



University of Fort Hare
Together in Excellence

A SOCIO-ECONOMIC IMPACT ASSESSMENT (SEIA) OF THE BEST
MANAGEMENT PRACTICES (BMP) PROJECT OF THE ZANYOKWE
IRRIGATION SCHEME AT FARM LEVEL.

BY

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Submitted in Fulfillment
Of the Requirements of the Degree of
Master of Science in Agricultural Economics

At the

University of Fort Hare
Department of Agricultural Economics and Extension
Faculty of Science and Agriculture

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April 2009

DECLARATION

I hereby declare that all the contents of this document that I have submitted in fulfillment of the requirements of the Degree of Master of Science in Agricultural Economics at the University of Fort Hare's Faculty of Science and Agriculture are the fruits of my independent work. They have not been previously produced and submitted in any University by anyone else in the entire universe for a similar purpose.

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ACKNOWLEDGEMENTS

My first sincere gratitude goes to my supervisor Dr Nomakhaya Monde without whom, I would not have managed to come up with this document. Thank you very much for your wisdom and desire to see me succeed not only in this research but in life as well. I really appreciate all the help you offered me together with your ever-undivided attention. There was never a need for me to make an appointment to see you because you were always willing to assist me even when you were busy with your own work. To me you were not only my supervisor but a friend as well. For all this, I pray that the good Lord richly blesses you so that you may continue being able to extend your helping hand to all those students you will work with after me.

To Prof C. Chiduzo, my 'co-supervisor', thank you very much for believing in me and my ability to do this research. I know you were worried about my lack of "necessary experience" not only to complete such a project but to do it on time too. In spite of this, you were brave enough to trust me with this project. Thank you very much for having faith in me and also for giving me this opportunity to work with you and your department. My sincere gratitude also extends to the Water Research Commission for funding this research. It would have been difficult to undertake this work without financial support, thank you so much

There was never a time when I needed secondary resources without getting them. All this is due to the entire library staff that was always there and willing to assist me in getting those books that I needed on time. Without you, this project would not have been what it is today which is why I will forever be grateful for having had such a wonderful relationship with you. How I wish the university could continue to work with people of your attitude as your department, the library, is an important tool of this entire institution.

As the saying goes, 'behind every successful man is a strong support structure'. It would be unfair of me to pretend to be an exception to this popular belief by not admitting that I also had a strong support structure in the form of friends who were always there to support me all the way. I cannot mention you by names because you are so many but at least allow me to say I am blessed to have such people as you for friends. Thank you very much for your support and words of encouragement that you were always ready to give me at no cost at all. It is my prayer that the Lord blesses you abundantly for the rest of your lives.

To GOD Almighty, your love, grace, blessings and wisdom did not go unnoticed. It is because of you that I am where I am today it and it is also through your love that I had the wisdom needed to carry me through my research. You gave me strength to go on even when things did not seem so promising. May all the praise and glory be to you, the King of Kings forever and ever, AMEN.

ABSTRACT

The main aim of this study was to assess the impact of the Best Management Practices (BMP) project on social and economic wellbeing at Zanyokwe Irrigation Scheme (ZIS) in central Eastern Cape Province. The BMP project is a knowledge-based initiative aimed at introducing management practices (mainly soft skills) in order to improve production and livelihoods in the study area. The study employed a survey to collect socio-economic data amongst farming households. The 2005 situation analysis, which was conducted amongst the same respondents before the introduction of the new practices allowed for comparisons in order to track changes or impacts after the implementation of the project. Also, the social and economic impact assessment (SEIA) framework was used to assess the impacts.

The results of the impact assessment showed the BMP project to have an impact on social and economic well being of households. The skills introduced were in the areas of water management, agronomic practices, marketing and institutional arrangements. More than 90% indicated that there was improvement in agronomic practices and water management and 68% in marketing. More than half of farmers worked in their farms on a daily basis, which is a big change as none of the farmers worked during weekends in 2005. The average time spent on the farms also increased from four (in 2005) to seven hours (this investigation) on average per day. The BMP project also had a positive impact on social relationships and networks between farmers and the BMP project team as well as well as farmers and non-farmers.

Land use intensity improved due to increases in acreage of main crops as well as cultivating at both seasons. More than 40% of farmers cropped their land at both seasons (winter and summer). In 2005, most of the land was fallow in winter. While some of the new practices introduced had a negative impact on input expenditures, the returns were positive. These extra efforts and expenditures resulted in improvement in incomes. Agricultural contribution to household income increased from 71% in 2005 to 81% in 2007.

The increase in household incomes had a positive effect on poverty and food security status of households. The proportion of households earning incomes that are below poverty line dropped from 61% in 2005 to 38% in 2007. Changes in the diet of the households were noticed. In addition to the consumption of staples such as samp, maize meal and rice, people

added a variety of vegetables. Own production was the main source of these vegetables as was indicated by 66% of respondents compared to only 25% in 2005. Food remained the main expenditure category though, as was the case in 2005. Improvements in marketing such as performing extra marketing functions and adopting a marketing strategy (collective action) also led to improvements in economic wellbeing.

Key words: Small-scale irrigation; livelihoods; best management practices; social and economic impacts, poverty levels, household incomes.

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LIST OF ACRONYMS

ABARE - Australian Bureau of Agricultural and Resource Economics
AE - Adult Equivalent
ARC – Agriculture Research Commission
ARDC - Agriculture and Rural Development Corporation
BMP - Better Management Practices
BRS - Bureau of Rural Sciences
CMA - Catchment Management Agencies
CMS - Catchment Management Strategy
DC - Distribution Centre
DBSA – Development Bank of Southern Africa
DEAT - Department of Environmental Affairs and Tourism
DWA - Department of Water Affairs and Forestry
ECDA - Eastern Cape Department of Agriculture
EL - East London
FAO – Food and Agricultural Organization
HH – Households
IMT - Irrigation Management Transfer
KK - Keis-Kammahoek
KWT - King William’s Town
KZN – KwaZulu- Natal
MFP – Massive Food Programme
NAA - National Archives of Australia
NDA – National Department of Agriculture
NGO – Non-Governmental Organization
NPDALE - Northern Province Department of Agriculture, Land and Environment
NWA – National Water Act
PDL - Poverty Datum Line
SA – South Africa
SACCAR – Southern African Centre for Cooperation in Agricultural Research and Training
SEIA – Socio-Economic Impact Assessment
SIA – Social Impact Assessment
TAO - Together As One
SPSS - Statistical Package for the Social Sciences
SSA – Statistics South Africa
WMA- Water Management Areas
WRC – Water Research Commission
WUA - Water User Association
WHO - World Health Organization
ZIS – Zanyokwe Irrigation Scheme
ZIT – Zanyokwe Irrigation Trust

1: INTRODUCTION

1.1: Background of the study

The arrival of European settlers in Africa way back in the mid seventeenth century brought with it more than just Christianity and Commerce. The settlers had a significant influence on agriculture as well. They initiated small irrigation schemes of which some were later on developed into several large scale irrigation projects. However, since the mid-nineties, the small scale irrigation scheme sector in the Republic of South Africa (RSA) has been prioritized by the government due to the fact that the majority of South Africans were living in extreme poverty in the rural areas such as those of the Eastern Cape Province. Therefore, prioritizing the small scale schemes was perceived to be the first step towards promoting development in these impoverished rural areas as was suggested by Crosby, De Lange, Stimie and Van Der Stoep (2000). The homeland governments provided financial, technical and infrastructural support to farmers in the schemes (Van Averbek and Mohamed, 2006). During this time, the irrigation schemes in the then Ciskei Homeland became productive and farming thus became an important livelihood as the surplus was sold locally and outside the production areas to prearranged markets.

However, when the Ciskeian government could no longer afford to maintain such high level of support, it withdrew it (Van Heerden and Stimie, 2001). This resulted in a number of such schemes disappearing as they relied heavily on government support. Nonetheless, some schemes survived the hardships faced during this era and they are still in existence to date. The Zanyokwe Irrigation Scheme (ZIS) is one of them. This scheme was established in 1983 by the Ciskei government with Israeli assistance. When the scheme started, it was run as an estate and had only 48 recognized farmers but that number has since increased. The main ideas behind this scheme were to improve the standard of living of the people and create jobs (Rural Urban Consultants, 2001). Since the scheme was formed during the apartheid era, it existed under harsh environmental conditions created by apartheid. Nonetheless, the scheme continued to operate even during such harsh environment through 1994 when apartheid ended, resulting in the homeland of Ciskei ceasing to exist on its own and becoming part of the new Eastern Cape Province. The post democratization period initiated the partial collapse of the scheme as a result of the Irrigation Management Transfer (IMT)¹ policy implemented

¹ The INPIM (2004) defined IMT as the transfer of responsibility and authority for irrigation management from the government to non-governmental entities. This is caused by the desire of the government to reduce costs

by the Eastern Cape's Department of Agriculture. Furthermore, in 1997, Ulimocor and all its assets were liquidated and it is during this time that the scheme's infrastructure became susceptible to theft and vandalism (Neven, Readon and Hopkins, 2005). The irrigation infrastructure was stolen, and the buildings (sheds, office and employee quarters) were vandalized.

Nevertheless, this did not signal the end of the scheme as the Zanyokwe Agricultural Development Trust was established in 2001 to manage the irrigation infrastructure even though this infrastructure's ownership remained with the provincial government (Neven, *et al.*, 2005). This marked the beginning of the intense revitalization of the scheme as the municipalities also began being more hands-on in rural development and various new projects were initiated (Neven, *et al.*, 2005). Support started coming in and in the same year of 2001, the Provincial Department of Agriculture and Public Works extended its hand by making two tractors available at the scheme. The fences surrounding the scheme, which were in very bad state, were also repaired. Such infrastructural improvements helped the farmers to protect their crops from stray animals. The rehabilitation process of the scheme by the Eastern Cape Department of Agriculture (ECDA) is still in progress, and a farmer training programme is being implemented.

More attempts have also been made to improve the performance of the scheme. These attempts include projects such as the 12ha cotton project which is still in its planning phase and is linked to a private textile company (Da Gamma). There was also the 25ha paprika project initiated by the Siyakholwa Development Corporation (an NGO) and supported by the South African government. However, according to Monde, Chiduza, Brutsch, Mnkeni, Mtshali, Dladla, Modi, Mthembu, Van der Stoep and Stevens (2005), the paprika production was discontinued due to various reasons such as low paprika yields that led to low profits. The discontinuation of this project was done even though plans of increasing its scale to cover 90ha of the Zanyokwe land had already been started. During the period of interviews for this study in 2007, no one had done anything to revive this paprika project but visits to the scheme in 2008 revealed that the same project was in the process of being restarted through the funding by the Development Bank of Southern Africa (DBSA)

and relocate government revenues or the failure of governments to finance or recover the cost of irrigation management from farmers.

The other development initiative is the Massive Food Program (MFP), a grain project introduced in 2003 mainly to address problems of poverty and hunger, low skills and the grain (mostly maize) trade-deficit especially in the Eastern Cape where “70% of food was imported in 2001” (Neven, *et al.*, 2005). Nkwinti (2007) asserted that this MFP assisted 11 000 farmers in the Eastern Cape Province, operating through 424 farming entities that planted 15 000 hectares of maize and other food crops that yielded 50 000 tons of maize during 2006. Of this 15000ha of land cultivated under MFP, 150ha were in the ZIS. The Department of Labour has assisted in this development initiative by equipping farmers with important skills. Further training has come from a non-governmental organization called Together As One (TAO), which was responsible for training farmers in the scheme. Also, the Department of Agriculture provides farmers with subsidized inputs (seed, fertilizer) and extension services. However, despite all these sources of help, Neven, *et al.*, (2005) noted that by 2005 the MFP had not made any big impact in the lives of the farmers as intended. The Umthiza Farmer’s Co-op in East London has made life easier for farmers in terms of accessing production inputs. The Co-op supplies and delivers inputs such as seeds, fertilizers and chemicals, and helps the farmers to acquire farm equipment. Umthiza also donated a brand new tractor with a plough, disc and planter that the scheme recently received from Massey Ferguson.

The Best Management Practices (BMP) project, the focus of this study, was introduced in 2005 as the other development initiative in the scheme. It aimed at identifying and testing “best management practices” for revitalizing irrigation farming in the Eastern Cape and KwaZulu-Natal. Thus, through this BMP project, the existing knowledge, indigenous and new technologies (including farmer innovations) would be developed and implemented for farmers in order to improve rural livelihoods. In an attempt to avoid the inflexibility problems of the past caused by a top-down management style, the BMP project applied a bottom-up approach and was a collaborative effort amongst researchers, extension officers, farmers and the community.

According to Monde, *et al.* (2005), this Best Management Practices (BMP) project had three main phases; namely community mobilization and situation analysis (phase 1), testing or implementing technologies (phase 2) and monitoring and evaluation (phase 3). Information on the specific objectives and the participants in the BMP project was obtained from the contract signed between the funder (WRC) and the University of Fort Hare (and other BMP

project stakeholders). Starting with the community mobilization and situation analysis phase, it had seven specific objectives which are as follows:

1. Engage and obtain community and other stakeholder endorsement of the research project
2. Engage and obtain stakeholder participation
3. Analyse the institutional framework
4. Analyse the social organisation
5. Analyse the infrastructure, natural resources, markets and finance
6. Identify existing livelihoods and farming systems
7. Identify opportunities for innovation and technological change, give basic training for transformation to farmers.

The first two objectives of this phase were meant to develop an agreed approach for critical assessment for the field situation and farmer circumstance. This process provided the research team with the additional skills in farming systems and participatory action research methodologies. Led by the socio-economists, the research team then visited the residents of Zanyokwe to engage and obtain their endorsement and commitment to participate in the research project. Public meetings organized in conjunction with the local leadership and the agricultural extension services were used to achieve this.

Specific objectives three through five were addressed through the collection, analysis and synthesis of secondary information. A researcher assisted by Masters students were responsible for this task. Information was collected under five categories that typically characterize farmer circumstances. Thus, information was collected on (1) Natural (physical and biological circumstances (rainfall, soils, animals, crops, pests and diseases), (2) Institutional circumstances (marketing and distribution mechanisms of inputs and produce; tenure arrangements; credit programmes; extension programmes; farmer organisations/water users associations; co-operatives), (3) infrastructural circumstance (road network; educational facilities; and irrigation infrastructure including its history and development), (4) economic circumstances (population density; settlement pattern; crop statistics – acreage and production; marketed products; purchased inputs; marketing channels for produce and inputs and (5) social and cultural circumstances (beliefs and attitudes; food preferences; social obligations; gender).

Guided by the results of the preliminary synthesis and analysis, a review was conducted of existing reports and other sources of information to identify the irrigation technologies and practice compatible with smallholder farming that could address the constraints identified. These covered aspects such as water management, soil fertility and cropping practices, and pest management. Emphasis was put on local or regional reports (WRC, ARC, SACCAR, NDA, etc) and a few landmark studies were included in this review.

For specific objectives six and seven, the contract between WRC and Fort Hare further stated that the BMP team engaged directly with the communities in Zanyokwe. The aim of this approach was to give people in the scheme the opportunity to speak, discuss, identify livelihoods and farming systems, institutions and social organizations, technologies and practices and thus analyze these from their perspective. This was meant to ensure that the project team fully understood the situation on the ground and perhaps have an idea of the target groups that potentially existed on each of the chosen villages in the scheme. The survey helped identify the main constraints (such as the physical, social, institutional, infrastructural, technological and economic) to irrigation farming in the scheme.

Basically, the purpose of the baseline study (phase 1) was to provide an information base against which to monitor and assess an activity's progress and effectiveness during implementation and after the activity was completed (Australian Agency for International Development, 2005). This phase in the BMP project was completed in 2005 and this marked the beginning of phase two whose specific objectives were to:

1. Identify, introduce and/or adapt appropriate technologies in participation with farmers
2. Promote and enable individual decision making at farmer level
3. Improve flexibility of farming
4. Improve the application of technologies, including availability of supporting extension aids and basic farmer training.

These four specific objectives of phase two involved carrying out on-farm trials in the scheme with the help of trial-host farmers in order to evaluate the management practices/technologies pre-screened with the farmers. New technological options, focusing on water management were then compared with the farmers' conventional practices. This included such technologies as the wetting front detectors which had been previously investigated by the University of Pretoria for irrigation scheduling. The project team,

extension officers and farmers jointly managed these trials which served as avenues for hands-on training and skill development for community members and extension staff. The trials were conducted in both winter and summer growing seasons. Some relevant training was given to the farmers to help them to actively participate in the trials and demonstrations.

At the end of each growing season, Matrix ranking and scoring and/or pair-wise comparisons were used to evaluate the tested practices/technologies. The evaluations focused on technical feasibility, economic viability and social acceptability of the interventions after which decisions were then taken on whether to abandon, modify or recommend certain technologies for adoption. The intention was to take the modified technologies through another cycle of on-farm trials whilst the recommended ones were set up as demonstrations in the next cycle. Field days were organized during each growing season to provide an opportunity to non-participating farmers, the wider community and other stake holders to observe personally and ask questions about successful management practices/technologies. Host farmers played prominent roles in explaining and discussing the best management practices but with the team members on hand to explain technical points.

All these specific objectives in phase two have since been met, hence the implementation of the third phase – the monitoring and evaluation phase (also known as the socio-economic impact assessment or SEIA). This investigation therefore addresses the third phase of the BMP project in the Zanyokwe scheme. Through this study, the introduced technologies would be tested, monitored and any impacts of change evaluated. However, it should be stated at this point that since the introduction of the BMP project in 2005, many other development initiatives have been introduced at the scheme to help improve the farmers' livelihoods. All these initiatives have impacted on the farming households in a number of different ways but for the purposes of this study, focus was limited only to those impacts emanating from the BMP project.

1.2: Problem statement

Mamase (2003) described the Eastern Cape as a rural province whose majority of the population constitutes the historically disadvantaged groups. The proportion of the population in the province amounts to 15.3% of the nation's total population but has the highest poverty levels in the whole of South Africa with the majority of the households

living below the poverty line as cited by Statistics SA (2003). These households have also been noted to rely on external economic activities, especially state grants (Monde, 2003). The local economic activities play a minor role in the rural economy. Although agriculture still plays a role in rural households, it makes modest contribution to household income, and hardly ever constitutes the main rural livelihood activity to secure households' food needs (Monde, 2003). In Zanyokwe, more than 70% of income came from agricultural activities (both crop and animal production) but about two thirds of the farming population was still poor (Monde, *et al.*, 2005).

In spite of the initiatives and interventions mentioned in section 1.1, farming has not made a significant change to the lives of the interviewed farmers in Zanyokwe as 41% of them remained in the “ultra-poor” class (Monde, *et al.*, 2005). While a number of factors have contributed to this state, one factor can be singled out. The common mistake developers usually do is to focus on implementation stage of the project and either ignore or pay little attention to other stages of the project. The Monitoring and Evaluation (M&E) stage is usually not given attention at all. The success of technology or innovation introduced in any community is subject to the social, economic and institutional setup or environment of that particular community. Moreover, the main objective of development is to improve the social and economic well-being of the people targeted for the intervention. It is therefore important to assess the impact in order to ascertain whether this objective is being achieved or not. This study is therefore aimed at conducting this assessment. The aim is to analyze and document both positive and negative impacts with the intention to maximize the former and minimize the latter.

1.3: General objective of the study

The main objective of this investigation was to carry out a socio-economic impact assessment of the BMP project of the Zanyokwe irrigation scheme at farm level

The social challenges identified in 2005 by the baseline study were the lack of motivation in farming which in turn resulted in the farmers spending less time in their fields per day. There was also lack of good social networks as shown by the majority of farmers' unwillingness to participate in social functions like meetings. The type and poor state of infrastructure was another challenge noted.

1.4: Specific objectives of the study

The specific objectives were to:

- ❖ Assess the impacts of the BMP project on social status of farmers at ZIS
- ❖ Assess the impacts of the BMP project on economic wellbeing of farmers at ZIS

1.5: Research questions

The study had two main research questions, namely:

- ❖ What is the impact of the BMP project on social well-being of the farming households?
- ❖ What is the impact of the BMP project on economic well-being of the farming households?

1.6: Outline of the study

The study consists of six (6) chapters. Chapter one is an introductory chapter and gives background to the study. The problem leading to this investigation, as well as the objectives of the study is stated in this Chapter. Following the introductory chapter is a review of literature, which is presented in Chapters two and three. Chapter two is a profile of smallholder farmers and their irrigation schemes in South Africa. This chapter gives background information in terms of socio-economic characteristics of farmers operating in these schemes. Following this chapter is a review of concepts the of the SEIA concept. In reviewing this concept, an effort is made to present theoretical definitions as well as frameworks used to analyse the concepts. These theoretical definitions and frameworks will guide the methodology for this study. Chapter four is the methodology chapter. It begins with a description of the study site, and is followed by the methods used to collect, analyse and interpret data. Following the methodology chapter are results of the study presented in chapter five. This chapter five gives a detailed analysis of the socio-economic impact assessments of the technologies and practices introduced at Zanyokwe. The conclusions and recommendations are presented in chapter six.

2: A REVIEW OF SMALLHOLDER IRRIGATION IN SOUTH AFRICA

2.1: Introduction

Irrigated agriculture in South Africa has a history that goes as far back as the 19th century (Bundy, 1988). However, since its introduction in the country, so much has changed as the industry has developed in a number of ways, some of which are a result of various support systems from various sources such as the government. By the end of 1999, the Eastern Cape alone had more than fifty small scale irrigation schemes run by over 6350 farmers in over 9500ha of land (Bembridge, 1999). This chapter reviews various aspects of the small scale irrigators and their irrigation schemes in South Africa but with particular reference to the Zanyokwe Irrigation Scheme (ZIS) in the Eastern Cape. In this review, the socio-economic characteristics of the irrigators in terms of their livelihoods, arable land holdings, ownership of and access to capital resources and also their access to water resources would be discussed.

2.2: Smallholder irrigation in South Africa

Van Averbek and Mohamed (2006) defined smallholder irrigation as multi-farmer irrigation projects larger than 5ha in size that were either established in the former homelands or in resource-poor areas by black people or agencies assisting their development. These smallholder irrigation schemes consist of a number of smallholder irrigators who come together to form a multi-farmer project. De Lange (1994) categorized the smallholder irrigators that make up the smallholder irrigation schemes in South Africa into (i) farmers on irrigation schemes; (ii) independent irrigation farmers; (iii) community gardeners; and (iv) home gardeners.

One of the common features of these smallholder irrigation schemes highlighted by May (2000) and Aliber (2003) is that most of them are found in the deepest corners of the rural areas where poverty levels are very high, with only a few locating closer to towns. Thus, the role of the former in such areas is to try and help these rural farmers improve their livelihoods and hopefully escape the vicious circle of poverty that has been so severe in most rural areas of the developing nations. Chambers (1983) also believes that as a tool of improving rural livelihoods, these smallholder irrigation schemes act as vital assets that can be used to increase and diversify the livelihood activity of plant production, resulting in

improved livelihood outcomes. This improvement in livelihood outcome can either be directly, in the form of food or income for plot holders or indirectly by providing full or partial livelihoods to people who provide goods and services in support of irrigated agriculture on these schemes. This has been the case for a long time now especially with those schemes that were initiated in the smallholder canal era, passed through all the other eras and are still running today. Van Averbeké and Mohamed (2006) classified these eras as the smallholder canal scheme era which ended around 1960, the independent homeland era which lasted from 1970 to 1990 and lastly the irrigation management transfer (IMT) and revitalization era which is still continuing.

However, for the purposes of this study, focus would be limited to the current status of smallholder irrigation schemes in South Africa. Thus, only the schemes that came into existence during the IMT and revitalization era (which is still continuing), such as the ZIS in particular, are the ones that would be reviewed. Even though all the schemes between these different eras irrigated their crops, differences could be noticed in terms of the irrigation techniques used and furthermore, a lot has changed especially on the management side and technology side. Therefore, it is possible to distinguish between these schemes of different era using their characteristics such as the socio-economic characteristics, land holdings, access to water resources and resource management.

2.3: Socio-Economic characteristics of irrigators

2.3.1: Demographic characteristics

Empirical evidence presented by FAO (2000a) shows that most of the small-scale irrigation schemes in Africa are run by women and these women-run schemes are also more successful than those owned by men. FAO (2000a) further established that the dominance of women can be explained by the fact that the plot sizes cultivated are often too small for households to be able to get enough income with which to sustain their livelihoods, hence men leave their women behind as they seek alternative sources of income such as formal sector jobs for wages and salaries. This view was further defended by Shah, van Koppen, Merrey, De Lange and Samad (1992) through their research of the 37 108 farmers on the 202 smallholder irrigation schemes in former South African homelands such as those in the former Ciskei, Lebowa, Transkei and KwaZulu. Their findings were that 63% of these 202 schemes

belonged to men who had relocated to towns and cities in search of better paying formal sector jobs, thereby leaving their wives to cultivate only tiny food plots. Nevertheless, FAO (2000) also pointed out the fact that it takes more than just gender to run a successful scheme as conclusions from its (FAO's) studies revealed that most of the successful schemes are those run by farmers or cultivators who have received some form of training. These irrigators must still be in a position to continue to receive expert knowledge or at least feel they can get it when they need. Moreover, the farmers must be willing to seek some form of training as the level of farming knowledge plays a very vital role in making the schemes either successful or otherwise.

Furthermore, those members of the rural households that get formal education are rarely found in their homesteads participating fulltime in farming. Instead, they prefer to seek jobs in other sectors than staying at home to irrigate. One can therefore be justified for saying that the smallholder schemes in South Africa are not only dominated by women, but by women who also do not have much formal education. These women and the few men who remain at home to farm usually start farming when they are still very young (below the age of 35) as most of them inherit the land they cultivate from their parents and grandparents. The current structure in the ZIS as noted by Neven, *et al.* (2005) has a generation of old farmers (over 70 years) leasing their land to the enthusiastic able-bodied farmers below the age of 50 years. Others drop out from school and help with farming at home and as time goes on, they acquire their own pieces of land to cultivate and support their own families. However, these farmers tend to cultivate the same piece of land for decades until they get too old to continue cultivating. Such was the case also in the Northern Province of South Africa as revealed by Mphahlele, Malakalaka and Hedden-Dunkhorst's (1999) studies. Such behavior consequently leads to a reduction in the size of the cultivated land as the farmers get older and weaker.

2.3.2: Livelihoods

The general trend by most agricultural economists regarding agriculture as the tool for alleviating poverty has led to the perception that most rural households should engage in farming to improve their livelihoods. However, in the South African context, it has also been confirmed through a number of studies done by World Vision (2004), Monde (2003), just to mention but a few, that agriculture in most rural households hardly ever constitutes the main rural livelihood activity to secure income and household food security. One of the reasons

for this is that these rural irrigators only get small pieces of land to cultivate and this, coupled with the low demand elasticity for the farm products, has made the small scale irrigation sector not to be a viable source of sustainable livelihoods. As a result, such households depend on other sources of income such as formal sector wages and social grants to supplement their agricultural income, a move that has left most of these irrigators only to participate in the fields on a part-time basis (Shah, *et al.*, 1992).

Evidence of such a situation whereby irrigators are involved in other sectors to supplement their income was observed by World Vision (2004) in the Enable village of the Sekororo area in Limpopo. Most small-scale irrigators in that area supplement their income by working in the mines, factories and with a few being professional teachers, nurses and police officers. To further highlight how minute a role smallholder irrigated agriculture has played in the lives of some farmers in smallholder irrigation schemes, the NPDALE (1999) cited J. Kirsten's studies in which 75% of households in a rural scheme in the Northern province earned income from cropping but this income only amounted to just 5.8% of their total household income. This has made these households to intensify their pursuit of other sources of income and food besides their farm produce and formal sector jobs in order to enhance their livelihood status. Such behaviour of pursuing a variety of income sources to achieve better livelihoods is what Chambers (1983) termed the "hedgehog strategy" and the strategies used include borrowing food directly or money from friends and relatives to purchase food. Regardless of the source of income, most smallholder irrigators in the rural areas have resorted to the tactic of buying cheap or less-preferred food (Mpahlele, *et al.*, 2000). In Zanyokwe though, close to only one in every five people (22%) were not entirely involved in the irrigated farming business. Instead, they either worked elsewhere fulltime or part time. This is according to a survey done by Monde, *et al.*, (2005).

In short, even though irrigated smallholder agriculture is hoped to be the key to alleviating poverty and getting agriculture 'moving' as Eicher (1994) suggested, most smallholder irrigators have actually been relying more on other sources of income than they have on agriculture. There is hardly a household that entirely depends on its produce for its livelihoods. In the case of the Zanyokwe farmers, studies by Monde, *et al.* (2005) revealed that the farmers in this scheme get about 29% of their total household income from external sources, with their farm produce contributing 63.5%. The remaining percentage came from the internal sources such as the sale of their animals but not crops. This shows that the

smallholder irrigated sector has not yet established itself as the only paramount source of a better livelihood.

In terms of livelihood objectives, evidence shows that most smallholder farmers do not wish their children to become farmers (Van Averbeké and Mohamed, 2006). Instead, they try by all means to give them formal education so that they can enhance their chances of getting formal wage employment. However, this should by no means be taken as a sign that these smallholder farmers do not value their plots. As a matter of fact, Van Averbeké and Mohamed (2006) hold the view that to most of the black irrigators, their plots represent an important livelihood asset that could be put to productive use in times of need. For example, they can cultivate it in times of severe hardships to supplement their food.

Despite such seemingly overwhelming evidence by the likes of Van Averbeké and Mohamed (2006), NPDALE (1999), World Vision (2004) and Shah, *et al.* (1992) that irrigated agriculture does not contribute much to household incomes as was hoped during the revitalization of smallholder schemes era by the government in the mid-nineties, there are also a number of success stories that have been noted and documented. Highlighting these success stories however creates a strong argument in favour of revitalizing the schemes that collapsed due to the withdrawal of government support. Apart from also proving that investing in their revitalization can be worthwhile, given the right setup, it further answers the question of whether there is any potential in improving rural household livelihoods through irrigation.

The success of the various irrigation schemes can be explained by a number of various factors such as the diversification of the farming enterprises, especially where farmers have full ownership of the plots they cultivate. Furthermore, such farmers manage their own marketing strategies rather than relying on government's market mediated approaches, e.g. through the Massive Food Programme in the Eastern Cape. This section briefly discusses two of the successful case studies in an attempt to create an understanding of how these farmers have managed to survive where others have failed. The first case study focuses on a single farmer from the ZIS, Gqwetha Booï whilst the second case study is much broader as it focuses on an entire irrigation scheme and not an individual farmer.

Case study 1: The case of Ggweetha Booi – Zanyokwe irrigation scheme

Mr. Booi is 56 years old, married and has four children. He has access to 6.3ha of land out of which 5.3ha is the land allocated to him and the additional one hectare is a lease. The average land holding at the scheme is 3ha and this means Mr Booi is one of the few farmers whose ownership of land is above average. He has access to physical infrastructure of the scheme despite the fact that most of this infrastructure is either not working or in very bad state. Some storage facilities of the scheme have been vandalized, others are still standing on the ground but no longer in use as they were never repaired. Farmers can only store products using own storage facilities. Most farmers (including Mr. Booi), don't have such facilities. There is only one dwelling house in his homestead. This means that Mr. Booi cannot store the produce at home as some farmers do. To deal with limited access to such physical capital, Booi's strategy is to sell all his produce from his production site. Other farmers have adopted this strategy as well even though most of them experience problems such as product spoilage due to lack of market. Booi hardly experiences this problem as he first finds buyers or markets for his products before harvesting. The same with labour, his strategy is different. He has at least one permanent worker and this gives him a sense of security and peace of mind knowing that everything is taken care of when he cannot be at his field. Most farmers make use of family labour but don't pay for it. Even though Mr. Booi also makes use of this labour, he differs from the rest by paying his family to keep them motivated. Donations of farm produce to relatives and friends enable him to have access to social capital, which is needed to accomplish farming activities such as weeding and harvesting.

In addition, his marketing strategy is different from others. He does not only rely on the buyers or markets arranged for him. In 2006 he got into an informal verbal contract with a dairy farmer in Seymour in the Fort Beaufort area to supply him with both white and yellow maize for his livestock. Under the MFP that he was once a member of, a 40kg bag of maize is sold as grain for R40 but his contract with the dairy farmer in Seymour allows him to sell a 40kg bag of maize cobs at a price of R40. That way he makes more profit than his counterparts in the MFP as his bag of maize is about half-a-bag of grain. The white maize is sold at R100/40kg bag. The difference is again huge as the kilogram fetches twice as much (R2.5/kg) compared to only R1/kg in the MFP.

In his farm, Mr. Booi produces three main enterprises, namely, cabbages, butternuts and maize. Apart from these crops, he also grows vegetables like spinach, carrot and onions on relatively small plots. A bigger share of the land (2.5ha) is allocated to cabbages (especially in summer) followed by butternuts (2ha) and maize is usually planted on 1.5ha. The other three vegetables are each planted on 0.1ha. Maize and butternuts are seasonal crops, and are grown in summer only. Mr. Booi grows all vegetables in both seasons (winter and summer) but cabbages are planted on a smaller land in winter. The method of cultivation is by tractor traction. Farmers at ZIS have access to three tractors that are hired by farmers for tillage purposes. For cabbages and maize, he buys all production inputs while those of butternuts are subsidized by government.

In terms of net farming profit, all his three enterprises are profitable as he gets R7 084.00 for cabbages, R2 109 for maize and R4 675.00 for butternut. However, these figures are still very low for him to make huge investments on the farm. Maize has the lowest net farming profit (R2 109/1.5ha) of all the crops but in terms of yield, he receives about 164bags (50kg) of maize, which translate to 8,2tons from 1.5ha he cultivates. This means that he is producing about 5,5tons per hectare, which is an acceptable yield under irrigation. Whilst most farmers lose money on transport and due to poor quality and packaging, Mr. Booi makes an effort to improve quality and also performs extra marketing functions such as grading and packaging. The main problem is high production costs, especially the labour costs (permanent labour). The permanent farm worker is paid R900/month i.e. R10 800 per annum. This figure was then divided equally amongst the three enterprises, hence a figure and an expense of R3 600 for each enterprise. His wife is also actively involved in farming and his two children who are scholars also participate in some farming activities such as weeding and harvesting. Apart from crop production, he is also involved in animal production. He keeps cattle and chickens, which are sometimes sold for purposes of earning cash. The money earned from the sale of animals is sometimes used to purchase agricultural inputs or pay children's education. Nonetheless, farming is his main livelihood strategy as it contributes more than 70% to household income).

Even though he only has standard five of formal education, he received training in agronomic practices conducted at Fort Cox College. After this, he also underwent training on book keeping conducted by Border Technikon (now Walter Sisulu University). He claims that most of his agricultural knowledge was obtained from the Israelis era.

Source: Aliber, 2008

Case study 2: Mthatheni irrigation scheme (KwaZulu-Natal)

Mthatheni is an irrigation scheme that was established early in the 1900s as market gardening plots irrigated by a gravity-fed canal off the Tugela river. It was very slow in getting going but in the 1980s with the advent of bakkies and black grocery sellers it has taken off into a flourishing market-gardening hub and produces output that is sold up to 200 kilometers away. Plots are individually owned by farmer families. There are over 2000 farmers, mainly women owning one or two plots (each plot is 10 x 180 meters in size). There are some men in the scheme and mechanization is minimal (although hankered after) – donkey owners make a good profit ploughing fields for other farmers. The crops use inputs intensively, e.g. hybrid seeds fertilizer and intensive chemical pest and disease controls. The main cash crops are green maize, which tend to be the first on the market as they can grow early and avoid the frost that other farmers are still dealing with. Tomatoes are a huge crop but there is always overproduction, resulting in narrow profits. Sweet potatoes are grown with no inputs and yield good financial returns. Buyers often have pre-planting agreements on the crops and will often pre-buy a number of farmers' crops so as to ensure volume. With little or no inputs from the state, the scheme has been going for more than 30 years. Most of these farmers are typically subsistence – illiterate poor black women – but are all actually small commercial farmers.

Source: Aliber, 2008

2.3.3: Arable Land Holdings

According to Van Heerden and Stimie (2001), South African smallholder irrigation schemes are multi-farmer irrigation projects larger than 5 ha in size. However, individual plot sizes in SA can be in the regions of 1ha or less as is the case in most developing countries such as Zimbabwe where Manzungu, Bolding and Zawe (1999) pointed out that the nation's individual plots range from 0.76 to 1.1ha. In the South African case, Mpahlele, *et al.*, (1999) attributed such smallness in size to the fact that there is not much land available for farming in the country (due to the current land tenure system which has not addressed the inequalities created by the apartheid government) and also the fact that these individual plots are run by women as men seek formal sector jobs to supplement a substantial proportion of their livelihood needs. Without strong manpower, women are therefore forced to cultivate only tiny food plots and vegetable gardens even though the yields are hardly ever enough to sustain their households and even worse, to have surplus produce for selling purposes.

Besides the very small schemes that are about 5ha in size, there are some schemes that are hundreds of hectares in size such as the ZIS in the Eastern Cape (635ha), Tugela Ferry irrigation scheme (1400ha) in the KZN Province, the Tonga Irrigation Scheme in Mpumalanga (600ha), the 546ha Shinyokana Irrigation Scheme also in Mpumalanga and many others. Although these statistics (sizes of these community schemes) may seem to indicate an abundance of irrigation land in SA, the truth of the matter is that most of the

smallholder irrigators in South Africa and other developing nations still do not have enough land for farming purposes.

Shah, *et al.*'s (1992) explanation of this shortage of irrigation land is that the present land tenure² arrangements do not provide much room and incentive for those currently owning land but are not interested in agriculture to sell out their land to those who want it specifically for farming purposes. This means that there are some farmers in need of land for irrigation purposes in particular but cannot obtain it whilst there are some people at the same time who own land but are not interested in farming. The latter group of people attained the land on the basis that their forefathers had lost it during the 1913 period of forced removals of black people from their land by the whites. Some of those who were resettled on agricultural land were not producing anything from the land. Such a scenario in South Africa can be seen in the Dingleydale and New-Forest Schemes in the Northern Province where some farmers who are not cultivating their land are reported by Mpahlele, *et al.* (1999) to be very reluctant to let interested irrigators crop on their field because they are afraid not to be able to get it back. As a result, they only lend their pieces of arable land to a "trustful person, such as an influential person, friend or relative" (Shah, *et al.*, 1992).

Monde, *et al.* (2005) also realized a similar problem in Zanyokwe where the lack of clarity in land ownership made some households in possession of land to be very reluctant to rent it out to those interested in cultivating it in fear of losing 'their land' permanently, hence prefer to leave the land fallow than have it used by someone else. Other land owners who do not cultivate their land fully prefer to keep their land only as insurance in case they need credit at some point. Such people only cultivate a small portion of their entire plots to minimize their risk of losing them to the government. These attitudes emanating from land insecurity have caused large pieces of land in the country which can be irrigated to produce food to remain idle as argued by Richard and Schur (2000).

Despite all this, the land tenure system under which smallholder irrigators can hold land in South Africa is divided into the freehold tenure system, the quitrent tenure system and the communal tenure system. Briefly, the freehold tenure system is that system under which the land holder is given exclusive rights which guarantee security. These rights mean that the

² Land tenure is the system of rights and institutions that govern access to and use of land (Adams, 2001).

land owner can freely sell or rent the land to others. However, even though there is such freedom given to the land owner under this system, the land owner still has to operate within the statutory restrictions and any sale of the land should be thus approved by the state.

Farmers in Lenye West, Ngqumeya and Zingcuka in the ZIS are good examples of freeholders as they have full ownership and freedom to alienate and use the land at will, but subject to statutory restrictions (Monde, *et al.*, 2005). These freeholders make up 44% of the entire land under the scheme as revealed in studies done by Van Averbek, *et al.* (1998). As for those farmers in Zanyokwe that are still without proper rights to the land they cultivate, they have tried acquiring these necessary title deeds that would give them ownership of the land but recent studies by Monde, *et al.* (2005) show that this move has not yet yielded any fruit. These farmers have pinned the blame for their failure to get the title deeds on the mismatch of names of applicants and original owners of land in the records at the deeds office. On the other hand, the quitrent tenure system gives the recipients of the land about 4 to 6ha of land for commonage who are then required to pay rent on a monthly basis. Thus, one can say this system allowed farmers to acquire land subject to their ability to pay a stipulated monthly rental fee as is currently the case in the Burnshill village of the Eastern Cape (Monde, *et al.*, 2005). In Ntonto's (2005) view, this annual payment of rent for the land is one of the features that distinguish the quitrent from the freeholder system.

2.3.4: Ownership of and access to capital resources

In South Africa, there are a number of irrigation schemes that were initiated by the government soon after the 1994 elections with the aim of getting "agriculture moving" as Eicher (1994) posited. These schemes were basically run and managed on behalf of the small farmers by the government through its relevant organs. For example, Backeberg, Bembridge, Bennie, Groenewald, Hammes, Pullen and Thompson (1996) highlighted that for over three decades, the Agriculture and Rural Development Corporation (ARDC) has managed smallholder irrigation schemes through an elaborate top-down command and support system, which has eventually proven unsustainable. All the schemes under the ARDC were fully subsidized, and the ARDC organized mechanized cultivation, planting and fertilizer application in the schemes. This means that the government owned most of the schemes' economic capital resources such as the machinery, water through the Department of Water Affairs and Forestry (DWAF) and even the working capital used in the schemes thereby

leaving the farmers only with the responsibility of weeding and harvesting. However, all this government support introduced in the mid-nineties was withdrawn, leaving the farmers with the responsibility of acquiring their own resources. Thus, the farmers became the owners of both their farms and the resources they used.

Due to the rural location of most small scale irrigation schemes and the fact that they are now owned by the farmers themselves (most of whom are poor and less skilled), the condition of most of their infrastructure such as machinery and buildings have deteriorated whilst others have become outdated. In addition, many rural areas continue to lack basic infrastructure such as roads (SARPN, 2007). The road systems that connect various sections of the schemes such as the buildings, the fields, water sources and the nearest business centres are not tarred either, and this disrupts the whole irrigation schedule when the roads are slippery due to rains. This is not only a problem affecting South Africans but the whole of Africa too as paved roads scarcely exist. According to Harsch (2004), the sub-Saharan Africa has the lowest density of paved roads of any region with only 16% of roads being paved. In the case of the ZIS, the same can be said about the bad road system, especially the route to the Lenye village that is located across the Keiskamma River which can be risky to cross during the rainy season. Luckily, there is a safer alternative route to this village but in general, the scheme is one of the very few served by a good road system particularly in the Lenye and Burnshill villages where most of the members of the scheme come from (Monde, *et al.*, 2005).

Still using the ZIS as an example, the farmers there irrigate their crops using the sprinkler system obtained through the farmer association. At the time of visiting the scheme in November 2008, the fences within the scheme were found to be still intact and efficiently protected the cropped areas from being invaded by livestock and other animals. These fences do not surround individual farms but instead, each fenced section covers large cropped areas belonging to different farmers who cultivate close to each other (Monde, *et al.*, 2005). Furthermore, the farmers in this scheme have had their human capital (skills) enhanced by the training that they receive from the Department of Labor, a trend that has not only been noted in Zanyokwe, but also in a number of other schemes nationwide as Neven, *et al.* (2005) clearly put it. The government and NGOs have also been playing a vital role in trying to improve the small scale irrigation sector in SA by offering the farmers technical advice

and Monde, *et al.* (2005) noted this to be the case even with the farmers in Zanyokwe as they are given technical advice by the Department of Agriculture.

In a survey done by Bembridge (1999) on the small scale irrigation schemes in the Eastern Cape, the results show that most of the schemes in the region have access to infrastructure such as water reservoirs, office buildings, irrigation pipe valves, telecommunication systems and diesel or electric engines to pump water. Of concern though in spite of the presence of such infrastructure is the fact that the farmers in these schemes are still without proper infrastructure management skills. Consequently, the condition of most of the infrastructure in the schemes in the region has deteriorated rapidly, resulting in a reduction in the crop production as well as increased costs.

Even though diesel and electric engines are used by many to pump water, Steven's (2006) stance is that these engines have since emerged in the region as one of the major stumbling blocks faced by the irrigators as they breakdown frequently and the pipelines they are connected to are old, in a bad state and therefore leak, plus the valves are also not working properly. This is a common feature in many small scale irrigation schemes such as the ZIS and the Qamata in the Eastern Cape. Stevens (2006) further observed that at the present moment, the farmers in Burnshill East and Lower Ngqumeya in the ZIS are having serious difficulties settling their electricity bills due to the fact that they use huge amounts of water (most of which is lost through leaking pipes and the use of improper irrigation practices). As a solution, they have since asked the government to intervene and settle their electricity bills. In a nutshell, even though there are some irrigators who have access to electrical power, their schemes have not greatly benefited from this as the farmers constantly face huge electricity bills that they cannot afford to settle.

2.3.5: Access to water resources

When it comes to the issue of water, South Africa, just like many Sub-Saharan nations has very low average rainfalls, well below the world average. Oosthuizen (2002) put the mean annual rainfall for South Africa at 497mm/yr, with only 8.5% being able to find its way to the rivers and the rest is lost as run-off and through evaporation. Due to such low rainfall figures, the nation is vulnerable to water shortages every now and then and this has prompted the government to declare this precious resource a national asset. To preserve this national

asset, all the water resources for the nation are managed by the government through its DWAF. It is DWAF's duty to allocate the water to all the users, including the irrigation schemes. For example, the ZIS gets its water from the Sandile dam which is owned and managed by DWAF. Dams, rivers and boreholes are generally the major sources of water for the small scale irrigations in SA and the rest of the developing world. Other water sources for irrigation purposes include streams and the use of tanks that are filled with water through the use of rain-water harvesting techniques.

In its allocation of water, the DWAF is guided by the National Water Act (NWA) of 1998. According to Oosthuizen (2002), this National Water Act (NWA) (Act 36 of 1998) was introduced after the 1994 democratic elections and it provides for a fundamental reform of water resources law, for the conservation of this scarce resource, and for the equitable allocation of water for beneficial use. Part of this Act of 1998 stipulated that there should be statutory bodies set up specifically to govern the allocation of this precious resource to its users, including all the smallholder irrigation schemes so that it does not get easily exhausted. Besides this, Farolfi (2004) holds the view that these institutions also play the role of identifying methods to increase agricultural productivity of small-scale irrigation systems and developing improved institutional arrangements for productive, socially equitable and sustainable irrigation systems and they include the Catchment Management Agencies (CMA) and the Water Users Associations (WUA).

2.3.5.1: The Catchment Management Agencies (CMAs)

Catchment Management Agencies are statutory water management bodies established under the Act of 1998 specifically to manage the water resources. With respect to this, the nation of South Africa has been divided into 19 Water Management Areas (WMA) and each CMA has a specific WMA to manage (Oosthuizen, 2002). It is important to note that each of the 19 WMAs is different from the rest and as such, has specific requirements. Therefore, Oosthuizen (2002) suggested that all CMAs must develop and implement a catchment management strategy for the water resources within their WMA. Having established a WMA in compliance with the National Water Act, Schreiner and Van Koppen (2002) cited that the Minister of Water Affairs and Forestry would then decentralize some of the water resource management powers held by DWAF to these WMAs. These WMAs would then be the ones responsible for compiling the Catchment Management Strategy (CMS), and, ultimately, also

carrying out functions such as water resources planning in the catchment, registration, water charge collection, water authorization and licensing .

2.3.5.2: The Water Users Associations (WUA)

WUAs are formed under section 92 of the water Act of 1998 and in Oosthuizen's (2002) view, these are statutory bodies formed with the broad aim of enabling water users within a community to pool their resources (money, human resources and expertise) to more effectively carry out water-related activities. Thus, the members of a WUA must be those who wish to undertake water-related activities for their mutual benefit. At the present moment, not all irrigation schemes have WUAs. The Zanyokwe irrigation scheme, for example, only had a WUA established in 2005 and it is still in the process of registering it. Once registered, it would then become a statutory body that is legally recognized as responsible for developing the improved institutional arrangements for productive, socially equitable and sustainable irrigation systems in the Zanyokwe region. Some schemes are also set to follow suit soon in order to help conserve water and improve its efficient use.

With such water management institutions one would expect that all schemes have enough water to irrigate their crops at any given time of the year. The reality of the matter, however, is that this is not always the case as some schemes still have severe water shortage problems. Such problems are mostly due to the unreliable rains that the nation receives. Take the example of the Enable village in the dry Limpopo province where, regardless of the fact that they practise the water-saving drip irrigation and also have two boreholes (one running with a diesel engine and the other is an electrical pump), the households usually face severe water shortages especially in winter when the rains are at their lowest resulting in them failing to grow winter crops like Zanyokwe does. At the same time, the ZIS itself is not without its own water problems as some parts of the scheme still face water problems especially due to the high water demand as the water system in the area not only supplies the scheme but also the municipal drinking water supply system. This, coupled with the poorly managed, hence leaking main pipes has validated Neven, *et al.*'s (2005) stance that water problems are still not a thing of the past in these areas.

2.4: Synopsis

This chapter has highlighted all the major socio-economic characteristics that identify with the smallholder irrigators in SA. The characteristics covered include the gender of irrigators, their land holding size, the extent to which they are able to access irrigation resources and their livelihood characteristics such as occupation. As explained in this chapter, most smallholder schemes are operated by women in the absence of men who work in the formal sector to supplement their households' income. Small pieces of land of less than one hectare are cultivated by these women but community schemes such as the ZIS can be a couple of hundred hectares in size. In spite of the huge sizes of community schemes, the majority of irrigators are involved in other sectors in an attempt to supplement income since farm produce does not provide them with enough income for them to achieve sustainable livelihoods. Even though some schemes have infrastructure such as roads, diesel or electric water engines, buildings and irrigation pipes, most are in very bad condition due to mismanagement caused by lack of proper management skills by the irrigators. Apart from the lack of infrastructure management skills, such lack of skills also extends to irrigation as the farmers also do not have the proper irrigation skills such as scheduling and consequently, the majority of these irrigators have continued to fail to obtain optimum yields from their fields.

3: THE SOCIO-ECONOMIC IMPACT ASSESSMENT (SEIA) CONCEPT

3.1: Introduction

This study made use of the Socio-Economic Impact Assessment (SEIA) framework to assess how the BMP project introduced at Zanyokwe has impacted on the lives of the farmers both socially and economically. In this Chapter, the SEIA concept is reviewed, starting with the theoretical definition and reviewing the framework used to analyze the social and economic impacts. The variables and key indicators used in this SEIA are also identified and the benchmarks for determining the impact of the entire project in the farmers' lives are set by means of a framework for analysis.

3.2: Socio-Economic Impact Assessment definition

A socio-economic impact assessment (SEIA) examines how a proposed development will change the lives of the communities targeted for development. The Australian Government Bureau of Rural Sciences (2005) defined SEIA as “a useful tool to help understand the potential range of impacts of a proposed change, and the likely responses of those impacted if the change occurs.” Thus, it systematically identifies and evaluates the potential socio-economic and cultural impacts of a proposed development on the lives and circumstances of people, their families and their communities. If such potential impacts are adverse, then the SEIA can assist the developer and other parties involved to identify them before they occur in order to make recommendations for mitigation (Inter-organizational Committee, 2004). Evidence from Michael (1984) has shown that any project introduced at any level can have both positive and negative impacts on its surrounding community. In Hindmarsch's (1990) interpretation, it is therefore the presence of such negative impacts that makes SEIA an important tool to forecast, monitor and control these prospective social and economic problems especially resulting from the process of technological change.

Any project can impact on a community in a number of ways and these impacts can be classified as lifestyle impacts (on the way people behave and relate to family, friends and cohorts on a day-to-day basis); cultural impacts (on shared customs, obligations, values, language, religious belief and other elements which make a social or ethnic group distinct); community impacts (on infrastructure, services, voluntary organizations, activity networks and cohesion); amenity/quality of life impacts (on sense of place, aesthetics and heritage,

perception of belonging, security and aspirations for the future) and health impacts (on mental, physical and social well being, although these aspects are also the subject of health impact assessment). In order to determine the extent of these socio-economic impacts, SEIA framework is needed to provide the necessary guidelines and also to provide a baseline or benchmark against which the impacts would be compared. In other words, SEIA provides a framework for monitoring and measuring the impacts of any project, the BMP project included.

3.3: SEIA: A framework for analysis

The SEIA framework is divided into three phases, viz, (1) scoping, (2) baseline profiling and (3) assessing the impacts.

3.3.1: Scoping

The purpose of scoping is to determine the focus, scope and content of the SEIA, the initial assessment of the potential impacts, possible mitigating measure and monitoring programmes. Thus, this phase of SEIA establishes and sets the extent or boundaries within which the whole assessment would be carried out especially by focusing on only the key impacts. The Bureau of Rural Sciences (BRS) (2005) identified the important aims of scoping as determining the:

- ❖ time and resources available for the SEIA
- ❖ nature of the proposal being assessed
- ❖ groups who are potentially impacted
- ❖ key impacts of interest
- ❖ extent of available information, its potential usefulness in terms of appropriate scale, timeframe, content etc and how data gaps can be addressed
- ❖ Process and methods to be used for the SEIA.

Once these aims are clear enough, then the scoping phase would be further used to identify the important social and economic variables to be used in the assessment. Information needed to come up with these necessary variables can be obtained through public surveys and public participation techniques. However, the ideas of everyone affected are very

important hence they should be considered as well. Finally, the variables would then be selected according to the following criteria suggested by the DEAT (2006):

- ❖ Probability of event occurring;
- ❖ Number of people that will be affected;
- ❖ Duration of the impact;
- ❖ Value of benefits and costs to the impacted groups (intensity of impacts);
- ❖ Extent to which the identified impacts are reversible or can be mitigated;
- ❖ Likelihood that an identified impact will lead to a secondary impact;
- ❖ Relevance for present or future policy decisions;
- ❖ Uncertainty over possible effects;
- ❖ Presence or absence of controversy over the issue

3.3.2: Baseline profiling

This phase follows the scoping phase and is also equally important in carrying out a SEIA. In this phase/stage, the historical context and current status of the impacts under which the project is undertaken are explained. Regarding the BMP project, profiling was done in 2005 by the BMP team through a collaborative effort with extension officers, farmers and the community as explained in chapter 1.1. However, since the baseline report was used for this study, it was important to highlight how it done. The aim of baseline profiling is to create the understanding of the socio-economic conditions that existed prior to the implementation of the project as these would act as the benchmark for determining the extent of the changes brought about by the project. In this sense, these baseline conditions should encompass the relationship with the biophysical environment, historical background, political and social resources, culture, attitudes and social conditions, economic and financial background and population characteristics (DEAT, 2006). Basically, a good baseline profile as proposed by the BRS (2005) should identify the:

- ❖ types of activities likely to be affected, who undertakes these activities, when and where
- ❖ extent of activity potentially affected and range of values associated with these activities
- ❖ historical, regulatory and other factors impacting on these activities
- ❖ ways of contacting the affected people so they can provide data about potential impacts
- ❖ geographic location of members who are likely to be impacted by the proposed change
- ❖ proportion of the group, or of their activity, likely to be affected

3.3.3: Assessing the impacts

Following the baseline profiling phase is the actual assessment of the impacts of the entire project. This phase is done towards project completion and involves comparing the situation before project implementation (using baseline data) and after its implementation to identify any variations between the two scenarios. It is only after assessing the existence/non-existence of changes that solid conclusions regarding the contribution of the implemented project to the targeted community can be deduced. Since by the time of assessment not all impacts would have been experienced, then predictions are also used especially to assess expected future impacts. The socio-economic impacts in this framework are divided into two, the direct and indirect impacts.

3.3.3.1: Direct impacts

The Inter-organizational Committee (1994) referred to the direct impacts as those impacts that are usually felt by the participants in the project, be it individuals, groups and firms that are directly engaged in the activity being affected. In this case, the term ‘direct impact’ would be used to refer to the impacts felt by the farmers who are members of the BMP project together with their families. Ideas pertaining to such impacts was obtained from those identified as potentially affected by the activity, where possible over a period of time and this data would in turn be used to establish a baseline level and rate of change in key variables. The direct socio-economic impacts would also be used as the variables when assessing the impacts of a project. The data on these impacts can be collected using the primary and secondary sources. In the case of the former, the people who feel the impacts can be asked for their opinions, attitudes, beliefs, experiences and reactions pertaining to the impacts from the project through a survey or focus group meetings.

3.3.3.2: Indirect impacts

The Inter-organizational Committee (1994) defined the indirect impacts as those that often occur later than the direct impact, or farther away. In other words, they emanate from the direct impacts. It is not an easy thing to separate the indirect from the direct impacts but the former usually occurs at a broader level as a result of the individuals or groups directly associated with the caused by the latter. In this sense, it is no surprise that the indirect impacts can include direct impacts such as income. Just like with direct impacts, data on the

indirect impacts can also be obtained through surveys, focus groups and the secondary data sources. These impacts as suggested by the BRS (2005) include changes to:

- ❖ employment and income in a region
- ❖ population in a region including age, employment, length of residence and other demographic characteristics
- ❖ levels of service provision and social capital in a community/region

In measuring these impacts, it is important to understand the difference between process and impact indicators. This is because in Koontz's (2007) view, a project could achieve all process steps but not have desired impact, so it is very important to have both types of indicators. The importance of measuring the impacts especially using baseline data is that it increases the likelihood of identifying causal factors in change and it also allows a clearer measure of the degree of change (Australian Agency for International Development, 2005). Furthermore, it is important to determine not only the full range of impacts, such as changes to levels of income and employment, access to services, quality of life, but also the implications of each particular change. In the Australian Government Bureau of Rural Sciences' (2005) view, impacts of a certain proposal such as the BMP are also distinct from, though influenced by, other activities which may be occurring concurrently. It is important therefore to identify the key source of impact and to separately identify impacts arising from other sources.

In the case of the BMP project, it was structured in accordance with the phases of the SEIA framework as its three stages corresponded with those of the SEIA. Its current phase (the monitoring and evaluation phase) is the same as the SEIA framework's impact assessment stage, hence the choice of the SEIA framework in this study. One of the advantages of using this SEIA approach to assess projects such as the BMP project is that it is an interactive process by nature and assists the community to be part of the decision-making process (DEAT, 2006). This is very crucial as SEIA is a collaborative effort amongst various stakeholders and applies a top-down approach. By so-doing it empowers communities to participate in decisions that will affect their livelihoods and also gives them a channel through which their voices can be heard. The SEIA approach in this study was also justified by recognizing Burdge's (2004) argument that since SEIA recognizes the community input, involving the community minimizes local resistance to projects and therefore reduces

disruption. Thus, it increases project success by preventing major planning disasters and associated costs.

The ability of SEIA to reveal the existence of adverse impacts before they occur ensures that the project planners (BMP team), the Zanyokwe farmers and the general public affected can conduct an informed debate over which impacts can be avoided, which are socially necessary and which are socially intolerable. Therefore, understanding the impacts of the BMP project would go a long way towards contributing to the further development of small scale irrigation in South Africa through applying the best management practices in these schemes. However, in the absence of correct baseline data, impacts can still be measured through several options which may not be mutually exclusive. Felloni (2006) suggested the following alternative methods:

1. Reconstructing baseline data *ex post*: recall method
2. Use key informants and triangulate (mostly qualitative)
3. Reconstructing a baseline “scenario” with secondary data

3.3.3.3: Social and economic variables used in SEIA framework

The social key variables to indicate any changes in the beneficiaries’ lives include the following:

- ❖ Changes in community demographics (sex, age, dependency ratio, labour force)
- ❖ Social capital – networks of relations, communal work, leadership capability, trust in social institutions, level of understanding of constraints
- ❖ Psychological well-being - stress levels, happiness, security, attitudes and perception towards proposed developments
- ❖ Personal or household expenditure – e.g. changes to the cost of doing business (increasing or decreasing costs of farm input) / cost of obtaining food
- ❖ Skills and training, and
- ❖ Changes in quality of life

The economic variables and indicators include the following:

- ❖ Employment – availability, types of employment, composition (family/hired), average wage rate
- ❖ Changes in income levels (which leads to changes in quality of life)
- ❖ Physical capital – storages and irrigation infrastructure (condition and availability)
- ❖ Water availability
- ❖ Risks of food insecurity, and
- ❖ Production output

3.3.4: Synopsis

This chapter has provided a detailed review of the SEIA concept and its framework of analysis. This framework would be used to assess the impact of the BMP project. Positive socio-economic impacts include increased yields, crop diversification, food security, economic growth (forward and backward linkages), employment creation, increased income and the farmers' ability to acquire new assets really show how important a role the smallholder irrigation sector plays in the lives of rural farmers in developing countries.

4: RESEARCH METHODOLOGY

4.1: Introduction

Methodology refers to the techniques or methods to be used to collect all the relevant data needed for the study. This chapter begins with a detailed description of the study area (ZIS) in terms of biophysical and socio-economic characteristics. Following the site description is a section that explains in detail the methods used to collect, analyse and interpret data. The framework of analysis as well as its application in this study is explained in this chapter.

4.2: Description of study area

The Zanyokwe irrigation scheme is located Amahlathi local municipality, at the foot of the Amatola Mountains, about 30km west of King William's town in the Eastern Cape Province of South Africa. It is one of the three largest irrigation areas in the upper Keiskamma and Tyume river catchments and occupies 635ha of land. According to Yokwe (2005), "the scheme comprises of 66 individual small farms ranging from 0.5 to 10hectares" which directly benefit about 402 households settled around irrigation scheme. These farms are in the six villages namely; Zingcuka, Kamma-Furrow, Nqumeya, Zanyokwe, Lenye and the Burnshill settlements (see Figure 4.1). Of the 635ha of land under the scheme, only 534ha are irrigated and this irrigated land is intended for crop production and consists of relatively small plots scattered between lower Nqumeya in the east to Kamma-Furrow in the west. The remaining portion of the land is unused simply because the Uvimba Development Bank has not been able to provide credit for inputs and maintenance of the pumping equipment due to significant budget cuts as argued by Ntsonto (2005).

The area is semi-arid region with annual rainfall of 590mm. Irrigation is required to supplement the inadequate rain. Water comes from the Sandile dam which is currently owned by DWAF and is one of the three main dams on Keiskamma River (Neven, *et al.*, (2005). According to Monde, *et al.* (2005), the responsibility of maintaining the pipeline lies with the Amatola Water Board on behalf of DWAF.

The Zanyokwe area has complex and varied soils, with a substrate consisting of shale, mudstone and fine-textured sandstone with dolerite sills and a dyke that cover extensive areas, particularly in the extreme northern and southern sections of the areas (Van Averbeke,

et al., 1998). There are also some very nutrient-rich alluvial deposits that can be found along the Keiskamma River and these alluvial deposits form terraces which are generally narrow but tend to become more extensive on the inside of river bends. These alluvial deposits enhance vegetation quality, hence vegetation is expected to reach its optimum especially if it also gets enough water.

Empirical evidence from a study done by Monde, *et al.* (2005) revealed that most of the farmers in the scheme use their farms mostly to grow crops specifically for marketing purposes as they sell about 80% of their produce and only consume the remaining 20%. This shows that the scheme in this area is taken as a form of business in which participants enter to make financial gains and not only to feed their families. Their produce includes both field crops and vegetables such as maize, potatoes, pumpkins, butternut, dry beans, cabbages, tomatoes, spinach, beetroot, carrot, onion and green peppers. Figure 4.1 is a schematic representation of the Zanyokwe Irrigation Scheme.

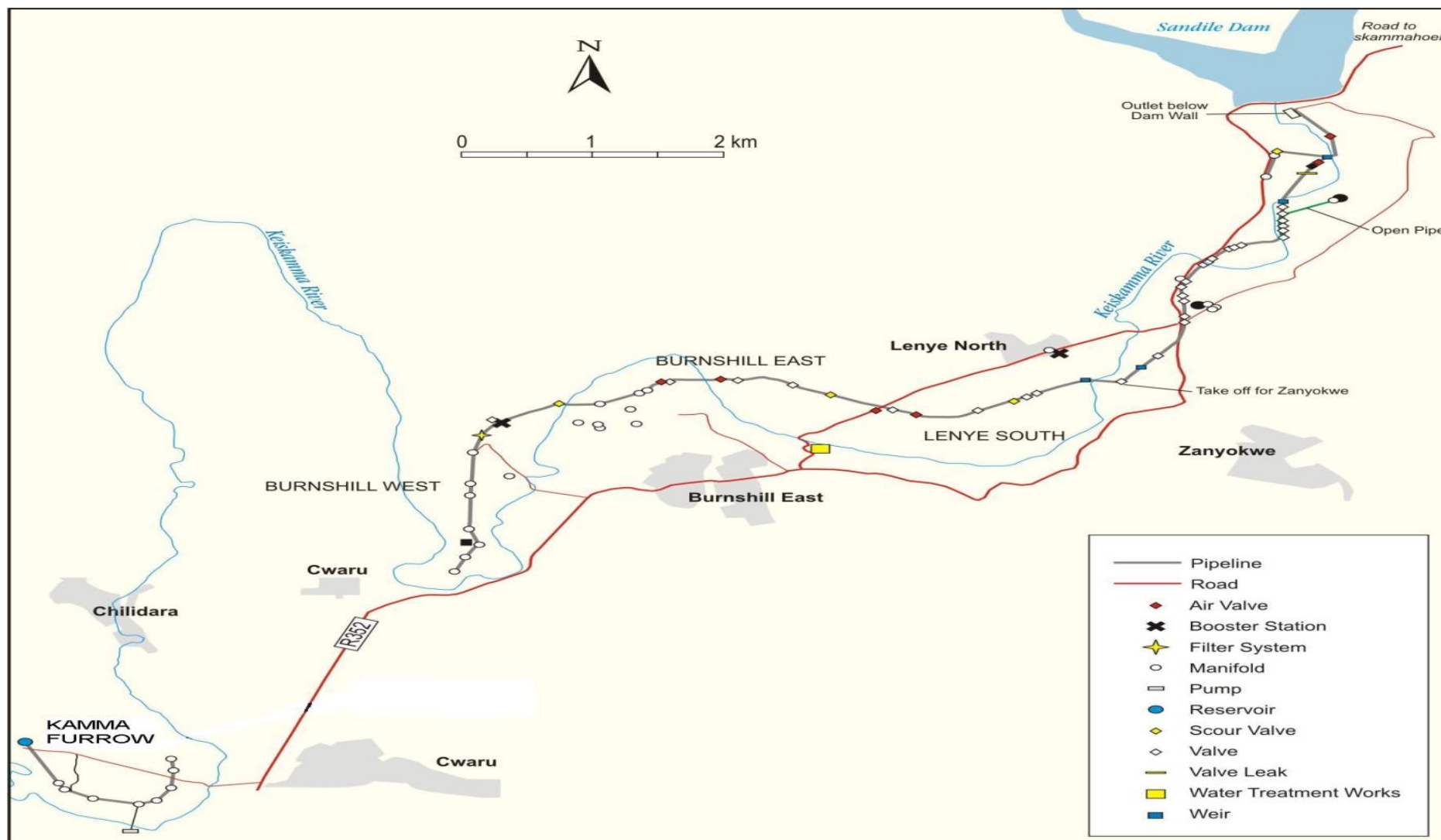


Figure 4.1: Schematic representation of the Zanyokwe Irrigation Scheme
Source: Stevens, 2006.

4.3: The SEIA framework of analyses and its application in this study

4.3.1: The SEIA framework

The SEIA framework was used to assess both social and economic impacts of the BMP project at ZIS. As explained in chapter 3.3, the SEIA framework of analysis consists of three phases, namely, scoping, profiling and identifying who will be impacted and assessing the impacts. All three phases were employed in this study. The first two phases had already been completed before this study commenced. Although done prior to this study, scoping was done in partnership with all stakeholders, especially the farmers. Apart from establishing the goals and boundaries of SEIA, the scoping phase aimed at identifying the following:

- ❖ Time and resources available for the SEIA
- ❖ Key impacts of interest
- ❖ Process and methods to be used for the SEIA

The same farmers who were investigated during the situation analysis were identified and then interviewed for this study. As for the socio-economic indicators used for this study, they were the same as those used in the baseline study in 2005. These indicators were also suggested by the SEIA framework as highlighted in chapter 3.3.3.3 and included:

- ❖ Demographic changes – changes in the composition of farming population (age and gender),
- ❖ Psychological wellbeing – stress levels, security and attitudes towards the BMP project
- ❖ Changes in quality of life – better access to social infrastructure,
- ❖ Skills and training gained
- ❖ Livelihoods – changes in employments and household incomes
- ❖ Yields data of main crops (yield / ha), GVO/ha
- ❖ Cropping intensities by season
- ❖ Costs of production (inputs, labour and transaction costs); changes to the cost doing farming business
- ❖ Costs of operating irrigation systems (irrigation costs per ha)
- ❖ Impact on markets and marketing system

4.4: Methods of data collection

4.4.1: The survey

A formal survey based on key informant interviews was used as a research strategy to elicit mostly quantitative data. The situation analysis report was used as a baseline and thus enabling the identification and measurement of changes. However, although the aim was to investigate all key informants interviewed in 2005 during the baseline study in order to compare the situation then and now, only 69% was investigated. The other 31% was not available at the time of this investigation. The same questionnaire used in the baseline study was also employed in this study as a tool to collect data (see Appendix 1). Nonetheless, this study was not confined to these questions as it emerged that the baseline study was not comprehensive enough to measure certain changes that had occurred since 2005. In a move meant to rectify this problem by fully assessing all the impacts, new questions were added to the questionnaire and the respondents' perceptions were used to measure such changes in variables not identified in the baseline study.

In general, the questionnaire consisted of both open and closed-ended questions but the latter dominated for a number of reasons. The reasons for the dominance of the closed-ended questions are that such questions can be more specific (hence more likely to communicate similar meanings), they take less time to administer especially in large-scale surveys and they are also easy to analyze (Barribeau, *et al.*, 2005). However, disadvantages of using this type of questions include the fact that they require the researcher to spend a lot of time generating a list of responses and also, if the list of responses is too long, then the respondents may become confused or disinterested (Gates and McDaniel, 1997). The questionnaire elicited most of the information mentioned in the third phase of SEIA (see section 2.3). Interviews were carried out during the month of November 2007 with the heads of the households but where a head of household was absent at the time of the interview, other senior members of the household were interviewed.

During the data collection exercise, a number of difficulties were encountered but the one that sticks out the most was the negative attitude by respondents towards being interviewed. Such an attitude was said to have been created by the fact that a number of researchers, some from as far as KwaZulu-Natal and Pretoria had been regularly visiting the farmers in the scheme to interview them. These researchers were accused of making community

development promises for years but nothing benefiting the community has emerged from their researches. Another notable problem experienced was the fact that most of the farmers in the scheme did not keep their farm records. This made it very difficult for them to give the correct information about their agricultural income and expenditure. Despite encountering such problems, the necessary data was collected as planned.

4.5: Data analysis and interpretation

For the purposes of this study, the unit of analysis was the farming household. The farming household was taken as a unit that consisted of all people residing in a single homestead, sharing resources and activities whether they were related or not. However, to determine impacts on livelihoods and incomes, household members residing elsewhere but get a share from the incomes of the rural households were considered in the analysis. This is because dependence on farm income represents another form of expenditure to the farming household.

A socio-economic survey involves both the qualitative and quantitative data and this requires the use of the relevant qualitative and quantitative data analysis techniques. These techniques can either be used independently or jointly, if necessary. The quantitative analysis focused on measuring specific profiles of community characteristics whereas the qualitative analysis was used to describe some of the community dynamics. In general, simple statistics, tables and graphs were chosen to analyze data and interpret the results. Where necessary, correlations between various variables were established. Thus, after collecting the data through the questionnaires, then all the quantitative responses were coded to make analysis much easier as suggested by Bless and Higson-Smith (2000).

To analyze the qualitative data, Taylor-Powell and Renner's (2003) approach of categorizing the responses was adopted. However, unlike in the quantitative data where numerical codes were assigned to label the exclusive variables, categorizing qualitative data was done in two steps, namely (1) identifying the themes or patterns and then (2) organizing them into coherent categories. The former step involved identifying such themes or patterns like ideas, concepts, behaviours, interactions, incidents, terminology or phrases used. On the other hand, the latter step was taken to organize the themes or patterns identified in step one in order to summarize and bring meaning to the text. To make this process of categorizing the data simple, abbreviated codes of a few letters, words and symbols were assigned and placed

next to the ideas and themes found. In Taylor-Powell and Renner's (2003) view, this helps to organize the data into categories.

During the process of categorizing the data, other themes that served as subcategories were identified and this process was continued until all relevant themes had been identified and labeled. Lastly, having identified the themes and put them according to various categories, then their meaning and significance to the analysis was explained through what Taylor-Powell and Renner (2003) termed "interpreting the data".

4.5.1: Testing the associations between variables using Chi- Square (χ^2)

The Chi-square test was used for testing the association between different variables. Dougherty (1992) explained that the chi-square test uses different significance levels to test the strength of the relationship between variables. Thus, this chi-square statistical test is commonly used to compare the observed data with data the researcher expects to obtain according to a specific hypothesis. Fisher and Yates (1974) argued that this test therefore shows the "goodness to fit" between the observed and expected data. For example, a chi-square can be used to determine if the deviations were the result of chance or were they due to other factors. A certain chi-square value is then chosen as the benchmark to determine how much deviation from this benchmark can be allowed to occur before concluding that something other than chance is at work, causing the observed to differ from the expected.

A significance level of 5 percent is taken as the relative standard in many researches to serve as the basis for accepting or rejecting the hypothesis. The same significance level of 5% was therefore used even in this research such that any deviation from the expected value was due to chance alone 5% of the time or less. However, the chi-square tests do not explain the nature of associations and therefore, possible interpretations were provided to help come up with a deductive reasoning as to what could have influenced the responses.

The chi-square value is obtained by dividing the expected data in all possible categories by the sum of the squared difference between observed (O) and the expected (e) data (or the deviation, d). Mathematically it is represented as:

$$\chi^2 = \left(\frac{(o-e)^2}{e} \right)$$

4.5.2: Econometric analysis of variables using the multiple regression model

All the benefits that exist in farming are determined by the amount of output produced. For this reason, the role played by the new practices was determined by the change in the output of the main crop (cabbages) per area of land cultivated in the scheme. The key independent variables chosen were the time spent in the fields, number of people employed, income levels and the age of household head. Using the multiple regression model, the relationship between these key variables and the output of main crop in the scheme was assessed. Any piece of technology should result in more being produced either in the same period of time or in a shorter period of time. Understanding how output changed relative to the time spent in the fields each day by the farmers created a basis for justifying the testing for the relationship between the two variables.

As for the age of household, good practices are those that accommodate as many people from different generations as possible. The BMP project was meant for all the farmers within the scheme regardless of their age. Therefore, it was of paramount importance to test hoe the issue of the farmers' age affected total out. On these grounds, the 'age of household' variable was incorporated into the model as well.

Changes in household income levels also play a major role in showing the economic impact of any agricultural development initiative. This was the case with the farmers in the ZIS as they viewed agriculture as a business meant to provide the owners with income. Understanding the relationship between changes in output and income created an idea of how the new practices influenced household incomes at the scheme. The availability of income or its lack thereof also contributed to determining the number of labourers employed by each farmer at the scheme to assist in the fields.

The reason for adopting such a model was to determine the extent to which the changes in the independent variables such as the time spent in the fields by each farmer, the number of people each farmer employed, household income levels (R/AE/Yr) and the age of each

household head would affect the total production of main crop. Understanding such information could become very helpful especially when formulating policies such that preference should be given to influencing those variables that positively relate to the output of main crop by a bigger margin. This regression model used the results obtained by running the data on SPSS and its formula is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U$$

Where Y = Total production of main crop/Ha

β_0 = Intercept

X_1 = Time spent in the fields

X_2 = Number of people employed

X_3 = Income levels (R/AE/Yr)

X_4 = Age of household head

U = Error term

This model was used to regress these independent variables in order to obtain their coefficients (beta coefficients) which are necessary in showing how strongly each independent variable influences the dependent variable (Y). Thus, it sought to obtain the beta values to determine the strength of each independent variable on the dependent variable. A higher beta value represented a great impact of the independent variable on the dependent variable and vice versa. The error term (U) encompassed all the variables that could not be assigned numerical values but had an impact on the dependent variable.

The significance of the beta values in this model is determined through the t-statistic values. According to Gujarati (1992), a t-statistic is significant at 1% if it is greater than 2.67, significant at 5% when its value ranges from 1.9 to 2.6 and significant at 10% if it is below the value of 1.9. A confidence level of 95% (or 5% significance level) was used in this study such that any value below 0.05 showed a significant relationship whereas that greater than 0.05 represented an insignificant relationship.

4.5.2: Assessing the impacts on Livelihoods

In terms of determining the project's impact on livelihoods, income and expenditure were used as the main measures. Therefore, the unit of analysis was the adult equivalent (AE) so

as to provide a more accurate reflection of the ‘living standard’ by analyzing all affected households. Shinns and Lyne (2002) suggested that the number of AE can be determined through the following formula:

$$\text{No of AE} = (\text{No. Adults} + 0.5 \text{ Children})^{0.9}$$

Where, No. of AE = number of adult equivalents in the household,

No. of adults = number of household members aged 15 years or older,

No. of children = number of households younger than 15 years old.

The amount of income each AE receives was then measured against the poverty datum line (PDL). Frye (2005) defined this PDL as the level of personal income and involves the quantification into a monetary value of a set number of items, based on a strict calorific count, a basket of goods etc, the absence of which has been decided by the quantifier, as constituting poverty. In this case, the year 2000 PDL of R593.00 per capita per month as given by Statistics SA (2007) was used to determine if the income each AE got was enough for it to meet its basic needs. This figure was then adjusted using the relevant current consumer price indices (CPIs) to get the new PDL value of R720.73. The reason for such an analysis on livelihoods is that income is the main factor affecting livelihoods, so by understanding the ‘real income’ for each household would paint a picture of the livelihoods of the Zanyokwe farmers.

4.6: Synopsis

The results of this whole study were obtained through these methods that have already been mentioned. These include the multiple regression model, cross tabulation and the use of simple statistics. These results were then represented on schematic diagrams such as tables, graphs and charts to make interpretation easier. In their interpretation, the results were compared with those suggested in the frameworks of analysis suggested earlier on (see chapter three). The reason for doing this comparison was to identify, hence give explanations for any possible variations between the actual field and the expected desk results. Therefore, these frameworks were adopted to provide a “measuring stick” by which the socio-economic impact of the BMP project was evaluated.

5: RESULTS AND DISCUSSION OF THE SEIA

5.1: Introduction

This Chapter reports on the impact the BMP project has had on the social and economic status of farming households at Zanyokwe. It begins with a broad picture of the demographic characteristics of households in the study sites as obtained during the investigation period. An attempt is made to compare this information with that obtained in 2005 during the situation analysis. Thereafter, the social impact assessment section, which is followed by the economic impact assessment, is also discussed.

5.2: Demographic characteristics

5.2.1: Composition and size of the Zanyokwe households

In 2005, a total number of households interviewed amounted to 68. During the 2007 survey, the plan was to interview the same households in order to track changes over this two-year period. However, only 47 of the 68 households interviewed in 2005 were available to be interviewed. Apparently some of the farming households interviewed in 2005 were food plot holders and were no longer active in farming at the time of this investigation. The main challenge faced by this group of farmers was the lack of access to irrigation water. These 21 farmers who were interviewed in 2005 but could not be reached during this survey were not removed from the data base. This is because those who had left the scheme were plot holders who cultivated only small pieces of land and did not contribute much to the scheme. The farmers who were available both for the baseline and this study were the ones who cultivated bigger land, hence their availability for this study created a reasonable basis for a comparison. Furthermore, the 2005 data base was also presented in the form of percentages to allow for a comparison to be made with the 2007 data.

Apart from the food plot holders, other households seemed to have discontinued farming and moved to neighbouring towns such as Keiskammahoek and Middledrift. One of the reasons given to explain such relocations was the fact that the BMP team, together with the Department of Agriculture had failed to address the constraint of water among the food plot holders. This lack of access to water was caused by the theft and vandalism of the irrigation equipment from the scheme as was stated in chapter 1.1. Leakage of pipes, which resulted to low pressure, also appeared to be a problem affecting the irrigation practices of farmers.

As revealed in Table 5.1 overleaf, on average there were six people in each household, ranging from one to fifteen. This figure increased from the national average figure of five people per household in 2005 to six in 2007. The number of active people also showed a slight increase from three people in 2005 to four in 2007, making this group to remain the biggest in terms of household population as was the case in 2005. Perhaps such an increase could be attributed to the fact that some of the people who were below the age of 15 years had since joined this category as they were now 15 years or older. However, in spite of such increases in total population size and the number of active people, Table 5.1 shows that the Adult Equivalent (AE) for each household dropped from four adults to three per household.

Table 5.1: Composition and size of households in ZIS from 2005 to November 2007 (n=47)

Demographic Variable	2005	2007	Mean (2005)	Mean (2007)	Range (2005)	Range (2007)
Active people (15-64 years)	134	166	3	4	1-7	1-10
Number of Children	98	75	2	2	0-4	0-6
Number of Adults	209	189	3	4	1-7	1-10
Total population size (All HH)	307	264	5	6	1 -9	1-15
Adult Equivalent	221	185	4	3	1-6	1-3

5.2.2: Gender and age of household heads

The gender distribution of the household heads in Zanyokwe had not changed since 2005. As demonstrated in Figure 5.1, the majority (83%) of households were still being headed by males and only 17% by females. Such gender distribution in Zanyokwe concurs with the conclusions made by the Department of Agriculture (2002) that less than “one third of all South African households are female-headed.” However, it should be noted that women usually do not choose to become heads of household but it is the “absence of a man able to play this role that leads them to perform these duties” (UNDP, 2001). As such, the female heads category consisted of widows, the divorced and those not yet married.

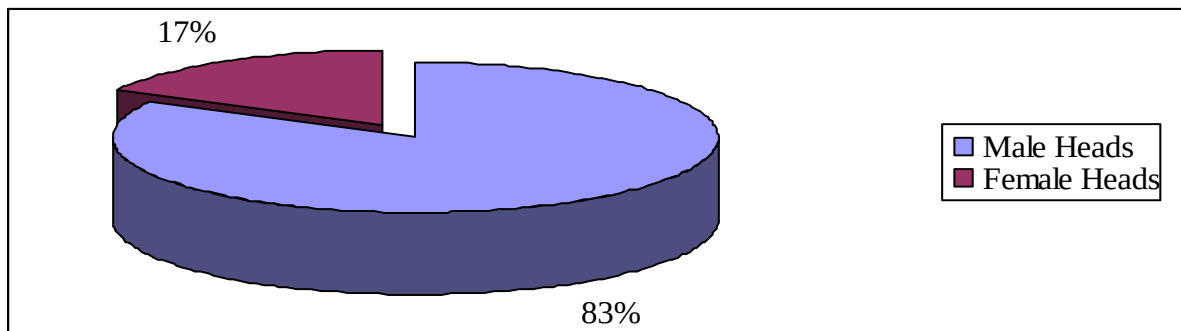


Figure 5.1: Gender of household heads at ZIS in November 2007 (n=47)

On average, the age of heads of households in Zanyokwe was 49 years but with the youngest head being 24 and the oldest 83 years old. Unlike in 2005 where the youngest farmer was 29 years old, the past three years saw an increase in the number of younger people more involved in farming. These young people of between 24 and 27 years made up 6.3% of the total sampled population but 38.4% are in their forties.

5.3: Impact of the BMP project on the social status of households

5.3.1: Relationship between the BMP project team and beneficiaries

The importance of a good relationship between the project implementers and beneficiaries cannot be over stated. The understanding of the project by beneficiaries as well as their active participation in the project is very important for the success of any project. When the respondents were asked about their awareness of the BMP project taking place in their community, 66% of them indicated that they were aware (see Figure 5.2). The other 34% did not seem to know anything about the BMP project. A possible explanation for these results could be the fact that the interviewees in some households were persons other than the farmers or heads of households. Furthermore, when the baseline study was done in 2005, 68 farmers were interviewed but some of them did not necessarily join the BMP project after its implementation, hence the reason why they said they were not aware of the project. Thus, it must be acknowledged at this stage that not every scheme member who was present when the project was launched in 2005 later joined the project. However, the reason for not removing them from the sample is that their existence helped determine the membership of the BMP project. Therefore, they showed the BMP team how many farmers joined the project out of all those who attended its implementation. Figure 5.2 shows the respondents' awareness of the BMP project in November 2007.

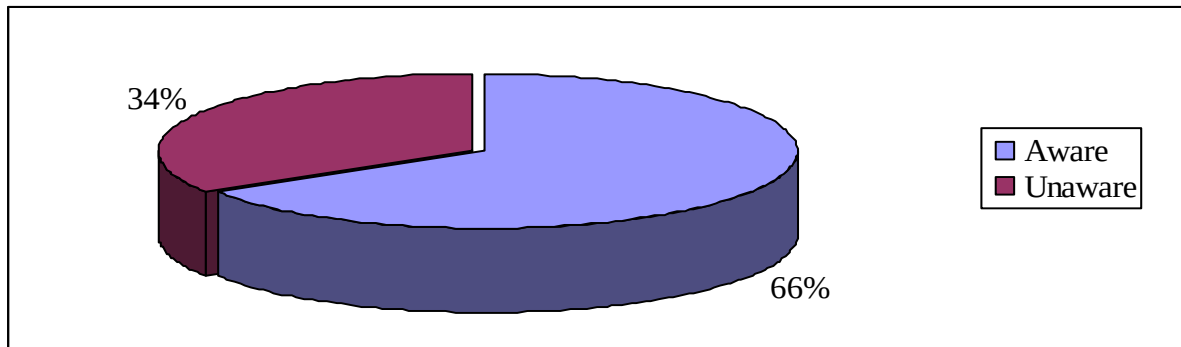


Figure 5.2: Awareness of the BMP project by the respondents in November 2007 (n=47)

Although the BMP was mainly about identifying and testing “best management practices” for revitalizing irrigation farming in the Eastern Cape and KwaZulu-Natal, its final outcome was to improve rural livelihoods. The respondents therefore showed an understanding of the objectives of the BMP project as they identified poverty alleviation, enhancement of production, food security for the farmers, community development, job creation as well as improvement in the skills and knowledge of the farmers. The proportion of the farming households who identified each of these objectives are shown in Figure 5.3.

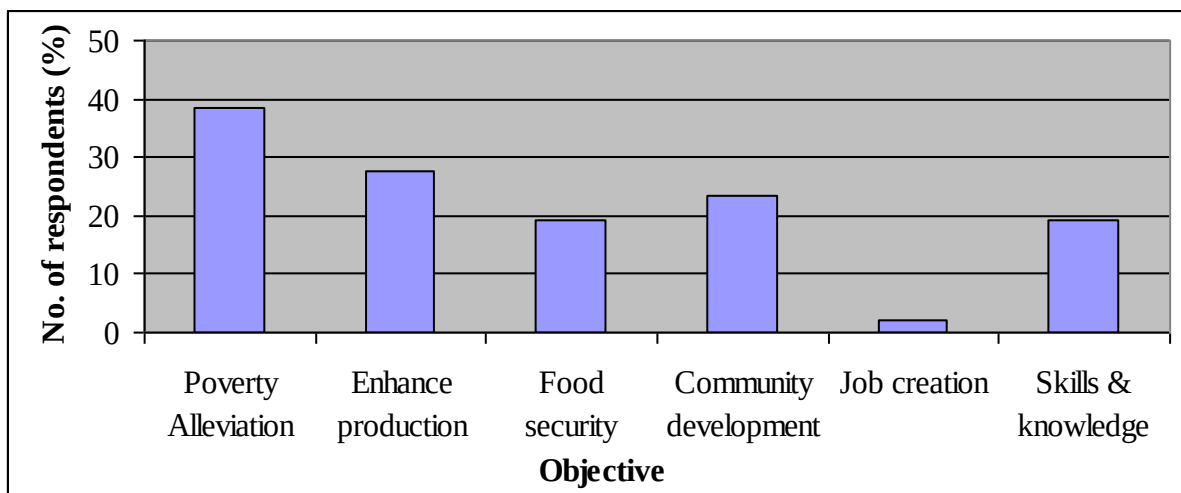


Figure 5.3: Objectives of BMP project as perceived by farmers in November 2007 (n=47)

About 38% of respondents recognized poverty alleviation as the most important objective of the BMP project. Thus, they perceived the project as a strategy meant to help them escape this vicious cycle of poverty and improve their quality of life. Following poverty alleviation was the enhancement of production and community development objectives. Such an understanding of the objectives of the project suggests good communication between the project initiators and beneficiaries. In addition, respondents also highlighted that the team

members were always willing to assist them in their farms. As a result, 73% felt strongly that the BMP project was in the right direction towards meeting the stated objectives.

Slightly more than 40% of this 73% cited improvement in markets and sales while the others mentioned improved access to inputs as well as job creation as their reasons for believing that the project was indeed in the right direction. The other 27% of the respondents felt otherwise about the project being in the right direction to meet the set objectives. The lack of visible progress and credit facilities were given as explanations for such an opinion despite the latter not being the goal or responsibility of the BMP project.

5.3.2: Impact of new technologies and practices on farmers and their households

In line with Crosby's (2000) perceptions that "sustainable irrigation farming is only possible if the production levels attained make it affordable", the BMP project team introduced a number of technologies and practices at Zanyokwe during the past three years with the aim of improving household farm production. The information presented in Table 5.2 was obtained from the sampled farmers through interviews. This table shows a lot of improvement in agronomic practices as practices such as the use of wetting front detectors, best times to irrigate, cropping calendar and low cost irrigation practice were not used at all prior to the introduction of the BMP project. Most farmers, (98%), as demonstrated in the table adhered to the correct cropping calendars and time of planting. They also made use of certified seeds as well as correct rates of fertilizers and herbicides. This investigation revealed that at least 91% of the farmers were now using the correct rates of herbicides and fertilizers compared to 81% noted in 2005. The baseline study showed that 15% of the respondents used animal manure but this seems to have been discontinued as none of the same respondents stated they were still using it. Integrated pest management was a practice adopted by almost 94% of farmers. These technologies and practices introduced as well as the proportion of farmers who adopted them are shown in Table 5.2.

Table 5.2: Practices and technologies adopted at ZIS by November 2007 as stated by farmers (n=47)

Name of Technology/Practice	Farmers who adopted (%)	Farmers who did not adopt (%)	Total (%)
Low cost irrigation practice	70.2	29.8	100
Wetting front detectors	36.2	63.8	100
Best times to irrigate	91.5	8.5	100
Introduction of crops that have demand	85.1	14.9	100
Cropping calendar	97.9	2.1	100
Correct time of planting	97.9	2.1	100
Use of certified seeds	91.5	8.5	100
Correct plant population	87.2	12.8	100
Integrated pest management	93.6	6.4	100
Correct rates of herbicides and fertilizers	91.5	8.5	100
Use of no-till planter	53.2	46.8	100
Introduction of new maize cultivars	38.3	61.7	100
Land use intensity at all seasons	76.6	23.4	100
Keeping of records	70.2	29.8	100
Better leadership	66.0	34.0	100
Conduct of meetings	70.2	29.8	100
Legal and registered structure	36.2	63.8	100
Facilitation and formation of WUA	8.5	91.5	100
Marketing – collective action	17.0	83.0	100
Formal contracts	8.5	91.5	100
Exposure on marketing	31.9	68.1	100
Better access to input & output markets	34.8	65.2	100

As also shown in the same table, more than ninety percent of respondents indicated the improvement in the management of water through irrigation scheduling. Despite Clyma's (1996) stance that the adoption of scientific irrigation scheduling by smallholder schemes in South Africa is far below expectations, 92% of farmers in ZIS mentioned that they now irrigated at the right times ever since the introduction of the BMP project in an attempt to achieve maximum yields by maximizing water use efficiency, avoiding water wastage and plant stress (Lamacq, Le-Gal, Bautista and Clemmens, 1996). Prior to the project, Monde, *et*

al. (2005) noted that there was no proper scheduling of irrigation as all the farmers irrigated at any time of the day, even when it was too hot. The BMP team discouraged this practice and introduced wetting front detectors in an effort to enforce management of water amongst irrigators. The majority of these farmers as revealed in Table 5.2 still did not have access to these devices. Nonetheless, those who made use of these devices said they were useful and enabled them to conserve water. On the other hand, those who did not have the devices also wanted but could not afford to buy them. Further interaction with the respondents revealed that there were some farmers who wanted the devices but did not buy them not because they were expensive but simply because they were not willing to buy them as the few who were in possession of the devices did not buy them either. Instead, they were given by the BMP team to those whose farms were used during the demonstration of the technology. In terms of figures, less than five farmers got the devices for free from the BMP team and the rest were advised to buy their own.

The interaction of the BMP project team with the farmers also had an impact on the way farmers viewed farming. During this three year period, the team encouraged the farmers to take farming as a business. Arzeno (2004) once argued that the first and most important step in farmers taking control of their farm operation's financial well-being is to keep good and accurate financial records. Two major reasons were also highlighted by Arzeno (2004) for keeping these financial records and these include credit application and financial management purposes. These financial and production records act as a management tool by helping the farmers plan for the future, pinpoint the weaknesses of their farm businesses thereby allowing them to act accordingly, thus increasing profitability. As shown in Table 5.2, more than 70% of the respondents have adopted an attitude of keeping both physical and financial records. The necessary training on how to keep farm records was offered through workshops held at Fort Cox College, a nearby agricultural college.

In addition, a change was noticed in the area of marketing as 83% of the farmers adopted the collective action marketing strategy. This was an improvement from the 67% of farmers in who solely relied on farm gate selling. Such an approach to marketing helps magnify the voices of individual farmers, facilitates meeting market demand, reduces the costs of getting the products to the market and also improves the bargaining power of farmers (Johnson, Suarez and Lund, 2002; Knox, Meizen-Dick and Hazell, 1998; Agarwal 1994). This high adoption rate of the marketing strategy is a major change compared to less than 20% during

the situation analysis. Sixty eight percent (68%) of respondents stated that they also benefited from the marketing exposure as the BMP team took them to various markets in the province. Nevertheless, the farmers had not made much progress in the drafting of formal contracts and introduction of new crops that have high demand.

The contract marketing strategy appears to still be met with the same mixed feelings the way it was viewed in 2005. Only 8.5% of the respondents engaged in formal contract marketing. The reason given by the respondents for such a low adoption rate is that the respondents feared that the buyers would never pay them on time for the produce supplied. This problem was noted also in 2005.

Table 5.2 basically shows that the majority of farmers adopted most technologies and practices introduced at ZIS. However, this information does not say much about whether adopting these techniques had any positive or negative impacts. It is therefore important to evaluate the kind of impact these new practices have had on the social and economic status of farming households. While farmers showed a change of attitude and behaviour towards farming, some of the new practices adopted had a negative impact on their social status. This negative impact was in the form of increased stress levels and was said to have been caused by the adoption of such practices as correct time of planting technique, the use of no-till planter and record keeping techniques.

The correct time of planting approach demands that the crops be planted at the correct time in order to improve both quantity and quality. Failure to follow the correct cropping calendar could lead to poor quality products and hence poor financial returns for the farmers. The biggest demand of this technique as identified by farmers was labour, which is one of the most limited resources for the farmers in the scheme even though Pant, Gautam, Shakya and Adhikari (2006) expected it not to be a problem as the average household size of six per household was above the national average of five people per household. Furthermore, most farming activities in this farming community are usually performed by one member of the household, the household head in most cases. With the adoption of the new practices, that did not change. The only thing that changed was the fact that farmers had to spend more time in the fields than was the case before the introduction of the BMP project.

As for the use of the no-till planter, despite the fact that it had been adopted by 52% of the farmers, indications are that this practice sometimes resulted in germination problems as some seeds failed to grow. Bates and Danton (1999) ascribed such germination problems to the farmers' failure to follow the correct operating procedures such as "how to adjust the seeding rate, how to change the seeding depth, how the weight and ballasting system works, and what the horsepower and hydraulic requirements of the drill are". At the same time, some respondents were of the opinion that this practice wasted precious land as it required heavy dispersion of seeds and with lots of big spaces between successive plants. In addition, several respondents noted that using the correct plant population practice meant that they had to be very careful in determining the correct spaces between successive plants in order to get the correct plant population. These farmers argued that they determined the correct population of the different crops that they cultivate using guesswork and those who had tried this practice received low yields when they got the population wrong.

As was the case in 2005, 96% of the household heads identified themselves as full time farmers. The only difference between this study and that of 2005 was the change in the number of days and hours worked in the fields. This study revealed that over 50% of heads of households worked daily in their fields compared to 2005 where only a few worked during the weekends. The rest of the farmers worked four to six days per week. Each of these farmers spent an average of 7hrs per day, ranging from three to ten hours but at least 30% spent nine hours per day in their fields each day (see Figure 5.4).

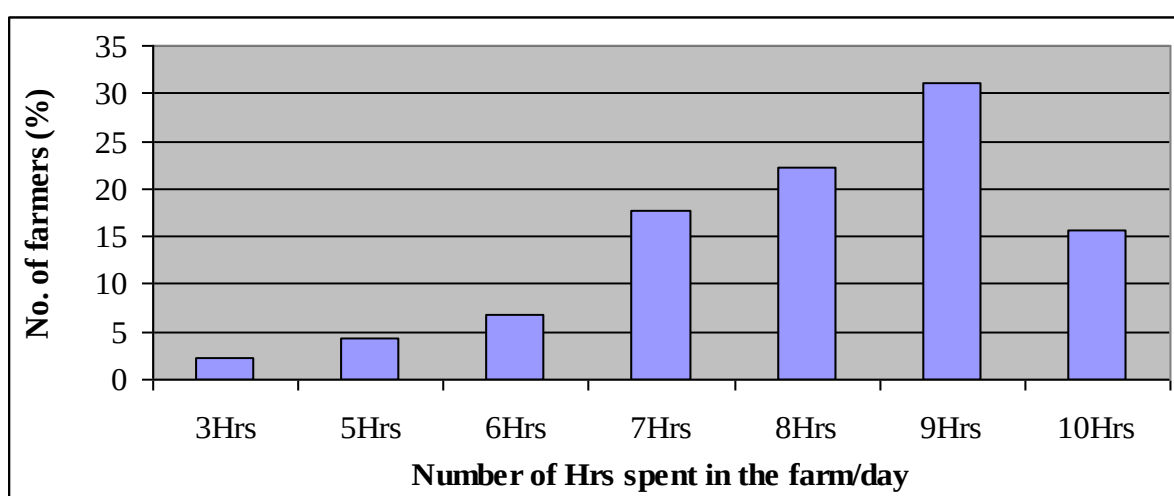


Figure 5.4: Average time (hrs) spent in the field/day at ZIS during 2006/7 season (n=47)

A number of studies such as those conducted by the World Vision (2004) and Monde (2003) pointed out that farming in the Eastern Cape and other areas of South Africa is slowly losing its importance as a source of livelihood. This is largely because of the new attitude of heavy reliance on the social grants (such as the old age, disability and/ child grants) that have emerged as the most important source of income in such rural areas of SA. The existence of such external sources of income has led to most farmers in the region devoting less time and effort to farming. However, findings from this study suggest otherwise.

Several empirical studies in different countries done by Chambers (1988) also demonstrate that irrigation systems should directly raise employment by increasing both the number of days worked per hectare and days worked during a cropping season. Even though the labour hired is on temporary basis at times, there are some who are hired permanently. Those who are seasonal or temporary labourers also get hired by different farmers each season depending on the need for extra labour and the availability of the means of payment. Such has become the case in Zanyokwe as the implementation of the BMP project has reversed the tendency of farmers putting less effort (and spending less time) farming in their fields. In actual fact, more than 80% of farmers as shown in Figure 5.5 stated that they now spent more time in their fields compared to three years ago. In Kydd and Dorward's (2001) opinion, history shows that the majority of the rural poor such as those in Zanyokwe are located in areas with no viable alternative income generating activities to agriculture. Therefore, notwithstanding the fact that 18% of households in the scheme still survived mostly on external income sources, indications point to the fact that they too will soon become more active in farming.

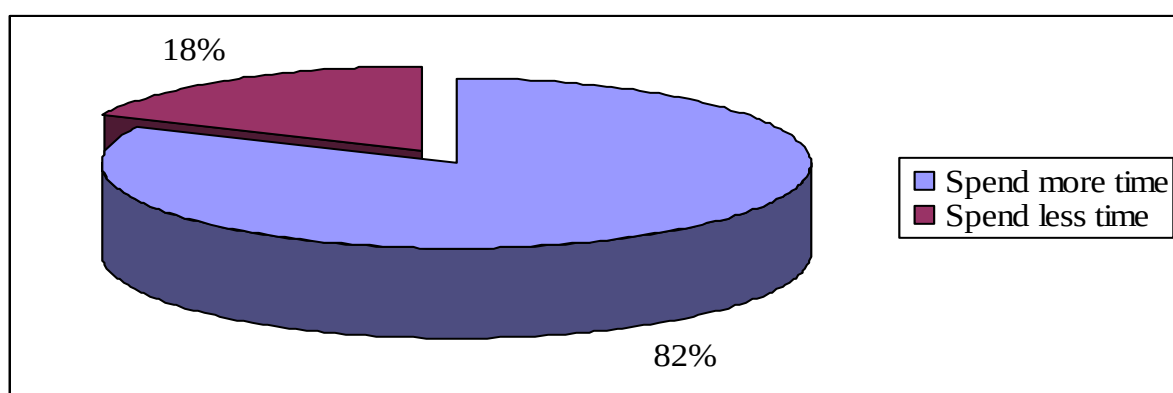


Figure 5.5: Time spent in the field at ZIS in November 2007 compared to 2005 (n=47)

As the farmers indicated, some of the new practices required more labour but due to financial constraints, most of them could not afford to hire more people to work in the fields. As a result of this, most of them had therefore resorted to increasing the number of hours they personally spent in their fields. This was one of their coping strategies to deal with the demands of the new practices as also noted by Bird and Shepherd (2002) in the various irrigation schemes they studied. As far as the gender bias of the new practices is concerned, none of them seemed to favour a specific gender over the other since all respondents mentioned that none of the practices introduced were gender specific.

5.3.3: Impact of the BMP project at community level

According to the respondents, the BMP project impacted even on non-members of the ZIS. Sometimes the project members held functions such as field and information days. The invitation to these functions was usually extended to non-project members. Forty-nine percent (49%) of respondents indicated that the non-project members attended and participated in these events (see Figure 5.6). These respondents further indicated that some of the non-members had even adopted some of the practices introduced in the BMP project. The practices adopted by non-members included the use of certified seeds, correct rates of pesticides and herbicides application, correct planting time, and fertilizer application.

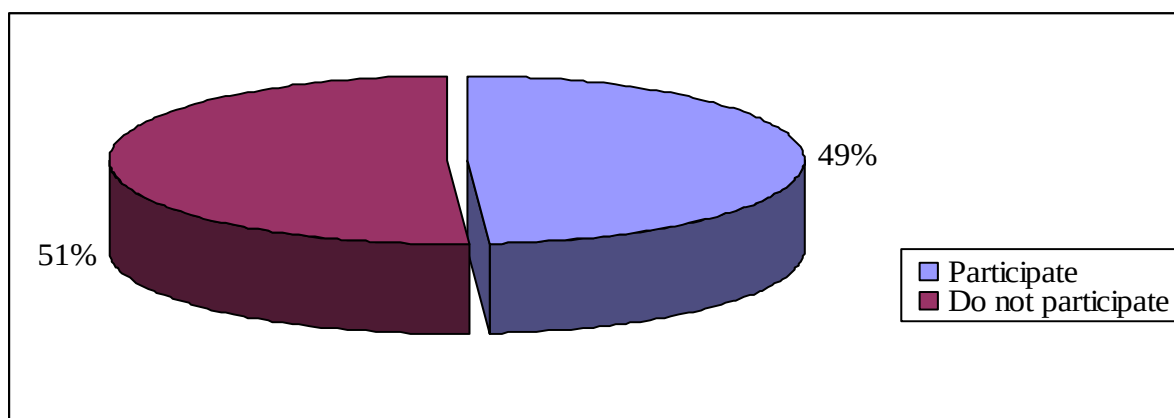


Figure 5.6: Participation of non-project members in scheme affairs in November 2007 (n=47)

The majority of respondents were of the opinion that the correct time of planting, followed by the use of certified seeds was the most common practice adopted by the non-project members. What attracted the non-members of the project to adopt the use of certified seeds technology is that these certified seeds have some yield advantage compared with farmers'

home-saved seeds because of their chemical coating that makes them unpalatable to termites beneath the soil (Philippine Rice Research Institute, 2000; Boland, Dhuyvetter and Howe, 2001). Consequently, almost all the planted seeds germinate, unlike those seeds taken from previous harvests that had not been treated.

Other social benefits enjoyed by the communities at large included the use of scheme resources such as the roads, irrigation equipment and tractors as demonstrated in Figure 5.7. From the information presented in this figure, it is apparent that the scheme roads are the most accessible resource to the general community members as highlighted by more than 60% of respondents. Even though the roads were accessible to everyone, they were still in the same bad state that they were in three years ago. They were all gravel hence made the farms inaccessible unreachable both by vehicles and on foot especially during the rainy season as they became slippery when wet. The two bridges leading to the Lenye section are also narrow and too low hence water usually flows on top of them when the streams flood. This automatically cuts the community from its vital markets whenever it rains.

Nonetheless, the farmers said they saw no need to restrict the accessibility of the roads as they are a “public good”³ which they were willing to share with other community members. Moreover, since the farmers practiced the gate sales marketing strategy whereby the buyers went to the farmers’ fields to make purchases, there was no way the scheme members could forbid them from using the scheme roads. Such a sales strategy is common in South Africa and therefore, Magingxa and Kamara (2003) considered it as a major characteristic of most smallholder irrigation schemes in the country. Another example of a scheme using the gate sales marketing strategy is the Boschkloof Irrigation scheme in Limpopo.

³ Holcombe (1997) defined a public good as a good that, once produced, can be consumed by an additional consumer at no additional cost and no consumer can be excluded from consuming it.

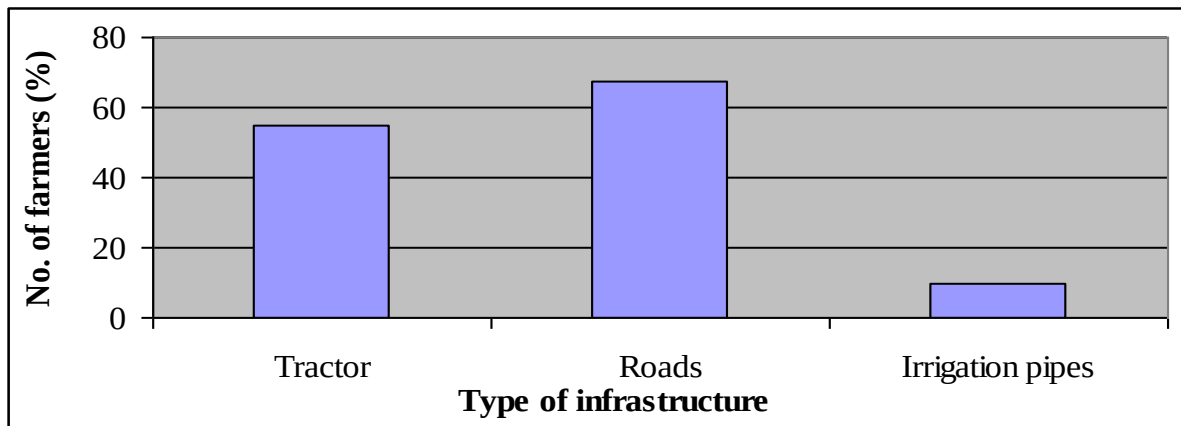


Figure 5.7: ZIS resources accessible to non-scheme members by November 2007 (n=47)

Lahiff's (2000) research suggests that in the past, smallholder irrigators in South Africa had access to very cheap public tractor services even though they may not have been particularly efficient. However, such services have since been withdrawn by the government and as a result; the ZIS now has its own tractors for its members which it hires out for use by non-scheme members. These non-scheme members were allowed access to tractors only when they were not being used by scheme members. In other words, priority is given to ZIS members. There are also few farmers in the scheme who own tractors for private use and these could also be hired by any community members, whether members of the ZIS or not.

As for the irrigation pipes, they belong to the individual farmers who, upon request can also lend them to their neighbours. However, none of these pipes had been replaced since 2005 hence the condition of most of them was still in a bad state despite the introduction of the new practices. Most of them were too old and therefore leaked heavily and this resulted in serious water wastage.

5.4: Impact of the BMP project on economic status of farming households

5.4.1: Production and land use intensity

There was no evidence of new crops at ZIS from the data collected during this investigation. Farmers were still involved in the production of the same crops as in 2005. In fact, the production of some crops and vegetables such as tomatoes and pumpkins seemed to have been discontinued as none of the respondents mentioned them. Of the eleven crops and

vegetables identified, maize, cabbages and butternut were produced by a larger proportion of farmers as demonstrated in Figure 5.8.

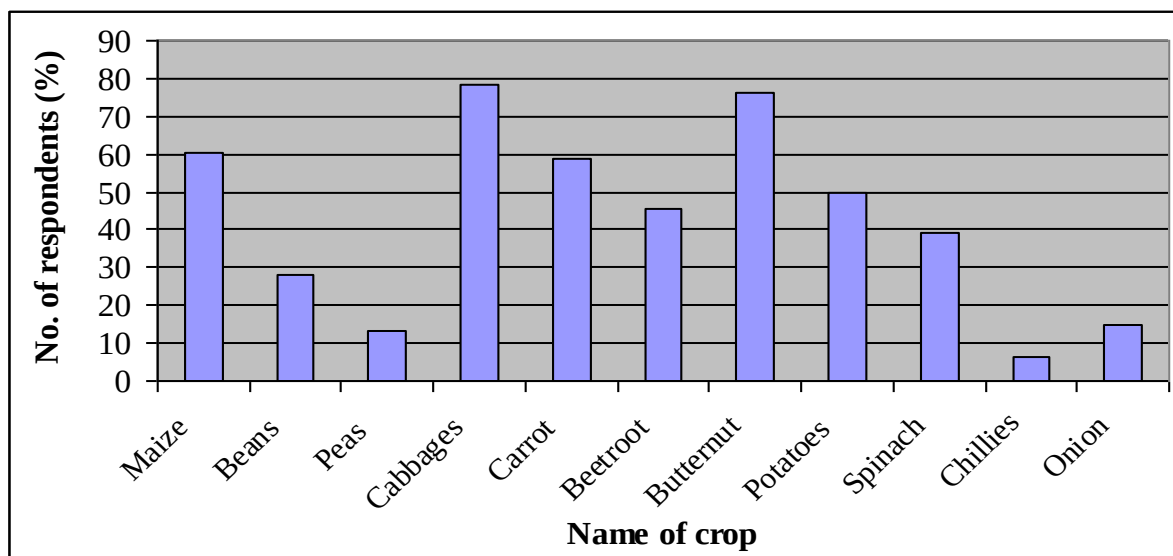


Figure 5.8: Type of crops grown at ZIS during the 2006/7 season (n=47)

Although no new crops were introduced, changes were identified in the cropping pattern at Zanyokwe. One change was the decrease in the number of farmers producing maize and the other the increase in those producing butternut. In 2005, all farmers produced maize but this investigation shows only 58% involved in maize production. According to the findings of this investigation, maize is the third largest produced crop at ZIS (refer to Figure 5.8).

Forty percent (40%) of farmers produced butternut in 2005 compared to more than 70% in this investigation. This big change is a result of two factors. One is the adoption of the best management practices introduced by the BMP project team. The BMP team encouraged the farmers to take farming as a business, and focus on those products that brought highest returns, which in the Zanyokwe case is butternut and cabbage. The evidence proving that butternut and cabbages were the highest selling crops is presented in Table 5.4. The other contributing factor was the fact that farmers were not making much money from maize production (the contribution of maize, butternut and cabbages to household income in the scheme is shown in Table 5.4). Most farmers therefore decided to switch from maize to butternut production as those who were already involved in this product were making good money.

In terms of proportion of the land allocated to the main crops and vegetables mentioned above, there was not much of a change especially in the case of maize. The average land size allocated to this crop decreased by just 0.2ha from 1.7ha in 2005 to 1.5ha in 2007. Despite such a decrease, maize in the scheme still occupied portions of land that are bigger than the total size of most irrigation schemes such as those studied by Abernethy and Sally (1999) in the Niger valley and Manzungu, *et al.* (1999) in the Nyanyadzi scheme in Zimbabwe. A major change in land cultivated was noticed in the case of cabbages and butternut whose acreage increased almost by 100% in both crops. In 2005, only 0.5ha was allocated to each of these two crops and findings of this investigation show the land size to have been increased to almost a hectare (0.9ha). The area planted to other crops in Zanyokwe still ranged from 0.1 to 0.5 ha.

There seems to be a change in land use intensity as well. Almost half of the respondents indicated that they produced mostly vegetables in both summer and winter cropping seasons. The best part (60.9%) of respondents produced cabbages in both seasons compared to only three percent (3%) in 2005. Thus, in 2005, cabbages were produced solely as summer crops (i.e. grew them in summer only). Since the introduction of the BMP project, that habit changed and not only for cabbages, but for most vegetables as well except for peas, beans and butternut which are either winter or summer crops, and not both. The change in land use intensity is demonstrated in Figure 5.9 and shows 67% of farmers acknowledging the change in land use intensity during this three year period.

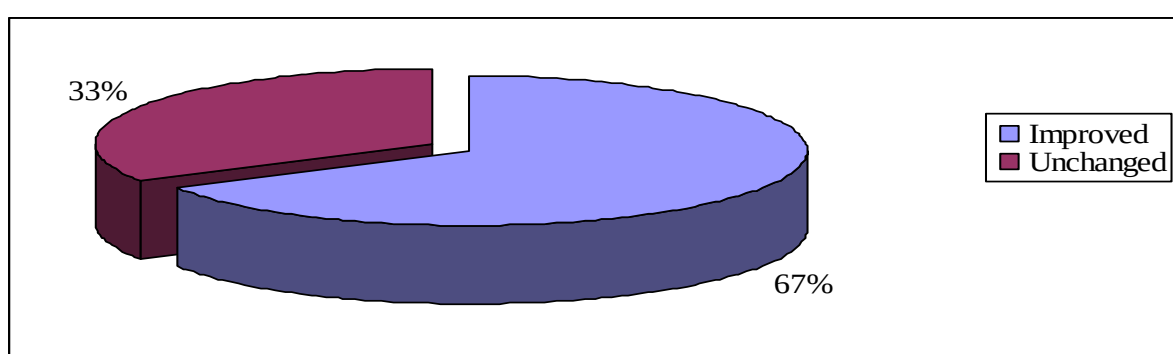


Figure 5.9: Changes in size of cultivated land at ZIS from 2005 to November 2007 (n=47)

Table 5.3 shows the proportion of land used in winter as well as the number of farmers cultivating those proportions.

Table 5.3: Proportion of land cultivated at ZIS in winter in 2007 (n=47)

Proportion of land cultivated	No. of farmers (%)
All land cultivated	24
Three quarters of land cultivated	11
Half the land cultivated	45
Quarter of the land cultivated	20
TOTAL	100

According to the table, 45% of farmers cultivated half of their land. Less than a quarter (24%) cultivated all the land they own or have access to whilst the other 20% made use of just a quarter of it. Water shortage and low temperatures were given as the reasons for not cultivating all the land in winter. Be that as it may, this is a major improvement compared to the near-zero numbers during the same winter season in 2005.

5.4.2: Impact of the BMP project on household incomes

When asked whether there had been any improvements in farm incomes during this three year period, 82% of respondents said “yes”. The responses to this question are presented in Figure 5.10. The 18% whose response was negative were those who said they had not yet adopted the best management practices. They mentioned that they did not have the sufficient funds to purchase the necessary inputs required by these new practices.

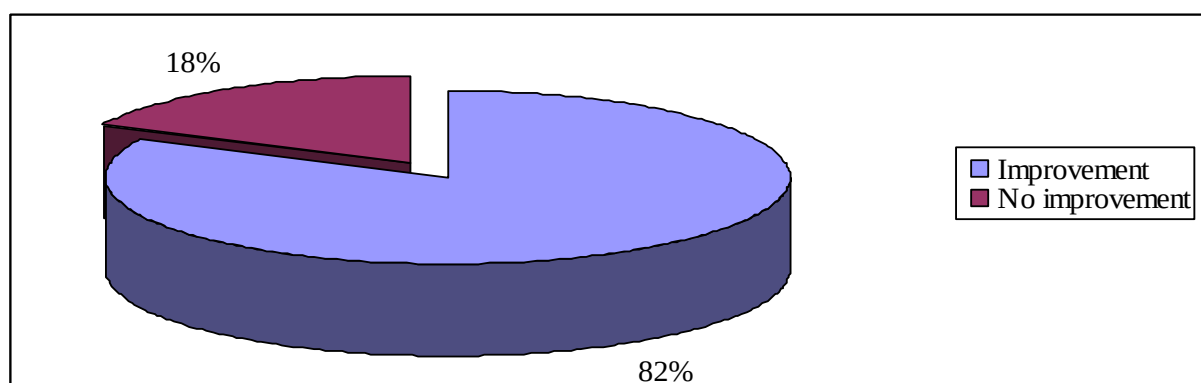


Figure 5.10: Changes in farm income at ZIS from 2005 to November 2007 (n=47)

Still on the issue of income, it was necessary to understand how these income changes had affected the economic well-being of the respondents since 2005 especially since literature from Hasnip, Mandal, Morrison, Pradhan and Smith (2001) presented economic well-being as one of the measures of poverty levels. As used in this context, economic well-being was generalized to refer to the state of households being healthy, happy, or prosperous (Mishra, El-osta, Morehart, Johnson, and Hopkins, 2002). All these states depend on a number of various factors such as family characteristics, the resources of these farm households, production and employment levels, and the ability of income to meet consumption, savings and other household needs. However, it should be acknowledged at this stage that use of income as the sole measure of economic well-being does overlook other indicators such as the wealth held by the household and the level of consumption expenditures for health care, food, housing, and other items as Mishra, *et al.* (2002) pointed out. Cantó (2000) and Ravallion (1992) agreed with Mishra, *et al.* (2002) that expenditures are typically a better guide to longer term well-being as households will exercise some consumption smoothing and use savings and ‘dissavings’ to deal with erratic incomes.

Nevertheless, the BMP project was expected to act as the source of such economic well-being by improving the farmers’ income, hence the choice of income as a measure of well-being. So far, 74% of the farmers who are members of the BMP project had experienced improvements in their economic well-being as the project had allowed them to get more from their fields than before its implementation. Figure 5.11 shows how the respondents perceived the BMP project to have affected their economic well being since 2005.

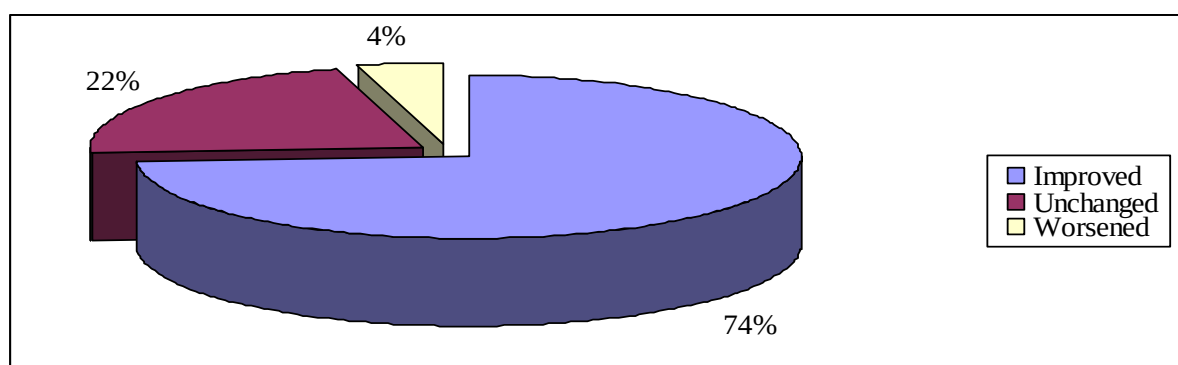


Figure 5.11: Changes in economic well-being of ZIS households between 2005 and November 2007 (n=47)

There also appears to have been no change when it comes to the main livelihood strategies at the ZIS as the farmers in the scheme still practice “pluriactivity⁴”. This means they continue to survive on both farming and non-farming activities but with the former still making major contributions to household income. Bird and Shepherd (2002) noted the same behaviour in the Zimbabwe’s Chivhu and Matopo smallholder schemes. In very production irrigation schemes like the ZIS, the tendency is that this pluriactivity strategy tends to decrease as the field size grows. Thus, farmers in such schemes tend to forgo other livelihood activities to concentrate more on farming to get income since farming is already their main livelihood strategy.

Anderson and Leiserson (1980) and Reardon (1997) posited that the frequency of “pluriactivity” should be inversely related to the average income level. Thus, in poor areas where households typically operate both farm and non-farm activities, they may not do very efficiently in both activities but are able to compensate for a poor asset base and survive by concentrating on one activity. Findings in this study point to the fact that households in Zanyokwe do use non-farm income sources but, in accordance with this theory by Anderson and Leiserson (1980) and Reardon (1997), they specialise mostly in farming as its contribution to household income has immensely increased since 2005. Their average household income in 2005 was R593.24/month/AE (ranging from R49.61 to R2628.33) but has since increased to R1 439.16 per month per AE, ranging from R126.88 to R13 520.17 (refer to Table 5.4). Such high monthly AE incomes indicate that the Zanyokwe scheme in general is one of the success stories of the modern South African smallholder irrigation schemes. The contribution of other local economic activities such as old age pensions has since decreased from its 2005 value of 20% to just 5.5% in 2007 whilst wages and salaries contributed 4.9% in 2007 compared to 8% in 2005. The different livelihood activities as well as the average incomes earned by each adult equivalent (AE) per household per month in ZIS are shown in Table 5.4.

⁴ Reardon, Berdegue, Barrett and Stamoulis (2006) defined pluriactivity as the engaging in multiple activities such as farming and non-farming activities in order to get more income.

Table 5.4: Sources of income and their contribution to household income in ZIS in November 2007 (n=47)

Income source	Average (R/AE/Month)	Range (R/AE/Month)	Proportion (%)
External sources			
Wages and salaries	70.52	173.54 – 526.91	4.9
Old age pensions	79.29	120.42 – 499.68	5.5
Child grant	50.94	34.71 – 184.67	3.5
Remittances	46.16	21.56 – 500.00	3.2
Disability grant	22.52	20.60 – 249.84	1.6
TOTAL EXTERNAL	269.43	-----	18.7
Internal sources			
Trade	1.45		0.1
Agriculture ⁵			
Cabbages	620.04	65.37 – 12 708.33	43.1
Butternut	295.85	20.39 – 5 935.86	20.5
Maize (Grain + cobs)	93.15	29.27 – 496.83	6.5
Potatoes	69.03	4.30 – 504.95	4.8
Other crops ⁶	90.21	3.18 – 230.83	6.3
Total Agric Income	1 168.28	-----	81.2
TOTAL INTERNAL	1 169.73		81.3
GRAND TOTAL	1 439.16		100

Nonetheless, such a livelihood inclination typifies the majority of modern irrigation schemes and vastly contradicts dry land farms as shown in KwaZulu-Natal where Kirsten and Moldenhauer (2004) found out that only 3% of the 2.4million households sampled for “The Rural Survey of 1997” relied on farming activities as their main source of income. According to Shah, *et al.* (1992), this is because farm incomes in such areas are far too low for households to meet all their subsistence requirements both in and out of farming season and generate the surplus needed for development. As for the external sources of income in Zanyokwe, the social assistance grants dominated probably due to various factors put forward by Armstrong, Lekezwa and Siebrits (2008). These factors include the rapid growth

⁵ Agricultural income in this case is limited to crop production only

⁶ This includes income from crops likes beans, peas, carrots, beetroot, spinach and onions

in the take-up of disability grants by victims of the HIV/Aids pandemic and, especially, the gradual raising of the age limit for eligibility for the child support grant from seven to the current 14 years.

The most commonly grown crops at the ZIS were cabbages, butternut, maize and potatoes and as demonstrated in Table 5.4, cabbages made the most significant contribution of 43% to household incomes followed by butternut with 21%. In the respondents' view, this was a major improvement from the 2005 contributions by the same crops. Both maize and potatoes each contributed less than 10% with the former contributing 6.5% and the latter contributing 5%. According to Table 5.4, agriculture contributed a total of 81% to household income and with the remaining 19% coming from the non-farming activities. This means that agriculture's contribution has increased by 10% from 71% in 2005 to its current value of 81%. These results prove that farming, crop production in particular, is now becoming an important source of income for farmers in Zanyokwe. Such contributions towards rural household incomes support Machete's (2004) rural development literature which considered agriculture as the best vehicle to reduce rural poverty.

5.4.3: Impact on the poverty status of households

It is widely argued that agricultural growth is the key to poverty reduction in third world nations because it is ubiquitous in rural areas, geographically dispersed, massive in aggregate and labour intensive (Hasnip, *et al.*, 2001; Lipton 1977; Machete, 2004). Furthermore, a provincial study of South African households' poverty levels done by Armstrong, *et al.* (2008) revealed that the incidence of poverty in the rural areas was more than double the rates for urban areas. To find out how deep the incidence of poverty was with the households within the ZIS, their degree of poverty was analyzed. The year 2000 PDL of R593.12 was used after being adjusted using the relevant current consumer price indices (CPIs) to get the new PDL value of R720.73.

In 2005, Monde, *et al.* (2005) documented that a 61% of households in the scheme earned incomes below the PDL. Bembridge (1999) carried out similar studies in four irrigation schemes in Limpopo and concluded that between 50 and 75% of households in the region also lived below the poverty line. The same conclusion was drawn by Bird and Shepherd (2002) after discovering that nearly three quarters of households in Zimbabwe's semi-arid

areas were extremely poor. Thus, they were living on less than the minimum monthly income required by a household in order to meet its basic needs. Since the implementation of the BMP project in Zanyokwe, the scheme's poverty levels have since dropped significantly to 38%.

The statistics in Table 5.5 confirm a great improvement in the poverty status of the Zanyokwe households compared to areas like Sekuruwe and Ga-Molekane in Limpopo where the numbers of the ultra-poor still dominated those of the non-poor class (Khosa, 2003). The number of ultra-poor households involved in this study dropped from 41% in 2005 to less than 9% in 2007. Such a decrease in poverty points to an improvement in household incomes of this poverty class. Simultaneously, the increase in the number of the non-poor households from 39% in 2005 to 62% in 2007 suggests that the previously ultra-poor households have since joined the poor and the non-poor classes. A detailed comparison of the poverty data results for both 2005 and 2007 is presented in Table 5.5.

Table 5.5: Categorization of HH in the ZIS into poverty classes in 2005 and November 2007 (n=47)

Poverty class	2005 Data (n=61)		2007 Data (n=47)	
	Number of HH	Proportion (%)	Number of HH	Proportion (%)
Ultra-poor	25	41.0	4	8.5
Poor	12	19.7	14	29.8
Non-poor	24	39.3	29	61.7
Total	61	100	47	100

5.4.4: The BMP effects on farm inputs

5.4.4.1: Changes to the costs of seeds, fertilizers and pesticides

Due to the fact that an assessment of the cost of farm inputs was not done during the baseline survey, farmer perceptions were used to get an understanding of the change in their farm inputs since 2005. Using these perceptions, it appears that not all practices introduced by the BMP project team resulted in positive effects. From the information obtained and demonstrated in Figure 5.12, some respondents (46%) felt that their expenditure on farm inputs had increased during the past three years. This was due to increases in such things like input prices and land use intensity. However, changes in expenditure on inputs were

determined by comparing the changes in input cost against changes in income obtained from the crops sold. In other words, changes in expenditure on farm input were measured against the changes in farm income. Thus, 46% whose input expenditure had increased were those who, despite adopting the new practices, were spending more on inputs than they got from the sold harvest. Forty-seven percent (47%) felt the opposite. It was only 7% of the total respondents who said the BMP project had not affected their input expenditure in any way as they were still spending the same amount of money on these inputs as in 2005 and years before that.

Those who complained about the high cost of some of the new practices blamed the use of certified seeds as the main cause especially since these seeds had to be bought from input suppliers. Boland, *et al.*'s (2001) studies support this argument by the farmers by explaining that certified seeds are expensive because they all pass through field inspection and seed testing standards for varietal purity and also treated with a fungicide to control seed-borne and seedling diseases. This became a big change for these farmers as they were used to using non-certified farmer-saved or home-grown seeds.

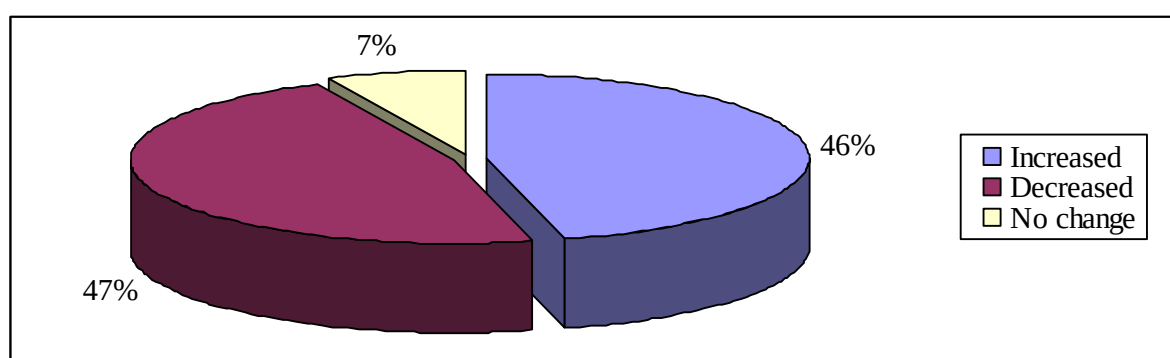


Figure 5.12: Changes in farm input expenditure from 2005 to November 2007 (n=47)

The other contributing factor was the use of fertilizer as well as increases in amounts used. In a case similar to that investigated by Maxwell, Hildebrand and Gladwin (2008) in Zimbabwe's smallholder schemes, some farmers in Zanyokwe also did not make use of fertilizers before and those who did, never applied correct rates as recommended by the BMP team. Although the same fertilizer quantity of 200kg/ha was still being used since before the BMP was introduced, its application had become more regular as all farmers now applied it every season and not after two to three years as was done before 2005. Some of the respondents though were of the belief that the increases in the prices of inputs such as

fertilizer were a result of inflation and had nothing to do with the new practices introduced. The other 7% of the respondents did not notice any changes in their farm input expenditures.

This section focuses on the proportion of respondents who purchased the farm inputs together with the average amounts they paid for these three inputs, namely seeds, fertilizers and pesticides for the 2007 season. From Table 5.6, it is clear that not all farmers bought treated seeds for cultivation. Carrot, beetroot and potatoes were the only crops whose seeds were purchased by all the respondents. The results of the situation analysis carried out prior to the implementation of the BMP project in year 2005 revealed that the farmers in Zanyokwe were experiencing serious problems in the form of pests and diseases. Monde, *et al.* (2005) documented these pests as including butterflies, stalk borers and aphids. Similar problems were still experienced by these farmers but chemicals such as bulldock, metasystox, cutworm bait, dithane and tamaron were still being used to mitigate this problem. No change was noticed in the application of these chemicals as the farmers continued to use knapsack sprayers (owned by most) for crops grown on small areas but for those grown on larger areas boom sprayers were hired. Potatoes, butternut, carrots and cabbages were the crops that had the highest percentage of over 70% of farmers purchasing pesticides to eradicate the pests feasting on these crops. The average number of respondents purchasing seeds, fertilizers and pesticides for each crop cultivated in the scheme in 2007 is shown in Table 5.6.

Table 5.6: Proportion of farmers at ZIS purchasing seeds, fertilizer and pesticides in November 2007 (n=47)

Name of crop	Total land cultivated/Hh (Ha)	Farmers growing crop (%)	Farmers purchasing seeds (%)	Farmers purchasing fertilizer (%)	Farmers purchasing pesticides (%)
Maize	1.5	59.6	82.1	82.1	67.9
Beans	1.1	27.7	69.2	69.2	69.2
Peas	1.2	12.8	50.0	16.7	33.3
Cabbage	0.9	76.6	89.2	86.5	77.8
Carrot	0.5	57.4	100.0	85.2	77.8
Beetroot	0.5	44.7	100.0	71.4	57.1
Butternut	0.9	74.5	82.9	77.1	71.4
Potatoes	1.1	48.9	100.0	91.3	78.3
Spinach	0.4	38.3	77.8	72.2	44.4

FAO (1997) pointed out that many Sub-Saharan countries have realized the critical role of irrigation in food production but that a number of constraints have been responsible for a relatively slow rate of irrigation development in this region. One of these reasons is the high cost of inputs. Still referring to Table 5.16, the bulk (91.3%) of the farmers bought fertilizer for their potato crops but 16.7% purchased fertilizer for the cultivation of peas. It is encouraging to note that the whole practice of fertilizer application had been adopted by such high numbers of farmers as can be seen from the high percentages of farmers who actually purchased fertilizers. The farmers applied the basal/starter fertilizer each season just before planting at a ratio of 2:3:4 (30) as recommended by the BMP team. However, even though this is the recommended ratio, such a mixture generally satisfies the Phosphorus requirement on reasonably fertile soils but may supply too little Nitrogen at planting as cited by Hadfield (2001). Consequently, it would need to be supplemented with one of the principal nitrogen fertilizer materials and the Zanyokwe farmers used Limestone Ammonium Nitrate (LAN), which contains 28 % Nitrogen, also about 5 % Calcium, urea (46%N) and Ammonium Sulphate to top-dress. Thus, the same types of fertilizers were used for all crops every season.

The baseline study only showed that 72% of the farmers regarded the cost of fertilizer as a demotivating factor but did not go further to investigate the average prices of this input. This study went a step further to investigate the cost of this vital input and thus revealed that the basal fertilizer was purchased at an official market price of R158.90/50kg bag whilst LAN cost R125.75/50kg bag. These average prices were then compared with those that prevailed in 2005. The conclusion reached was that the cost of fertilizer had increased over the last three years thereby making it even more difficult for the poor farmers to afford it despite its importance in farming. A summary of the different average costs incurred by each respondent for these three inputs (seeds, fertilizers and pesticides) are presented in Table 5.7.

Table 5.7: Average cost of seed, fertilizer and pesticides purchased per farmer in ZIS in November 2007 (n=47)

Name of crop	Farmers growing crop (%)	Average cost per of seeds farmer (R)	Average cost of fertilizers per farmer (R)	Average cost of pesticides per farmer (R)
Maize	59.6	595.90	581.40	301.50
Beans	27.7	171.70	335.00	281.00
Peas	12.8	186.70	80.00	258.00
Cabbage	76.6	930.00	558.80	293.00
Carrot	57.4	145.70	242.80	194.00
Beetroot	44.7	90.30	167.90	113.00
Butternut	74.5	241.40	359.00	241.00
Potato	48.9	375.65	240.80	216.00
Spinach	38.3	216.40	604.40	178.00

About 89% purchased their cabbage seedlings at an average cost of R930.00 per each farmer. This made the cabbage seeds to be the most expensive of all the seeds purchased in the area. Maize seeds were the second most expensive as each of the 82% of farmers who purchased the seeds parted with an average of R595.90. This table reveals that there were seven crops whose seeds cost an average of between R100.00 and R500.00 and these include beans (R171.70), peas (R186.70), carrot (R145.70), butternut (R241.40), potatoes (R375.65), spinach (R216.40) and onion (R154.25). Only beetroot and chillies seeds were below an average of R100.00.

Pesticides for maize absorbed the biggest share of the farmers' income as each farmer cultivating the crop had to part with R301.50 on average for the pesticides. A third (33.3%) of the farmers growing peas bought pesticides at an average cost of R258.00 whilst beetroot had the least money spent on its pesticides with each farmer paying an average of R113.00. In a nutshell, the average cost of pesticides was in the range of R200.00 to R301.50 per farmer for each type of crop grown.

5.4.4.2: Changes to the costs of draught power and farm labour per farmer

Starting with the draught power, the farmers in the scheme have not introduced any new approach for ploughing their farms other than the use of tractors. At the time of this

investigation farmers were still relying on tractors to plough and those who did not own them hired the scheme ones the same way they did in 2005. The only difference noted was a slight increase in the tractor-hiring fee as its range had increased from between R200-R450/ha in 2005 to between R250 and R500/ha in 2007, depending on the tillage operation requested. In other words, the hiring fee was not based on the type of crop to be planted but the area of land to be ploughed. Even though the use of the no-till planter reduced the cost of land preparation, the 52% of the farmers using this technique cited that this technique resulted in very low numbers of seeds that germinated. As a result, the no-till planter was only used for certain crops and not all of them.

Moving on to labour patterns in the scheme, Roder (1965) indicated that most irrigation projects have been successful in reducing the rural to urban migration by offering the rural population an alternative source of employment and income. Regarding the ZIS, it was illustrated earlier on in Figure 5.5 that 82% of the respondent farmers have been spending more time in their fields in the past three years due to reasons such as increased land use intensity. Such changes also prompted these farmers to hire more labour for farming activities such as planting, spraying, weeding, irrigating and harvesting. For each of these activities, each labourer hired was paid R25/day. With 20 working days in each month, each hired labourer therefore received at least R500/month from undertaking any of these five activities. Table 5.8 shows the average number and range of labourers for each of these farm activities.

Table 5.8: Number of labourers employed at ZIS for the 2006/7 season (n=47)

ACTIVITY	Average number of people employed by all farmers	Duration of activity/Ha	Average number of employees per farmer	Range
Planting	202	2-3days	4	1-7
Weeding	206	1week	4	1-8
Spraying	137	varies	3	1-5
Irrigating	80	2days/week	2	1-4
Harvesting	267	1week	6	1-8
TOTAL	892	-----	19	1-19

Looking at Table 5.8, the harvesting activity was the most demanding of all five farming activities. On average, each farmer hired at least six people, (ranging from one to eight) to

accomplish this activity. Planting and weeding activities were also hands-on activities, and on average farmers hired four people each to undertake them. It is important to mention that farmers at the ZIS relied mainly on hired and not family labour as is usually the case in the small-scale farming sector. In most cases, the family labour is limited to one household member, the head of household or the farmer himself. Although farmers made use of hired labour, none of the interviewed had permanent labourers. The farm labourers were hired on a part time basis and mostly during peak seasons such as the weeding or harvesting times. Sometimes labour for these peak season activities was supplemented with exchange labour, which Monde (2003) defined as the informal contracts between households in an attempt to help one another.

Although only one third (33%) of the respondents indicated that they employed more people than before the implementation of the BMP project (see Figure 5.13), the majority (56%) mentioned that these new practices required more labour. The sole reason why they had not hired more people was due to financial constraints. When things got out of hand, exchange labour was the best option for these farmers. This strategy, together with the use of family labour were the two labour-saving strategies adopted and relied on by the 11% of respondents who mentioned reductions in their hired labour to deal with high input costs such as labour.

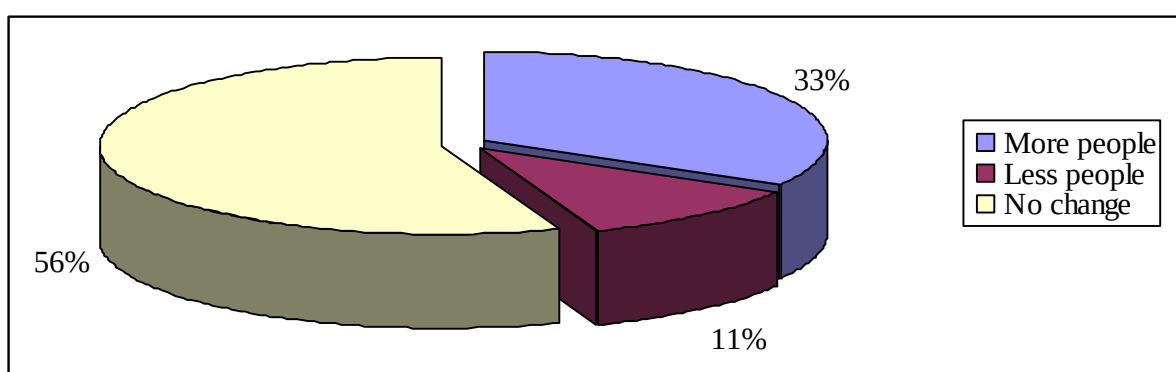


Figure 5.13: Change in labour size in ZIS between 2005 and November 2007 (n=47)

Hitherto, this chapter has discussed the impact of the BMP project on the changes in the times spent by the farmers in their farms compared to three years ago. Furthermore, a sizeable number (33%) of farmers stated that their labour had increased. However, this increase in labour does not say much about the cause hence the reason to test the association

between the labour size and time spent in the fields by each farmer. The test results of this association between these two variables are presented in Table 5.9.

Table 5.9: Association between number of labourers and time spent in the field (n=47)

Variables	$\chi^2_{\text{calculated}}$	χ^2_{critical}	Degrees of Freedom [n-1]	Probability
Number of labourers Vs Time spent in the field	58.23	62.83	46	0.0161*

Notes: * 5% significance level

Rowntree (1991) highlighted that a chi-square result can only be said to show a significant relationship if its calculated value is smaller than its critical value⁷. Applying this view by Rowntree (1991), the calculated chi-square value of 58.23 suggests a very strong relationship between the number of labourers employed and the time each farmer spent on the field as it is lower than the critical value of 62.83. This is supported strongly by the low, hence significant probability value of just 1.61% (or 0.0161). Thus, the farmers have two main options when it comes to labour, that is; (a) they either choose to sacrifice more of their own time to work their land at the expense of hiring workers or (b) they hire labourers to work for them such that more work can be done without increasing the number of hours spent on the fields each day.

5.4.5: Effects of the BMP on household food security

5.4.5.1: The general feeling of respondents towards hunger and food insecurity

FAO (2003) defined food security as a “situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” For the purposes of this research, this definition was widened to include William’s (2002) stance that food security should entail that households acquire acceptable foods in socially acceptable ways without resorting to emergency food supplies, scavenging, stealing, and/or other coping strategies.

Using this definition, Statistics SA (2000) noted that about 35% (or 14.3 million) of the total South African population is susceptible to food insecurity, with women, children and the

⁷ Thus, if $\chi^2_{\text{(calculated)}} < \chi^2_{\text{(critical)}}$

elderly being particularly more vulnerable. FAO (2004) further observed that households in the rural sector engaged in agricultural activities tend to be less poor and have better nutritional status than other households. The same sentiments were shared by Alvord (1933) who claimed that the Mutema irrigation scheme in Manicaland Province of Zimbabwe had alleviated famine in the area thereby resulting in the reduction in their need for drought relief grain from government by approximately 90 to 180tonnes per year.

Therefore, when the BMP project was introduced at the scheme, one of its general objectives was to develop and implement technologies and knowledge useful for farmers to improve their livelihoods and quality of life by enhancing their food security status. Since the implementation and adoption of new practices, 87% of the respondents indicated improvements in food security (see Figure 5.14). The main reason for the improvement in household food security was the fact that farm incomes had increased greatly as illustrated in Figure 5.10. Respondents further attributed such positive changes to their enhanced dedication towards farming than was the case three years ago.

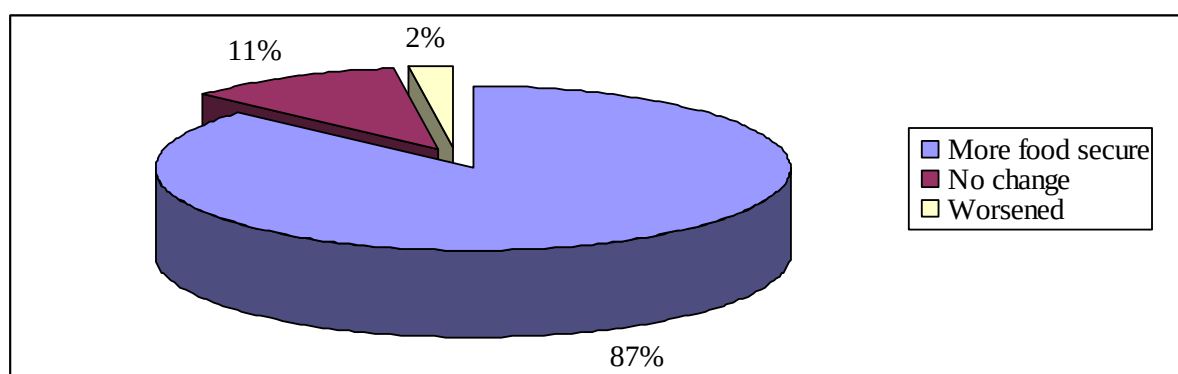


Figure 5.14: Impact of BMP on food security at ZIS from 2005 to November 2007 (n=47)

Eleven percent (11%) of the respondents highlighted that their position pertaining to their food security had not changed at all in the past three years in spite of the new practices adopted. This response was popular with those farmers who had not adopted the new practices as they continued to rely on the same income sources as before 2005. The remaining 2% stated that they were more food insecure than before the project was implemented. Some of these respondents had since stopped farming due to poor health whilst others kept failing to raise the required membership fee for the MFP that would have seen them receive free inputs. Accordingly, such farmers had not produced much in the past few years, hence no improvement in their food security status. Apart from this 13% of

respondents whose food security had either remained unchanged or worsened, it can be concluded that the new practices have had more of a positive impact on food security at ZIS at household level.

Findings by Monde (2003) showed high levels of poverty in the Eastern Cape Province. Such conclusions make it almost impossible not to assume that most rural households face at least a certain period of food shortage every now and then every year, resulting in them having to skip a meal or two. Nonetheless, evidence from this study shows that this was not the case for the scheme members as all the farmers who participated in this study denied that they ever went hungry during any time of the year. Furthermore, each household also mentioned that they ate at least three meals everyday. This was courtesy of the existence of alternative food sources such as the urban markets from which they purchased their food during times of low own production. The money gained from the sell of farm produce allowed the respondents to maintain their diet even during the times when crops were not yet ready for consumption. In other words, the farmers and their households can now afford to rely on alternative food sources to avoid going hungry during the course of any farming season.

One other interesting observation from this study was the fact that despite the scheme having 51% of farmers over the age of 49 years, all of them were still able to sufficiently provide for their families. In his interaction with smallholder irrigators in KwaZulu-Natal, Makhanya (2003) noted a demographic pattern similar to that of Zanyokwe where there was a high number of people over 49 years of age. One would have expected the farmers to become less energetic, hence less productive in farming as they grew older since farming involves a lot of very physical activity. However, this was not the case in Zanyokwe as households headed by people over 50 years old were still able to sufficiently provide for their families. This means that age in the scheme was not an issue in as far as being food secure through farming was concerned. This is shown by an insignificant chi-square critical value (χ^2) of 62.83 which is lower than the calculated value of 65.47 plus a high probability value of 0.234 at 5% significance level. The strength of this association between household head age and food security is presented on Table 5.10.

Table 5.10: Association between household head age and food security at ZIS (n=47)

Variables	$\chi^2_{\text{calculated}}$	χ^2_{critical}	Degrees of Freedom [n-1]	Probability
Household head age Vs Food security	65.47	62.83	46	0.234

5.4.5.2: Main ingredients of the diet and food acquisition strategies

Only those products consumed at least three times a week were qualified as main ingredients in this study. Foods from the cereal food group (rice, samp and maize-meal) were preferred by most respondents. These products are usually consumed with other foods which may be produced locally (such as vegetables, milk and on few occasions, meat) or outsourced from the urban markets. The information presented in Figure 5.15 shows that rice was preferred by 38%, samp by 30% and maize-meal by 32% of respondents. It is fascinating to note that people in this area are becoming more dependent on products produced outside such as rice rather than locally produced products. Perhaps this behaviour could be explained by the fact that the local diet is slowly changing due to changes in tastes and preferences. Thus, the local diet is becoming more influenced by the existence of modern products and style of living.

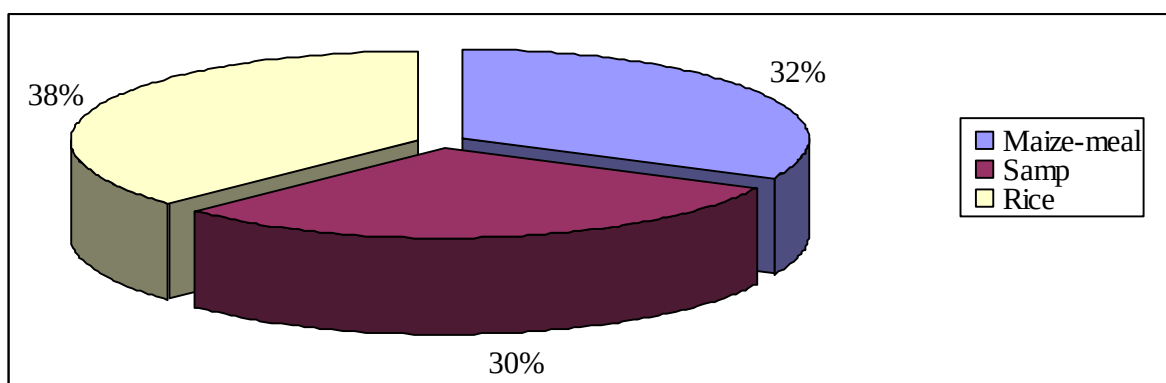


Figure 5.15: Main ingredients of diet at ZIS during November 2007 (n=47)

As already mentioned, the households in this study supplemented their three staple foods with vegetables and other foods. As illustrated in Table 5.11, maize-meal seems to be the most frequently consumed ingredient by the respondents in the scheme as it was consumed six times per week. This was followed by both samp and rice which were consumed at least five times per week. Vegetables such as butternut, spinach and the legumes such as beans and peas were consumed at least three times per week in the study area. Table 5.11 shows the main vegetables consumed as well as the frequency at which these were consumed.

Other foods included in this table are the three staples or cereals mentioned above, tubers (potatoes) and the legumes (dry peas and beans).

Table 5.11: Main foods consumed and their frequency of consumption at ZIS (n=47)

	Frequency of consumption				
Main ingredient	Everyday of the week	Six days per week	Five days per week	Four days per week	Three days per week
Rice			X		
Maize meal		X			
Samp			X		
Potatoes				X	
Legumes					X
Cabbages				X	
Butternut					X
Spinach					X
Onions				X	

Figure 5.16 shows the sources where food was sourced at ZIS. The main purposes of this analysis were to establish whether reliance on these sources changed during the course of the year, as well as to establish the importance of own production in the diet of respondents. The information obtained from the respondents in 2005 revealed two important food acquisition strategies, namely, buying or producing own food. While no new food acquisition strategies have been adopted over the past three years as revealed in Figure 5.16, there has been a change in the degree of reliance on each of these strategies. Prior to the implementation of the BMP project in year 2005, the majority (75%) of the households relied on urban markets as their major source of food and the remaining 25% relied on own production. However, the last three years have seen 66% of the respondents turning to own production (except for rice) with only 34% still dependent on urban markets as shown in Figure 5.16. Such changes towards the dependence on own fields for food production have been driven by the new practices that are said to be worthwhile as they have brought visible increases in both the quantity and quality of yields.

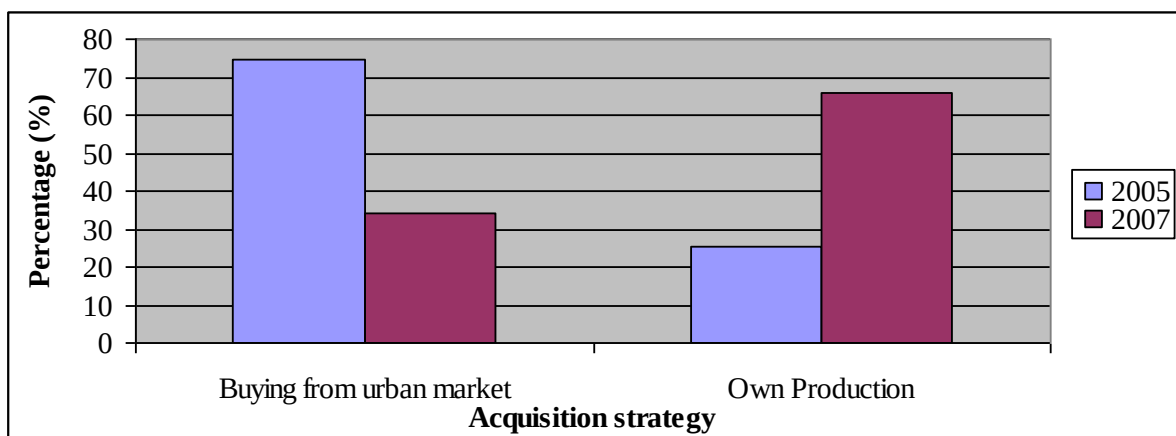


Figure 5.16: Food acquisition strategies at ZIS from 2005 to November 2007 (n=47)

Respondents gave three reasons for buying food from urban markets (refer to Figure 5.17). The most important reason was to supplement their diet. This reason was given by 34% of the respondents and was followed by the need to actually diversify the diet with the hope of attaining a balanced diet (29%). The farmers only produce a few crops like butternut, potatoes and spinach, just to mention but a few, and these crops are not enough for them to acquire a balanced diet. There is therefore a need for them to also purchase processed foods which give them nutritional value that they cannot get from their field crops. Almost 11% buy food items when their own crops would still be in the fields and not ready for consumption. This is usually the case from the planting time until the crops are mature enough to be harvested.

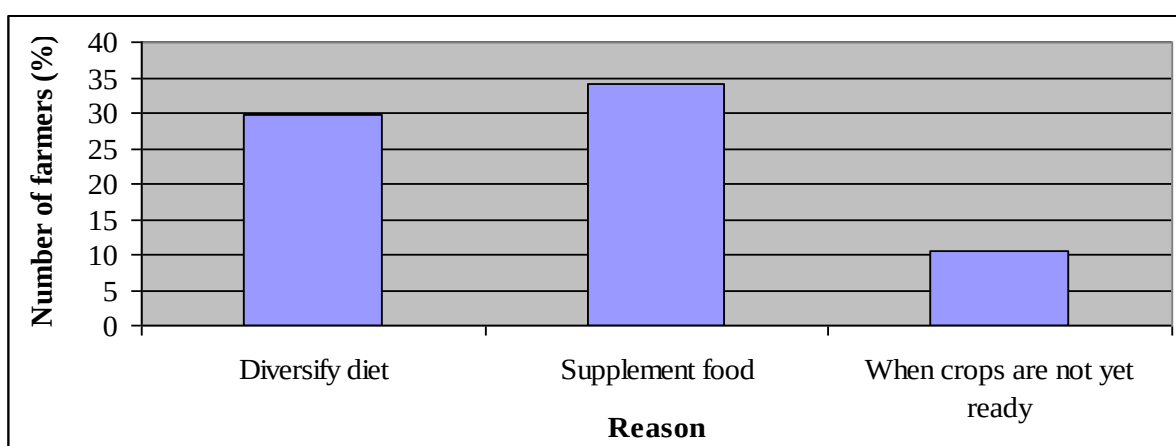


Figure 5.17: Reasons for outsourcing food at ZIS between 2005 and November 2007 (n=47)

5.4.5.3: Effects of the BMP on food expenditure

The baseline study done by Monde, *et al.* (2005) suggested food to be the most important expenditure category of households as it accounted for 36% of total expenditure. These

findings support those of Devereux's (2001) studies into expenditure patterns among rural households which suggested that low income households tend to spend more money on food than on any other expenditure category, but their share of the household budget devoted to food declines as household income rises (World Resources Institute, 2007). Armstrong, *et al.* (2008) further proved that hunger was extremely rare in households in the highest expenditure category since its incidence decreased as household food expenditure levels increased.

However, despite such conclusions and the fact that economic theory anticipates an ever accelerating rate of food expenditure with an increase in household size, findings from the data given by the respondents in Zanyokwe seem to follow the theory posited by Bonti-Ankomah (2001). In his theory, Bonti-Ankomah (2001) posited that household food expenditure increases as household size grows but peaks at a household size of four after which it increases at a very slow rate for a household size with more than four (4) members. Thus, it accelerates at an increasing rate as households grow in size to four (4) and then increases at a decreasing rate for a household of more than four people. The explanation for such behaviour is that smaller households tend to buy food stuffs that are costly because of their high nutritional value or good taste (such as processed foods). However, as such households grow in size, Bonti-Ankomah (2001) believes that nutrition becomes less important as survival becomes the priority hence the reason for shifting to low quality foods. This is done so that more can be afforded as these foods are cheaper due to their low quality. Thus, larger families buy more in terms of quantity than smaller families but the latter spend more money for less quantity as they value quality than quantity. Figure 5.18 demonstrates the relationship between household size and food expenditure in Zanyokwe.

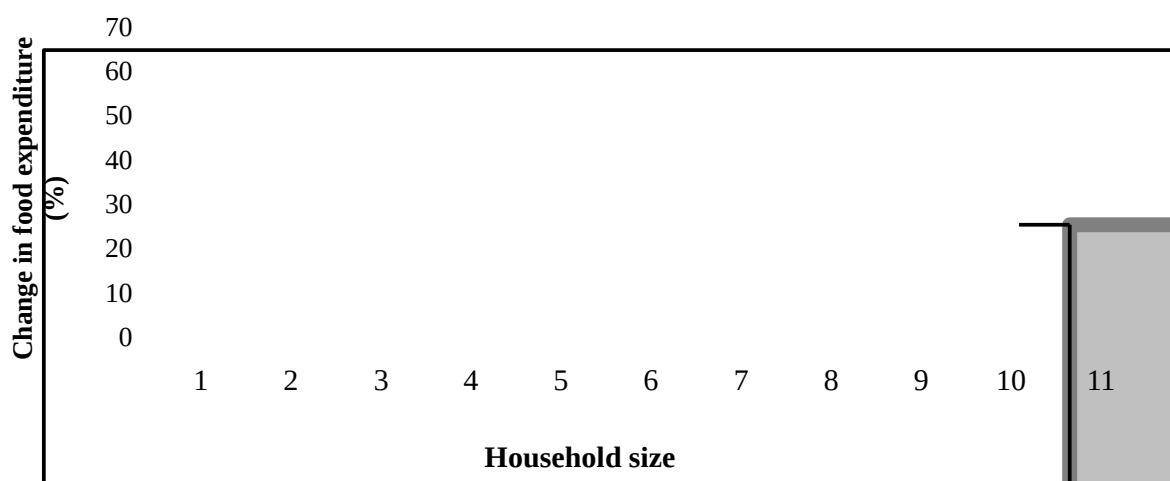


Figure 5.18: Relationship between household size and food expenditure at ZIS (n=47)

Although the baseline did not provide much information on the household food expenditure, it was necessary to investigate how the past three years had affected the respondents' purchase of food. The data obtained for his study was therefore based on the respondents' perceptions and it showed that household food expenditure accelerated at an increasing rate for those households with between two and four members before slowing down after a household of more than four people. For example, as a family increased from two to three members, its food expenditure jumped from 7.7% to 17.8% and then doubled to a peak of 38% for a family of four (see Figure 5.18). However, any growth in family size beyond four led to a smaller increase in food expenditure as Bonti-Ankomah (2001) suggested through his theory. As household size grew from four to five members, its food expenditure increased only by seven percent, increased by four percent for those with between nine to eleven members.

To understand how strong the family size affected the average household expenditure on food, the chi-square test was used. The results for this test concurred with the notion that these two variables relate positively to one another as a change in one would definitely cause the other to respond the same direction. The calculated χ^2 value of 73.31 is smaller than the critical value of 73.76 to show a significant relationship at 5% level between family size and the average household expenditure on food. This means that as family size increased, so did the expenditure on food. The same trend was noted in 2005 during the situation analysis.

Even so, the difference between these two values is too small to boldly support Bonti-Ankomah's theory. The probability value of 0.509 (which is above the benchmark value of 0.05) presented on Table 5.12 further suggests that mathematically, even though the information obtained from the respondents supported this theory, concrete conclusions that such behaviour by households in terms of their food expenditure was mainly influenced by their sizes could not be drawn. Perhaps this could be explained by the fact that the growth of these households was caused by relatives such as grandchildren whose parents based in other cities regularly bought and sent groceries instead of cash. Such a kind of support could explain how the extra mouths were fed without having to spend more on food. Furthermore, it could be a result of the own farm production being preferred than the food purchased from urban markets.

Table 5.12: Association between household size and food expenditure at ZIS (n=47)

Variables	$\chi^2_{\text{calculated}}$	χ^2_{critical}	Degrees of Freedom [n-1]	Probability
Household size Vs Food expenditure	73.31	73.76	46	0.509

The information presented in Figure 5.19 shows that not much has changed in terms of expenditure patterns in the study area. Food remains the main expenditure category. The only change is the increase in the amount spent on food from R135.12 in 2005 to R175.65 in 2007 resulting from inflation. As the food prices went up due to inflation, the respondents also increased their monthly expenditure on food in order to maintain the same diet.

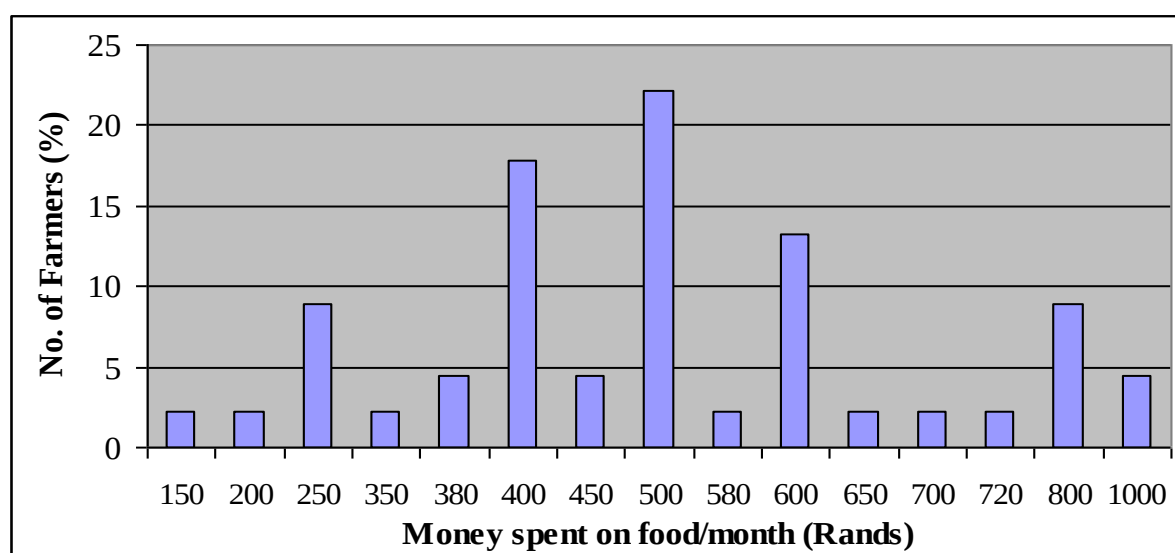


Figure 5.19: Average monthly expenditure on food per household in November 2007 (n=47)

5.4.6: Effect of BMP on Marketing

The ZIS is one of the biggest smallholder irrigation schemes in the Eastern Cape province of South Africa. It is therefore not surprising that the scheme impacts on a number of communities stretching from East London to as far as Fort Beaufort as demonstrated in Figure 5.20. The information given by the respondents shows that there were six other communities that benefited from the scheme apart from the immediate surrounding communities. These communities included Alice Town, King William's Town (KWT), East London (EL), Keiskammahoek, Dimbaza and Fort Beaufort.

Figure 5.20 suggests that KWT was identified as the biggest market (83%) for the produce coming from the scheme, followed by Alice town that was identified by 70% of respondents

as another important market. East London and Keiskammahoek were in third and fourth places with 42.6% and 29.8% respectively. Only 12.8% of the respondents were in business with the people from Dimbaza and Fort Beaufort. These were the biggest surrounding communities that purchased their vegetables from the scheme but there were some other communities besides these that benefited but only to a small extent. For example, there was one respondent involved in contract farming with a company based in Durban and there were also some buyers who came from as far as Port Elizabeth.

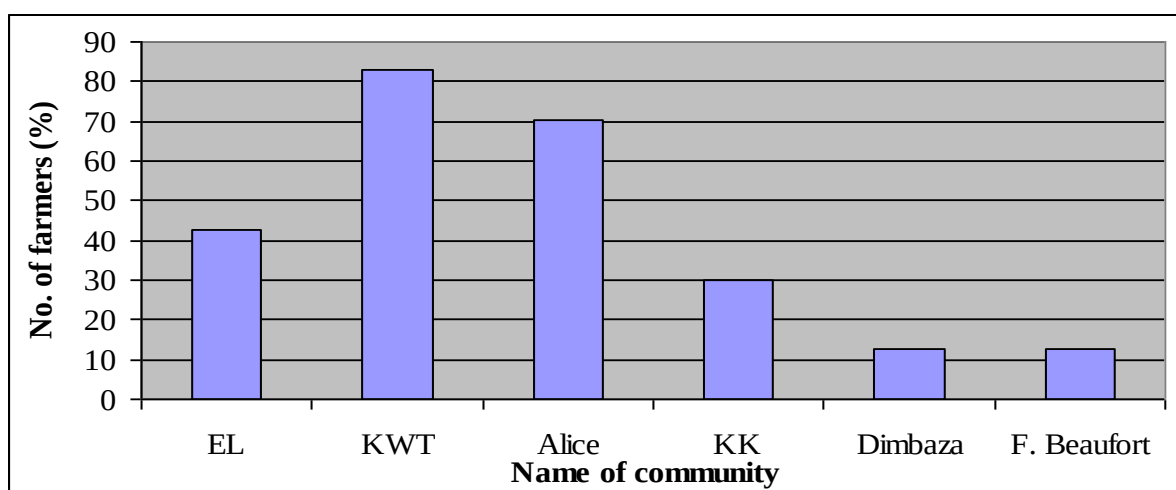


Figure 5.20: Communities benefiting from the ZIS from 2005 to November 2007 (n=47)

In spite of having such a great sphere of influence, there was no physical structure or formal marketing system in place for farmers to sell their produce to these hawkers. Instead, farmers continued to use the same marketing strategies as in 2005 whereby the buyers or hawkers went to the fields to purchase as these were the only points of sale. This was the case also with the Boschklouf Irrigation scheme in Limpopo studied by Magingxa and Kamara (2003) as stated earlier on. Thus, there continues to be a lack of formally set up structures where these farmers could take their produce for sale. Other problems that continue to haunt the farmers apart from the lack of clear marketing structures include the lack of transport to bigger markets, lack of storage facilities to keep products and low product prices. Before and after the introduction of the BMP project the farmers continue to rely on their customers to use own means of transportation to move produce that they purchase.

There are a number of pull factors that attract hawkers to travel all the way from places like East London and Fort Beaufort just to buy from the Zanyokwe farmers. The first and biggest factor or benefit is based on the law of demand that states that “other things being equal, the

higher the price of a good, the lower is the quantity demanded” (Parkin, 1993). Thus, the farmers attract more buyers by selling their produce at low prices which makes it easier for the buyers from these communities to resell at a profit after adding a reasonable mark-up. Fresh produce is the other enjoyed benefit that comes hand in hand with the fact that the scheme is conveniently located hence easily accessible to all these communities. Thus, buyers from all these six communities can easily go to the scheme to buy the crops for resell and get back to their communities where they resell them whilst they are still fresh. Vegetables are very perishable and it is of paramount importance for it to get to the market whilst it is still fresh and the convenient location of the scheme makes it possible for them to actually reach their final market whilst they are still fresh.

5.5: Econometric analysis of variables through the multiple regression model

Thus far, a descriptive analysis and interpretation of the results has been given in this chapter. It would be interesting to also predict scores of one variable (dependent variable) on the basis of scores on several other variables (independent variables). In other words, how would changes in the total production of main crop relate to those of independent variables such as time spent in the fields, the number of labourers and income levels? For this purpose, the multiple regression model was used to test how these variables relate to one another. The idea behind the model is to obtain the beta values ($\beta_1, \beta_2, \beta_3$ and β_4)⁸ as these measure how strongly each independent variable (X_1, X_2, X_3 or X_4) influences the dependent variable (Y).

Table 5.13: Multiple regression results

Parameter	Estimate ($\beta_1, \beta_2, \beta_3$ and β_4)	Expected sign (+/-)	Standard Error	t-Statistic	Pr > t
Intercept	0.859320 (β_0)		0.3113478	2.76	0.0635
Time spent in the fields	0.428441 (β_1)	+	0.1662620	2.58**	0.0566
Number of people employed	0.079645(β_2)	+	0.0556958	1.43**	0.0821
Income levels (R/AE/Yr)	-0.593424(β_3)	+/-	0.1837226	3.23	0.0078
Household Head Age	0.465477(β_4)	+/-	0.1790296	2.60*	0.0471

[Adjusted $R^2 = 0.581332$]

MODEL: $Y = 0.859320 + 0.428441X_1 + 0.079645X_2 - 0.593424X_3 + 0.465477X_4 + U$

⁸ The beta values in this case were converted and expressed as percentages as seen in Table 5.14.

NB: t-values: *significant at 5% level; **significant at 10% levels

Starting with the time spent in the fields by each individual farmer, there seems to be a positive association with the production of main crop. This is to say that at *ceteris paribus*, a one unit increase in the time the farmers spend working in their fields would result in a 43 units increase in the total production of main crop/ha. The farmers could be spending this extra time doing the extra work or simply supervising their employees to make sure they work efficiently and effectively. This supports the conclusion that spending more time in the field would trigger improvements in the total yield of main crop/Ha. This amount of time spent by each farmer could be substituted for by employing more labourers or using more capital resources like machinery.

When asked about the changes in labour that had taken place within the scheme, 33% of the respondents stated that they had not hired any extra labour since 2005. To measure the exact effect of labour changes on the production, results were regressed. According to these regressed results, if the farmers need to increase their production of main crop by at least eight units, then they should anticipate an increase in labour demand of one unit. For example, if a farmer had two employees and wished to hire one more labourer, this new labourer would result in an increase of approximately 625 units of the main crop at *ceteris paribus*.

Regarding household income, 82% of the respondents stated that their incomes had improved over the last three years. It is therefore important to find out how the main crop (butternut) responds to changes in levels of income from other sources. As was shown in Table 5.13, a one unit increase in income levels per AE/yr from other sources such as social grants, results in a 59 units decrease in the total production of main crop/Ha (Y). The more these alternative sources of income contribute, the less butternut is produced.

The new practices introduced in the scheme were supposed to be friendly to any farmer regardless of their age. Accordingly, the old must be as much productive with the practices just as the young farmers. Be that as it may, the regression model confirms a positive estimated coefficient (0.465477) for the age of farmers. This suggests that age does have an effect on the productivity of the farmers when estimated at 5% significance level. As a matter of fact, the older the farmer gets, the more productive he is especially in the production of the main crop. Although the general notion put forward by Mushunje (2003) is that young farmers are expected to be more innovative and receptive of new technologies,

hence more productive, this trend in Zanyokwe might be explained by a number of factors such as the older farmers being more experienced than the younger ones. Also, older farmers are likely to own most of their farming implements and do not depend on hiring as compared to the young farmers who are yet to acquire their implements. Therefore, with a significant critical t-statistic of 2.60, the conclusion that is drawn is that increasing total production of main crop/Ha in the scheme would depend on the farmer's age. The older the farmer gets, they more productive they become.

Last but not least, an Adjusted R^2 value of 0.581332 points to the fact that at least 58% of the variation in Y is explained by the variation of the independent variables (X_1 , X_2 , X_3 or X_4). Thus, approximately 58% of the changes experienced in butternut production are explained by the variation of the time spent in the fields by each farmer, the number of people each farmer employed, household income levels (R/AE/Yr) and the age of each household head involved in this study. The closer Adjusted R^2 is to 1, the better is the fit of the estimated regression line.

5.6: Summary

This chapter has given a detailed discussion and interpretation of the results obtained from the field. To make the results easy to understand, simple schematic representations and tables were used. Furthermore, the presentation of the results in this chapter was in such a way that social impacts were separated from the economic impacts in order to give a clear picture of the type and extent of each impact discussed.

The chapter began with a description of the demographic characteristics of the households in the scheme which showed male-headed households as still the main characteristic of almost every household. This was followed by the assessment of social impacts where improvements were noted in terms of the number of technologies and practices adopted at Zanyokwe, the marketing of their produce, the number of farmers becoming full-time farmers and even the average number of hours each farmer spent in the fields. All these social changes happened after the introduction of the BMP project.

The analysis of the impact of the BMP project on economic wellbeing of farmers provided evidence of positive changes in the form of increased size of land cultivated in winter in 2007, improvement in the number of labourers employed for various activities per season,

household food security and also growth in household farm incomes. Where possible, the results for this study were compared with the findings from other related studies in order to enhance their credibility.

6: CONCLUSIONS AND RECOMMENDATIONS

6.1: Introduction

This chapter provides a summary of findings of the impact assessment. It begins by giving overall conclusions to the entire study, and makes relevant recommendations in order to improve farming and management at ZIS and other small irrigation schemes.

6.2: Conclusions

6.2.1: Impacts of the BMP on social wellbeing

The skills introduced and adopted at ZIS were in the areas of water management, agronomic practices (use of certified seeds, correct rates of fertilisers and herbicides, correct time of planting and integrated pest management), marketing, institutional arrangements as well as leadership and management. More than 90% indicated that there was improvement in agronomic practices and water management and 68% in marketing. However, these changes resulted in farmers spending more time in the field, which is good for farming even though it had negative effects on other non-farming activities. More than half of farmers worked in their farms on a daily basis, which is a big change as none of the farmers worked during weekends in 2005. The average time spent on the farms also increased from four (in 2005) to seven hours (this investigation) on average per day.

The BMP also had a positive impact on social relationships and networks in the scheme. Firstly, farmers appeared to have had a good relationship with the BMP project team. More than 60% were aware of the project and had a good understanding of its objectives. Secondly, farmers and non-farmers established a network of relationships with each other. The non-farmers participated in BMP events such as farmer's days organised by farmers and BMP team. These events, which were mainly knowledge transfer enabled non-farmers to gain some knowledge resulting in the adoption of some practices such as use of certified seed, fertiliser and correct time of planting. The non-farmers also benefited from the physical capital of the scheme such as roads and hired tractors.

6.2.2: Impact of the BMP on economic wellbeing

6.2.2.1: Changes in land use intensity

More than 60% of farmers acknowledged improvements in land use intensity. This was due to increases in acreage of crops such as cabbages and butternut as well and planting at both seasons (summer and winter). In 2005, almost all land was fallow during the winter period at ZIS. In 2007, more than 40% of farmers cultivated their land in winter.

6.2.2.2: Changes in household incomes

About 74% of respondents indicated that their economic wellbeing improved after the implementation of the BMP project. As was the case in 2005, farming made significant contributions to household income. However, the degree of contribution was even better as it farming contributed 81% compared to 71% in 2005. Farmers made more money on cabbages and butternuts.

6.2.2.3: Impact on poverty

The increase in household incomes had a positive effect on poverty status of households. The proportion of households earning incomes that are below poverty line dropped from 61% in 2005 to 38% in 2007. The ultra-poor households dropped from 41% to less than 10% while the non-poor households increased from 39% in 2005 to 62% in 2007.

6.2.2.4: Impact on input expenditure

About 46% of farmers spent more money on fertilizers, seed, pesticides and tillage operations. The land allocated to the cultivation of cabbages and butternuts almost double the 2005 land size. Consequently, the quantities of inputs used increased, and hence increases in input expenditures. Expenditure patterns on labour inputs also showed some change. One third (33%) of farmers employed more labour. The rest (two thirds) did not increase their labour inputs for reasons associated with limited access to financial capital. Their coping strategy was to spend more time in their farms.

6.2.2.5: Impact of household food security

The majority (87%) indicated that they were more food secure than was the case before the implementation of the project. Changes in the diet of the households were noticed. In addition to the consumption of staples such as samp, maize meal and rice, people added a variety of vegetables. In 2005 the consumption of vegetables was limited to cabbages only. In 2007 they include butternuts, spinach and carrots. All these products were identified as the main ingredients of the diet as they were consumed at least three and more time a week. Also, own production was the main source of these vegetables as was indicated by 66% of respondents compared to only 25% in 2005. Food remained the main expenditure category though, as was the case in 2005.

6.2.2.6: Impact on marketing

The BMP made an effort on improving the marketing system at ZIS. Farmers were exposed to formal marketing as they were taken to formal markets as part of capacity building. As a result of this exposure, farmers improved their marketing system. More farmers became involved in contract marketing. They also put more effort to marketing functions such grading and packing. The number of markets they had access to also doubled the number in 2005.

6.3: Recommendations

In spite of the positive impacts highlighted in chapter 5, there are a number of factors that continue to inhibit the farmers from reaching the heights that they are aiming for. To eradicate these constraints, a few solutions have to be recommended.

6.3.1: Addressing the infrastructure problems

In spite of all the positive impacts brought by the BMP project as highlighted in chapter 5, the current state of infrastructure in the scheme has negatively affected the extent of the benefits accrued by the farmers. These infrastructure problems have made the scheme not to operate at its full potential even in the presence of the new practices. Starting with the impact of poor road infrastructure on marketing, the roads are all gravel hence become slippery when wet thereby making the fields unreachable both by vehicles and on foot. The two bridges leading to the Lenye section are also narrow and too low hence water usually flows

on top of them when the streams flood (see chapter 5.3.3). This automatically cuts the community from its vital markets whenever it rains. Even though this is not the responsibility of the BMP team, addressing this infrastructure problem by upgrading the roads and raising the level of the two bridges would go a long way towards attracting a bigger market by making the farms more accessible.

On the production side, irrigation infrastructure is also in a poor state. As was shown in Table 5.3, none of the farmers cultivated all their land during winter. As a matter of fact, 65% of the farmers preferred to cultivate a maximum of half their total land in winter. This was blamed on the water shortages and unfavourable climatic conditions. Addressing the water problem by revitalizing the irrigation system through replacing the leaking pipes would therefore play a big role in increasing the winter cultivation of crops in the scheme.

6.3.2: Introduction of crops that survive low temperatures

In chapter 5.4.1 the respondents cited low temperatures as one of their reasons for not cultivating all their land in winter. The issue of low temperatures can be dealt with by introducing winter crops that cannot only survive low temperatures but bring in more income. Winter wheat has been known to grow well even under very low temperatures provided enough water is made available to these crops. Zimbabwe is a good example of a country that highly relies on winter wheat for food and export purposes and the same can happen in Zanyokwe if the crop is cultivated. With such crops, the farmers are guaranteed of getting better financial returns for the time and resources they invested in their fields during winter. At the present moment, the BMP team only introduced crops with a high demand even though not resistant to the harsh winter temperatures.

6.3.3: Introduction of post-harvest activities

Almost all (83%) the Zanyokwe households are headed by males (refer to Figure 5.1). These male-headed households therefore depended on males to provide income. The women were noted to participate in farming only to help the heads perform activities like planting, weeding and harvesting. Promoting women's involvement to carry out other income generating projects involving processing, storage, post-harvest technologies and marketing especially now that the quantity and quality of the produce has increased would help supplement the income their households were obtaining at the time of this survey. This in

turn would improve their poverty status. Processing the high quality crops obtained by their male counterparts can help add value to the crops and thereby attracting more buyers such as retail shops. This is because the products would be ready for final consumption and can stay longer on the shelves. Such products may include dried foods.

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APPENDICES

APPENDIX 1

QUESTIONNAIRE

UNIVERSITY OF FORT HARE

FACULTY OF SCIENCE AND AGRICULTURE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

**SEMI-STRUCTURED QUESTIONNAIRE ON SEIA OF THE BMP PROJECT IN
ZANYOKWE IRRIGATION SCHEME AT FARM LEVEL**

Name of interviewer:

Name of respondent:

Status in household:

Location of farm (village):

Date of interview:

Questionnaire number:

A: SOCIAL IMPACT

1. Please provide the following information about your household (the researcher should compare this information with that obtained in 2005)

Demographic variable	Response
Household head gender	
Household head age	
Active population (15-64yrs)	
Number of people below 15yrs	
Number of people over 64yrs	
Males (no)	
Females (no)	
Total household size	
Adult equivalent (AE)	

2. Are you aware of the BMP project that is taking place in your scheme? Yes or No

3. If yes, what are the main objectives of the BMP project?

.....

.....

.....

.....

4. Do you think the project is in the right direction towards meeting these objectives?

Yes or No

5. Please explain your answer above

.....

.....

.....

.....

6. Can you describe the kind of relationship you farmers have with the BMP project team?.....

7. Did you adopt any of the following practices or technologies introduced by the BMP project team? (Tick Yes or No)

Area of intervention	Technology or practice	Yes/No
Irrigation management	Low cost irrigation practices Wetting front detectors Best time to irrigate	
Market-driven cropping plan	Introduction of crops that have demand Cropping calendar Correct time of planting Use of certified seeds Correct plant population Integrated pest management Correct rates of fertilizer and herbicides Use of no-till planter Introduction of new maize cultivars (green maize) Land use intensity at all seasons Keeping of physical and financial records	
Institutional arrangements	Marketing – collective action Formal contracts Exposure on marketing Better access to input and output markets	

8. What positive or negative effects do these or some of these new practices have on you as a farmer?

Positive:

Negative:
.....
.....
.....

9. What positive or negative effects do these or some of the new practices have on your households?

Positive:
.....
.....
.....

Negative:
.....
.....
.....

10. Are some of the practices mentioned above gender-specific? Yes or No

11. If yes, please state the practices as well as the gender they favour.

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

12. Do some of these practices increase your stress levels? Yes or No

13. If “yes”, name the practice and explain how it causes you stress.

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

14. Does the scheme have any impact on the surrounding communities? Yes or No

15. Do the local people obtain some of their food items from the scheme? Yes or No

16. If “yes” which products do they usually buy from the scheme?

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

17. Are there members of these communities employed by the scheme? Yes or No

18. Do the non-scheme members make use of the scheme infrastructure such as roads, offices and other equipments? Yes or No

19. If “yes”, state the type of infrastructure and explain how these non-members benefit from it.

.....
.....

20. Do the general community members participate in scheme affairs such as meetings, farmers’ days and demonstrations? Yes or No

21. In your opinion, are there any non-scheme members who have adopted some of the practices introduced in your scheme in their gardens or fields? Yes or No

22. If “yes”, name the practice(s) adopted.

.....
.....

23. Apart from the surrounding communities, name the other communities benefiting from your scheme.

.....
.....

24. What kind of benefits do these communities enjoy?

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

B: ECONOMIC IMPACT

1. How much money does your household earn from the following income sources on a monthly basis?

Source of income	Monthly income in Rands
Crops kind – consumed produce	
Crops cash – sold produce	
Animal kind	
Animal cash	
Trade	
Wages and salaries	
Old age pensions	
Retirement pensions	
Disability grant	
Child grant	
remittances	

2. How would you rate the economic well-being of your household after the implementation of the BMP project?
- a) it has improved b) stayed the same c) worsened

3. List the main crops you grow in your farm and provide the following information for the 2006/07 cropping season.

Name of crop	Season (W/S)	Area (Ha)	Expected Yield (Kg/bags)	Actual Yield (Kg/bags)	Amount sold (Kg/bags)	Amount consumed (Kg/bags)	Unit price (R)	Income (R)

4. Has your agricultural income improved during the past three years? Yes or No
5. For either a “yes” or “no” answer, provide an explanation
.....
.....
6. How are you now engaged in your farm since the introduction of the BMP project? a) Full time b) Part time
7. Do you work on the farm everyday? Yes or No
8. If “no”, how many days per week do you work on your farm?.....Days
9. On average, how many hours do you work per day?Hrs/day
10. Would you say you spend more time now in the field compared to three years ago? Yes or No
11. If you spend more time on the field now, what are the reasons for that?
.....
.....
12. How is your current land-use intensity compared to three years ago?
a) improved b) remained the same c) worsened
13. What proportion of land is cultivated in winter in your farm?
a) all land is cultivated b) three quarters c) half the land d) quarter of land
e) other (*define*)
14. If not all land is cultivated during winter, then what are the reasons for that?
.....
.....
.....

15. Do you keep physical and financial records of your farm? Yes or No

16. If “yes”, did you receive training on how to keep these records? Yes or No

17. For each of the crop identified in question 3 above, please state how much money you spent on the following farm inputs during the same cropping season (2006/07)

Name of crop	Seed (Rands)	Fertilizer (Rands)	Pesticides (Rands)	Planting (Rands)	Discing (Rands)	Weeding (Rands)

18. Has your farm input expenditure increased or decreased since 2005?

a) Increased b) Decreased c) Remained unchanged

19. For either a decrease or increase in input expenditure, explain how the BMP project played a role.

.....

.....

20. What is the source of labour for the following activities? *(State whether it's family, exchange or hired labour).*

Activity	Source of labour now	Source of labour 3yrs ago
Ploughing		
Planting		
Cultivating		
Weeding		
Spraying		
Irrigating		
Harvesting		

21. If your source of labour has changed for some of these activities, state the reason(s) for that.....

22. Do you have fulltime, part time workers or both?

a) Full time b) part time c) both

23. Please indicate the number of full time or seasonal workers for each of the activities listed below and also indicate the period of occupation.

Activity	Number of workers	Employment status (Part/Full time)	Period
Ploughing			
Planting			
Weeding			
Spraying			
Irrigating			
Harvesting			

24. How much do you pay each worker per day? R.....

25. Have you employed more, less or the same number of people now compared to three years ago? a) more b) less c) same number
26. If the number of employees has either increased or decreased, please explain the reason(s) for that.
.....
.....
27. What is the impact of the new practices on your household food security?
a) more food secure b) no change c) worsened
28. Do your household members sometimes go hungry? Yes or No
29. If “yes”, then explain when exactly does your household goes hungry.
a) everyday b) towards the end of the month c) in winter d) other (explain).....
30. How many meals does your household consume per day?
a) three b) two c) one d) sometimes no meal at all e) other (*state*)
31. How much money does your household spend on food per month? R.....
32. Do you buy or grow most of your household’s food items? a) Buy b) grow c) both
33. Provide an explanation for the answer given above
.....
.....
34. What are the main ingredients of the diet in your household?
.....
35. Which of these ingredients come from your own production?
.....
.....

36. Do you obtain these products from own production all year round? Yes or No

37. If “No”, then which times of the year do you outsource these products?

a) winter b) summer c) both

38. What was your household’s main food acquisition strategy three years ago?

a) buying from urban markets b) own production

39. What is your household’s current main food acquisition strategy?

a) buying from urban markets b) own production

40. If your food acquisition strategy has changed over this three year period, please provide an explanation for this change.

.....
.....

END OF INTERVIEW

THANK YOU AND ENJOY THE REST OF YOUR DAY