkler system. A few (4%) of the farmers blamed their dependency on contractors for the delay in sowing their crops since they depend on the availability of the contractors who rent on their farms.

#### **4.3.5. Employment creation**

The potential of irrigated agriculture to create employment in Taung was explored. It has been recognised by Gosh *et al.*, (2012) who state that irrigation resources have a critical role to play in poverty alleviation. This is made possible by ensuring agricultural development, expanding livelihood opportunities as well as employment both on and off the farm. Figure 4.7 below shows the number of labourers employed during 2014 by the plot holders.



**Figure 4.7: Labourers employed in 2014**

Out of the few farmers who employed permanent labourers, 62% employed one person, while 25% employed two people and 13% employed four labourers. This shows that irrigation plots do not create much direct employment. Of the farmers who employed casual labours 56% employed six people, while 11% employed 30, three, two and one labourers respectively. Irrigated agriculture therefore is more inclined towards hiring casual labourers than permanent ones. Although modern farming methods have become more sophisticated with the advent of technology, its main disadvantage is that it does not create much direct employment (Jordaan & Grove, 2013).

#### **4.4. INVOLVEMENT OF OTHER SECTORS**

The involvement of other sectors is necessary for the provision of support needed by the smallholder farmers to become more productive and sustain their livelihoods. Weak support services are a recurrent theme in most smallholder irrigation scheme assessments for example Bembridge (2000), Machethe (2004), and Van Averbek *et al.*, (2011). Support services in the Taung irrigation scheme were also investigated under the auspices of extension services, availability of credit as well as other support organisations.

#### **4.4.1. Extension services**

Algholor & Obi (2013) highlighted the importance of technology in the agricultural setting but noted that the gap between available technology and farmers' expertise remains wide. In the Taung irrigation scheme, most farmers (58%) acknowledged that there are extension services from the Department of Agriculture and Rural Development. They receive inputs, machinery, advice, and irrigation system maintenance. The department hires contractors to fix the irrigation systems but the farmers have to pay for the expenses. It was noted though that quite a large number of farmers (42%) do not receive extension services which is quite worrisome.

##### ***4.4.1.1. Frequency of extension services***

The frequency of extension visits has been seen to be positively correlated to farmer's technical efficiency by a number of studies (Jordaan, 2012). Farmers expressed dissatisfaction with the fact that extension officers did not visit them at their irrigation plots often enough. More than half of the respondents (55%) said the extension officers never visited them at their farms. There was a bad relationship between most of the smallholder farmers and the extension officers. Some farmers were visited by the extension officers on a weekly basis (26%) whilst 16% were visited quarterly. Of the respondents only 3% were visited fortnightly. There is a shortage of qualified staff to service all the farmers. This supports the conclusion made by Bembridge (2000) that poor performance of smallholder irrigated agriculture was associated with a range of factors which include lack of extension and farmer training; conflict; and weak local organisation.

##### ***4.4.1.2. Quality of extension services***

The quality of extension services in Taung was explored as they are crucial in determining the productivity of the smallholder schemes. Most farmers (79%) rated the quality of extension services as poor because they do not get to see the extension officers as often as they would like. This is because of the shortage of qualified staff. The quality of extension services is crucial because if irrigated farming is limited to the mere application of water to crops to avoid water stress, without simultaneously attending to issues of plant nutrition, cultivar choice, plant population and plant protection, it cannot be sustainable (Van Averberke *et al.*, 2011). Only 13% rated the quality of extension services as good, 5% said



they were excellent. These few have already cultivated good relations with the extension officers as there is communication between them.

#### **4.4.2. Availability of credit**

Credit falls under financial capital on the livelihoods framework as it denotes the financial resources that enable people to achieve their livelihood objectives according to Carney (1998). Most farmers (87%) do not have any access to credit. Only 13% of the respondents had access to credit. They could not get credit from commercial banks because they do not have title deeds for their irrigation plots to use as collateral. They only had permission to occupy but cannot use it to borrow from commercial banks. A few smallholder farmers received credit in the form of inputs from contractors. Most of the smallholder irrigating farmers did not have any other source of credit apart from the support they get from the Department of Agriculture and the contractors.

Farmers were not satisfied with the credit they are getting as it was insufficient to meet their needs. However, 26% are risk averse; they would rather not take any credit. This supports the observation by Carney (1998) that financial capital is the least available asset to the poor. Scoones & Wolmer (2003) argue that agriculture can only be transformed by the transfer of technology, supported by effective extension and input supply credit systems.

#### **4.4.3. Source of support for smallholder irrigating farmers**

Smallholder irrigated agriculture succeeded in other parts of the world like Bangladesh, Morocco, India and Zimbabwe in the early 80s because of adequate support from government and other sectors (Van Auerbeke *et al.*, 2011). It is therefore necessary to find out the source of support for smallholder irrigated agriculture in Taung, South Africa.

Government was found to be the major supporter for smallholder irrigated agriculture followed by the private sector, whilst only a handful received support from the Trust. The private sector, mainly the contractors however do not assist the farmers to become self-sustainable. Government, through the Department of Agriculture and Rural Development provides inputs and irrigation equipment to the farmers but the contractors benefit more as they are aware of the markets and they also have harvesting machinery. Mangisoni (2011) concludes that the poor do not always benefit from programmes meant for them; they are

usually hijacked by those who are not so poor. There is no support from the local municipality.

Smallholder farmers receive seed, fertilizers and pesticides and training mostly from government. The contractors also bring in seed, plant and harvest the crop as well as transporting and marketing the crop. Most of the maintenance of irrigation equipment was also done by the private companies. As a result, they take most of the profit and leave the farm owners with little or nothing. This shows that smallholder farmers are vulnerable to exploitation. Some smallholder farmers in the Taung Irrigation Scheme get additional support from the Tribal Office and from the Trust.

The additional support smallholder farmers are getting from the government and the private sector is machinery. Although the government is spending a lot of money buying equipment, providing maintenance and inputs, smallholder farmers were not enjoying the benefits. Respondents were asked whether the support they are getting was adequate. Most of them said it was inadequate and gave the following reasons.

#### ***4.4.3.2. Adequacy of support***

Efforts to develop efficient and effective technologies have achieved limited success in the case of small-scale farmers who are often regarded as resistant to changes according to Asefa (2008). Van Der Stoep (2011) attributed small-scale farmers' failure to adopt improved technologies partly due to the inadequacy of support systems, such as extension services, credit, and input supplies. To explore other potential avenues for support of smallholder irrigated agriculture, it is important to investigate the adequacy of the available support to smallholder farmers in Taung.

Most farmers felt that the support they are getting is not sufficient. Less than half (43%) of the respondents indicated that they received adequate support. Additional support required by the farmers is store rooms to put equipment and materials. They also need storage facilities to reserve some crops for use in the event of a bad season. The problem of lack of storage facilities was also noted by Burney & Naylor (2011) and Jordaan & Grove (2013). Farmers also called for government support to come in time i.e. seeds, fertilizers, equipment for them to plant in time.

They also need machinery like tractors, planters and harvesting machinery to reduce dependency on the white commercial farmers who end up exploiting them or delaying them. Farmers also cited the need for information about existing markets for emerging farmers. They also expressed their concern over timely maintenance of infrastructure. Repairs on burst pipes take too long due to the long procurement process. No irrigation takes place until the pipes are repaired. They also need proper fencing for their farms as their crops are prone to theft with the current dilapidated fencing facilities.

Smallholder irrigating farmers requested that government assists them with training in basic irrigation practices so that they can operate the irrigation system and do minor maintenance themselves. Smallholder farmers also expressed their need for assistance with input costs especially electricity as they cannot afford them. They need help from the Department of Agriculture to intervene in their production cycle. Government should look into the possibility of building a processing plant for lucerne in Taung. There is need for a direct marketing point in Taung to create more job opportunities. More involvement of extension officers is required. A technician also needs to be appointed to fix equipment in time after a breakdown.

It is interesting to note that the farmers are over dependent on the government for everything, the support they already receive is still not enough. They need to be equipped so that they can be self-reliant. Due to the complex set of constraints facing smallholder producers, providing access to irrigation water by itself is not enough. Smallholder farmers also require a broad range of support services e.g. access to inputs, credit, and output markets, knowledge of farming and secure land tenure (Asefa, 2008). If smallholder irrigation schemes are to achieve success on a market-oriented basis, they require access to support services and opportunities for producing high value crops for them to achieve economic viability.

## **4.5. PRODUCTION CAPACITY AND MARKETING**

This section explored the marketing behaviour of smallholder irrigating farmers in the Taung irrigation scheme. Most researchers who studied South African smallholder irrigation schemes for example Reinders (2011), Van Der Stoep (2011) and Van Averbeké *et al.*, (2011) concluded that the performance of the majority of irrigation schemes was well below potential. One of the objectives of this study was to investigate the behaviour of smallholder farmers associated with the highest financial returns to the irrigation water used for agricultural purposes as a means to alleviate rural poverty.

### **4.5.1. Purpose of the crop grown**

The purpose of farming on plots was shown to be dependent on the role irrigation played in the livelihood of individual plot-holder homesteads (Van Averbeké *et al.*, 2011). The purpose of crops grown by smallholder farmers in the Taung Irrigation scheme was explored.

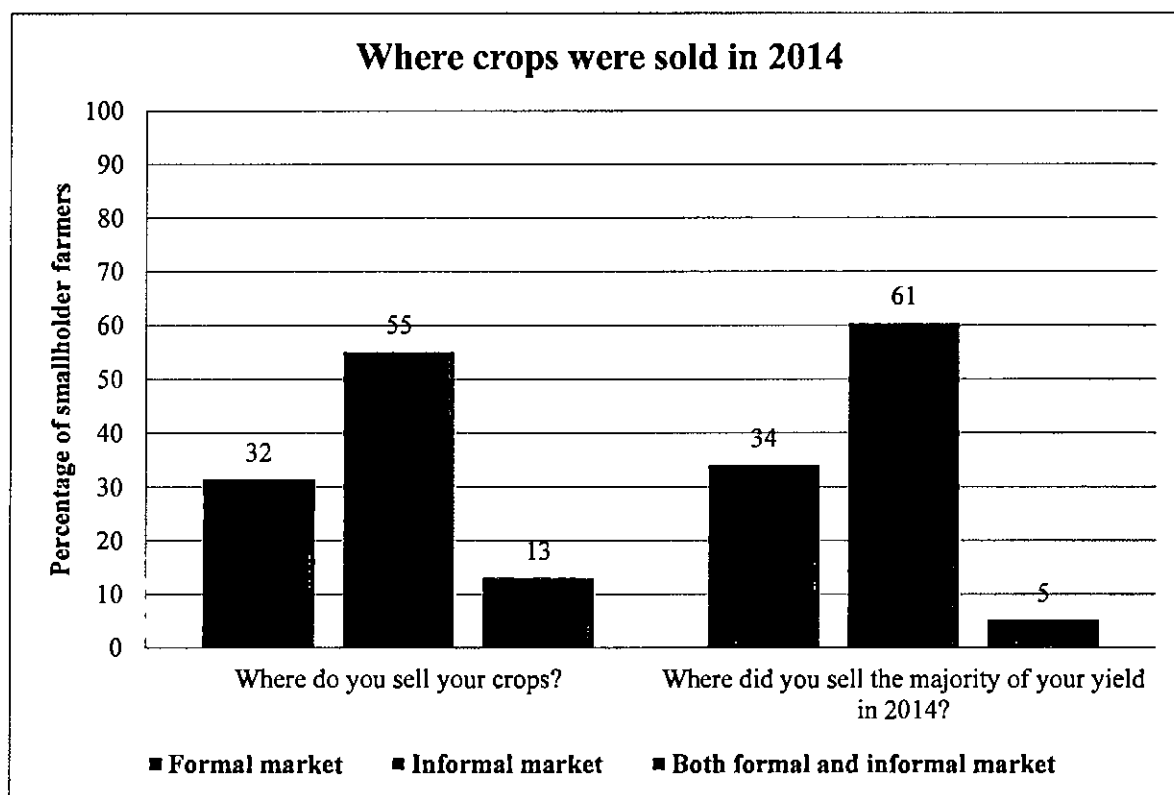
It was observed that the majority of respondents produced their crops for market purposes only (63%). The major crop that is grown in the Taung Irrigation Scheme is Lucerne which is produced for animal feed and has a ready market both locally and internationally. Those that produced for both home consumption and for the market were (32%). These farmers also grow other crops like maize, wheat and groundnuts which they can also consume. Very few farmers (5%) produce strictly for subsistence. This shows that smallholder farmers are moving from subsistence farming to more commercialised agriculture.

### **4.5.2. Quality of the crop produce**

The quality of the products that are produced directly influences the degree to which smallholder farmers can access high-paying markets and get good prices for their crops. The quality of the crop produced determines its marketability as well as the pricing hence it was necessary to inquire from the farmers the quality of their crops.

The quality of crops grown by the respondents ranged between average and good. Most respondents rated the quality of their crops as good (52%). The Lucerne produced in Taung is rated among the best in Africa in terms of quality hence its high demand both nationally and internationally. The quality of barley and maize is also good. A significant number (42%)

rated their crops as average. Wheat, groundnuts and vegetables are average in terms of quality. Jordaan & Grove (2013) also observed that smallholder irrigation farmers need support in the technical aspects of production to ensure a high volume of good quality produce, along with marketing to help them to sell that produce for the highest possible prices. Figure 4.8 shows where the farmers sold the majority of their crops in 2014.

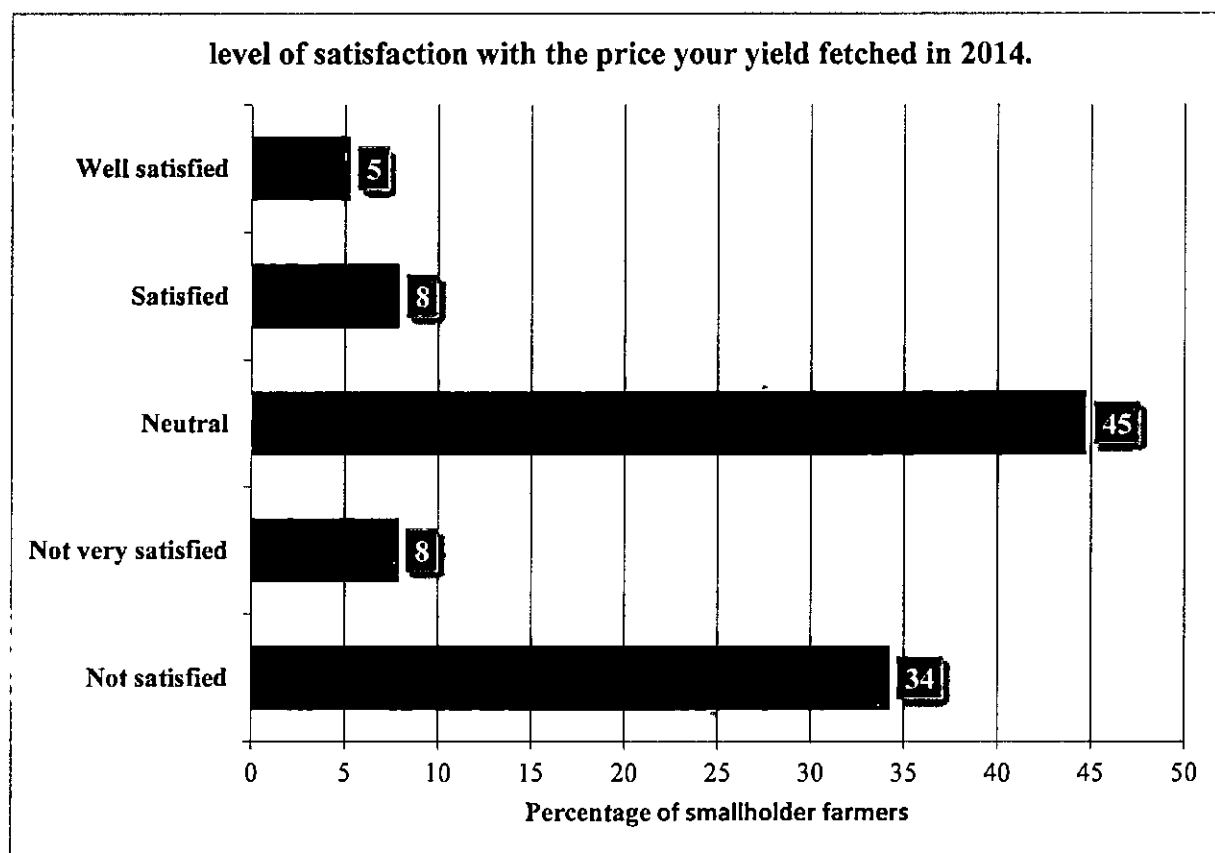


**Figure 4.8: Where crops were sold in 2014**

Due to their lack of information on available markets, the majority of smallholder farmers sell their crops to the informal market i.e. within their community, at roadsides where they compromise on the price of the crops. Hope *et al.*, (2008) showed that some crops tend to fetch a higher price on the informal market e.g. maize sold as green cobs fetches a higher price than dry cobs. Some sell to the formal market e.g. to SAB (South African Breweries) or commercial farmers that use their land but when the crop is harvested and expenses are deducted the farmers remain with very little or nothing. Mangisoni (2011) stated in his study of irrigation technologies that low income adopters of irrigation technologies do not always benefit from such investments. This is the case in the Taung irrigation scheme.

### 4.5.3. Pricing

Pricing has an impact on the profitability of the smallholder farms; hence farmers were asked whether they were satisfied with the price their crops fetched in the 2014 harvest season.



**Figure 4.9: Level of satisfaction with pricing**

Figure 4.9 shows that a significant number of the smallholder irrigating farmers feel that the price their crops are fetching is inadequate (42%) while only 13% expressed their satisfaction. Those who are satisfied are content with whatever they get. Though the majority of the farmer's response was neutral (45%) it was evident that they are not aware of proper prices.

The majority of farmers sold all their crops in the 2014 season as they do not have storage facilities for any surplus produce. Some farmers reserved feed for their livestock whereas others lost their produce to stray animals grazing in the fields due to poor fencing facilities on the plots. Few farmers could not harvest the whole crop because the person they hired did not harvest the crop properly. This is a reflection of the disadvantage the farmers have due to their dependency on commercial farmers for harvesting machinery.

#### **4.5.4. Source of information about available markets**

The source of marketing information is important in determining where crops are sold and whether the crops are adequately valued. The highest number of respondents (39%) indicated that they get information about available markets from the television. A significant number of respondents (37%) got information through other farmers by word of mouth. Only 13% received information on their cell phones. However, they do not have access to all those markets as distance is a barrier. The average distance from the plots to the nearest road is 3.4km. The maximum distance is 5km whilst the shortest distance is 0.2km. The average distance to the nearest market is 4km. The longest distance from the plot to the market is 25km whilst the shortest distance is 1km. The remaining 11% do not have any idea of where the markets are therefore they market their crops through the cooperatives.

##### ***4.5.4.1. Marketing challenges***

The biggest challenge noted was that smallholder farmers do not have information about available markets. Tapela (2008) notes that they face stiff competition from commercial farmers who have exposure to both local and international markets. Most of the smallholders irrigating farmers subcontract their farms to commercial farmers, in the end they do not make any profit. The smallholder farmers lack sufficient knowledge about pricing due to their lack of exposure to the available markets. Further investigation is required into how these subcontractors operate to find out if they are not exploiting the smallholder farmers.

The other challenge encountered by smallholder irrigating farmers when marketing their crops is lack of relationships with markets. Smallholder farmers face stiff competition from commercial farmers who have access and have been supplying those markets for a long time. This means they have established relations with these markets. Smallholder farmers also need to be exposed and build relationships with the markets if they are to penetrate them.

#### **4.6. POVERTY AND LIVELIHOOD STRATEGIES**

Researchers focusing on the positive linkages between irrigation and poverty reduction like Van Koppen (1998) and Shah (2000), cite increased cash generation, local multiplier effects, multiple-uses of irrigation (laundry, livestock). The linkages benefit vulnerable groups such as female headed households and forward linkages in the wider economy through job

creation. A World Bank Evaluation (1997) identified improved food security and increased income associated with its irrigation projects. Further, Hussain & Hanjra (2004) state that, global studies unfailingly document evidence of lower poverty rates when land is under irrigated production rather than rain fed production.

The MDGs are targeted at eradicating hunger and poverty in the 189 member countries of the United Nations of which South Africa is a member state. The poverty alleviation strategies that are available in Taung at present besides irrigated agriculture include old age grants, child grants and Extended Public Works Program (EPWP).

#### **4.6.1. Impact of smallholder irrigated agriculture on poverty alleviation**

Access to good irrigation water allows poor people to increase their production and incomes, to enhance their opportunities to diversify their income base, and to reduce their vulnerability caused by seasonality of agricultural production and external shocks. It increases employment opportunities not only for landholders but also for the landless. Hussain *et al.*, (2002) also support the view that access to good irrigation has the potential to contribute to poverty reduction, and to moving the poor from ill-being to well-being. Farmers were asked their view of the contribution of irrigated agriculture to poverty alleviation.

More than half of the respondents (57%) did not think that smallholder irrigated agriculture contributes in alleviating poverty in Taung. Some farmers were disgruntled because they do not realise their expected benefits from the scheme. They do not get profit from irrigation because they subcontract their land but do not get any benefits. They see themselves as providing business for the commercial farmers yet they remain with nothing. They end up with more expenses to pay than income. This is a sign of exploitation as the commercial farmers use their land, bring in their machinery to plant and harvest the crop. After the harvest they deduct the maintenance expenses for the irrigation system and electricity charges from the money they are supposed to pay the farmers. Due to the expensive maintenance costs farmers end up getting very little or nothing while contractors take the whole crop as they are aware of the markets. They even export most of the crop as it is of high quality yet the smallholder farmers do not derive these benefits. Those who do not subcontract sell to the local community of which the quantity sold is small and hence does not bring in the desired income. This had a negative effect especially on those who did not have any other source of income besides irrigated agriculture. A significant number of respondents had other sources



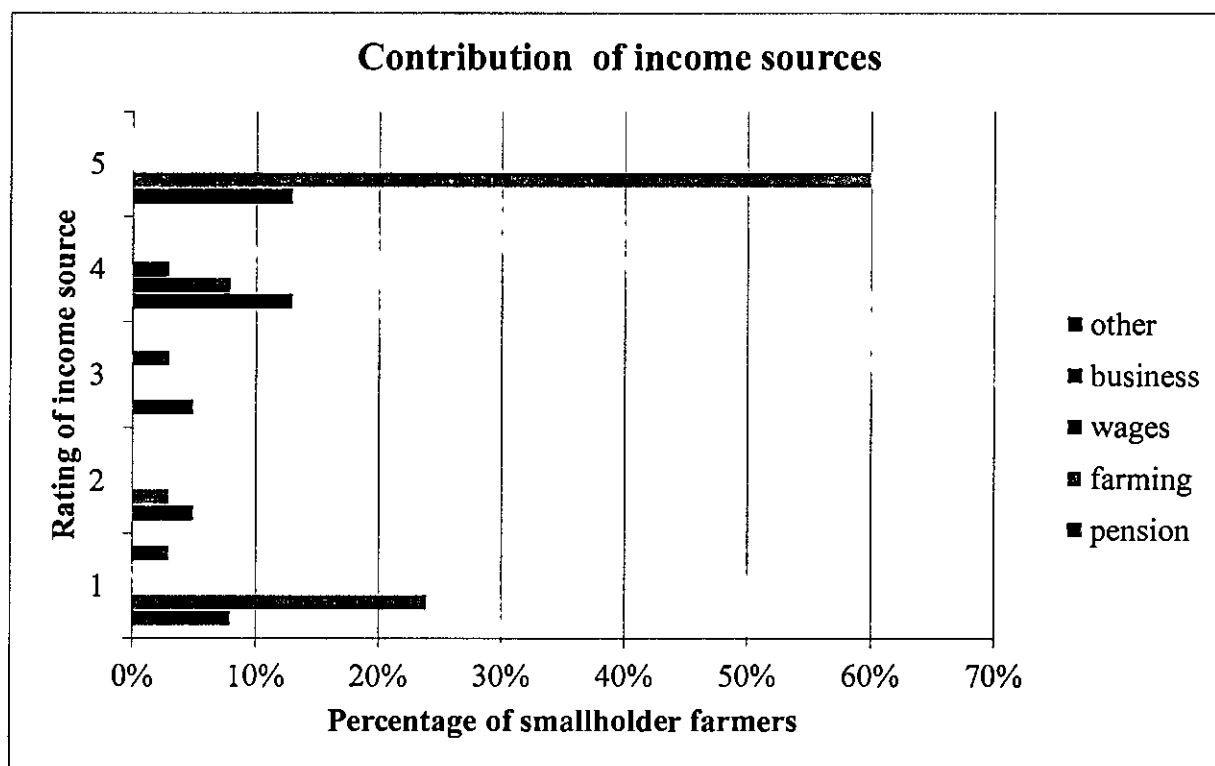
of income 47%).

#### 4.6.2. Other sources of income

Although irrigated agriculture is the major source of income for most smallholder farmers, they also have diverse livelihoods. Some respondents have other sources of income besides irrigated agriculture. These include mostly pension, followed by employment and livestock production. Machethe (2004) also noted that smallholder farmers have alternative sources of income to supplement their livelihoods.

##### 4.6.2.1. Contribution of each income source to livelihood

Table 4.10 below shows the contribution of each source of income to smallholder farmers' livelihoods.



**Figure 4.10: Rating of contribution of source of income**

On a rating scale of 1 – 5, with 5 being the highest contributor, farming was found to be the highest source of livelihood for 60% of the respondents. Pension at 13% was rated as the highest contributor for some respondents. For another 13% of the respondents' pension was the second highest source of livelihood. A few farmers (3%) had wages as their second

highest contributor. Another few (3%) had business as yet another contributor to their livelihood while yet another 3% had other sources like cash injections from their children working in cities. Ellis (1999) states that livelihood diversity is an important characteristic of smallholder farmers which should be considered when support programs are being planned. It is interesting to note that quite a number of smallholder irrigating farmers (24%) do not regard farming as contributing any income to their livelihood.

#### **4.6.3. Asset endowments**

To create sustainable livelihoods it is encouraged to build on the resources which people already have in their possession. In Gambia, irrigation provided smallholder farmers with the chance to increase their income and this was reflected by increased expenditure, investment in productive and household assets, saving and trade (Hussain & Hanjra, 2004). It is important to note people's assets as these are the resources upon which people can draw from in the face of hardship. These resources are inclusive of non-physical assets such as access to social networks and education. The physical assets accumulated by the farmers include:

- 2 Massey Ferguson tractors, 2 Vestak trailers
- bakkie, bailer
- computer
- furniture, television
- house
- sprinklers
- tractor implements
- lorry
- Lucerne cutting machine, Lucerne rake

##### ***4.6.3.1. Trends in possessions***

Some smallholder irrigating farmers have at one time found themselves having to sell some of their possessions when they needed cash. This has however not been happening frequently. Most participating farmers (63%) had not sold any of their possessions, neither had they bought more assets. This means that they had not been forced to sell any of their assets to get cash, neither had they earned more income to increase their possessions. Only 10 % of the respondents increased their possessions reflecting on their increase in earnings. Some respondents (27%) had their assets decreasing as they were forced to sell some of their

possessions in order to get cash. Their assets are crucial in reducing their vulnerability to shocks and stresses. This supports Carney's view (1998). Accumulation of assets is therefore an important component of empowerment.

#### **4.6.4. Migration**

Migration has an impact on financial capital as it reflects the sizeable flows of remittance income to the smallholder farmers. It is of interest to note that most irrigating farmers (86%) do not have members of their households who immigrated within the past ten years to neighbouring cities in search of employment. Only a few members of the farming community (14%) have migrated. This shows that the majority consider irrigating farming as their livelihood.

Those who migrated are between the ages of 20-35. Their destination was the cities e.g. Johannesburg, Pretoria, Bloemfontein, Mafikeng. They have been gone for a period of between 5-6 years. Migration means a decrease in farm labour. Food and income are better because of the cash injection and support from the migrants. The main reason for migration is the lack of jobs hence people migrate in search of employment. Others left because of the lack of cooperation among scheme members whilst a few left to attend college.

#### **4.6.5. Mutual aid**

Social capital includes relationships of trust which people can draw upon in pursuit of livelihoods. Mutual trust and reciprocity lower the cost of working together (Carney, 1998). Therefore, respondents were asked if they help each other within their farming community. Most of the respondents (71%) admitted that they help each other within the irrigation scheme community. However, some did not get any help from other community members. The kind of help farmers give each other include:

- advice
- Implements
- equipment hire
- helping with control methods e.g. weeds and pests
- labour, supporting old age homes, funerals
- maintenance of equipment
- donation of resources
- starting and stopping the centre pivot
- to look after farm during absence
- burial society

This supports Carney's (1998) view that social capital can have a direct impact on other types of capital. For example, it can be effective in improving the management of common resources (natural capital) as well as maintenance of shared infrastructure (physical capital). It also helps in facilitating innovation through sharing and developing of knowledge (human capital). It can help to increase people's income and rates of saving (financial capital) through improving efficiency in economic relations.

However, social capital also has its shortcomings which include the fact that networks could be based on coercive relationships which entail obligations that limit mobility and prevent people from escaping from poverty.

#### **4.7. INSTITUTIONAL ARRANGEMENTS**

The institutional arrangements involve the organisations that shape livelihoods. They operate across all spheres and effectively determine access to various livelihood strategies (Carney, 1998). They also determine the returns both economic and otherwise to any given livelihood

strategy. The next section explores the internal organisation of the scheme as well as issues of maintenance of the irrigation system and the challenges existing in the scheme.

#### **4.7.1. Organisation of the scheme**

The Taung irrigation scheme is organised into cooperatives. Primary and secondary cooperatives are being resuscitated and currently there are eight cooperatives which are Rethuseng, Ipelegeng, Tshidiso, Reaithloma, Bosele Kgosietsile, Tshenolo and Penelopele. Each cooperative has an elected committee for scheme coordination and these are elected by the smallholder irrigating farmers.

Smallholder farmers were asked how they rated the internal organisation of the scheme and more than half (55%) said that the scheme was fairly organised. Most respondents were happy with the structure of the internal organisation of the irrigation scheme although they acknowledge the fact that the leaders need to be equipped with proper management skills to be more effective.

#### **4.7.2. Irrigation system maintenance**

Maintenance of the irrigation system reflects on the strength of the social capital on the scheme. Social capital is intimately connected to structures and processes (Carney, 1998). The perception of respondents on the maintenance of the irrigation system in Taung was rated. The majority of participants (42%) rated the maintenance of their irrigation system as fair whilst 32% said it was poor. The remaining respondents (16%) rated maintenance as good. Most pipes are old and need to be replaced otherwise government is maintaining the system fairly well.

The major reason cited by those farmers who rated maintenance as poor was that the cost of maintenance of the irrigation system is too expensive for them and they cannot afford it. The other reason for poor maintenance of the irrigation system is that government takes too long to assist due to the long procurement process. This supports Carney's (1998) view that structures and processes are a product of social capital.

#### **4.7.3. Challenges faced by smallholder irrigating farmers**

The smallholder irrigating farmers face a variety of challenges in the irrigation scheme.

Among the major problems in the irrigation scheme, poor scheme management topped the

list. There is poor attendance of farmers at meetings and some complained that the chairman restricts the use of farm implements for scheme members. This supports Hussain *et al.*, (2002) who also observed that institutional and managerial weaknesses, poor governance, and lack of funds for maintenance are the main problems in irrigation schemes, rather than technical constraints, which could be addressed without large physical interventions but with greater cost-effectiveness benefiting the poor.

Farmers complain that there is a lack of communication between them and the Department of Agriculture. There are misunderstandings between farmers and the extension officers. Support is not timely due to the lengthy procurement procedures and this in turn affects farmer's efficiency in production.

Underground pipes are old and valves are not working, there are no drainage pipes thereby leading to blockage which affects the smooth flow of water. Mainline pipes are not working as a result of the blockages making it difficult to irrigate. There is also no pump house to assist with water pressure for those using the sprinkler system.

Farmers have financial challenges as they do not generate enough income. Smallholder farmers lack knowledge on pricing methods and marketing. They do not have information on available markets. There is no support in terms of equipment maintenance expenses, farmers pay for maintenance expenses from their own pockets. They do not have machinery for planting and harvesting as it is expensive to purchase so they hire from neighbouring commercial farmers. The yield is not sold in exchange for money but in exchange for possessions. When they hire harvesters they pay with their produce. They also do not have quality infrastructure e.g. fencing. As a result, stray animals graze and thieves can easily access the fields leading to loss of produce.

Other farmers also complained of shortage of water and poor irrigation methods used. They need to be educated on irrigation methods. They also do not have storage facilities for any surplus produce hence they prefer to sell all their crops without reserving stock for the next season.

## **CHAPTER 5: CONCLUSION AND RECOMMENDATIONS**

### **5.1. INTRODUCTION**

This chapter summarises the outcome of the study. It provides a brief conclusion and makes recommendations to the various stakeholders within the Taung irrigation scheme.

### **5.2. CONCLUSION**

The role of smallholder irrigated agriculture in promoting livelihoods and poverty alleviation can be more significant if there is adequate support from all role players. Currently, government is the only institution providing most of the support to the smallholder farmers creating an unhealthy dependency. Although government offers inputs and machinery, other sectors should also be encouraged to support other areas for example maintenance of irrigation systems and capacity building for the smallholder farmers. Support should be provided in such way that farmers can become self-sustainable at some point. This should be done gradually to prevent previous mistakes when handing over scheme management to the farmers.

It has been found that, extension services in the Taung irrigation scheme are poor. This is because of lack of good relations between farmers and extension officers. Extension officers need training so that they are empowered to impart knowledge and mobilise the smallholder farmers. There is no commitment to a tested conceptual framework for extension programming which is guiding extension services in Taung. If it is there it is approached in a top down manner without participation of the farmers in the planning process. Smallholder irrigation farmers also need to be supported in the technical aspects of production to ensure a high volume of good quality produce as well as marketing to help them sell that produce for good prices. Only then will irrigated agriculture meet expectations in terms of contributing to the alleviation of rural poverty. This will also protect the vulnerable farmers from being exploited by commercial farmers like what is happening now in Taung. Commercial farmers rent some of the farms from smallholder farmers but after the harvest they deduct all

expenses e.g. electricity and water and pay the farm owners with a few bags of Lucerne for using their land. Most of them do not get any cash but are paid in kind.

The Taung irrigation scheme is undergoing restructuring and individual farmers are now organised into cooperatives. Currently there are about 8 primary cooperatives which are run by a committee in conjunction with the Department of Agriculture and Rural Development. Organising the farmers into cooperatives is a noble idea as this will enable farmers to gain in terms of input prices through economies of scale. They will also be able to sell their crop produce as a collective hence making it possible for them to meet market demand. As a collective there are also benefits of information sharing.

However, working as a collective requires a great deal of organisation, administration and leadership skills if it is to be successful. Leaders need to be capacitated so that they can take advantage of opportunities in the market. Being organised as a collective also has its problems which include greater potential for conflict. Therefore, there is need for proper structuring in terms of registering the cooperatives with all required documentation including conflict resolution procedures.

There is a problem with water which was noted especially at the tail ends where water does not pump at the desired rates. Water needs to be distributed equitably as preference is presently given to those farmers under centre pivot. Maintenance of burst pipes also takes time due to the long procurement process in the Department of Agriculture.

Investments in agriculture should yield the greatest impact in promoting the achievement of the MDGs, one of which was eradicating poverty and hunger. Although the cut-off date was 2015 for the MDG, since these goals were not achieved, they need to be pursued further because eradicating poverty and hunger is critical for the people in Taung too. Despite the extensive irrigation infrastructural support given to the smallholder irrigating farmers by the South African government, people are still not realising the benefits of irrigated agriculture and poverty is still rife.

The study found that although modern technology has made farming easier, observation shows that it has become less labour intensive and it does not create much direct



employment. Irrigated agriculture is more inclined towards creating casual than permanent farm jobs. The linkages that are there as a result of irrigated agriculture include production, consumption and employment.

### **5.3. RECOMMENDATIONS**

Based on the conclusions drawn from the study the following recommendations are proposed:

#### **5.3.1. Rationalisation of irrigation service fees as well as capacity development of sector institutions.**

Some of the key benefits would be increased irrigated areas, increased crop yields and increased irrigated area in the tail ends. Additional outcomes include drastically reduced irrigation-related complaints, increased access and flow of information, and empowerment of farmers and users. The institutional performance has a great impact on the profitability of schemes.

#### **5.3.2. Effective monitoring and control mechanisms for water distribution**

Involving the poor in water management decisions through representation of the smallholder farmers and the poor, along with their capacity development through information and training programs. This can be done through partnering with the Taung Agricultural College for the training of farmers. Regular supervision and monitoring is needed, for example, from Department of Agriculture and Rural development to improve transparency of and prevent corruption.

##### **5.3.2.1. *Water allocation rules***

There are five proposed rules which are aimed at equitable distribution of water among the water users. The first rule is about reallocating water to command areas where groundwater is of poor quality that is mostly tail ends where poverty is highly concentrated. Secondly allocating more water per unit of area for smallholders as compared to large farmers can be done so as to bridge the gap in productivity. The third rule has to do with promoting dual use of surface and ground water where applicable. The fourth rule is introducing specific area ceilings for seasonal irrigation per farm households or per distribution canals depending on

total water availability. Lastly, prioritised protection of minimum water flow for smallholders in drought and scarcity conditions to ensure food security.

#### **5.3.2.2. *Water pricing***

In order to improve on water affordability differential pricing can be included firstly for larger areas that are beyond a specific ceiling per farm household. Secondly, commercial crops consuming more water and produced by large farm households should be differentiated against subsistence crops. Lastly, irrigation timing can be practiced whereby higher charges may be levied in water scarcity months.

#### **5.3.3. Employment opportunities**

This could be promoted through involvement of the poor in operation and maintenance of activities, water fee collection and other monitoring and supervisory measures. There is also need for employing a technician and an Agricultural Engineer specifically for maintenance and management of the irrigation system. The possibility of building a processing plant for Lucerne in Taung can be explored as this has a potential for creating more indirect employment.

#### **5.3.4. Credit policy**

There is also a need to facilitate the spread of rural financial institutions that are self-sustaining on the basis of savings and loans organised according to conventional banking criteria. This requires more effort from provincial government to put in place the appropriate regulatory and guarantee provisions that would encourage the formation of such institutions and ensure confidence in them in the long term.

#### **5.3.5. Extension services**

The challenges observed in the Taung irrigation scheme included poor relations between the extension officers and the smallholder farming community. Contractors have also been seen to manipulate the farmers. In order to solve these problems five recommendations were made.

It is recommended that relations between the farmers and the Department of Agriculture

should be improved through communication. The second recommendation concerns partnerships. It is recommended that other organisations like NGOs and other private organisations should partner with the government in providing support to farmers. The third point is about the contractors. It is recommended that contractors should be monitored to avoid manipulation of the vulnerable farmers. Fourthly, extension services should be improved. Numerous problems must be resolved in order to allow for proper positioning of extension services in South Africa. These are inclusive of the improvement of staff to farmer's ratio, distance and geographical area between farmers and the linkages between farmers' cooperatives and extension service providers. Lastly, the issue of capacity building. Extension officers should be empowered through training so that they can be more adequately equipped to assist farmers.

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## **APPENDICES**

### **Appendix 1: Smallholder farmer's questionnaire**

#### **The Role of Smallholder Irrigated Agriculture in Promoting Livelihoods and Poverty Alleviation: The Case of Taung, South Africa.**

##### **INTRODUCTION**

My name is Esther Chiyaka. I am a student at the University of the Free State in Bloemfontein. You have been selected alongside the other members of the Taung Irrigation Scheme to participate in this study. The objective of this interview is to obtain information regarding the contribution of irrigated agriculture in promoting livelihoods as well as alleviating poverty in Taung. The information will be used for study purposes but will not include any specific names. There will be no way to identify that you gave this information. Participation in this interview is voluntary and the information that you give will be treated as strictly confidential. If there is any question that you do not wish to answer you are free not to do so. This interview will take approximately 30 minutes of your time and your participation is highly appreciated.

##### **(A)PERSONAL CHARACTERISTICS**

###### **A.1 Age of the respondent**

1. < 20
2. 20-30
3. 31-40
4. 41-50
5. 51-60
- 6.> 60

###### **A.2 Highest level of education**

1. No formal education
2. Primary
3. Secondary
4. Tertiary

###### **A.3 Have you received any agricultural training?**

1. Yes

2. No

*If no to A.3 go to A.6*

**A.4 Have you received formal agricultural training?**

1. Yes

2. No

**A.5 Have you received informal agricultural training?**

1. Yes

2. No

**A.6 Gender of respondent**

1. Male

2. Female

**A.7 Marital status of respondent**

1. Single

2. Married

3. Widowed

4. Divorced

5. Separated

**A.8 Number of dependants**

1. <5

2. 5-10

3. 11-15

4. >15

**A.9 Duration of stay on the scheme**

1. <1 year

2. 1 - 5 years

3. 6 - 10 years

4. 11– 15 years

5. 16 - 20 years

6. 21 - 25 years

7. 26 - 30 years

8. >30 years

**A.10 How did you acquire the land you are irrigating?**

1. Inherited



2. Allocated by government
3. Renting
4. Bought
5. Leasing
6. Other (specify) \_\_\_\_\_

**A.11 Do you own the land you are irrigating?**

1. Yes
2. No

**A.12 If you own the land you are irrigating, do you have title deeds?**

1. Yes
2. No
3. Other (specify) \_\_\_\_\_

**A.13 How big is the area which you are irrigating?**

\_\_\_\_\_

**(B) POTENTIAL OF THE SCHEME**

**B.1 Which crops do you grow on the scheme?**

\_\_\_\_\_  
\_\_\_\_\_

**B.2 What type of water application method do you use?**

1. Flooding
2. Furrow application
3. Sprinkler irrigation
4. Drip irrigation
5. Centre pivot

**B.3 What methods of water abstraction do you use?**

1. Gravity
2. Motor pump
3. Using treadle pump
4. Other (specify) \_\_\_\_\_

**B.4 Does your access to water limit the area that you cultivate in any season of the year?**

1. Yes
2. No

**B.4.1** If your answer to B 4 is yes, indicate the reason based on the magnitude of the problem

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**B.5** Do you sow your crops in time according to your sowing date?

1. Yes
2. No

If the answer to question B.5 is no, why?

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**B.6** Do you own any harvesting machinery?

1. Yes
2. No

*If yes to B.6 go to B.9*

**B.7** Do you hire any harvesting machinery?

1. Yes
2. No

**B.8** Where do you get harvesting machinery?

---

**B.9** How did you harvest your crops in the 2014 irrigation year?

1. Hand picking
2. Mechanical
3. Both handpicking and mechanical

**How do you describe your yields per hectare during the 2014 season? Indicate by ticking the appropriate box.**

Type of crop	1.Rapidly Increasing	2.Gradually increasing	3.Constant	4.Gradually decreasing
B.10 Vegetables				
B.11 Maize				
B.12 Barley				
B.13 Lucerne				
B.14 Groundnuts				
B.15 Wheat				
B.16 Other (specify) -----				

**Yield per crop in the 2014 season?**

Type of crop	Total yield in t/ha
B.17 Vegetables	
B.18 Maize	
B.19 Barley	
B.20 Lucerne	
B.21 Groundnuts	
B.22 Wheat	

Indicate the percentage of your yield which you sold in the 2014 harvest season.

Type of crop	% of yield sold
B.23 Vegetables	
B.24 Maize	
B.25 Barley	
B.26 Lucerne	
B.27 Groundnuts	
B.28 Wheat	

**B.29 Did you employ permanent labourers on your irrigation plot during the 2014 irrigation year?**

1. Yes
2. No

**B.29.1If yes to B.29 how many permanent labourers?**

---

**B.30 Did you employ casual labourers on your irrigation plot during the 2014 irrigation year?**

1. Yes
2. No

**B30.1If yes how many casual labourers?** \_\_\_\_\_

### **(C) INVOLVEMENT OF OTHER SECTORS**

**C.1 Do you get extension services from the Department of agriculture?**

1. Yes
2. No

**C.2 How often does the Extension Officer visit your irrigation plot?**

1. Daily
2. Weekly
3. Fortnightly
4. Monthly
5. Quarterly
6. Never

**C.3 How do you rate the quality of extension services?**

1. Excellent
2. Good
3. Average
4. Poor
5. Undecided

**C.4 Do you get any credit services?**

1. Yes
2. No

*If no to C.4 go to C.6*

**C.4.1 If yes to C.4, from where do you get credit?**

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**C.5 Is the credit you are getting sufficient?**

1. Yes
2. No

**C.6 Do you need additional training on irrigation practices?**

1. Yes
2. No

**C.6.1 If yes, in which area**

---

Where do you get infrastructural support to the scheme from? (Tick applicable response)

Institution	1.Yes	2.No
C.7 Government		
C.8 NGO		
C.9 Private Sector		
C.10 Local Municipality		
C.11 Other (specify) ----- ----- -----		

What kind of support is it? (Tick applicable response)

	1.Government	2.NGO	3.Private Sector	4.Local municipality	5.Other (specify) ----- -----
C.12 Seed					
C.13 Fertilizers					
C.14 Pesticides					
C.15 Training					
C.16 Transport					
C.17 Marketing					
C.18 Maintenance					
C.19 Other(specify) ----- -----					

C.20 Is such support adequate?

1. Yes
2. No

**If no to C.20, what other support could they assist you with?**

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**C.21 What kind of benefits do the communities derive from the scheme?**

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**C.22 What are the challenges of the scheme in meeting your expectations?**

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**(D) PRODUCTION CAPACITY AND MARKETING**

**D.1 For what purpose do you use the crop you produced?**

1. Home consumption only
2. Market purpose only
3. Both

**D.2 How would you describe the quality of your crop produce?**

1. Good
2. Average
3. Poor

**D.3 Where do you sell your crops?**

1. Formal market (Supermarkets, shops etc.)
2. Informal market (informal traders, individual customers, roadside, bakkie etc.)
3. Both formal and informal market
4. None of the above

**D.4 Where did you sell the majority of your yield in 2014?**

1. Formal market (Supermarkets, shops etc.)
2. Informal market (informal traders, individual customers, roadside, bakkie etc.)
3. Both formal and informal market
4. Other (specify) \_\_\_\_\_

**D.5 Indicate your level of satisfaction with the price your yield fetched in 2014.**

**not satisfied    not very satisfied    neutral    satisfied    well satisfied**

1	2	3	4	5
---	---	---	---	---

**D.6 Is there any surplus produce that you could not sell in 2014?**

1 Yes

2. No

**If yes to D.6 what was the reason?**

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**D.7 Where do you get information about available markets?**

1. Cell phone

2. Television

3. Internet

4. Radio

5. Newspapers

6. Word of mouth

7. None

8. Other (specify) \_\_\_\_\_

**D.8 Do you keep records?**

Not at all

rarely

sometimes

most of the time

always

1	2	3	4	5
---	---	---	---	---

**D.9 What is the distance from the irrigation scheme to the nearest track/road?**

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**D.10 What is the distance from the irrigation scheme to the nearest market?**

---

**D.11 What challenges do you encounter when marketing your produce?**

1. Competition from commercial farmers

2. Lack of information about available markets

3. Quality of produce

4. Pricing

5. None

6. Other (specify)

-----

**D.12 What are the different linkages created due to the implementation of the irrigation scheme in the area?**

1. Production linkage
2. Investment linkage
3. Employment linkage
4. Consumption linkage
5. Other (specify)

-----

### **(E) POVERTY AND LIVELIHOOD STRATEGIES**

**E.1. which poverty alleviation strategies are available in Taung at present?**

1. Child Grants
2. Old age grants
3. EPWP
4. Other (specify)

-----

**E.2 Do you think smallholder irrigated agriculture contributes in alleviating poverty in Taung?**

1. Yes
2. No

**If no to E.2, Can you explain why?**

-----  
-----

**E.3 What are the contributions that smallholder irrigated agriculture can make to livelihoods and poverty alleviation in Taung area?**

1. Food security
2. Income
3. Employment
4. Other (Specify)-----

**E.4 Do you have any other source(s) of income besides irrigated agriculture?**

1. Yes
2. No

*If no to E.4 go to E.7*



**E.5 If yes to E.4, what are the sources?**

1. Pension
2. Employment
3. Business
4. Other (Specify) \_\_\_\_\_

**E.6 Can you rate on a scale of 1 to 5, the contribution of each income source to your overall household income? 1 being the least contributor while 5 is the highest contributor.**

Source of income	Rating
Pension	
Farming	
Wages	
Business	
Other(specify)	

**E.7 Which assets have you accumulated since occupying the scheme?**

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**E.8 Are you at any time forced to sell some possessions because you need cash?**

1. Yes
2. No

*If no go to E.10*

**E.9 If yes to E.8, were there some years when you were forced to sell more possessions than usual?**

1. Yes
2. No

**E.10 If no to E.8, have your possessions increased, decreased or remained the same over time?**

1. Increased
2. Remained the same
3. Decreased

**E.11 Have any members of this household left the area for over a month in the past year?**

1. Yes
2. No

*If no to E.11 go to E.14*

**E.12 If household member(s) has left ask: Could you describe the household situation (labour/cash/food) in the year that s/he or you left the area?**

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**E.13 What factors have influenced the decision of the household member to leave temporarily or permanently?**

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**E.14 Do you help each other within the community?**

1. Yes
2. No

**If yes to E.14, what kind of help do you get from other community members?**

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**E.15 Have these forms of mutual aid increased, decreased or stayed the same over time?**

1. Increased
2. stayed the same
3. Decreased

## **(F) INSTITUTIONAL ARRANGEMENTS**

**F.1 Do you have any elected committees for scheme coordination?**

1. Yes
2. No

**F.2 If yes to F.1, how are the committees for scheme coordination elected?**

1. Nominated by the village leaders
2. Elected by the water users in the scheme
3. Elected by farmers
4. Other (specify) \_\_\_\_\_

**F.3 Who makes a decision on the sequence of irrigation water use?**

1. Executive committee
2. Water committee
3. Based on the agreements between the water users
4. Vaal harts Owners
5. Others (specify)\_\_\_\_\_

**F.4 How do you rank the internal organisation of the irrigation system (Centre pivot maintenance, water distribution, etc.) of your scheme?**

1. Well organised
2. Fairly organised
3. Poorly organised

**F.5 How do you rate the maintenance of irrigation systems in your irrigation scheme?**

1. Good
2. Fair
3. Poor

*If the answer to F.5 is 3 go to F.6*

**F.6 If the maintenance of irrigation systems is poor in your irrigation scheme what do you think are the causes?**

1. Poor coordination of maintenance activities by the committee?
2. Poor imposition of sanctions on reluctant users?
3. Low level of members' participation in maintenance activities?
4. Cost of maintenance is high and not affordable by members
5. Poor communication between members and contractor
6. Other (specify)\_\_\_\_\_

**F.7 What are the major problems in the irrigation scheme?**

1. Poor scheme management
2. Market access
3. Water logging
4. Drainage
5. Salinity
6. Other (Specify)

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**F.8 Do you receive enough water?**

1. Yes

2. No

**F.9 Do you receive water when needed?**

1. Yes

2. No

**F.10 Generally irrigation water is affordable**

1. Strongly agree

2. Agree

3. Strongly disagree

4. Disagree

5. Undecided

**F.11 Is there any other information that you would like to share that we have not discussed that you think should also be considered?**

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**Thank you for your time your cooperation is greatly appreciated!**

## **Appendix 2: Checklist for key informants**

The role of irrigated agriculture in promoting livelihoods and poverty alleviation: The case of Taung, South Africa.

1. How many smallholder farmers are in the Taung irrigation scheme?
2. How is the irrigation scheme organised?
3. Which crops are grown by the farmers in the scheme?
4. What do you suggest for the improvement of smallholder irrigation in Taung?
5. What are the main problems that your organization faced in the management of the smallholder irrigation system?
6. Do you think the organization is efficient enough to manage the irrigation system in the Taung? If not, why?
7. What is the support provided by the Department of Agriculture irrigation office to smallholder farmers in the area?
8. What is/are the socio-economic contribution of small scale irrigation for Taung?
9. What are the major social and technical problems in the irrigation system?
10. What is the contribution of smallholder irrigation in creating employment conditions for the local society?
11. According to your opinion what is the contribution of the small scale irrigation for the local and national economy of the country

**Thank you for your time your cooperation is greatly appreciated!**

## Appendix 3: Access letter

27409 Vista Park 3

Bloemfontein

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Phone: +27745408820

Email: estherchiyaka@gmail.com

► Mr Phutieagae  
Deputy Director  
Department of Agricultural,  
Environmental and Rural Development  
Dr R. S. Mompoti District  
Taung Irrigation Scheme  
P.O. Box 953  
Taung  
8580

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**Request to carry out research in the Taung irrigation scheme as part of the requirement to fulfill studies in Masters in Development Studies at the University of Free State (Bloemfontein)**

My name is Esther Chiyaka. I am a student at the University of the Free State in Bloemfontein. I write this letter to request your permission to carry out research in the Taung Irrigation Scheme as part of the requirements for a mini dissertation in order to fulfil studies for a Masters in Development Studies.

The objective of the study is to obtain information regarding the contribution of irrigated agriculture in promoting livelihoods as well as alleviating poverty in Taung.

Thank you for your assistance

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**Esther Chiyaka**

Ms.

University of the Free State

8/24/2015

## Appendix 4: Informed Consent Form

Researcher:	Research Supervisor:
<b>Esther Chiyaka</b>	<b>Dr E.M. Zwane</b>
27409 Vista Park 3	Limpopo Department of
Bloemfontein	Agriculture
	Private Bag x9487
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	Telephone: +27512943358
	Cell: +2782 8087 173
	Email: <a href="mailto:zwane frank@gmail.com">zwane frank@gmail.com</a>

### Informed Consent:

Dear Participant

I would like to invite you to take part in this research project:

**The role of smallholder irrigated agriculture in Promoting livelihoods and poverty alleviation: The case of Taung, South Africa.**

This study is about the role of smallholder irrigated agriculture in promoting livelihoods and poverty alleviation. The objective of this interview is to obtain information regarding the contribution of irrigated agriculture in promoting livelihoods as well as alleviating poverty in Taung. You have been selected alongside all the other smallholder irrigating farmers in Taung to participate in this study. The information obtained will be used for study purposes and not include any specific names. There will be no way to identify that you gave this information.

Participation in this interview is voluntary and the information that you give will be treated as strictly confidential. If there is any question that you do not wish to answer you are free not to do so. This interview will take approximately 30 minutes of your time and your participation is highly appreciated.

While I greatly appreciate your participation in this important study and the valuable contribution you can make, your participation is entirely voluntary and you are under no obligation to take part in this study. If you do choose to take part, and an issue arises which makes you uncomfortable, you may at any time stop your participation with no further repercussions.

If you experience any discomfort or unhappiness with the way the research is being conducted, please feel free to contact me directly to discuss it, and also note that you are free to contact my study supervisor (indicated above).

Should any difficult personal issues arise during the course of this research, I will endeavour to see that a qualified expert is contacted and able to assist you.

Yours sincerely,

Esther Chiyaka

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Please fill in and return this page. Keep the letter above for future reference

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**Study: THE ROLE OF SMALLHOLDER IRRIGATED AGRICULTURE IN LIVELIHOODS AND POVERTY ALLEVIATION: THE CASE OF TAUNG, SOUTH AFRICA.**

Researcher: *Esther Chiyaka*

Name and Surname: \_\_\_\_\_

Age: \_\_\_\_\_

Contact number: \_\_\_\_\_



I hereby give free and informed consent to participate in the abovementioned research study.

- I understand what the study is about, why I am participating and what the risks and benefits are.
- I give the researcher permission to make use of the data gathered from my participation, subject to the stipulations he/she has indicated in the above letter.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_