

**POTENTIAL OF SUSTAINABLE
IRRIGATION IN BLACK DEVELOPING
COMMUNITIES**

iSineke Developments (Pty) Ltd

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Water Research Commission



Potential of sustainable irrigation in black developing communities

by

iSineke Developments (Pty) Ltd

Report to the Water Research Commission

on the project

"An investigation into the potential of sustainable irrigation in black developing communities of two sub-catchments of the Pongola and Thukela Rivers"

Project Leader: O. Mwanyama

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS	iv
EXECUTIVE SUMMARY	v
CHAPTER 1 INTRODUCTION	1
CHAPTER 2 LITERATURE SURVEY	2
2.1 The multiplicity of rural farming systems	4
2.2 Gender equity	4
2.3 Appropriateness of technologies	4
2.4 Inclusive participation	5
2.5 Land acquisition procedures,	5
2.6 Location of most communal gardens in relation to markets	5
2.7 Production objectives	5
2.8 Sustainability through management	6
2.9 Organisation	6
2.10 Decision making and accountability	6
2.11 Training and extension	6
CHAPTER 3 RESEARCH METHODOLOGY	8
3.1 Reconnaissance survey	8
3.2 Socio-Economic survey	8
3.3 Participatory Assessment	9
3.4 Observations through extended stays	10
3.5 Strategic Planning	10
3.6 Analysis	10
CHAPTER 4 FINDINGS OF THE SOCIAL SURVEY AND PARTICIPATORY ASSESSMENT	11
4.1 Gender and ages of scheme members	11
4.2 Differentiation of gender roles in production activities of the irrigation schemes	11
4.3 Chores performed by men and women before and after working in the irrigation scheme	12
4.4 Absenteeism due to social obligations	12
4.5 Employment and income generation opportunity	13
4.6 Farming systems and livelihood	15
4.7 Use of income earned from crop sales	16
4.8 Sustained membership to the scheme	17
4.9 Objectives of irrigated farming	18
4.10 Land acquisition and access	19
4.11 Education and training	19
4.12 Technology (Irrigation Infrastructure)	20
4.13 Sufficiency of agriculture equipment	22

4.14	Farm management, decision making, accountability and Organisation of Work	23
4.15	Provision of labor for agriculture activities on the schemes.	29
4.16	Training	30
4.17	Targeting irrigation development	31
4.18	Objectives of farmers and their opinions on future development of the irrigation scheme	32
CHAPTER 5 DISCUSSION		36
5.1	Community demand and drive	36
5.2	Inclusive and participatory planning	37
5.3	Taking a comprehensive support strategy	38
5.4	Dealing with land acquisition at inception of the irrigation scheme: (Design for evolution)	39
5.5	Organising for success: setting up appropriately sized groups of the like minded people	41
5.6	Enhancing potential by balancing benefit and costs	41
5.7	Enhancing potential through access to technical information and training	42
5.8	Enhancing potential through gender sensitivity	44
5.9	Paying attention to technologies to be used	45
5.10	Create capacity for management	46
CHAPTER 6 CONCLUSIONS		49
CHAPTER 7 RECOMMENDATIONS		51
7.1	Setting Up Schemes in the Future	51
7.2	Upgrading of the Case Study Schemes	52
CHAPTER 8 REFERENCES		53
 ANNEXURE 1 MAPS OF THE STUDY AREA		55
A1.1	Map of Esiphongweni	55
A1.2	Map of Ndaya	56
ANNEXURE 2 PROFILES OF THE STUDY AREAS		57
A2.1	The Esiphongweni Irrigation Scheme	57
A2.2	Ndaya Irrigation Scheme Profile	60
ANNEXURE 3 CHECKLIST		63
ANNEXURE 4 SELECTION CRITERIA		64
ANNEXURE 5 QUESTIONNAIRE		65

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The following persons served on the steering committee responsible for this project:

Dr GR Backeberg	Water Research Commission
Dr SS Mkhize	Water Research Commission
Mr FB Reinders	Agriculture Research Council
Mr N de Wet	Department of Agriculture and Environment (Kwazulu/Natal)
Mr S Ntinga	Farmer Support Group
Professor CJ van Rooyen	University of Pretoria
Mr CM Stimie	Agriculture Research Council
Dr RMB Auerbach	Rainman Landcare Foundation
Dr J Jaganyi	University of Natal
Mr JT van Rooyen	Department of Agriculture and Environment (Kwazulu/Natal – North-West Region)
Mrs M de Lange	Socio-Technical Interfacing

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EXECUTIVE SUMMARY

In recent years, most irrigation developments in black developing communities of South Africa have been implemented as an upgrade of previous communal gardens. When individuals from these communal gardens sell the surplus production, it is commonly interpreted as an expression of interest in market oriented agricultural production. In many cases this led initiators of irrigation schemes to believe that government intervention would enhance the potential for irrigation and transform the scheme members into commercial producers. In most instances the intervention is technical and the myriad of constraints related to the social and economic status of black developing communities is not always given adequate consideration. Yet for any investment in irrigation development to be viable and sustainable, the scheme members should make decisions in terms of the time, risk and resources that they are willing to commit for the scheme to be successful. In most black developing communities these decisions are largely influenced by the social and economic circumstances of the scheme members.

This study investigated the main socio-economic factors that may limit or enhance the viability of irrigation developments in black developing communities. The study was conducted in two schemes namely the Ndaya and Esiphongweni irrigation schemes located in KwaZulu/Natal province. The underlying question for the study was - if it would be possible to optimise irrigation infrastructure grants and achieve commercial objectives with no or partial consideration of, and no defined actions for dealing with the main socio-economic issues affecting small holder irrigation.

The purpose of the investigation was to:

- Define the socio-economic context in which water driven agriculture systems in black developing communities must exist.
- Evaluate the importance of considering the socio-economic context in order to enhance sustainability of the agriculture systems mentioned above; and
- Develop guidelines and procedures for identifying actions to deal with socio-economic factors at the inception of irrigation developments.

The specific objectives were to:

- Investigate the existing farming systems within the schemes in terms of size and technology;
- Identify institutional arrangements within such farming systems;
- Identify potential target groups for potential farming systems;
- Identify steps for transformation of present irrigation farming systems;
- Prepare an action plan for the development of irrigation farming systems in black communities;
- Develop a monitoring procedure for the implementation of the guidelines; and
- Identify the human capacity needs for running and managing sustainable irrigation farms.

Major findings and conclusions

Existing farming systems revealed that the scheme members continue to be involved with various agricultural and non-agricultural activities while maintaining their involvement in the irrigation scheme. The scheme members consider irrigation an add-on activity as part of their strategy to fulfill their food needs and cash requirements. In addition to working in the irrigation scheme, most members continue to engage in other agricultural activities such as rain-fed farming, livestock rearing, poultry production, etc. Scheme members also engage in many other small business activities such as sewing, selling drinks, constructing roofs, baking, etc. Reliance on pensions is also evident. The majority of members at both schemes consider crop production as their main employment and the most important contributor to family income. Given these social circumstances, scheme members would not solely rely on the irrigation scheme to meet their financial and food needs. A comprehensive support strategy should be

adopted that recognises the complex farming and livelihood systems within which rural communities exist. Focus on irrigation development alone, as is currently the approach, represents a narrow and ineffective approach.

Regarding the objectives for engaging in irrigated agriculture, members expect irrigated agriculture to transform their social and economic circumstances. They perceive irrigated agriculture as a growing and lucrative business and there is a great expectation regarding the economic benefits that the irrigation scheme can provide. However, the origin of the schemes from communal gardens whose objectives were social development, limits the economic potential for irrigation development. In both Ndaya and Esiphongweni schemes, demand for commercial production was not ascertained at the point of setting up the irrigation schemes. Enhancement of the potential for irrigation could be achieved by primarily building consensus around social, economic and production goals and a vision that is shared by the scheme members, through adopting participatory planning. Irrigation developments that focus on commercial objectives should be established in communities that demand them, and not be given as a grant to all.

The study confirmed that the majority of scheme members that are most interested in irrigation in both schemes are female. The youth is generally not interested in agriculture production and the parents normally force their children's participation. Results show that owners of the plots at Ndaya, mainly women, perform all activities by themselves and do most of the laborious work. At Esiphongweni, other family members assist with different chores but to a lesser degree it was also found that improvements in irrigation technology have benefited men more than women. Technological improvements have simplified some activities traditionally performed by men. For example when furrow irrigation was used, men did most of the in-field irrigation, now with the current irrigation technology such as sprinkler irrigation systems, men are less involved. Since the introduction of the irrigation schemes, women have to work longer hours than men in order to cope with their many social obligations and the traditional household management role. In essence, irrigation development would be enhanced through gender sensitivity and assessment of population dynamics. Irrigation development should specifically identify how women will participate. Concrete actions should be developed regarding women's involvement in design, negotiation, maintenance and developing objectives for the scheme.

Most social obligations, events and beliefs are not only obligatory and unplanned but they can take up considerable time, and potentially disrupt production activities at critical or peak times. For example, as much as one week of productive time could be lost when there is a death in the community. This demonstrates that social issues could have considerable impact at the operational level. Such issues, which would seem peripheral to irrigation initiators, should be identified and actions defined to deal with them when they occur.

Members in both schemes considered land sizes of 1 to 5 ha per person as adequate for commercial irrigated agriculture. The scheme members did not perceive access to extra land as a constraint. However, the lands where the gardens are located belong to a section of the community and therefore local rules would come to play if further land acquisition was necessary. This study has found that one of the social factors that would affect allocation of the land to a few individuals on current land areas is that the original landowners reserve the right to deny relinquishing rights of their ancestral land to only a few individuals. Thus, social dynamics such as the tacit power of the original landowners, determine further land allocations. This may require designing for evolution i.e. dealing with land size at inception to allow for expansion when the need arises.

Low levels of education limit access to information and understanding of commercial farming concepts and development processes. The levels of education predominant in these schemes do not offer much leverage for farmers to operate in complex agricultural production systems. It was also found that the farmers do not have adequate technical expertise to operate a profit making crop production entity. For the majority of the members their main experience in crop production has been through trial and error and they do not possess all the skills required for commercial production such as irrigation scheduling, crop management and protection, financial management etc. This suggests that to be sustainable, there is a need to train the members specifically in commercial agriculture and impart knowledge on the basis of commercial farming. Extension support available was inadequate and unreliable to sustain a

commercial entity. This means that members could not depend on the extension services to provide production information timeously.

Scheme members perceive the current irrigation infrastructure satisfactory for their water needs, but this is based on their current production levels. Technological constraints such as lack of information and lack of understanding of operational and maintenance costs, pose limitations to irrigation development. There was no clear understanding of the maintenance and energy costs of the current irrigation infrastructure. The members confirmed that they require an irrigation system that they can easily maintain which makes the current infrastructure unsuitable. The members also suggested that provision of irrigation infrastructure should be coupled with acquisition of agriculture equipment. Making information available at the inception to the members so that they make informed choices regarding the type of technologies to be adopted would enhance irrigation development. It is also important that both men and women are involved in the design, training for maintenance and effective use of the system.

Regarding institutionalisation, the majority of scheme members at Ndaya would prefer to work on their own whereas the majority at Esiphongweni would prefer to work in a group. This discrepancy is probably due to the fact that at Ndaya, the scheme members are composed of people that are not related whereas at Esiphongweni most scheme members belong to the Zulu clan, which creates a level of trust. The majority of members do not want to be involved in the management of the scheme. Members felt that the responsibility for determining which crops to grow at the scheme should lie either with the Farm Manager or Extension Worker or the committee. This shows that there is high dependency on the prominent member (or on somebody with an elevated status) to make important production decisions. The results show that many members are willing to enjoy the benefits but lack confidence to take responsibility for important decisions. The study also found that where there is a level of trust such as at Esiphongweni, management decisions are taken collectively. In contrast, at Ndaya, management suffers because of lack of collective responsibility. Inexperience with group controlled irrigation, general level of mistrust and lack of assurance for sharing the costs and the benefits, limits the opportunities for organizing effective groups that take collective responsibility in the schemes. Setting up small groups of like-minded people would enhance potential.

The isolated locality of the schemes generally restricts income generating and market opportunities. Because the schemes were established as a social entity, they were not developed with marketing in mind. Market access is further constrained by the lack of price information as well as high transportation and transaction costs.

There is limited possibility to turn the current investment into an opportunity since the overall cost and benefit makes little economic sense for rural communities. The costs of running the schemes are high. Under these circumstances, other non-agriculture investments that perform better could increasingly become attractive to the members. They may also consider it worthwhile to grow crops for subsistence only instead of investing time and resources for commercial production. In addition, considering the current production levels and the current socio-economic circumstances, the scheme members would not be able to maintain the infrastructure and sustain the scheme. For the scheme to be considered sustainable, a different set of conditions should prevail such as the identification of niche markets, high value crops, high management standards, disciplined financial and crop production management etc. Future development of irrigation schemes and sustainability of the current schemes would depend on improved returns on investment. The development of the schemes should always include an assessment of the potential returns to investment, and should also define the exact set of socio-economic conditions that should be considered to achieve the said returns.

Recommendations for enhancing potential when setting up schemes in the future

The general conclusion of the study is that many socio-economic factors influence the livelihoods of black developing communities. Whether the scheme was established as a social or commercial entity, communities will not stop the socio-economic activities that sustain their livelihoods. Irrigation development has to recognise this and setting up of irrigation schemes should primarily acknowledge the socio-economic circumstances of the user communities. It is therefore recommended that at the inception:

- The socio-economic aspects are identified and given primary consideration. Irrigation developments could define actions for dealing with such socio-economic issues as, the existing complex farming systems; the influence of gender, specifically the position of women; the impact of social obligations; land resources and access etc. The gravity of each of the aspects should be considered and actions to deal with these should be adopted immediately. This may require an investment in preparation of the farmers prior to setting up of irrigation schemes by allocating adequate time during planning.
- Full profile of the community should be done with the intent of harnessing support for site-specific objectives. This would also harness community demand. A participatory approach could be adopted to identify community offerings and define actions for encompassing and getting consensus around farmers' objectives.
- A complete system of support to deal with all factors at once is desirable other than identifying an individual or a couple of constraints and just dealing with those.
- Promoting a broad based strategy for crop production and agriculture production of which irrigation is a focal point is desirable.
- A feasibility study should be conducted at the outset of developing the irrigation schemes, giving indication of the available land resources and a long-term strategy for improvement and possible expansion when need arises.
- Targeting irrigation to small groups of people is more desirable as it raises the economic stakes at an individual level and increases the potential for success of the irrigation schemes. When the small group is well-equipped and well-educated group, the potential is even higher.
- Dealing with gender and population dynamics should occur at planning stage as a primary consideration.
- There needs to be a balance between achieving overall objectives of delivery and quick injection of money, and matching expectations and the rate at which the community develops.
- Adopt a strategy combining empowerment, awareness and capacity building and training to facilitate prospects for continued prosperity.

Upgrading of Current Case Schemes

Due to the low income margins, careful strategic interventions would be required to increase farm income opportunities for participants in the schemes. These could include the following options:

- The Esiphongweni scheme will benefit from the comprehensive agricultural support process currently adopted by the National Department of Agriculture, where as the Ndaya irrigation scheme will benefit by adopting a commodity approach and conducting a feasibility study to identify what commodities are suitable for the area. A second thrust could be to activate market needs for high value products such as exotic crops, medicinal crops, etc. For this option a focused Research and Development effort would be required. The approach should combine adapting production methods, use of high value crops, and appropriate institutional development such as extension support, marketing arrangements and information access. Coupling this with concrete action in addressing such socio-economic issues as gender biases, education and training, livelihoods, decision making, capacity building etc would enhance irrigation development
- Improved market access through the development of a localized central facility to reduce transportation costs. With the necessary market opportunity development, however, surplus production could be stimulated and profitably disposed of for cash income. This would clearly establish a more diverse farm business typology.
- "Low-cost production systems" should be promoted as the major thrust for the schemes. The sustainability of a low input cost strategy would also depend on whether government would provide the necessary resources for such a conversion to occur so that the irrigation system is cost effective.
- Management capacity: cost saving input supply, cooperative market development and new commodity development provide interesting opportunities. However, all these require business

management capacity and coordinated action. Substantial and expensive management support systems would be required to turn such a vision into reality.

Recommendations for further research

- Identify the potential land parcels that could be used as a focus for future commercial production oriented irrigation development in black developing communities and ascertain the demand for commercial irrigation.
- Evaluate the performance of the community group controlled schemes and other arrangements that are developing within black developing communities. This could include a synthesis of the procedures and guidelines from feasibility to planning to implementation of irrigation schemes that are community controlled.
- Simplified resource materials are required that identify the different irrigation technologies available, the advantages, disadvantages and implications of adopting a particular technology given the peoples socio-economic circumstances.
- There is a need for procedural guidelines for targeting women that are specific for group level irrigation development in black developing communities.
- As a further output of this study, it is suggested that a booklet should be prepared outlining the guidelines for identifying and defining action for consideration of socio-economic issues. This can be used as a field manual when conducting assessments for irrigation development in black developing communities.

Achievement of objectives of the study and actions to be taken

The study achieved its objectives. Using participatory methodology, the farming systems were investigated and therefore satisfied the first two objectives of the study. To identify institutional arrangements within the farming systems, the participatory assessment identified the general mechanisms and rules for social organisation such as rules for land control and access; rules for obtaining additional land resources; organization of groups for irrigation management and rules for conflict management. The target group was defined through direct questions that dealt with who in the community was the most interested in irrigated agriculture, and through general observations. The identification of steps for transformation of present farming systems and the preparation of an action plan were achieved through synthesis of the results. Strategic actions embracing objectives 4 and 5 were formulated and are given in sections 5.1 and 5.2 of Chapter 5. To achieve objective 6, guidelines and monitoring aspects were developed and are also given in Chapter 5. The guidelines are designed to assist with definition of actions for developing local institutions for water and management of schemes in developing communities; for targeting irrigation at community level and identifying and implementing a development path for rural communities for irrigation development. The final objective was to identify the human capacity development needs for running and managing sustainable irrigation farms. The investigation looked at the collective ability of the scheme members to manage the irrigation development. A synthesis of human capacity building requirements is given in sections 5.10 of Chapter 5.

Capacity Building

The research project provided an opportunity to provide exposure and build capacity of young black professionals in research methods. Four previously disadvantaged students benefited while working as technical staff for the project, namely: Mr Musa Funeka, B.Sc. Agric Honors student, University of Zululand; Ms Thabile Mzimela, B.Sc Agric Honors student, University of Zululand; Ms Joyce Thamaga, University of Natal; Mr. Brian Mbatha of University of Natal. The participants were assisted through directed reading, one-on-one consultations, and group discussions. The main areas of focus were Farming Systems, Research Methodology, Basic Principles of Research, Community Participatory Methodology. The facilitators at the workshop were Dr. Theodore U. Ferguson (Knowledge and Globalisation, Farming Systems), Prof. Peter Ewang (Farming Systems) and Mr. Patrick Mbanjwa (Community Participatory Methodology). The technician participants used this training as a

springboard to move on to related areas of work mainly in government departments and parastatals. Most of them are working directly with communities and on socio-economic aspects.

CHAPTER 1 INTRODUCTION

Various factors hinder or provide opportunities for people to improve themselves. For irrigation development in rural black communities, some of these factors are related to the socio-economic circumstances of the participants. Studies and extensive literature are available in South Africa that identify institutional arrangements that constrain irrigation development of:

- The previously government subsidised and government run schemes.
- Food-plot irrigators.
- Schemes transferred to communities through Irrigation Management Transfer (IMT) programs; and
- Community garden models (where the members individually sell the surplus).

In recent years, most irrigation developments are made as grants predominantly to the community garden model schemes. Very little has been done to identify the socio-economic factors for these schemes. This study uses two such schemes as case studies to identify some of the socio-economic factors that may constrain or enhance irrigation development in black developing communities. The main purpose of the investigation was to:

- Define the socio-economic context in which water driven agriculture systems in black developing communities exist.
- Evaluate the importance of considering the socio-economic context in order to enhance sustainability of the agriculture systems mentioned above; and
- Develop guidelines and procedures for identifying actions to deal with socio-economic factors at the inception of irrigation developments.

The specific objectives were to:

- Investigate and analyze the existing farming systems within the schemes in terms of size and technology;
- Identify institutional arrangements within such farming systems;
- Identify potential target groups for potential farming systems;
- Identify steps for transformation of present irrigation farming systems;
- Prepare an action plan for the development of irrigation farming systems in black communities;
- Develop a monitoring procedure for the implementation of the guidelines; and
- Identify the human capacity needs for running and managing sustainable irrigation farms.

CHAPTER 2 LITERATURE SURVEY

Planners project that most of the food production increases in the next three decades, when the world population reaches eight billion, would have to come from irrigation (Skogerboe, 2000). Irrigated agriculture will increasingly become important world-wide such that the use of irrigation to meet world food needs is unavoidable and inevitable (Horinkova, 1999). In South Africa, there are various initiatives and programs that support irrigation as a means of social and economic development. Most of these programs and initiatives are directed at black developing communities. Considering current legislation, these irrigation developments are set to increase over time. The National Water Act (Act 36 of 96) of the Department of Water Affairs and Forestry is an example of the type of legislation that currently drives this expansion. The act makes provision for water to be protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner to the benefit of all people. It also recognises that in fulfilling these provisions, special account must be taken of previously disenfranchised communities (DWAf, 1997).

One of the aims of the water policy of South Africa is to increase access to water for economic development of black communities (DWAf, 1997). This provision compliments the strategy of the National Department of Agriculture developed in 2002. The strategy aims to broaden participation in a prosperous agriculture sector by increasing access of previously disadvantaged communities to agriculture resources, including water for irrigation purposes (NDA, 2002). Since 1998, the agricultural policies have been reformed with an overall objective to create opportunities for smallholder and resource poor farmers, to improve the efficiency and therefore the competitiveness of the sector and to utilise resources sustainably (NDA, 1998). Irrigation development is considered as one of the policy options and possible means to create such efficiency and competitiveness (NDA, 2002).

Before the general elections of 1994, which marked the end of the *Apartheid* era in South Africa, irrigated agriculture in black developing communities consisted mainly of government-controlled schemes, a range of privately owned irrigated plots and food plot irrigation schemes (Bembridge, 2000). The identification and development of the government controlled and the food plot irrigation irrigation schemes was mainly based on appropriateness of physical conditions and availability of water (Bembridge, 2000). Almost all schemes developed in the Eastern Cape and KwaZulu/Natal during the period 1976-1985 resulted mainly from an assessment of the natural resources (irrigated soils + dam site = irrigation scheme) (Van Averbeké *et al.*, 1998). In some cases even the technical aspects were not considered thoroughly. Irrigation schemes were hurriedly constructed before an in-depth study was conducted regarding the type of irrigation system, crop-water response function, dam capacity and stability of water supply (Backeberg and Groenewald, 1995). In black developing communities, government-driven irrigation development mainly meant the supply of infrastructure and the farmers became wage labourers that were not involved in the management or decision-making processes of the schemes. Moreover, most of the larger irrigation schemes were established for political reasons. In this instance, neither the biophysical suitability nor the social and economic circumstances of the beneficiaries were assessed (Bembridge, 2000). Economic circumstances such as marketing, land size, management and capital were ignored or neglected in the design of irrigation schemes intended to benefit black communities (Bembridge, 2000). In most cases social issues were remotely acknowledged (IPTRID, 2000) and cost-benefit analyses were not always conducted (Van Averbeké *et al.*, 1998). Thus, the history of irrigation development in black developing communities indicates that generally the socio-economic realities of black communities to sustain irrigation were inadequately incorporated in the irrigation development process. Clear actions to deal with these realities were seldom taken in the establishment of irrigation schemes. Bembridge (2000) indicates that the history of irrigation in South Africa has not been one of participation by, or consultation with the supposed beneficiaries.

Since the general elections of 1994, there has been a shift in the irrigation development from government-controlled schemes to community or group controlled. The introduction of special programs such as the Xoshindlala Campaign of the Department of Agriculture in KwaZulu/Natal; the Community Production Centre (CPC) programs of the National Department of Public Works; the Land Redistribution for Agriculture Development (LRAD) Program of the National Department of Land Affairs, resulted in an upsurge of assistance provided for irrigation schemes of various sizes, directed at community groups. The Esiphongweni and Ndaya irrigation schemes (the two case studies for this

research) were developed under the Xoshindlala campaign (meaning "chase away hunger"), and the Community Production Centre Program, respectively.

Despite the shift in scheme control, the post 1994-election schemes were approached in a manner similar to the schemes developed in the eighties and early nineties. Upgrading of the schemes from ordinary communal garden sites to formal irrigation schemes has been supply-driven by the initiators of irrigation, and not demand-driven by the prospective scheme members, generally focusing on technical solutions such as production processes, marketing and extension support. The irrigation management models and technologies used are typically scaled down versions of the white commercial farms with sophisticated infrastructure (IPTRID, 2000). For example, despite the availability of alternatives such as treadle pumps, drip kits, short furrow irrigation, etc., sprinkler systems are used indiscriminately in various situations in South Africa (IPTRID (2000). This is inappropriate, as commercial white farms demand modern farming technologies, high financial start-up investments, high standards of management, etc. These demands of commercial farming are not always matched with the capacities of black farmers when designing the schemes (Van Averbeké *et al.*, 1998).

Moreover, most of the post 1994-election scheme development programs promote upgrading irrigation infrastructure and intensifying agricultural production activities, with the aim of encouraging sale of produce by the scheme members, to increase incomes and to rise out of poverty. However, the supply and use of irrigation systems for increased incomes requires a careful combination of farmers' objectives with particular physical, economic, social and cultural environments, to produce incentives and intended outcomes of irrigation schemes (Ostrom, 1993). Reaching an understanding of community social, economic and institutional setting is therefore a major factor determining the sustainability of developing irrigated agriculture (IFAD, 1995). These issues should receive equal priority with physical irrigation features. In most cases the initiators of irrigation attach greater importance to physical features in order to accomplish what they believe are satisfactory levels of performance (Ostrom, 1993). Inadequate consideration is given to the capabilities and socio-economic circumstances that may constrain the farmers and therefore affect the sustainability of the irrigation scheme (Bembridge, 2000). Shah *et al* (2002) state that there is potential for increasing the wealth and change the economic circumstances of small holder agriculture when institutional arrangements deal with the entire complex of constraints facing black developing communities all at once. The success of small-scale farmer irrigation schemes depends on the integration between technology, management, farmer typology, farming systems and the socio-economic situation (Bembridge, 2000).

From the preceding paragraphs, it can be said that there has been an over emphasis on technical matters and a disregard for social factors in the design of irrigation projects intended for the benefit of black communities. Lack of attention to social-economic factors that constrain irrigated agriculture has led to lack of success of many schemes (Bembridge, 2000). Some of these critical socio-economic factors, found in literature, that are considered important to irrigation development in rural areas relate to:

- The multiplicity of rural farming systems;
- Gender equity;
- Appropriateness of technologies;
- Land acquisition procedures;
- Location of communal gardens in relation to markets
- Production objectives
- Sustainability through management
- Organisation
- Decision making and accountability
- Training and extension

2.1 THE MULTIPLICITY OF RURAL FARMING SYSTEMS

Lipton *et al.* (1996) indicates that to fulfill their social and economic needs, rural people engage in a wide range of activities in order to generate a livelihood. Diversification of income sources is a key factor influencing the well being of households in rural areas (May, 1996). Through diversification, households are able to buffer themselves against risk in agrarian environments. By engaging in diversified activities, households may be seen as trying different options, which they hope will generate an adequate and sustainable¹ livelihood that is resilient to shock and acts as a buffer against risk (UNDP, 2002; Lipton *et al.*, 1996). FAO 1997, suggested that lack of integration of the different rural farming activities such as rain-fed agriculture or other non-irrigation activities that the communities are engaged in, constrains irrigation development and often hinders the economic strengths of traditional practices of survival (FAO, 1997).

2.2 GENDER EQUITY

Chancellor (2002) identifies the main gender biases that affect irrigation development in rural communities. These include lack of gender sensitivity in the project designs, in access to training for the technology used on the scheme, recognition of the different chores, activities, social obligations and different objectives of men and women regarding the use of irrigation facilities, targeting of irrigation and gender biases regarding operation and maintenance of irrigation infrastructure. Generally the focus is on men inspite the knowledge that in South Africa, successful community gardens are often managed and operated by a small number of women (IPTRID, 2000). In many cases the relatively more sophisticated technology such as ploughing and irrigation, are traditionally considered the domain of men. Training on any mechanical aspects of irrigation tend to be directed towards men (Chancellor 2002). Even when volunteers are requested to undergo training in mechanical aspects of irrigation it is usually the men who volunteer (Chancellor, 2002).

However it has been found that in cases where there has been a balance in crafting local irrigation institutions that are sensitive to women, performance has increased (Chancellor, 2002). For example, the presence of an irrigation scheme generally increases the workload of women because activities such as transplanting, harvesting and leveling are burdens of women, as is the extra weeding that results from applying water in the schemes (Chancellor, 2002). Thus the introduction of irrigation puts extra pressure on women who are already burdened by unrelenting work schedules and their many other productive roles. Some irrigation initiators have alleviated these problems and made irrigation programs more successful by including energy saving technologies in the design of irrigation development (FAO, 1996b, Chancellor, 2002, van Koppen, 2001). In Tanzania the initiators of irrigation schemes included other processes such as fuel saving technologies, milling machines, monitoring, nutrition education, etc. (van Koppen 2002).

2.3 APPROPRIATENESS OF TECHNOLOGIES

Technological constraints in a social context relate to knowledge and training on use and operation of the equipment; levels of participation in the design of the irrigation system; knowledge of, and access to information on the different technology options available and appropriateness of such technology to the operations of small-scale farmers in terms of sustainability, maintenance and cost effectiveness (IPTRID, 2000; De Lange, 1997; Backeberg *et al.*, 1996)

For example, the choice of technology to be applied is not always planned and implemented to suit the management and operational skills needs of small-scale farmers (IPTRID, 2000). Moreover, training on irrigation infrastructure is mainly conducted on maintenance and not on the effective use of the system (De Lange, 1997). The lack of knowledge and understanding of the operations of an irrigation system usually leads to poor maintenance of infrastructure and affects its sustainability. (Backeberg *et al.*,

1. livelihood is sustainable if it can cope with or recover from or adept to stresses and shocks, if it can maintain and enhance its capabilities and assets and enhance opportunities for the next generation. It should have all these characteristics without paralyzing the livelihood options of other people and not undermine the natural resource base (Chambers, date?)

1996). For example, the Arabie Olifants scheme was successful until government support and management was withdrawn. The scheme members could not maintain the scheme any longer (IPTRID, 2000). The dependency on external maintenance of irrigation schemes should be avoided if they are to remain sustainable (Crosby *et al.*, 2000). Any new small-scale irrigation development would need greater participation from farmers in the decision-making process in terms of choice of irrigation technology (IPTRID, 2000).

2.4 INCLUSIVE PARTICIPATION

Crosby *et al.*, 2000 indicated that organising people for future development processes requires participation of all that are involved in irrigation. Participatory planning is in itself an important component of irrigation development that can lead the way to successful farmer managed irrigation schemes (Crosby *et al.*, 2000). Interactive participation, whereby people participate in partnership with external agencies at the early strategic stages of project design and throughout its implementation is desirable (Horinkova, 1999; ODI, 1998). The active participation of farmers in the planning process as opposed to mere consultation, makes a difference in the potential success of an irrigation development (Crosby *et al.*, 2000). Participation in decision-making at the onset of the project can assist initiators in ascertaining the demand for the planned irrigation system (IPTRID, 2000).

2.5 LAND ACQUISITION PROCEDURES,

Social factors related to land acquisitions that can impede irrigation development are lack of opportunities and limited options to increase land proportions per scheme member when such a need arises, lack of assumable tenure of security for investment for commercial production and uncertain land use rights (IPTRID 2000, FAO 1997).

The larger the land area per person sharing in the scheme, the more there is a shift of objectives and an orientation towards commercial production (Bembridge, 2000; Van Averbeke *et al.*, 1998). On studies of schemes in the Eastern Cape, Van Averbeke *et al.*, 1998, found that commercial production requires approximately 2 ha of land. On schemes with an average plot size of 2 ha, the farmers were able to make a fairly large profit, recover the main operating costs and provide full time employment for both husband and wife (Van Averbeke *et al.*, 1998). However, complicated political processes and issues in getting land allocated for community gardens (as well as issues of right-to-occupy, title deeds, tribal/communal land allocation, how farmers are selected for assistance) constrain irrigation developments (IPTRID, 2000). One of the constraints is tenure insecurity, which discourages land transactions that can make it possible for people within a community to increase land sizes (FAO, 1997). An understanding of traditional African land tenure systems and the management of common property are essential elements in designing successful small-holder irrigation systems and it may not always be prudent to disrupt existing tenure systems (FAO, 1997). Tenure arrangements that seem like loose arrangements can be more secure than formalised arrangements, depending on social, legal and administrative institutions in a given society (FAO 1997). However, Shah *et al.* (2002) suggested that the constraint may not be that of tenure security or insecurity, but rather of concern on the part of the scheme members for the rights of use and lack of opportunities for expansion of land, that are critical

2.6 LOCATION OF MOST COMMUNAL GARDENS IN RELATION TO MARKETS

Van Averbeke *et al.* (1998) suggested that market access is one of the factors that would encourage the move from subsistence to commercial production orientation. However, the remote location of many community gardens and small-scale schemes lead to frustrations over communication difficulties and market access. (IPTRID, 2000). Small-scale farmers and community gardeners are able to sell produce in local markets when these are located within practical reach. This can be either a township or reasonable access to a road to sell surplus produce (IPTRID, 2000).

2.7 PRODUCTION OBJECTIVES

Although irrigation development based on high return cash crops, can yield returns comparable to non-agricultural investments, Lipton *et al.*, (1996) found that the production objectives of rural communities

are mainly determined by their short-term food security needs and the farmers do not always choose high value cash crops. (Bembridge, 2000) found that integrating the social objectives of the scheme members with those of commercialization as promoted by the irrigation initiators enhances the potential of the irrigation schemes.

2.8 SUSTAINABILITY THROUGH MANAGEMENT

Turrall (1995) stated that productivity of the irrigation schemes increased when management skills were available among the farmers. Experience from countries such as the US, Australia and Chile shows that technical performance and productivity increases when new managers accumulate experience and where functional systems are handed over to relatively small numbers of well-capitalised and market-oriented farmers, operating within a well-established legal framework (ref). In Mexico this approach reformed the industry rapidly and comprehensively (Turrall, 1995). This is supported by Shah *et al* (2002) who states that one of the characteristics of high performance irrigation groups in Africa has been where the culture of collective self-management (financial and managerial) is well established. The performance of most small-scale farmer irrigation schemes has been poor due to a combination of social and technical factors combined with a large element of non-accountability and poor management skills (Bembridge, 2000).

2.9 SOCIAL ORGANISATION

Institutional building at a local level constitutes identifying the rules and patterns of behavior that shape social interaction (Bass, 1997). Ignoring this aspect of group dynamics such as the lack of concrete action to harness community rules, regulations and social organisation in project design can significantly constrain irrigation development in rural communities (Agarwal, 2002). Groups of individuals that are bound by a common goal create this social capital (Bass, 1997). Enhancing local institutional arrangements constitutes development of social capital and it should be promoted as it encourages solidarity (Bass, 1997). An in-depth understanding of the abilities, functioning and interaction of institutional and organisational mechanisms of rural society is of paramount importance for rural irrigation development (Greenberg, 2000; Bass, 1997).

2.10 DECISION MAKING AND ACCOUNTABILITY

The requirements for an appropriate irrigation management system are that it should be financially sound, accountable to the members and it should be properly constituted (IPTRID, 2000). Small-empowered groups that receive constant training can sustain an irrigation scheme better than those that are weakly organized. The latter would require continuous support and training (IPTRID, 2000).

2.11 TRAINING AND EXTENSION

IPTRID (2000) stated that successful gardens have farmers or cultivators who have received some form of training and continue to receive expert knowledge, or at least feel they can get it when they need it. A shift in production objectives from household food supply to market oriented production appears to increase farmer's need for and interest in specialised advice (Van Averbeké *et al.* 1998).

IPTRID (2000) found that many of the ideas connected with training are already in place in South Africa but the principal constraint is getting the message across to emerging farmers and small plot cultivators. Bembridge (2000) found that one of the contributory factors to the difficulties of message transfer is the low levels of education among black developing community members, which limit the methods by which they can acquire information. Van Averbeké *et al.* (1998) found that because of the general low level of education of the scheme farmers, irrigation technology transfer is expected to rely heavily on farmer training programs and extension advice. IPTRID (2000) found that training methods that are largely visual and such as farmer's days, demonstrations, road shows, and TV are important. But, lack of properly qualified extension staff and farmers is a major drawback to the effectiveness of many schemes (Bembridge, 2000). Bembridge (2000) emphasizes the importance of training programs and indicates that at all levels training should receive high priority and assessment of training needs should be the basis of any well planned institutional upgrading of small-scale irrigation schemes.

The preceding text indicates that there is a whole range of complex socioeconomic factors that black-developing communities could face in irrigation development. Localised and in-depth understanding of these socio-economic circumstances is therefore important in the design of irrigation schemes. However, available literature suggests that research has not been done yet on the nature of the social factors that may contribute to the viability of the schemes in black developing communities in South Africa. This study intends to understand and define the exact nature of these issues from the point of view of the prospective scheme members, and investigate how these socio-economic factors affect the sustainability of water driven agricultural systems in black developing communities.

CHAPTER 3 RESEARCH METHODOLOGY

Various methods of data collection were used in the community diagnosis. These methods included a reconnaissance survey, discussions, social-economic surveys, participatory assessment and use of data sheets. The formal assessment was coupled with observations conducted during extended periods of stay in the community. It was never the intention of this study to make comparisons of the two schemes. However, in some cases a body of information was collected that could be compared and contrasted.

3.1 RECONNAISSANCE SURVEY

A reconnaissance survey in the context of this study meant the identification of types of available irrigation schemes in KwaZulu/Natal, identifying the membership and characterisation of the schemes.

The survey commenced with discussions at the Department of Agriculture and Environment (DAE) regional offices under whose jurisdiction the two schemes fall. Objectives and expected outputs of the study were discussed. Some of the critical issues affecting irrigation scheme development as experienced by the DAE in the areas were also identified.

Subsequent to the meetings held with the DAE officials, the research team held a workshop. The aim of the workshop was to refine methodology for the reconnaissance survey. Based on the conclusions of the meeting with the DAE and the workshop, eight aspects were identified as critical for the initial scanning of the irrigation schemes that could be considered as study sites. A checklist (Annexure 3) was developed at the workshop and was used to guide the reconnaissance survey. The eight aspects were community assets, institutional structure, biophysical suitability, socio-economic setting, information systems, development history, farming systems and management. Thirteen irrigation schemes located all over KwaZulu/Natal were scanned in the reconnaissance survey. From this information, black farming communities were characterised. The profiles outlined in Chapter 4 were partly derived from the results of the reconnaissance survey. In addition, interest groups and stakeholders as well as important actors in the particular study areas were identified so that the important linkages were identified. A criteria (Annexure 4) for selection of the schemes was derived. The criteria were then applied to select the study areas. It was necessary that the chosen schemes for the study are fairly similar to allow for reasonable generalizations. Two communities were selected: one along the Mooli River, a tributary of the uThukela and another along Umkhomazi River. A community, in the case of the study, was described as the group of people living together in the same area. The complete profiles of the schemes are contained in Annexure 2.

3.2 SOCIO-ECONOMIC SURVEY

The socio-economic survey was shaped by the results of the reconnaissance survey and a questionnaire (Annexure 5) was developed. The aspects that were considered by the community members as impeding to irrigation development were included in the socio-economic survey.

Consideration of cost and time allocated for completion of each questionnaire determined the number of questions that could reasonably be completed in a single interview. The strategy was therefore to identify the main known aspects that impact rural communities and identify how these would further impact irrigated agriculture. A questionnaire was developed, which captured information on age and gender, objectives of farming, employment opportunities, decision making, technologies, family labour, land size etc. To reduce the load of questions in the questionnaire, data sheets were used to collect some of the data on livestock numbers, income, household composition, services, crops grown etc. This information was summarised and also contributed to the development of the profiles contained in Annexure 2. The questions in the questionnaire were structured as follows:

Gender

This study did not assess the gender issues at stake in the division of responsibilities at household level. It focused on identifying the roles and activities that are gender based that would impose a constraint on women's involvement with irrigated agriculture. This exercise was only conducted at

Esiphongweni because the husbands and wives work together. The assessment was not done per household but with all the 31 scheme members in a focus group type session. The Ndaya scheme is composed predominantly of women and from the observations it was felt that the gender issues affecting women are similar to those of women at Esiphongweni and generalisations could be made.

The scheme members did ranking of gender-biased roles. The first of all identified and roles of women and men in the irrigation scheme of Esiphongweni area and thereafter ranked them. The farmers listed all activities conducted in the irrigation scheme and scored them on a scale of 1 to 5, where 5 represented activities that were exclusively done by either women or men, 2.5 represented activities that were equally shared by both men and women and the allocations for any activity that was predominantly done by one group was allocated 3 or 4.

Land Sizes:

Farmers were requested to assess the adequacy of the current land sizes for commercial production. Those farmers that could not estimate the size in hectares were asked to give football ground equivalents. In the area the football ground measured 100m by 100m, which where afterwards converted into hectares.

Technological Constraints:

During the extended periods of stay in the communities the team identified that the main technological concerns that may negatively impact on irrigation development included the irrigation infrastructure, the agricultural implements and equipment. To this end, the study took a narrow interpretation of technology and Scheme members were requested to assess current irrigation infrastructure, the agricultural implements and equipment and its sufficiency for crop production.

Youth Involvement:

The study assessed the perceptions of the scheme members and the youth themselves were not questioned.

3.3 PARTICIPATORY ASSESSMENT

The participatory assessment set out to augment the findings of the socio-economic survey conducted for this study. PRA is an intensive, systematic but semi-structured learning experience that was carried out by the team but also relied heavily on the participation of the community members. A range of techniques and approaches were used aimed at actively involving community members in identifying problems and formulating responses. Several techniques and tools of Participatory Methodology and Gender Analysis were used. These included Semi structured interviews, Farming Systems Analysis, Diagramming, Ranking, Profiles and Force Field Analysis. The main aim was to gain an in-depth understanding of the dynamics of gender relations in the irrigation schemes, record the current farming objectives, constraints and opportunities as well as the members vision for future farming in crop irrigation, current livelihood systems and interest groups. Part of the information from the assessments is contained in the profiles in Chapter 4 and in Chapter 5: Findings of the Social Survey.

The scheme members' overview and objectives were discussed using Force-Field analysis at Esiphongweni. At Ndaya the size of the group prevented containment of the discussion using the Force Field analysis. Thus, group discussions were used instead. The methodology of Force Field Analysis requests the farmers to discuss, and then in a few sentences write down their opinion of:

- The current situation
- Where they are now in relation to their long term objectives for farming; and
- Where they would like to be in five years time in terms of irrigation development.

The participants were further requested to identify what they consider to be the main positive and negative influences for change.

The scheme members' livelihoods assessment was conducted using sketch diagram methodology. The scheme members drew a sketch diagram on the ground (with sticks and stones) of the main relationships between various products emanating from the different livelihood activities. The facilitator simultaneously recorded the explanations and descriptions given for each product flow.

3.4 OBSERVATIONS THROUGH EXTENDED STAYS

Observation meant thinking about what we saw and understanding what was happening so that we could cross check with the information we had collected through other methods. During the stays we observed the communities' mechanisms for assigning boundaries for management, identifying and balancing benefits and cost, investments in monitoring and sanctioning activities, conflict resolution mechanisms, organisational arrangements and general institutional issues that could likely to affect irrigation use. During the extended stays we also conducted transect walks/community walks to analyze the quality of the natural resource base (land, soil, water and pasture). The transect/Community walks constituted walking the breadth of the community and the irrigation scheme. We also observed the community response to use and management of the water resources.

3.5 STRATEGIC PLANNING

To devise strategic directions for the schemes, a "strategic planning" approach was followed using an adapted version of Logical Framework Analysis (Log frame) (Van Rooyen & Haese, 2003). Thirty scheme members attended the planning process. This participative planning approach focused on environmental analysis of the project situation followed by the identification of constraints and opportunities that were experienced by scheme participants and other stakeholders. Through problem solving analysis conducted during group sessions, strategic guidelines for the further development of the scheme were proposed. An agribusiness focus was used to direct the analysis i.e. the identification of the required inputs/actions to achieve business results and outputs.

A farmer typology assessment was attempted during the strategic planning process. The farmer typology process acknowledges and describes the economic and social diversity of the scheme members. Farmer typology could in turn be an important parameter for future planning. However, this was constrained by the group nature of the discussion sessions.

3.6 ANALYSIS

The data from the Questionnaire were captured in a spreadsheet and percentages of the responses were calculated, analysed and interpreted. The information gathered from the other methods were summarised and used to cross verify some of the information collected through the Questionnaire. Constraints and opportunities associated with irrigated farming in black developing communities, as well as any general problems, that may influence agricultural production on the irrigation schemes were developed thereafter.

CHAPTER 4 FINDINGS OF THE SOCIAL SURVEY AND PARTICIPATORY ASSESSMENT**4.1 GENDER AND AGES OF SCHEME MEMBERS**

The Ndaya CPC is composed of 89% women and 11% men whereas Esiphongweni is composed of 55% women and 45% men. This concurs with other findings that most irrigation schemes are composed of more women than men (IPTRID, 2000).

Age provides an indication of whether the farmers are still of a productive age to cope with the demands of an irrigation scheme. Ndaya is made up of a relatively younger population than Esiphongweni with average age of 40 years and 60 years respectively. It may be necessary to develop a succession plan, especially for an ageing group of scheme members such as Esiphongweni, to ensure that irrigated agriculture continues to provide sustainable livelihoods for new members.

4.2 DIFFERENTIATION OF GENDER ROLES IN PRODUCTION ACTIVITIES OF THE IRRIGATION SCHEMES

The different roles of male and female members of the scheme are presented in Table 4.1. The findings suggest that men are involved with fewer tasks whereas women appear to engage in the most laborious work. Women perform work such as weeding, ridging, planting, harvesting and marketing of produce, whereas the two main roles done by men are to operate and maintain the electric pump and to control insect pests and diseases. Harvesting and application of manure are tasks that are exclusively done by women. These roles have a profound impact on the workloads of women.

Table 4.1 also shows that the activities that were traditionally performed by men have been reduced significantly with improved technology, and some are now shared with women. For example, when furrow irrigation was used, men mainly did in-field irrigation, but currently because sprinkler irrigation is used, in-field irrigation is done by both women and men. Ploughing, which men previously predominantly did, is now no longer a man's job only, because tractors are used instead of oxen, and both men and women pay for the service equally. Improved technology has benefited men more than women as it has reduced the traditional activities of men in the irrigation scheme. However, the women acknowledge that the activities done by men only are generally heavy and tedious tasks such as moving water pipes. This activity requires that pipes be carried above ground to avoid damaging crops on the ground, an activity that the women consider to require manpower.

Table 4.1: *Production activities conducted by female and male members in the irrigation schemes.*

Production Activity	Male Members %	Female Members %
Starting the pump	100	0
Ploughing	50	50
Weeding	20	80
Ridging	20	80
Irrigation	40	60
Planting	20	80
Insect pests and diseases control	100	0
Harvesting	0	100
Manure application	0	100
Carrying the harvest home	20	80
Marketing/selling produce	20	80

4.3 CHORES PERFORMED BY MEN AND WOMEN BEFORE AND AFTER WORKING IN THE IRRIGATION SCHEME

Table 4.2 shows the chores and/or activities performed by male and female scheme members before going to the irrigation scheme and after they return from the irrigation scheme. The female members have more chores and activities than men. It was established that to cope with these schedules and the workload from the irrigation schemes, the women start their day about 4.30 am and complete their daily tasks at 10.00pm. The men also commence their day at the same time but end it earlier at about 6.00pm.

Table 4.2: *Chores and/or activities performed by male and female scheme members before going to, and after returning from the irrigation scheme.*

Chore/Activity	Before		After	
	Men	Women	Men	Women
House cleaning e.g. making beds, sweeping yards, washing dishes	√	√		√
Cooking		√		√
Attending to school going children		√		√
Fetching firewood				√
Fetching water		√		√
Attending to personal needs e.g. bathing, praying	√	√	√	√
Laundry				√
Handicraft				√
Tending to fowls				√
Tending to livestock e.g. opening gates to release animals for grazing, feeding livestock,	√	√	√	√
Clean and repair garden tools	√	√	√	
Dealing with family welfare matters such as family disciplining, maintenance of vehicles, grocery shopping where needed	√	√	√	√

4.4 ABSENTEEISM DUE TO SOCIAL OBLIGATIONS

Social activities that may impact on the time the scheme members spend in the irrigation scheme are listed in Table 4.3. Irrigated agriculture for commercial purposes requires minimal interruptions at critical or peak production times. However, in the social context of black developing communities there are some social obligations, events and beliefs that are not only obligatory and unplanned but that can also take up considerable time and potentially disrupt production activities.

Each scheme member at Esiphongweni is away from the scheme approximately 18 days each year. In an evaluation session it was found that at Ndaya there are 15 such days. For both Ndaya and Esiphongweni this may not be significant as it represents less than 5% of the labour days in a year. However, these days are not planned and they can fall on critical production days. Also considering

that in most of these communities, the scheme members themselves provide labour requirements for the scheme, an absence of a total of approximately 600 man-days and 1000 man-days per year for Esiphongweni and Ndaya respectively seems high. The scheme members themselves stated that the obligatory social events do significantly disrupt the production activities at the schemes.

Table 4.3: *Social activities that contribute to reduction of time spent in the irrigation.*

Activities	Times Per Month	
	Men	Women
Funeral services	3	5
Cattle dipping	4	
Community meetings/workshop	2	3
Breakdown of the engine such as cut off of electricity supply	1	1
Attending to conflict for theft of tools and/or irrigation pipes	1	
Traditional ceremonies	1	1
Prayer meetings (Tuesday for men and Thursday for women)	4	4
Pension pay-outs	1	1
Agricultural extension meetings	1	1
TOTAL	18	16

4.5 EMPLOYMENT AND INCOME GENERATION OPPORTUNITY

The farmers were requested to indicate what they considered their main employment opportunity and rank which activity contributed the most to their income. The majority of scheme members at both schemes (91% at Ndaya and 58% at Esiphongweni) considered crop farming as their main employment. Crop farming was also ranked as the most important contributor to family income at both schemes.

Tables 4.4 and 4.5 show the multiple activities that the communities are involved with in order to survive. Although they state that crop farming is their main activity they still engage in many other small businesses such as sewing, selling drinks, constructing roofs, baking etc. Pensions were another significant source of income at Esiphongweni (23%) where there is a large proportion of older members than at Ndaya.

Information generated from the data sheets shows that both Ndaya and Esiphongweni scheme members do not have many opportunities for employment apart from the opportunity presented by the irrigation schemes themselves. This may suggest that where there is no alternative employment or another income source, agriculture production offers the best opportunity. In addition, farming is normally an activity that is commonly practiced by almost all black families in rural communities.

Considering the choices that the people at the Ndaya and Esiphongweni schemes have, it may be said that the scheme members engage in irrigation as a way of life and as a way of maximising the available options, not necessarily as a planned strategy for generating an income. It is therefore critical that the objectives of the members are clarified or affirmed before investments for irrigation development are made.

Table 4.4: *Types of employment opportunities available for scheme members at Ndaya and Esiphongweni schemes.*

	Ndaya	Esiphongweni
Activity	%	%
Crop farming	91	58
Small businesses e.g. sewing, selling drinks, constructing roofs, sale of wood, baking, brick making	17	6
Seasonal/temporal jobs	9	19
Other professional jobs e.g. teaching, tractor driver	7	7
Animal farming	3	3
Medium enterprises e.g. construction, taxi, painting, welding and ploughing services	3	13
Labour work e.g. weeding	3	
Arts and craft	2	3

Table 4.5: *Ranking of various sources of income generating activities available to scheme members.*

Activity	Esiphongweni			Ndaya		
	%			%		
	Rank			Rank		
	1	2	3	1	2	3
Crop farming	29	32	7	88	5	0
Small businesses e.g. sewing, selling drinks, constructing roofs, sale of wood, baking, brick making	0	3	0	1	2	0
Pensions	23	0	0	0	0	0
Seasonal/temporal jobs	13	3	7	2	0	0
Other professional jobs e.g. teaching, tractor driver	3	0	3	0	0	0
Animal farming	0	19	39	18	16	7
Medium enterprises e.g. construction, taxi, painting, welding and Ploughing services	3	3	0	0	0	2
Labour work e.g. weeding	0	0	3	0	0	3
Arts and craft	0	3	0	0	0	0
Inheritance	3	0	0	0	0	0

The information presented in Table 4.6 show that the majority of scheme members (77 % at Ndaya and 42% at Esiphongweni) never had any formal employment before joining the scheme. Most of the scheme members that have been employed at Ndaya, worked in Durban and in the surrounding area as labourers, domestic workers, taxi driver, cook, catering supervisor, etc. The Esiphongweni scheme members that had worked before joining the scheme, mainly worked at the nearby town of Greytown or in Johannesburg. Most of the scheme members have only just subsisted on the schemes.

Table 4.6: *Places worked and type of jobs carried out by scheme members before joining scheme.*

Places worked and type of jobs	Ndaya %	Esiphongweni %
Never been employed before	77	42
Employed elsewhere e.g. Durban, Pietermaritzburg, Johannesburg, Greytown doing jobs such as domestic worker, catering supervisor, Road construction, adult educational centre, farm worker, shop worker, taxi driver, labourer.	23	58

4.6 FARMING SYSTEMS AND LIVELIHOOD

The farmers were requested to describe the nature of their livelihoods (Box 4.1). The results show the dependency on a variety of activities and the cross-subsidisation that occurs among the various activities that the scheme members engage in to meet their financial and food needs. This scenario may not necessarily change with a shift in objectives to commercialisation because it is interwoven in the social setting of the rural households. The descriptions show that there is a complex flow of products from one activity to another aimed at satisfying the scheme member's social and economic obligations.

The results also show that decisions to use products from one system to the other are not random, but are carefully planned. For example, when the farmers at Esiphongweni ranked the products in terms of importance for livelihood security, pension money was ranked as the most important followed by livestock production. Pensions in this case were also identified as a source of loans and credit to purchase input requirements for the scheme. But pensions are also used as a reliable and cheap source of loans as the money is lent without interest. It was indicated that the irrigation scheme currently relies on pension money for its continued existence. In addition, livestock production was described as providing security and hedging against financial losses and crises. It is also a short-term investment as it provides financial security and satisfies other social needs such as paying for *lobola* (Bridal dowry). Tuckshops and provision of casual labour, ranked third. Loans and credit from financial institutions were ranked fourth. Other activities mentioned included participation in Zulu dancing which provides remittances.

Through brain storming sessions, a similar picture was drawn for Ndaya except that livestock production and pensions did not feature highly. However, the practicing of rain-fed agriculture was considered very important.

Box 4.1: Flow of products from various activities at household level.**Flow of products between the livestock production and the households**

The households carefully allocate the funds from livestock production depending on the need. When the household needs food they will collect eggs and slaughter chickens for immediate household use. To pay for immediate cash requirements they will also sell fowls. For major purchases such as inputs (seeds, hiring a tractor and payment of bills for the irrigation scheme, feed and medicines for livestock), they will sell goats. Occasionally when they need to make even bigger purchases such as clothing and food, and to build houses and pay school fees, pay for lobola, they will sell cattle. Cattle are also used as collateral when money is borrowed from other community or family members.

Flow of products between the household and crop production

There is a complex flow of products between the household and crop production. The households obtain vegetables, fruit, maize, potatoes and beans from the irrigation scheme to provide for subsistence needs. The surplus produce is sold and in certain cases the scheme members buy produce from each other. Cash generated from the sale of the crops is used to buy food, clothing for the family, and inputs such as seeds, seedlings, tractor and casual labour hiring for crop production. The family contributes its labour towards the production of crops. From the household comes pension funds that are used mainly for the purchase of agricultural inputs. Some family members work and provide income through off-farm employment. The family members will get loans and credit to support the irrigation scheme.

Flow of products between cropping and livestock systems

Crops benefit from livestock through manure and animal draught whereas the livestock production system benefits from crop residues, maize-grains, radish and vegetable leftovers.

Relationship with the river

The families obtain fish from the river and they use water from the river to irrigate crops in the irrigation scheme, drinking water for both livestock and human beings. Members of the households also wash and bath in the river.

4.7 USE OF INCOME EARNED FROM CROP SALES

Esiphongweni scheme members mainly use their income to buy food and basic household needs (100%), and school fees (58%) (Table 4.7). At Ndaya the money is spent mainly on food and household needs (83%), fertilizer (79%) and school fees (65%)(Table 4.7). Only very little is used on personal effects. The money is either ploughed back into the farm or used for basics. This demonstrates that at current levels of production, the incomes are not sufficient to raise living standards significantly. For the farmers to prosper, irrigated agriculture should go beyond supplying the basics to farmers and should raise incomes to such an extent that the scheme members would not only subsist off the scheme, but should have extra money.

Table 4.7: *Use of income by members of Esiphongweni and Ndaya irrigation schemes.*

Use of Income from sale of produce	Esiphongweni %	Ndaya %
Buying food & basic household needs	100	83
School fees	58	65
Buying fertilizer	16	79
Seeds and seedlings	13	35
Hiring labour for the farm	13	3
Buying personal effects	0	2
Hiring tractor	3	0
Hospital bills	3	0

4.8 SUSTAINED MEMBERSHIP TO THE SCHEME

The perceptions of the scheme members in relation to sustainability of irrigated agriculture was assessed based on whether they have previously abandoned farming for other opportunities or whether they could do so in the future. There was no family member of any of the scheme members at Esiphongweni that had abandoned farming. However, at Ndaya, some family members of the scheme members had abandoned farming due to family problems and other commitments and not because they thought farming was unsustainable.

The majority of scheme members at Ndaya (95%) and at Esiphongweni (97%) said that they would not abandon farming at the scheme if other opportunities became available. The main reasons why they would not consider abandoning farming are outlined in Table 4.8. Table 4.8 shows that farmers would not leave farming mainly because they consider it a growing business and that they like farming. Some of the less important reasons include lack of capability to engage in other activities due to old age or other commitments, and because they do not have any other professions.

Table 4.8: *Reasons for not wanting to abandon farming at the scheme for other types of jobs.*

Reason given by the Scheme members	Ndaya %	Esiphongweni %
They like farming, farming is a growing business and/or want to become commercial farmers	50	37
Farming provides food and money	18	27
Old age and/or sickness or other commitments	18	27
Farming has a future and it is reliable	12	2
Do not have any profession, no other jobs available and farming only requires little other investment apart from labour	5	5
To assist with community development	2	2

The few people that indicated that they would abandon farming would do so in order to get easier work because they consider farming to be hard work. Some said that they would leave if jobs would become

available within the community. Some indicated they would abandon farming because they lacked capital to invest in farming and that their plot sizes were too small to be considered sustainable.

The majority of community members perceived irrigated agriculture as potentially lucrative and that it can be operated as a business. They consider commercial farming attractive because they perceive that it can provide them with both food and money. The results also suggest that there is an expectation that economic transformation can occur through irrigated agriculture, considering that there are no other options.

4.9 OBJECTIVES OF IRRIGATED FARMING

The majority (83% at Ndaya and 97% at Esiphongweni) of scheme members indicated that they joined the irrigation scheme in the hope that they would become commercial farmers². However, in practice, they were mainly interested in household level food production and in supplying local market demand. They only wanted to trade sporadically in the wider environment of the hawker market and other markets further a field. In general all scheme participants had a very similar farm business focus as well as similar aspirations, constraints and suggested solutions. One participant only, out of more than 50, had ambitions to operate as an "agribusiness" agent by supplying services to provide inputs and to market scheme produce at a profit. This establishes a fairly homogeneous farm typology and set of objectives.

The reasons for wanting to engage in irrigated agriculture are listed in Table 4.9. The table shows that generating a cash income is most important (Esiphongweni 97% and Ndaya 88%) followed by reduction of poverty and improvement of living standards. This suggests that the scheme members expect commercial irrigated agriculture to provide more than just supplement food but that it should potentially transform their socio-economic circumstances. It means that careful planning should precede investments in infrastructure in order to enhance the possibility of fulfilling these expectations and reduce the potential abandonment of the investment. It also suggests that it is important to ascertain why farmers would want to be involved with irrigated agriculture through participatory planning. Unfortunately this is normally a drawn out process and most irrigation initiators are not willing to engage in such a process. Ascertaining objectives has implications for the nature of investment that the scheme members would be willing to make in terms of time, maintenance and costs. It also has an influence on the choice of system that the initiators of irrigation should consider.

Table 4.9: *Reasons for wanting to become a commercial farmer of irrigated agriculture.*

Reasons given by the scheme members	Ndaya %	Esiphongweni %
Generate cash income	88	97
Eradicate/reduce poverty	74	81
Improve living standards	62	58
Food needs	9	3
Surplus food	8	3
School fees		7
Pass time	2	0
Create job opportunities	2	10

² The farmers likened a commercial farmer to a white commercial farmer owning a large land area, using modern technology and making money and profit.

4.10 LAND ACQUISITION AND ACCESS

The majority of scheme members felt that the current plot sizes were inadequate for commercial production (83% at Ndaya and 53% at Esiphongweni). The majority (80%) of scheme members at Ndaya consider a land size of between 1 and 2.5 hectares as adequate for commercial irrigated agriculture (Figure 4.3). Ndaya Scheme has an 18hectares garden for 75 participants. Because of community disputes, an area of approximately 3 hectares, which was negotiated as part of the scheme is no longer available to the farmers. The effective planting area is therefore 15 hectares, which means that each member is entitled to 0.2 hectares. Thus at Ndaya, the current average land size is far less than what they consider to be necessary for commercial production. The majority (63%) at Esiphongweni scheme considered land sizes of between 1 and 5 hectares as adequate for commercial irrigated agriculture (Figure 4.3).

The communal part of the Esiphongweni farm is approximately 42 hectares. The scheme has 31 farmers. On average each scheme member is entitled to 1.5 hectares of land, which is further shared with sharecroppers. The number of sharecroppers could not be verified because there was some disagreement among the scheme members regarding who they consider a sharecropper. At Esiphongweni the current land size falls within the range of what the scheme members themselves consider an adequate land size for commercial production.

If the need arose to increase land size per scheme member at Ndaya, then either the land size should be increased or the number of participants should be reduced. But it seems the latter would be difficult because there is no possibility for reducing the number of beneficiaries in order to increase land size per beneficiary. In most cases these gardens belong to the members of a specific tribal authority hence there is open access for everybody. At the moment, the other eligible members do not come to work in the scheme simply because it is located far from their homesteads.

4.11 EDUCATION AND TRAINING

Figure 4.4 shows the level of education of scheme members. At Ndaya, about half of scheme members can read and write whereas at Esiphongweni only a third of scheme members can read and write. Sixty-eight percent at Esiphongweni cannot read and write and 50% at Ndaya cannot read and write which may mean that the majority of scheme members are illiterate.

Of those that are literate, the majority of scheme members at both schemes attained standard 5. The highest standard of a scheme member attained at Ndaya was standard 10 whereas at Esiphongweni the one member has a degree. The majority (60% at Ndaya and 84% at Esiphongweni) of scheme members have no other skills other than farming (Table 4.10). Most of the scheme members have not trained further to do anything specific. Their main occupation is crop production or agricultural activities. The members may have difficulty in understanding commercial farming concepts such as costing, production systems, marketing contracts etc.

Low levels of literacy limit access to information and understanding of development processes. Irrigated farming is a risky business and for members that have not had experience with it, greater assistance with understanding the demands of irrigated farming would be a necessity. In these circumstances a certain level of enlightenment through awareness campaigns and capacity building should precede provision of grants for irrigation infrastructure. This may in some cases mean a drawn out process of community participation to make sure that the scheme members understand the issues and that expectations are clarified.

Table 4.10: Skills training other than farming skills that scheme members have received before.

Other Acquired Skills	Ndaya %	Esiphongweni %
No training or other skills	60	84
Making mats	2	0
Skills related to operations of the scheme e.g. market survey, irrigation infrastructure maintenance, Farm Management, Nursery management.	21	0
Chicken rearing	6	0
Artisan (sewing, catering, fashion design, carpentry)	6	3
Block making, brick laying and road construction	2	0
Teaching	3	10
Security and cashier	2	0
Managing a shoe shop		3

4.12 TECHNOLOGY (IRRIGATION INFRASTRUCTURE)

The majority of scheme members (87% at Ndaya and 57% at Esiphongweni) consider the current irrigation infrastructure satisfactory for their water needs for commercial production. This may be explained by the fact that the levels of commercial production have not been clearly defined such that their standard for sufficiency is based on the crops they grow and sell presently. The farmers could only comment on the irrigation technology they currently use because they are generally not aware of any other technologies. Experience with sophisticated technology for agricultural production is limited or non-existent.

Discussions with the farmers during the participatory exercises also revealed that they have no understanding of the energy requirements and long-term costs associated with the system. The farmers had no idea at all that there may be a need to replace the irrigation systems in the future. In both schemes the farmers originally practiced subsistence farming with no previous experience in the use of more sophisticated technology such as sprinkler irrigation. It appears that the scheme members welcomed the idea of the sprinkler irrigation because it seemed an easier option compared to using buckets to draw water for irrigation.

The problems experienced by some scheme members are presented in Table 4.11. The table shows that some scheme members think that the system is inefficient. There are problems related to operation, maintenance, design, establishment and lack of knowledge of use. Some of the main limitations experienced with the current irrigation infrastructure at Ndaya are lack of money to buy diesel, an inadequate number of sprinklers, few and short hose pipes; hydromatic valves that are far which means that some of the scheme members are not able to get water at the right time. At Esiphongweni the limitations include inadequate sprinklers, and few and short hose pipes; and the small size of the reservoirs. It can be said that the design was a commercial version.

Table 4.11: *Limitations experienced with the existing irrigation infrastructure at Ndaya and Esiphongweni Irrigation Schemes*

Limitations	Ndaya %	Esiphongweni %
Inadequate sprinklers, and few hose pipes	65	72
Hydromatic valves are located far apart	39	6
Infrastructure is unsuitable, unreliable and inefficient	23	
Lack of money to buy diesel	20	
Sprinklers do not spread water adequately	6	
Inability to repair the engine when it breaks down	3	
Hose pipes are cut and clamps do not tighten pipes well	3	
Engine failure	3	
Lack of a non-return valve in the main pipe	2	
Infrastructure is not adequate for the size of the garden (63 hectare land size)		6
No proper management system		6
Water reservoirs are small and water finishes quickly		11

Table 4.12 shows the main characteristics of irrigation infrastructure that were considered critical by the scheme members of the two schemes. Hose pipes and adequate sprinklers, coverage of the sprinklers and sprinkler reliability were critical aspects. The results show that the scheme members overwhelmingly require a system that satisfies the water requirements by offering:

- adequate sprinklers and hose pipes
- sprinklers that are adjustable and cover a wide area
- hydromatic valves that are more closely spaced

In addition the scheme members would like a system that is designed to cover the whole working area and a system which is reliable, and easy to maintain

Table 4.12: *Characteristics of irrigation infrastructure that would satisfy the needs of scheme members of commercial crop production.*

Reasons given by scheme members	Ndaya %	Esiphongweni %
Adequate sprinklers and hose pipes, sprinklers (adjustable and cover wide area) closely spaced hydromatic valves	85	47
System should be designed to cover the whole working area	12	11
System which is reliable, and easy to maintain	12	7
Sprinklers with higher watering capacity	11	
Sprinklers should be accessible to every plot holder	6	
Should have a reserve diesel tank	3	
Well paid and trained person to fix the engine when it breaks down	3	
System which uses electricity	2	
Furrow irrigation is better compared to sprinkler		4
Proper managed irrigation infrastructure		4
Current irrigation system is satisfactory		9

4.13 SUFFICIENCY OF AGRICULTURE EQUIPMENT

Fifty three percent of scheme members at Ndaya indicated that they were able to finish the tasks required for crop production on time using current agricultural equipment. In contrast, at Esiphongweni the majority (84%) indicated that they were unable to complete the tasks. Those that indicated that they were able to complete the tasks offered the following reasons for their achievement:

- the plot sizes are small;
- they hire labourers to do some of the work for them
- they work extra hard
- they are favoured by the owners of the equipment (e.g. the tractor owner)
- they operate at small scale and for subsistence purposes only.

This suggests that the equipment is sufficient for the current levels of production and size of the land. If the land area were to be increased for a more commercialised purpose, it would probably not be sufficient.

Those that indicated that they were unable to complete the tasks offered the following explanations:

- farming is time consuming;
- equipment being used is inefficient;
- sickness and old age;
- markets require produce in bulk and they can not produce enough;
- a tractor is required;

- they have no money to buy the necessary tools.

Table 4.13 shows some of the suggestions offered by farmers on how crop production activities can be made more efficient. The main suggestion for both Ndaya and Esiphongweni is the need to complete land preparation in time using a relative sophisticated technology such as a tractor. Land preparation using a tractor is a major concern since it requires a large sum of money to be paid up front. Apart from supplying irrigation infrastructure, the initiators of irrigation do not find it obligatory to deal with other aspects such as the need for agricultural implements because normally these requirements are not in the policy guidelines for granting infrastructure. Appropriate and structured arrangements for access to and acquisition of agricultural implements would need to be identified in a systematic manner. The policy guidelines of irrigation development for both the National Department of Agriculture and the Department of public works do not include provision of agricultural implements.

Table 4.13 shows that scheme members would be less constrained if they had implements that would allow early land preparation. The majority of scheme members (76% at Ndaya and 81% at Esiphongweni) suggested that the use of a tractor equipped with a plough, disks, boom sprayers, etc. would facilitate more efficient crop production activities. Thus it could be said that technological improvements (especially farm implements) take precedence over other aspects. Because these aspects are not included in the development or establishment of irrigation schemes, the irrigation schemes only last the first year of establishment, after that, the scheme members abandon the scheme (IPTRID, 2000).

Table 4.13: *Suggestions on how crop production activities can be made more efficient.*

	Ndaya	Esiphongweni
Suggestions given by scheme members	%	%
Tractor equipped with ploughs, disk and boom sprayers	76	81
Inputs (seeds, seedlings, chemicals etc)	6	29
Access to capital		3
Equipment and tools e.g. forks bush knives, disc, rake, sharp hand hoes, spraying equipment, planting machines, etc	2	16
Choose best variety crops		3
Obtain agricultural advice		3
Employ extra labour	6	3
Own transport for inputs and transportation of produce to markets	2	3
Committee to convince people to work hard in the scheme		3
Involve more youth in the community	4	
Plot sizes should be increased	1	

4.14 FARM MANAGEMENT, DECISION MAKING, ACCOUNTABILITY AND ORGANISATION OF WORK

4.8.1 Farm management

The majority of scheme members (70% at Ndaya and 74% at Esiphongweni) do not want to be involved with the management of the scheme such as being on the management committee. Table 3.14

presents the findings on the reasons given by those members that are willing to be involved in the management of the scheme. Some of the main reasons included that it was because they had confidence in their farming skills, they like farming and advising other farmers. They also saw personal benefits such as potential to gain experience in financial and management skills, and/or marketing skills; receive training; and other technical skills in farming. The results show that many members are willing to enjoy the benefits but do not want to be responsible for taking decisions. Management of irrigation schemes suffers because of lack of collective responsibility of the schemes (Shah et al, 2002).

Table 4.14: *Reasons for wanting to be involved in the management of the scheme.*

Reasons given by scheme members	Ndaya%	Esiphongweni %
Knowledgeable in farming and like farming		42
Like giving advice to people	13	25
To gain experience on financial and management skills, and/or marketing skills	17	17
Would get some technical skills in farming	25	8
We need a manager that can lead and make people work		8
To receive training	21	
To reduce the cost for hiring a skilled manager	4	
Would be better able to raise my concerns about farming	4	
Management by farmers themselves ensures commitment	4	
Would earn more money without working hard	8	
To bring improvement but would require training first	4	

4.8.2 Qualities of a good manager

Table 4.15 presents the findings of the survey on what members perceive to be qualities of a good farm manager.

The majority of scheme members felt that a good farm manager of a scheme should have at least the following critical qualities:

- agricultural skills especially crop production and irrigation infrastructure operation and maintenance;
- should know how to deal with social issues;
- have patience and know how to deal with people and;
- should have a rural background and respect rural norms

Table 4.15: *Qualities of a Good Farm Manager.*

Responses of scheme members	Ndaya %	Esiphongweni %
Person with agricultural skills especially crop production and irrigation infrastructure and maintenance	39	42
Know how to deal with social issues, know how to deal with people and have patience, should have rural background and respect community norms	23	16
Person who is more educated	8	1
Farm business management skills and human resource management skills	8	7
Marketing skills and financial skills	8	
Someone who gives good advice and can demonstrate	5	3
Should have democratic leadership skills, communicative skills and advertising skills	3	6
Should be a male	2	
Should not be politically affiliated	2	7
Should be a female	2	
Dedicated and hard worker		7
Willing to learn		1
Marketing and financial skills		6
Person with legal knowledge		3
Somebody who likes farming		1

4.8.3 Decision making

The willingness of scheme members to take major decisions was tested by identifying who they think should be taking critical decisions such as the choice crops to be grown. The results of this poll is presented in Table 4.16. The majority of scheme members felt that the responsibility for determining which crops are grown at the scheme each year should lie either with the Farm Manager or Extension Worker or the committee. This shows that dependency on the prominent member (or on somebody with an elevated status) to make critical decisions is high and there is no collective responsibility for taking critical decisions.

Table 4.16: *Who should make decisions concerning which crops are to be grown each year at the scheme.*

Who	Ndaya %	Esiphongweni %
Farm Manager	35.3	28.9
Extension Worker	26	40
CPC committee/ Managing team	29	13
Farmers	2	11
Market demand		8
Extension worker in consultation with the committee	6	
Cropping plan for the CPC	2	

Table 4.17 presents the findings of the poll on who and what scheme members think determines the choice of crops grown at a scheme each season. The majority (76% at Ndaya and 100% at Esiphongweni) of scheme members felt that seasons and types of soil determine which crops would be grown in the scheme each year. According to the farmers, the Farm Manager, Extension Worker or committee, must do this planning. Again this shows dependency on those who are considered to have authority. However the farmers demonstrated an understanding of the critical factors that the manager should consider when choosing crops.

Table 4.17: *Who and what determines which crops are grown at a scheme each season.*

Determinants	Ndaya %	Esiphongweni %
Season and soil type determines which crops will grow well	77	100
Demand of crops from the community and in the market	17	29
Extension worker, cropping plan, booklets from DoA, Committee's recommendations	18	7
Diseases and pest occurrence	15	
The committee's recommendations	3	
Household need	2	
Follow other farmers	2	
Do not know	2	

4.8.4 Organisation of work

The majority (73%) of scheme members at Ndaya indicated that they would prefer to work on their own whereas the majority (87%) at Esiphongweni would prefer to work in a group. This discrepancy is probably explained by the fact that at Ndaya the scheme members are composed of people that are not related whereas at Esiphongweni most scheme members belong to one clan, called the Zulu clan.

The reasons for not wanting to work in a group are given in Table 4.18. Both groups attach significant value to the avoidance of conflict and the fear of other people not doing their share of the work. At Ndaya the concept of taking responsibility for one's own work is much better developed than at Esiphongweni. The Esiphongweni farmers in contrast consider the fact that the produce is for the individual's own use a greater reason for working as an individual. It may be that there is a general level of mistrust in a community such as Ndaya where people are not related, where as in Esiphongweni, they are all related and they think working in a group is feasible and beneficial. The main reasons given include the need to be responsible for own work and depend on oneself; and that in a group some people are lazy; to avoid conflict or because they mainly produce for household consumption.

The results demonstrate the need for initiators of irrigation schemes to thoroughly assess the situation of each community in order to ascertain the best entry for organisation of work on irrigation schemes. Currently the initiators use generic methodologies in setting up irrigation schemes and coercing communities to work as a group seems to be the norm.

Table 4.18: Reasons given by scheme members for not wanting to work in a group.

Reason given by the scheme members	Ndaya %	Esiphongweni %
I want to take responsibility for my work and be self reliant	37	
Some people do not come to work because they are lazy	33	25
Avoid conflict	20	50
Plots are small	4	
I work harder if I work alone	4	
Other people will want a share of the produce	2	
Easier to reach targets and obtain the best results	2	
The produce is for my own use		25

The common reasons for wanting to work in a group are shown in Table 4.19. Some of the common reasons are the need for support from the other scheme members as well as increase in efficiency of working. It is believed that the work would be easier and faster; that they can share ideas and/or share input costs; and that they can assist and rely on each other. Irrigation initiators could highlight these beneficial aspects when organizing groups.

Table 4.19: Common reasons, given by scheme members, for wanting to work in a group.

Reason	Ndaya %	Esiphongweni %
The work would be easier and faster	35	13
Share ideas and/or share input costs	18	23
Assist and rely on each other	30	36
Effective time management	6	
Easy to meet market demands	6	
Motivate each other	6	
We can generate more money		16
Work is organized and each person is accountable		16
To have access to government funding		16
Small groups are more manageable		16

Table 4.20 summarizes the type of support received from the Department of Agriculture when the extension worker visits the sites. At Ndaya the majority of scheme members indicated that they received technical support but did not receive managerial and financial support from the Department of Agriculture. However, at Esiphongweni the majority indicated that they received technical, managerial as well as financial support from the Department of Agriculture. The extension worker is therefore an important source of information for the scheme members. However, in both the Ndaya and the Esiphongweni irrigation scheme the farmers indicated that the Extension Worker does not visit regularly. Also, from the observations during our extended stays, it was apparent that the extension workers only visit once per month on average. This means that the farmers could not depend on the extension to provide critical information. However, when the extension officer was available he advised the communities on market information, crop production and irrigation practices

Table 4.20: Technical, managerial and financial support received at Ndaya and Esiphongweni Irrigation Schemes

		Technical %	Managerial %	Financial %
Ndaya n=66	Yes	85	17	8
	No	15	83	92
Esiphongweni n=31	Yes	77	97	97
	No	23	3	3

4.15 PROVISION OF LABOR FOR AGRICULTURE ACTIVITIES ON THE SCHEMES.

Table 4.21 shows the provision of labour for various agricultural activities on the irrigation scheme.

Table 4.21: *Provision of labour for the various agricultural activities on the schemes.*

Who	Ndaya (%)					Esiphongweni (%)				
	Planting	Irrigating	Weeding	Harvest	Selling	Planting	Irrigating	Weeding	Harvesting	Selling
Owner	67	88	83	91	91	50	39	13	16	42
Owner assisted by other members	0	3	2	2	0					
Committee	0	0	0	0	2					
Owner and other family members	26	9	13	5	4	48	55	63	61	52
Caretaker Farm Manager and farmer	0	0	0	0	3					
Owner and hired labour	7	0	2	2	0	2	6	23	23	7

The results show that the owners, mainly women, provide most of the labour for almost all production activities by themselves at Ndaya. Considering that the scheme members are mainly women, it follows that the impact of the extra burden is significant on their workloads. The other family members sometimes assist with the different chores but to a lesser degree. In some cases the scheme members use hired labor, particularly during weeding and harvesting. Table 4.21 also shows that at Esiphongweni family members (mainly their husbands) provide greater assistance than at Ndaya. The scheme members in Esiphongweni also use hired labour more than at Ndaya. Pension receipts supplement their incomes and they are perhaps able to pay for the extra labour.

The study found that the majority (69% at Ndaya and 87% at Esiphongweni) indicated that they get some general assistance from family members in carrying out various agricultural activities. They get some assistance in the following activities: irrigation, weeding, financial support, planting, fertilizer application, making ridges and fetching water from the river when the engine breaks down.

The contribution of family labor is significant in most black developing communities. Unpaid family labour through husbands, wives and children is used in black developing communities and socially this is expected of household members. The need for hired labour increases when plot size is increased and crops acquire more commercial value (Van Averbek *et al.*, 1998). More labour is required to prepare the land, plant the crops, do the weeding and to harvest the produce. Furthermore, a new demand for labour is created as a result of the need to market a larger proportion of the yield. Currently the owners of the schemes provide the labour with occasional assistance from family members.

The study found that the majority of scheme members at Ndaya (56%) and at Esiphongweni (74%) involve their children in agricultural activities. The children are involved on request by their parents. They involve their children in agricultural activities in order to:

- Create job opportunities for the youth;
- Train them and to generate an interest in farming;
- Assist with farm work when required; and to
- Earn money for school fees and other household needs.

Most children at Ndaya are involved mainly in weeding, planting and irrigation whereas the majority (40%) of children at Esiphongweni assist with all agricultural activities (Table 4.22).

Table 4.22: *The various agricultural activities that children (under 21 years old) assist with at the Irrigation Schemes.*

Activities	Ndaya %	Esiphongweni %
Weeding	32	23
Planting	20	9
Irrigation	25	3
Application of chemicals	5	3
Ploughing	2	
Harvesting	4	20
Draw water manually when engine breaks down	7	
All agricultural activities	4	40
Selling	2	3

Table 4.23 is a summary of the reasons why some parents do not involve their children in agricultural activities. The reasons are the following :

- The children play in the plots and damage the crops;
- They do not have children or do not have children who are below 21 years; and
- Their children are at school and/or do not work because of religion.

Table 4.23: *Reasons why certain parents do not involve their children in farming at the schemes.*

Reasons given by scheme members	Ndaya %	Esiphongweni %
They play in the plots and damage the crops	20	25
Do not have children or don't have children who are below 21 yrs	34	63
They are at school and/or do not work because of religion	23	
They do not like farming	11	13
Afraid that children would be affected by poison	9	
The work is not much so I don't need assistance	3	

4.16 TRAINING

The majority of scheme members at Ndaya received initial training in fertilization and application of pesticides only while the majority of scheme members at Esiphongweni did not receive any training. The majority of scheme members have expressed the wish to be trained in the various farm skills listed in Table 4.24. The results show that the farmers do not possess all the critical skills required for commercial production. There is a need to train the scheme members specifically to become farmers

and impart knowledge on the basis of crop farming. When the requirement is to prepare farmers for the commercial farming environment, the need for proper training would be even more accentuated.

Table 4.24: *Training received in various farm skills by Ndaya and Esiphongweni scheme members.*

Training Received	Ndaya		Esiphongweni	
	Yes	No	Yes	No
Mixed Farming Skills	2	98	3	97
Managerial Skills	10	90	0	100
Processing Skills	2	98	3	97
Crop Production Methods	40	60	3	97
Grading	5	95	7	94
Fertilization	85	14	7	94
Pesticides	81	19	0	100

The farmers do not have adequate technical expertise to operate a profit making crop production entity. For example, their technical knowledge on the linkage between production practices and the required end product in terms of quality is inadequate. The current process of cabbage planting demonstrates this. The farmers do not currently plant cabbages on the recommended spacing between plants; as a result the cabbage heads that are harvested are small and fetch a low price. But the farmers do not figure out the linkage and they repeat this process every year. Their main experience in crop production has been through trial and error. There is a critical need for training.

Table 4.25: *Methods of training preferred by scheme members at Ndaya and Esiphongweni Irrigation Schemes.*

Method of training	Ndaya %	Esiphongweni %
To be trained practically, preferably on the scheme	77	61
Formal and practical training is required	22	29

The majority of scheme members at Ndaya (71%) and Esiphongweni (61%) would prefer practical training, and preferably at the scheme. The scheme members indicated that they would prefer an outside trainer who is fluent in isiZulu. This suggests that the training programs should be mainly hands on and should be tailor made to suit the situation on the ground.

The majority at Ndaya (93%) and Esiphongweni (55%) indicated that on-farm demonstrations were conducted at the schemes. However, all scheme members at Ndaya and 87% at Esiphongweni indicated that there were no field experiments conducted at the scheme. The scheme members at both Ndaya and Esiphongweni indicated that they have been shown how to use and manage irrigation water.

4.17 TARGETING IRRIGATION DEVELOPMENT

The family members that are most interested in irrigation agriculture at Ndaya (64%) and at Esiphongweni (73%), are mostly female. This demonstrates that discussions about irrigation development should target critically the participation of women. In most cases women are brought into the discussion late, and discussions are conducted with men. For example, the scheme members indicated that when the preliminary discussions on critical design and practicality issues took place at Ndaya, the audience was predominantly male.

The scheme members suggested that the children are generally not interested in agriculture production and that their perception is that the parents force their participation. There are no major succession plans for irrigation in rural communities because irrigation is not considered as an inheritable activity. At the moment the returns from agriculture are also not so attractive to allow a natural succession by the youth unless irrigation can show significant returns. On the other hand parents do not encourage the children's participation. The lack of interest generated for agriculture activities at an early stage perpetuates some of the problems regarding succession in irrigation farming

4.18 OBJECTIVES OF FARMERS AND THEIR OPINIONS ON FUTURE DEVELOPMENT OF THE IRRIGATION SCHEME

The responses were recorded and are presented below in Figures 4.3 and 4.4.

The results show that the farmers are generally dissatisfied with their current situation. They do not view the current operations and social arrangements as conducive to meeting the requirements for commercialisation. The farmers indicated that there should be a structured organisation, which would increase efficiency in management and planning. Technical and business operation and management skills as well as financial soundness are also necessary. The farmers understand that commercialization would require conducting the scheme as a business through intensifying production, having appropriate technology (buy a tractor and enough farming implements and tools), and having financial security by saving some of the money. One of their indicators for achievement would be an improved standard of living. More importantly the farmers believe that one of their future roles is that of assisting the growth of other farmers by training others (indicating a need for role models) and diversifying to other money making farming projects such as broilers, eggs and beef production.

Figure 4.1 Objectives and opinions for the future of irrigation at Esiphongweni

Current position • Our standard/level of production is low, • Do not have many farming inputs, • Lack of farming knowledge • Our committee is not trained to do its job, • Lack of start-up funds, • Insufficient irrigation infrastructure	Negative influence • Conflicts and disputes, • Lack of team spirit, • Lack of planning, • Poor farm management, • Record keeping, • Lack of reliable markets, • Theft • Insect and pests, • Poor knowledge of farming, • Inappropriate technologies, • Insufficient planning
Positive influence • • Organise into an association, • Diversification, • Ability to run the scheme economically, • Business plan produced and executed, • Set goals, policy rules and regulations, • Development of business and technical skills	Where they want to be in the future • • Increased level of income • Improved standards of living

Figure 4.2 Objectives and opinion for the future of irrigation at Ndaya

Current Position • Low production • Not well organised • Weak transportation • Lack of markets • Poor road network	Negative • Lack of transport technologies • Extension support • Input costs • Road network
Positive • Increase market access • Household food production and generate savings • Focused training	Where they want to be in the future • Increased Production, • Farming run as business, • Organised and trained, • Funds managed well, • Training other farmers, • Standard of living raised, • Reliable Irrigation system, • Own financing

Figure 4.3. Land size considered by scheme members as adequate for commercial irrigated agriculture

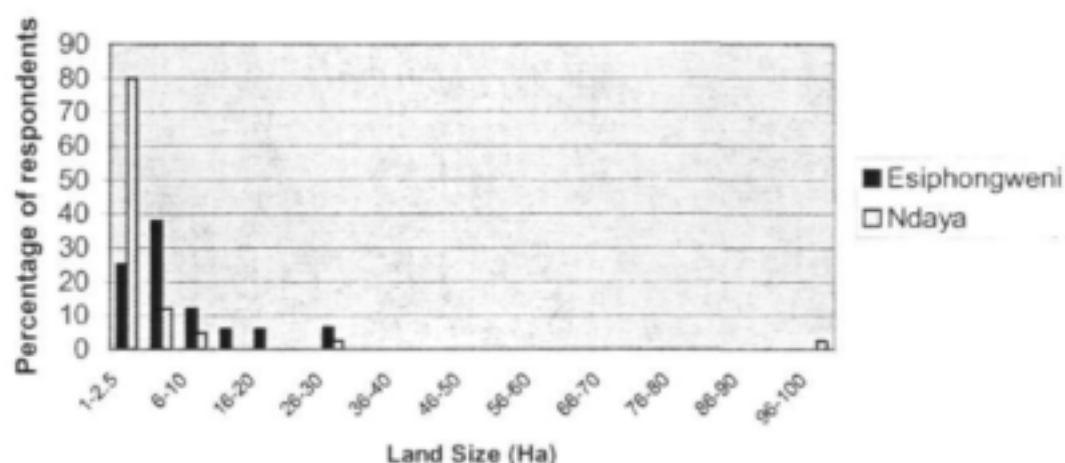
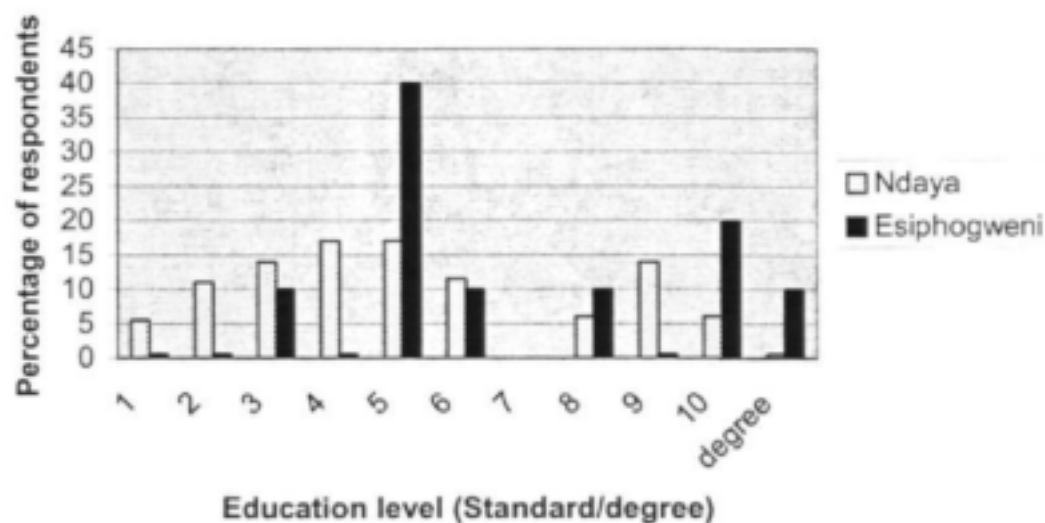


Figure 4.4. Education level of scheme members at Ndaya and Esiphongweni Irrigation Schemes



CHAPTER 5 DISCUSSION

The aim of the initiators of irrigation programs is to encourage the sale of produce by the scheme members so that they can increase incomes and to rise out of poverty. Some of the social demands that may constrain these intended outcomes include:

5.1 COMMUNITY DEMAND AND DRIVE

The study has shown that generally the objectives of the scheme members are both social and economic and these should be harnessed. However, the demand for irrigation for commercial purposes is not simple to ascertain because the aspirations of communities are buried beneath a mound of socio-economic difficulties. This may be traced back to the origins of the schemes. The Ndaya and Esiphongweni irrigation schemes emerged from the initiatives of individuals or a couple of individuals. In these circumstances the decision to commence irrigation activities was therefore not based on any planned strategy but it was just maximising the options available to sustain livelihoods. The selling of surplus produce that sometimes occurs was not a planned strategy either. The community members just engaged in the irrigation activities as a way of life. This is also true for many other schemes found in black communities in KwaZulu/Natal. It can therefore not be assumed that upgrade of schemes would automatically favour the development of the economic objective.

Community-group controlled irrigation schemes for commercial purposes are a relatively new phenomenon in rural areas of South Africa. Taking into account the original circumstances under which the irrigation schemes were established, it is possible to enhance the potential of the schemes objectives by engaging a process that would allow the scheme members to own and affirm the commercial objectives of the schemes. The closer the objectives of the initiators are aligned with those of the recipient communities, the more likely it is that consensus would be created among the scheme members around a common purpose. Generating community demand at grass roots level should be a crucial component of successful community engagement.

In black communities, such a demand would have to be generated through wide information dissemination prior to the irrigation establishment. Communities should first be aware of available irrigation techniques and technical information should be on hand that describes the demands of irrigation schemes in terms that can readily be understood and interpreted by the potential participants. This would systematically raise aspirations and promote the creation of individual and/or collective objectives. Demand can then be ascertained through rapid appraisals and surveys.

Below are guidelines for practical steps for harnessing community demand and drive:

Guidelines for Harnessing Community Demand and Drive	Intended Outcomes (What are you looking for in the end)
• Observe indications of current irrigation activities, land availability, bio-physical suitability and prevailing farming systems • Gain the trust of the community by expressing the objectives of the initiator of irrigation • Disseminate information regarding irrigation programs and requirements • Conduct a survey to ascertain the demand • Community should demonstrate interest in irrigation by making investments beyond supply of labour e.g. contributions to diesel, equipment, etc.	• Raised aspirations and communities' demand not only for irrigation but also related services such as financing, extension, other development oriented information

5.2 INCLUSIVE AND PARTICIPATORY PLANNING

The study has demonstrated that the scheme members do not have a complete understanding of the irrigation scheme because they did not participate at all stages of development. Harnessing community demand should be coupled with participative planning. Due to the socio-economic circumstances of black communities, it is expected that irrigation development will continue to be initiated by government or other funders. Most black developing communities will not have the initial capital outlay required to establish an irrigation system. It is imperative that the initiatives should allow creation of effective partnerships with communities encompassing their goals and social economic reality. This would allow the communities to move from passive recipients to active transformers of their own circumstances. In pursuing a goal of participation it is important to create effective partnerships in which the offerings of the scheme members are identified and used to define concrete action for interaction. This calls for comprehensive and participatory planning that precedes investments in infrastructure.

However, most irrigation initiators are not willing to engage in participatory planning as it does not fit within the time frames allocated by the funders or the often hurried nature of setting up irrigation schemes. Although participatory planning can be a drawn out process, the interactive nature of the process enables all parties to gradually approach the optimal outcome and therefore it increases the chances of sustainability. The costs in terms of time to allow for comprehensive participation are small compared to the costs when scheme members abandon what usually is a huge investment (IPTRID,2002). Adopting a participatory approach would alleviate the potential for abandonment of commercial objectives that usually occurs when the objectives of the scheme members are not considered. Eventually the scheme members can no longer invest their time and resources. Below are guidelines for fostering participation:

Practical guidelines for adopting participatory planning	Intended Outcomes (What are you looking for in the end)
- Promote interactive participation in the early stages of project design by identifying who is who and the education levels, the elderly, youth, business people, who else is perceived as critical to participate, why and how they will participate. Differentiate between the different types of participants (i.e. typology). This will create a clear picture of diversity and the farmer typology be established - Establish recording procedures to keep track of the participation by people from a whole range of typologies - Identify the information requirements of the farmers in order for them to contribute effectively to the planning. - Identify information needs that the scheme members would require in order to make informed decisions. - Prepare and provide information required by the scheme members to make options available e.g. technologies and systems. - Simplify the discussion on technologies by building models if necessary. Model building and graphic presentation e.g. building small models of the irrigation scheme can stimulate discussion and encourage experiential learning during set-up of the schemes and at planning	Consensus on objectives and identify interested individuals; Community offerings; verified expected benefits and products

- | | |
|---|--|
| <ul style="list-style-type: none"> • Create case studies from other successful schemes. • Find out who are most interested and specifically target women groups with information to ensure that information has reached the women before commencement of the irrigation development discussions • Indicate to the women the implications of their not participating fully in the early stages of planning • Discussions should also be conducted with men as a separate focus group | |
|---|--|

5.3 TAKING A COMPREHENSIVE SUPPORT STRATEGY

The scheme members in this study have demonstrated their dependency on a variety of activities, and the cross-subsidisation that occurs among the various activities that the scheme members engage in to meet their social and economic needs. This scenario may not necessarily change with a shift in objectives to commercialisation, because it is interwoven in the social setting of these rural households and exist within complex farming and livelihood systems. This requires an understanding of the farm-household system as a whole. For example, pensions received by the old aged members of the community are not only a source of income for basic needs, but the aged community members also act as informal, reliable and low interest moneylenders for the sustenance of the irrigation scheme. It means that when targeting irrigation development as a means of economic development in black developing communities, focusing activities on irrigation alone may represent a narrow approach to development, and may not be sustainable. In order to prolong the good intentions of the initiators of irrigation, it is necessary to understand the complex issues in developing communities. Irrigation development in rural communities should take a broad livelihood assessment approach. An approach that provides concrete actions regarding all the livelihood options available to rural communities with irrigation as a central focus is desirable.

A multifaceted and multi-pronged approach would enhance irrigation development in rural areas and should alleviate some of the constraints in irrigation development. One of the steps on the development path and transformation of the irrigation schemes should therefore be getting consensus around social, economic and production goals which are substantiated by farmers' objectives, in order to develop a vision that is shared by the scheme members.

A multi skilled team should assist with setting up the schemes. The initiators do not necessarily have background in agricultural production. Even when expertise of the Department of Agriculture is used, most Extension Workers do not have extensive experience with irrigated agriculture. An appropriately constituted team of irrigation initiators would enhance potential, because part of the success of irrigation schemes depends on the skills of the initiators of irrigation. In the case of Ndaya, cooperation between the Provincial Departments of Agriculture, the municipality and the Department of Public Works has already started, but further cooperation with other departments would be beneficial. A new positive development is that the government has recently embarked on "clustered development programs" at least at a ministerial level. The clusters encourage cooperative governance and implementation of development projects through departments with related functions thereby pooling resources. In the case of Ndaya strict guidelines intended for the implementation of purely infrastructure projects were used for the establishment of the irrigation scheme. This resulted in most of the critical aspects for an irrigation scheme being considered in retrospect. The inclusion of the Department of Agriculture was done in retrospect. The lack of timely participation of the scheme members and other critical stakeholders represent a constraint to irrigation development in black developing communities. With the clustered development programs, a broad development approach is possible and cases such as Ndaya could probably be avoided. Below are guidelines for adopting a comprehensive support strategy:

Guidelines for adopting a comprehensive support strategy	Intended Outcomes (What are you looking for in the end)
- Find out how the scheme members make a living and what are the important means of survival normally for example how do they survive in a disaster or in good years - Rank the problems and opportunities and identify appropriate interventions to demonstrate how irrigation can alleviate some of the problems	- Characterised livelihoods with linkages between the different systems and irrigation in terms of contribution - Ascertain priorities on the basis of community input
- Identify Stakeholders - Explicitly identify the stakeholders and various interest groups of the irrigation scheme - Define exactly the structure and nature of the contribution of each of the stakeholders and their linkage with the scheme. - Identify who currently works with the community and who should be assisting them in the future and structure the support accordingly - Identify where the stakeholders are located in relation to the scheme - Identify processes that each stakeholder will get involved and nature of their involvement.	Harnessed technical support for the project
- Undertake first approximation of the business plans. - Design and implementation of a more focused support program - While in the process of discussing with the community, identify some small actions that they can work on towards the development of the scheme	Master Plan for the area with concrete actions developed

5.4 DEALING WITH LAND ACQUISITION AT INCEPTION OF THE IRRIGATION SCHEME: (DESIGN FOR EVOLUTION)

The scheme members perceive the current plot sizes of less than 2 ha insufficient for future commercial oriented production and not sufficient to achieve both the social and economic objectives simultaneously. The scheme members consider a land size of between 1 and 5 ha as adequate for commercial irrigated crop production. The farmers did not indicate access to extra land as a constraint. But the communal garden sites were originally sufficient for a few households or a single-family unit and the long-term land expansion requirements were not a consideration. The initial upgrade of the sites to irrigation scheme status occurred when initiators of irrigation provided fencing materials to formalise the gardens into communal gardens. The materials were given as part of a broader social development strategy. In such a case, the garden is perceived as belonging to all community members found in the area of the iNkosi under whose jurisdiction the garden is located. Every individual in that specific community is therefore a beneficiary. As a result of this, the number of participants in the schemes, especially at Ndaya, is high in proportion to the size of the land.

If the need arose to increase land, one of the options that was tested with the scheme members was to reduce the number of participants. Unfortunately this was not considered a practical solution. At Ndaya it would mean a reduction from 75 to 7 members and at Esiphongweni a reduction from 31 to 20 members to achieve the suggested 2ha per scheme member. Reducing the number of participants would be inconsistent with the social development objectives under which the gardens were initially developed. The gardens belong to the members of a specific tribal authority where everybody feels they have a stake in it and nobody would be willing to consider giving up his/her right to participation. For Ndaya it is the whole iSimahla Tribal Authority (approximately 5 000 people) and for Esiphongweni it is

the whole of Enyathini Tribal Authority (approximately 2 000 people). One of the social factors that would affect allocation of the land to a few individuals on current land areas is that the original landowners reserve the right to deny relinquishing rights of their ancestral land to only a few individuals. At Ndaya it was indicated that even though the garden is allocated to the greater iSimahla tribal authority, the original owners have a greater say in the matters of the garden. In theory the land was donated to the whole community but in practice the local social dynamics determine access and use. Socially it is not readily acceptable in rural areas to divide what is considered to be public property among a few individuals, particularly for the purposes of making them better off than the rest.

Conducting a feasibility study to identify extra land resources at the point of establishing an irrigation scheme is important to allow for progression to commercial farming and future expansion should the need arise. It would be desirable if these pieces of land could be found in close proximity to the current dwelling area so that there is no major disruption to the social setting of the scheme members. The scheme members that demonstrate entrepreneurial skills would have an opportunity to evolve and rise to the business opportunities so created. Considering the socio-economic circumstances in the present schemes and the expectation that public funds should benefit a wider population, it is a challenge to strike a balance between social development and creating sustainable incomes for a smaller group of people. An integrated program combining highly entrepreneurial groups with broad social development programs could be considered so that the social and business objectives are achieved simultaneously. The strategy would look at promoting agriculture production in general while opening other opportunities in irrigation and other non-farm activities for the entrepreneurial persons to evolve. Some practical steps for fostering land allocations are described below:

Dealing with Land size at inception	Intended Outcomes (What are you looking for in the end)
• Define the land area requirements and verify land availability in relation to the potential beneficiaries • Identify opportunities and options for local tenure arrangements, constraints and mitigation • Define land use rights from the point of view of the land owners, from that of the community and the iNkosi and get consensus on how these will be institutionalized within the current community rules and regulations • Ascertain land required to achieve the objectives of the scheme • Identify local dynamics for land acquisitions • Identify local issues and procedures for allocating land and potential areas and the procedures for expansion. • Identify local land transactions and procedures • Identify the landowners who control access to land and those who make decisions regarding any landless member of the community that needs access to the irrigation scheme. • Identify general procedures for lease agreements and benefits for commercial production • Identify local mechanisms for dealing with conflict • Identify the objectives and discuss with the communities how best they can be achieved on available land e.g. reducing income poverty.	• Land as a critical resource for development of the irrigation schemes is earmarked • Procedures for expansion are set.

5.5 ORGANISING FOR SUCCESS: SETTING UP APPROPRIATELY SIZED GROUPS OF THE LIKE MINDED PEOPLE

It may be said from the study that the scheme members of Esiphongweni prefer to work in small, democratic and informal groups of like-minded people, where they have a degree of assurance that they will share both the costs and the benefits i.e. collective responsibility. Where the small group shares similar objectives and individuals trust each other, coupled with enabling conditions such as capitalisation, market orientation, high management levels and continuous training and support, potential success of irrigation will be high. Some of these conditions were met at the Esiphongweni scheme.

Where people are many and not closely related, there could be a general level of mistrust and group organisation should be more formal - the case of Ndaya. This prompts the need for initiators of irrigation to thoroughly assess the situation of each community in order to ascertain the best method for organization of work on irrigation schemes. Flexibility in group organisations should be encouraged. Currently the irrigation initiators use generic methodologies for setting up working arrangements and forcing communities to work as a group seems to be the norm no matter how different their objectives or the number of participants and the level of trust.

Groups with fewer members will be more desirable for rural communities. During the observations, the researchers recorded that the group at Esiphongweni quickly reached consensus on most of the issues raised, particularly when discussing the future of the scheme and production goals. The discussions were more informal and allowed even the women to participate openly. The level of trust was higher and open conflicts were absent. Working in small groups will alleviate conflict and raise the stakes of commitment at an individual level to make the scheme a success. These small groups could be considered as centers of production that are bound by a common goal. One of the binding goals could be the need to access facilities for marketing or a support system. This kind of potential exists at Esiphongweni because the numbers are relatively small. With proper planning the same investment that has been made on the scheme can be equitably allocated to small groups of like-minded people, which increases the potential for success.

Where the schemes are small with a large number of beneficiaries, as is the case at Ndaya, opportunity exists in intensifying production by adopting high value crops. The project objective may have to be structured to focus on a system to promote household food security as the major objective. Such a strategy would immediately reduce expenditures on food purchases and improve the nutritional status of the project area. The development of (informal) market arrangements could simultaneously be considered to stimulate commercialisation as a secondary priority. At Ndaya the opportunity exists for the promotion of a "co-operative club" structure to enable training and financial support mobilization (co-operative savings clubs). This "Co-operative Club" may also mobilize sufficient collective action to allow more cost effective input provision and market access.

Organising for Success: Setting up appropriately sized groups of like-minded individuals	Intended Outcomes (What are you looking for in the end)
- Identify relationships and common groups in the community and define factors for cohesion - Identify demands that could be brought about by irrigation and workshop these in the community in advance	Groups organized with simple rules for affiliation

5.6 ENHANCING POTENTIAL BY BALANCING BENEFIT AND COSTS

Future demand for the development of irrigation schemes and/or the sustainability and continuity of the current schemes would depend on improved returns on investment. Overall, the cost and benefit balance should make economic sense for communities. The scheme profiles show that with the current

models, the production costs far outweigh the benefits. In both schemes the challenge is to turn the expenditure made as a public good into an investment.

According to the business plans prepared for the schemes by the Department of Agriculture and the Department of Public works, the investment at Ndaya alone is approximately R4 million and at Esiphongweni R1.2 million. At Ndaya, R1.5 million was spent on the irrigation infrastructure and the remainder was used to construct farm buildings (pack house, implements storage and an administration block) and farm roads. At Esiphongweni the total investment of R1.2 million was spent on the irrigation infrastructure alone. The cost of the schemes per unit area is therefore very high.

The study shows that for rural people to invest time and resources and assume risk, the schemes should provide returns beyond mere food self-sufficiency. Otherwise the costs of running the schemes would be too high and other non-agriculture investments that perform better could increasingly become attractive to the scheme members. They may also consider it worthwhile to grow crops for subsistence only and not invest time and resources in the scheme for commercial purposes. Considering the current production levels and the current socio-economic circumstances, the scheme members would not be able to maintain the infrastructure and sustain the scheme. For the scheme to be considered sustainable, a different set of conditions should prevail such as the identification of niche markets, high value crops, high management standards, disciplined financial and crop production management, etc. With the current low skills in irrigation crop production for commercial purposes, this may not be possible.

The development of the schemes should always include an assessment of the potential returns on investment and should also define the exact set of socio-economic conditions that should be considered to achieve the said returns. Below are guidelines:

Cost-Benefit Analysis	Intended Outcomes (What are you looking for in the end)
- Specify input requirements per period, expected outputs and income flows. - Conduct near approximation cost-benefit analyses.	The community considers the irrigation scheme an investment.

5.7 ENHANCING POTENTIAL THROUGH ACCESS TO TECHNICAL INFORMATION AND TRAINING

The study shows that a combination of lack of education, experience, exposure and the risks involved in irrigated agriculture, together with lack of training and the absence of a reliable extension system could constrain the farmers in the two irrigation schemes. The levels of education predominant in these schemes do not provide leverage for farmers to operate in complex agricultural production systems. Irrigated agriculture needs readily accessible and available information for decision-making. Considering the level of experience of the farmers, they will for a long time rely on outside assistance to understand and manage the irrigated agriculture system and to understand their duties and obligations. In this study, the farmers have shown that they are not ready for self-management therefore they cannot be expected to source and access information on their own. The use of outside help is therefore inevitable. Currently the outside help available is in the form of an Extension Worker who does not visit often because of problems of coverage and overload of work. The dependency on an Extension Worker cannot sustain and enhance irrigation development.

From our observations, it was apparent that while there is a place for an extension service, the scheme members need to find creative ways to access information. New opportunities and channels for information access such as cellular phones could be investigated. Commercial farming is a business and it has to be treated in the same way as starting any other business. It requires dedication, subscription to a long-term vision, continuous learning and the provision of high quality products. This

approach would therefore require an intensive program of training. The methods of training that the scheme members found to be effective included practical training, and visual such as on the field observation trips, On farm demonstrations and exchanges with different organisations from other irrigation schemes. Where the Extension Worker is readily available, the interaction cannot only be seen as a sequence of extension events but as a process of communication and discussion so that there is meaningful transfer of technical and organisational responsibilities to the scheme members. Necessary capacity to handle the irrigation systems in a self-reliant manner including access to information should be developed. Guidelines for enhancing information access are described below:

Education and Training	Intended Outcomes (What are you looking for in the end)
• Identify interest in specialized advice and type of advice • Identify options for harnessing extension advice • Identify immediate training requirements • Identify who would provide immediate support and continuous support • Contact the provider and ensure that they will provide the service- it should not be assumed. • Identify mechanisms for getting messages across to farmers • Identify acceptable methods for information acquisition • Identify other options such as selected farmers to include farmers day, demonstrations, traveling road shows, radio, TV • Identify the levels of education categorized by gender and typology, who can read and write and use the skills when constituting the decision-making body. Do not exclude the illiterate from the decision making body • Identify the skills available and test that these are not perceived but actual skills that they have and that people can do what they claim they can • Identify what enlightenment processes are required as well as awareness campaigns for the community to understand the processes and demands of irrigation.	• Increased use of information which is packaged and disseminated in a manner that is useful for the community
Extension service • Identify need for extension services • Identify special advice required e.g. marketing information but more especially break it down to the exact advice required other than non-specific advice • Identify ways on how the extension services for that advice will be acquired • Identify how assistance provided by the extension worker can be made more efficient without complete dependency • Identify other methods for getting the same required message	

5.8 ENHANCING POTENTIAL THROUGH GENDER SENSITIVITY

On the two schemes studied, women were the most interested in irrigation. This study has also shown that both schemes have women in their productive years and the Ndaya scheme has even attracted younger women. The study also shows that women, even when they engage in commercial production, still continue with their burdensome work as providers for the home, whereas men tend to concentrate only on the production side. Balancing gender roles in rural developing communities should consider that the women themselves also respect tradition. Socially in rural areas women are proud of this role and will not readily relinquish these duties. Neglecting to perform a thorough gender analysis is to overburden the women. When women are overburdened they tend to consider their immediate requirements first. In this case, they will attend to the reproductive roles and overlook the productive roles, such as attending to the irrigation scheme. There will be a tendency to concentrate on the daily survival chores. Over time the irrigation schemes will degenerate to food plots. Gender transformation in these communities can therefore not happen at the same rate as the other aspects of irrigation development. In the Zulu culture, social transformation cannot easily occur without significantly interfering with the general culture of the community. Dealing with gender would require tact. The preliminary round of discussions about establishment of the irrigation schemes should pay special attention to the processes and procedures that would ensure that women are involved at inception. To be effective, the actions should be implemented as an on-going process of change, taken with small incremental steps.

This could commence with defining actions regarding women's involvement in design, negotiation, maintenance, setting of objectives and management. This would represent one of the main steps for enhancing irrigation development. Since women will be targeted, the planning of productive and reproductive roles would have to be considered before, or at the same time as infrastructure considerations. Below are steps for enhancing potential through gender sensitivity:

Enhancing potential through gender sensitivity and balance	Intended Outcomes (What are you looking for in the end)
• Obtain an initial indication of who will be involved in the scheme and verify the number of women that will participate • Shorten or consolidate list • With the scheme members, identify the different chores and activities and social obligations of men and women • Identify whether women are considered the main workers in irrigation systems and conduct comprehensive discussions with them. Gender analysis will be conducted even if there are few women. For those few, gender analysis is critical to their functioning as equal members of the irrigation scheme • Define what productive and reproductive roles are considered critical by the scheme members • Identify the impact of irrigation production processes on these roles • Check the general culture of the community attitudes and perceptions towards these roles • Identify who is managing and who is working • Identify why only women perform some tasks.	

Enhancing potential through gender sensitivity and balance continued	Intended Outcomes (What are you looking for in the end) continued
Identify tasks that are mainly conducted by women that could be shared with men and describe the social implications which men and women find as acceptable . - Identify tasks that men consider their own and how women could be involved in these tasks - Identify what would happen to the productivity and efficiency of the scheme if the women issues were not considered critically. - Describe the irrigation system design with women in small groups on their own to identify their concerns regarding labour and allocation of time - Provide full disclosure of the technologies to be used and their maintenance requirements. - Identify work schedules for women and how these relate to production schedules. Compare these schedules to the production schedules and identify clashes and methods for mitigation - Identify production tasks and how much time is required for each (e.g. transplanting, harvesting and leveling) and identify other labour options - Identify energy saving technologies e.g. fuel saving technologies, milling machines. - Identify maintenance and operational requirements and discuss with women which aspects they could cope with in maintenance - Identify training requirements for maintenance - for routine maintenance as well as for fixing simple breakdowns - Let both men and women discuss each others tasks and determine whether they are complementary - Identify the impact of improved technologies on women and the imbalances they might cause such as extending the work day of women through the increased time demands of the irrigation - Make calculations on how much time is being saved or added and define how left over time would be spent	Balanced participation of both men and women and reduced workloads for women so that they can participate fully in the scheme.

5.9 PAYING ATTENTION TO TECHNOLOGIES TO BE USED

The study has shown that some of the dissatisfaction of the farmers with the irrigation infrastructure is based on a lack of understanding of operational and maintenance requirements. There was no clear understanding of the maintenance and energy requirements of using sprinklers.

Spontaneous action in commercial production is of paramount importance. Full involvement of the participants in the understanding of all aspects of production should be the domain of all farmers involved in the farming enterprise. It is also important that both men and women are involved in the design, training for maintenance and effective use of the system. In transforming the irrigation scheme, full disclosure of these aspects would be required. For farmers to participate satisfactorily in the design

of the irrigation system they need to access and be able to synthesise information or the information should d for them, yet remain comprehensive. Below is the procedure for identifying appropriate technologies:

Technology	Intended Outcomes (What are you looking for in the end)
• Establish communities' knowledge of technologies • Establish training needs on use and operation of the equipment. • Establish levels of participation in the design of the irrigation system and knowledge limitations • Establish access to information different technology options available. • Build models for training on irrigation infrastructure • Prepare information that the community will need • Identify the needs of the farmers • Pick options of technologies and how to modify to suit farmers • Method of infrastructure maintenance • Provide clear picture of what is required such as the management standards, modern technologies • Solicit views from all members of the community • Define the levels of production that they aspire to in relation to infrastructure and provide technology options to suit • Discuss energy requirements and cost of replacement • Experiences with different technologies • Identify tested technologies • Check that the suggested approaches have been tested or they may lead to failures. • Identify farming unit and how they are organized at household level and how this will affect irrigation • What type of farming system is predominant • Household labour and interactions of household members with the production cycle • Local technologies used or indigenous technologies that could be adapted • Equipment and technologies owned and how it is used • Processes of production, crops grown and for what use • Opportunities for creating a support system • Opportunities for marketing and marketing mechanisms • Access to farming inputs and transportation of inputs • Storage of agricultural produce • Equipment and future acquisition plans	• Options are provided to the community members matching the skills level and experience for the operations of small-scale farmers in terms of sustainability of maintenance and cost effectiveness.

5.10 CREATE CAPACITY FOR MANAGEMENT

In schemes of a communal nature, decision-making will have to be done by a collective body of selected community members. The issue then arises about who takes the risks associated with taking certain decisions. This can potentially be a point of conflict. The study has also shown that currently there is great dependency on the prominent member or somebody considered of elevated status in the

community to make critical decisions. Lack of collective responsibility for making critical decisions was evident.

The study has also shown that for both schemes the majority of scheme members do not want to be involved with the management of the scheme. Almost all of the members are willing to enjoy the benefits but do not want to be responsible for taking decisions. The scheme members agree to the need for multiple skills, that combines technical knowledge and knowledge of social issues. These characteristics are critical and such people should be sought out in the planning process. There may not be many people with such qualities in a rural community, which means there must be deliberate effort in the planning exercise to seek the appropriate people.

Both irrigation schemes were promptly implemented without in-depth study of the human capacity needed to manage and to sustain these developments. Many irrigation schemes do not sustain themselves beyond the duration of government assistance mainly because the capabilities and management arrangements are not always compatible with social economic realities of the beneficiaries. The management skills and levels of management experience are low because the primary objective is generally to provide for household food requirements.

In setting up the decision-making bodies in schemes of a communal nature, consensus on what it means to be part of the decision-maker's body, how they share risks and how they share benefits should be clearly defined. The results show that negotiating decision-making bodies can be a complicated process where the majority of the scheme members (approximately 70% in both schemes) are not interested in management. Collective responsibility can only be setup with full disclosure, information, trust and share of benefits and costs. This is a slow and difficult process that requires time. Currently the role of assisting farmers in setting up the decision-making bodies is left to the Extension Worker but the process is long and cannot effectively be dealt with by the Extension Workers who consider the work with irrigation schemes as just another task. According to their mandate, the Extension Workers are required to reach a larger clientele. This might not be achievable if they had to invest the amount of time required to establish irrigation projects effectively.

Management	Intended Outcomes (What are you looking for in the end)
• Identify skills required in management such as financial accountability • Identify support and training requirements to become effective managers • Identify ways of rapidly creating management experience through use of mentors and business planning e.g. a water management expert; a qualified agriculturist and a role model farmer to deal with production issues. • Identify the enabling environment for creating collective self management • Methods for creating accountability e.g. meetings, documents to be presented for decision making, etc. • Ways of creating responsibility for credit and finance • Methods for monitoring and reporting to the rest of the scheme members • Identify roles and procedures on what it means in practice to be a manager • Create procedural documents for collecting charges for running and maintenance • Identify processes for information flow and procedures for periodic briefing of progress and accountability • Identify people with right1Xes of agricultural and social skills • Identify rules for cooperative management and what can be done in the event of non cooperative behaviour. • Management body with financial skills, expertise and resources and outside help in form of farm manager • Identify the persons responsible for day to day duties and the relationship between them and other community governing bodies • Identify critical processes to facilitate the development of the farming business e.g. design and establishment of cropping plans, marketing and processing plan, farm business plans • Prepare criteria as described by the community and find candidates from the community • Identify incentives for personal benefits to be gained by the individuals such as farming skills	Communities collective responsibility for management of the scheme

CHAPTER 6 CONCLUSIONS

The general conclusion of the study is that household food needs drive the farm business model both at Ndaya and Esiphongweni and the "household production" model prevails. There is a myriad of social and economic aspects associated with this model that should be given primary consideration when introducing irrigated agriculture developments in rural black communities. Some of the main socio-economic factors that may depress the ability of the black communities to evolve from the "household production" model to commercial irrigation development are:

1. Lack of consensus around social, economic and production goals among farmers on the scheme and the initiators of irrigation. Demand for the commercial entity was not ascertained at the point of setting up the irrigation schemes.
2. Inadequate consideration of the complex farming and livelihood systems and failure to address the obstacles created by this environment. Little emphasis on the variety of activities that the scheme members engage in to meet their social and economic needs and ignorance of the cross-subsidisation that occurs among the various activities.
3. These two schemes were originally communal gardens with social development objectives. This initial orientation limits the potential for irrigation development.
4. Within the irrigation schemes the number of participants is high and access to the garden is unlimited. The social dynamics such as the tacit power of the original landowners, determine the viability of further land allocations. The restricted possibilities for expansion of land to increase land size per scheme member can contribute to reducing the potential for irrigation in black developing communities.
5. Inexperience with group controlled irrigation, the general level of mistrust and lack of assurance for sharing the costs and the benefits, limits the opportunities for organising effective groups that take collective responsibility for the scheme such as in the case of Ndaya. Understanding reasons for social organisation of members would enhance potential for irrigation.
6. The lack of possibility to turn the current expenditure into a self-sustaining investment. The system or scheme may not always make economic sense for rural communities. The cost of the schemes per unit area is high for rural people to invest time and resources and assume risk beyond mere food self-sufficiency.
7. The sites are not conveniently located in relation to physical markets because they were chosen without any strategic plan but as a social investment. This restricts farm income generating opportunities. Opportunities to increase income levels through commercial farming practices are limited due to high transport costs and problems with market access. The accumulation of cash through farm production is therefore largely limited to actions such as cash savings on food purchases and cash generation through sporadic sales of own production.
8. The predominant levels of education in these schemes do not offer much leverage for farmers to operate in complex agricultural production systems. Technical know-how is non-existent and the extension services provided are inadequate. A combination of lack of education, lack of experience, exposure and the risks involved in irrigated agriculture, coupled with lack of training and the absence of a reliable extension system, is constraining the farmers in the two irrigation schemes.
9. There was a general lack of gender sensitivity when the schemes were established. Inadequate gender sensitive planning occurred despite the knowledge and evidence that the largest interest group in irrigation development are women and that women will in the future constitute the majority of people that should be targeted for further irrigation development.
10. Lack of experience with sophisticated technology for agricultural production. Technological constraints related to lack of participation in the system designs which in turn is limited by education

and lack of information, lack of understanding of operational, maintenance requirements and energy requirements.. All these pose a limitation to irrigation development. The high maintenance costs of irrigation facilities would also be a problem if participants are expected to carry all the costs themselves. An separate exercise should be engaged in to ascertain appropriateness of the technologies suggested.

11. Non-existent or low management levels and skills. This is reflected in the unwillingness of the majority of scheme members to be involved with the management of the scheme. Almost all of the members are willing to enjoy the benefits but do not want to be responsible for taking decisions. Collective responsibility can only be undertaken with full disclosure, information, trust and share of benefits and costs.
12. Market opportunities are constrained by market access problems. Market access is constrained by the lack of price information as well as by high costs of transportation to reach markets and any additional transaction costs.

CHAPTER 7 RECOMMENDATIONS

7.1 SETTING UP SCHEMES IN THE FUTURE

The enabling conditions for transformation of the irrigation schemes are the following:

1. Harness Community demand. It would be more useful if all the socio-economic requirements and institutional arrangements that influences the demand for an irrigation system could be assessed prior to establishment of the schemes. This would be a useful tool to evaluate the feasibility of the scheme.
2. Adopt a participatory approach to identify community contributions, and define actions for encompassing the goals and socio-economic reality and to develop consensus around farmers' objectives. There needs to be a balance between achieving the governments of speedy delivery and quick injection of money and matching the expectations of the community and the rate at which the community develops
3. Transforming and designing a development path for scheme members requires an investment in preparation of the farmers prior to setting up of irrigation schemes. Allocating adequate time during planning to understand social organisation and site-specific objectives for farming, as opposed to providing generic solutions, is desirable.
4. Full characterisation of the recipient community with the intent of harnessing support for the site specific objectives should precede any attempts at developing irrigation infrastructure so that a livelihood approach could be employed. Concrete and practical actions for inclusion of the unique characteristics in irrigation planning, designing and implementation should be identified.
5. Each of the social factors identified, individually has the potential to significantly depress the capability of rural people to achieve long term objectives. Considering the socio-economic circumstances of these communities, fragmented assistance would have limited impact. A whole and complete system of support to deal with all factors at once is required. Identifying many constraints and just dealing with a few may be appropriate in private farms and on large commercial schemes. In these instances the mitigating factors may be that the participants have high standards of self-management, are self-motivated and have access to or the possibility of mobilising resources (financial, management and human, information, production). In black developing communities actions should be defined for all socio-economic aspects. A multi-faceted, holistic approach would be more effective in dealing with issues of management, maintenance, balancing benefits and costs among the participants, etc. than piecemeal initiatives.
6. Socio-economic issues and infrastructure considerations for irrigation development should receive primary consideration simultaneously. Gender and population dynamics and infrastructure considerations should be considered simultaneously. . Defined actions should be developed for dealing with the productive roles (e.g. farming, irrigation scheme participation, etc) as well as the reproductive roles (e.g. child rearing, providing food for their families, etc.) of women to enable them to deal with the complex issues associated with irrigated agriculture.
7. Promoting a broad based strategy for crop production in which irrigation plays a central role, is desirable.
8. A long-term strategy for incorporating the needs for expansion should be adopted at the outset of developing the irrigation schemes. A feasibility study that includes an assessment of available land resources at the point of establishing an irrigation scheme, should be conducted as well as the social dynamics that govern the further acquisition of land.
9. Targeting irrigation to small groups of people is more desirable as it raises the stakes at an individual level and increases the potential for success of the irrigation schemes because it increases the individual's sense of responsibility towards the success of the scheme.

10. Adopt a strategy, which combines empowerment, awareness, capacity building and training in an effort to create better prospects for continued prosperity.

7.2 UPGRADING OF THE CASE STUDY SCHEMES

Careful strategic interventions would be required to enable increased farm income opportunities for participants in the two schemes. These could include the following options:

1. Esiphongweni will benefit from the comprehensive agricultural support process currently adopted by the National Department of Agriculture where as the Ndaya irrigation scheme will benefit by adopting a commodity approach and conducting a feasibility study to identify what commodities are suitable for the area.
2. Improved market access through the development of a localized central market facility to reduce transportation costs. This could be done in cooperation with other nearby schemes. For Ndaya it would mean a new facility but for Esiphongweni there are already efforts by the Department of Agriculture to link it with REAP and UMVEPCO. This will attract local consumers as well as the "Hawker" traders. A centralized market point could help to reach and maintain a "critical mass" in the supply of food products. With the development of market opportunities, surplus production could be stimulated to generate cash income.
3. A second thrust to improve market access could be to activate market needs for high value products such as exotic crops, medicinal crops, etc. For this option a focused Research and Development effort would be required. Institutions such as the Agricultural Research Council (ARC) or the Institute for Natural Resources (INR) could be approached to initiate such Research and Development processes. Focused market development and business arrangements (contracts) would also be necessary. Opportunities for such a strategy should be based on a market and production analysis with "contract type" business systems in mind.
4. "Low cost production systems" should be accepted as the major thrust for the schemes. For example, a change in the irrigation system to allow a flood system may also reduce maintenance cost. The sustainability of a low input cost strategy would also depend on the government's approach to assisting the community. They may choose to subsidize the high irrigation costs or to change the irrigation system to flood irrigation.
5. Improving and developing management capacity. Substantial and expensive management support systems would be required to turn such a vision into reality. Thus appropriate technologies offering ease of operation and maintenance by community members must be investigated. The design, establishment as well as ensuring that sufficient knowledge regarding the use of the technology is available, should be taken as a priority.

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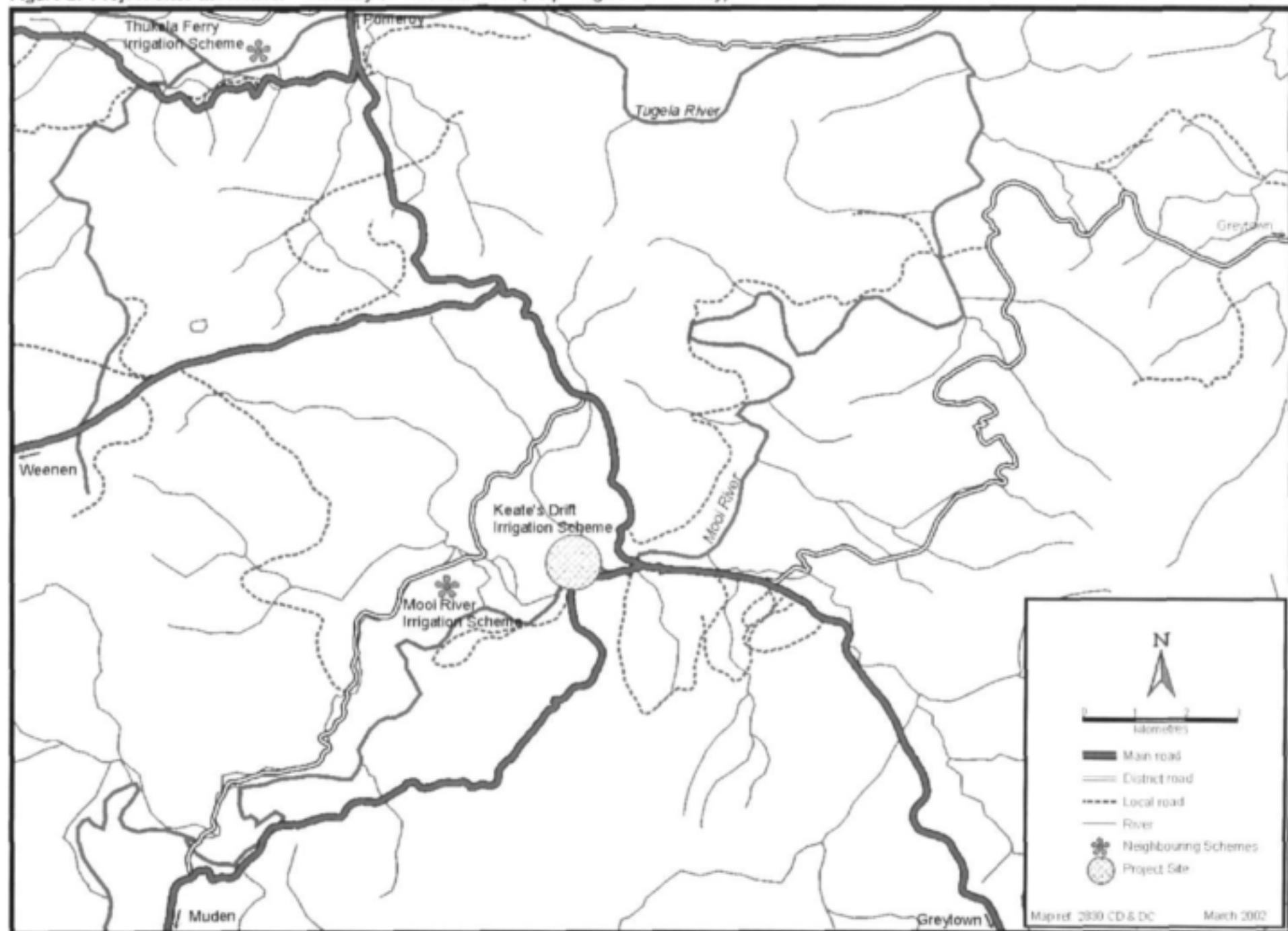
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ANNEXURE 1 MAPS OF THE STUDY AREA

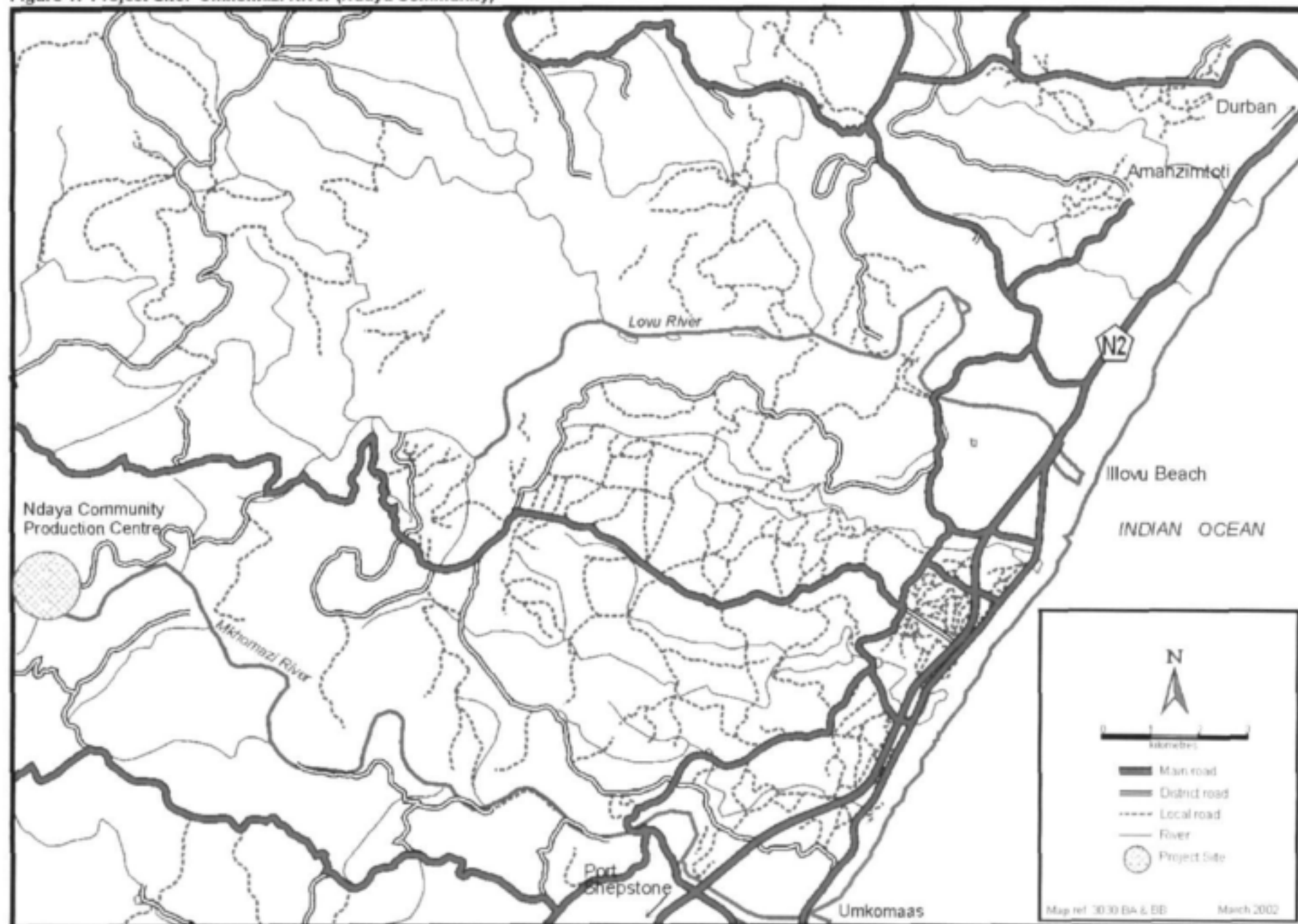
A1.1 MAP OF ESIPHONGWENI

Figure 2: Project Site: Mooi River - Tributary of Uthekela River (Esiphongwe Community)



A1.2 MAP OF NDAYA

Figure 1: Project Site: Umkomazi River (Ndaya Community)



ANNEXURE 2 PROFILES OF THE STUDY AREAS

A2.1 THE ESIPHONGWENI IRRIGATION SCHEME

A2.1.1 Description of the scheme

The Esiphongweni irrigation scheme is situated in the Natal Midlands of KwaZulu-Natal at Keatesdrift, between 30° 29' 00"E to 30° 29' 35"E and 28° 51' 25"S to 28° 51' 40"S (See Map 1 attached). The scheme falls under the jurisdiction of iNkosi Mchunu.

The surrounding area is generally rocky with visible rock outcrops both along the river and on road sides. The vegetation type of the area is a mixture of thorn bush and bush veld.

The scheme is approximately 63ha and is situated on the banks of the Mooi River. The scheme is composed of two parts: one area belongs to individual community members and is considered the communal garden, while the other part was acquired through the Land Reform Program of the Department of Land Affairs, which was bought from Impala Farms. This part is considered the commercial section. Currently, there are only six farmers who have access and control of the latter piece of land. This piece of land does not fall under the iNkosi's (Village Headman) jurisdiction and membership is open to all Esiphongweni farmers whose aim is to grow crops for sale only. To gain membership, individuals have to apply to the development committee, which was established during the land reform planning process. The new entrants have to acquire a certificate of Permission To Occupy (PTO) for the land from the iNkosi.

A2.1.2 Investment

According to the Business Plan for infrastructure development prepared for the scheme by the Department of Agriculture, approximately R1.2 million was invested in the project for irrigation infrastructure alone.

A2.1.3 Land tenure

Tribal arable land was traditionally allocated by the iNkosi of the area to all the subjects. When the irrigation scheme started, all landowners automatically became members of the scheme. These landowners control access and make decisions regarding any landless member of the community that needs access to the irrigation scheme. It is not uncommon for those without farming land to enter into lease agreements with landowners to farm the land. The owners of the land usually receive part of the produce as payment for such a lease agreement. The scheme members consider land tenure to be secure once land is leased. There is mutual respect between people on lease agreements and misunderstandings are resolved through discussions. The iNkosi sometimes resolves conflicts regarding land.

A2.1.4 Local institutions and scheme management

There are two levels of institutional structure in the community. The first institutional level is comprised of the local municipality governed by elected councillors, the iNkosi and his indunas. The municipality is responsible for the provision of services. The councillors are responsible for liaising between the community and the municipality. iNkosi Mchunu and his indunas are responsible for keeping law and order in the community and for the administration of communally owned land on behalf of the community. The second institutional level constitutes community committees and development clubs. Three committees in the community are respectively responsible for agricultural activities (Khanyisani Esiphongweni), crèches (Ekucabangeni) and water (Ethembeni).

Currently, there is an ineffective elected committee whose main duty is to manage the scheme. The committee has done little to monitor and sanction the irrigation activities and as a result there are a number of unresolved conflicts. Farmers sometimes complain about the committee's ineffectiveness to the extent that they have approached the local Extension Officer to provide training on the roles of the committee members so that they would be able to manage the scheme effectively and efficiently.

According to the scheme members, irrigation scheduling and pipelines are the project's main problem because there are no formalised rules and regulations for the farmers. There are no persons elected by the members to manage the irrigation system and to ensure that the electricity bills are paid on time by all the members. In order to deal with conflicts, those who break the rules are reported to the chairman who calls a special meeting to resolve the matter peacefully. If the matter is not resolved in the meeting, it is reported to the Induna who in turn refers the matter to the iNkosi. If the matter still cannot be settled at this level, it is taken to court.

A volunteer is in charge of the running and maintenance of the engine, and the pumping of water from the river into the reservoirs. If there is a problem with the engine and pipes he sees to it that all the members are informed. If the problem cannot be solved locally, they report it to the irrigation initiators. Another volunteer looks after, and moves pipes and sprinklers, from one block to another every six hours. He also encourages farmers to pay for their electricity bills. It was agreed that in future defaulters would not be supplied with water to irrigate their plots. They neither have a constitution nor written rules and regulations. They have no bank account and all money collected by the treasurer is kept at home. Record keeping is very poor.

A2.1.5 Farming systems

The area was included in the "Betterment Planning" introduced by the previous government in the 1970s which ensured that agricultural and dwelling areas were established separately. There are two predominant land uses namely dwelling and crop production. Some of the land in the hilly areas is used for livestock grazing. The majority (81%) of scheme members practice both livestock and crop production. Scheme members own, in decreasing order, the following livestock: goats; chickens; cattle; sheep; and ducks.

In Esiphongweni the farming is done as a family unit. Both men and women work in the fields, but men are commonly considered the "owners" of the residential stands. A large number of women are involved in the day-to-day activities associated with farming.

The farming system in the area is largely subsistence, but a small proportion of the produce is sold to local buyers. The main crops grown by the community include maize, beans and pumpkins although other crops and vegetables (such as sweet potatoes; Irish potatoes; tomatoes; onions; and brinjals) are grown on a smaller scale.

Access to farming inputs, such as seeds, seedlings, fertilizers and pesticides is very poor. There is also a lack of transport to collect purchased inputs. There are no storage roinputs and no pack house to store and process farm produce. A commercial farmer from Greytown supplies farmers with seed potatoes and offers credit to community members, affording them an informal support system.

Scheme members own various types of equipment necessary to carry out their farm work and the following, in decreasing order of quantity, are the main types: hand hoe; bush knife; fork; spade and tractor. Land preparation is usually through the use of a tractor. A member of the community owns the tractor and hires it out to the rest of the community for a fee.

A2.1.6 Household size and income

The average number of dependents per family at Esiphongweni Irrigation Scheme is 6 and ranges from 0 to 13 dependents per family. The average number of dependents per family that help with agricultural work is 3. Some scheme members have dependents that provide farm labour. The main sources of income, in decreasing order of importance for the household, are as follows: sale of agricultural produce; pension; remittances by spouses; financial support from child or sibling; salary; sale of drinks; and sale of livestock. The main uses of income, in decreasing order of amounts spent, are the following: food; clothing; household needs; school fees; doctor's fees; labour costs; and purchase of inputs.

A2.1.7 Services

Services such as hospitals, markets and shopping centres are relatively far. The nearest hospital is uThukela, which is 25 km away. The nearest small shopping centre and markets are located in Keatesdrift (3 km away) and nearest large shopping centre is Greytown, which is 35 km away. The nearest large markets is located in Muden, which is 25 km away.

A2.1.8 Market system

The high unemployment rate in the area has compelled both men and women to explore opportunities for selling surplus produce and to avoid losses through rotting of produce. Several stakeholders are involved in the marketing of produce. Local and external hawkers come to buy directly from the irrigation scheme. The hawker market is not reliable and hawkers generally offer very low prices for the produce. Community members also buy directly from the scheme.

Several organisations are available to assist farmers in selling the produce, AFRICARE, UMVEPCO, AGRILINK, and READ. AFRICARE, a non-government organization, has promised to organize a reliable market for produce. AFRICARE has already, in the past, organised a market for tomatoes produced in the scheme. An umbrella organization called UMVEPCO, has recently been established in the region. They aim at helping farmers to access markets and financial assistance. AGRILINK is willing to buy produce from the scheme and REAP has indicated that it will buy organically produced farm produce. However the community has not been able to fully utilise these opportunities because of many factors including lack of funds and organisation and lack of access to inputs.

A2.1.9 Catchment and water management

There are currently no identifiable plans for water resource management. The community considers that water is obtained for "free" from the river, and they do not see any need for adopting specific activities to manage water, either in terms of quantity or quality.

A2.1.10 Extension and training

There is an Extension worker assigned to the area. However, from the observations during our extended stays, it was apparent that the farmers could not depend on the extension service to provide them with critical information because the Extension Worker services a large area and is therefore not dedicated to the irrigation scheme. When the Extension Officer was available he advised the communities on market information, crop production practices and irrigation. The extension worker only visits once per month and the service is therefore deemed inadequate.

A2.2 NDAYA IRRIGATION SCHEME PROFILE

A2.2.1 Description of the irrigation scheme

The scheme is located at KwaNdaya ward (between 30° 39' 40"E to 30° 40' 45" E and 30° 07' 10"S to 30° 08' 15"S) in Umbumbulu Region in KwaZulu-Natal (See Map 2 attached). The scheme is approximately 18 ha in size and is located on the banks of Umkhomazi River. Kingsburg, located 30 km away, is the nearest town.

A2.2.2 Investment

According to the Business Plan prepared for infrastructure development, the Ndaya Community Garden was developed in 1999 with funds from the Community Based Public Works Program (CBPWP) of the National Department of Public Works (NDPW). The overarching goal for the NDPW is to contribute to the reduction of poverty and unsustainable livelihoods. The garden was developed under the Ndaya Cluster which also included market stalls, a crèche, installation of irrigation infrastructure (pump and pump house, pipes and sprinklers, reservoirs), fencing for approximately ten hectares of land and a poultry house. Expenditure of R795 000 (Phase 1) was made for facilities in the garden alone. It was never the intention at this stage to set the garden up as a business entity. Instead the garden was a communal entity available to any community member who was interested in food plot crop production.

In the year 2000, the garden became eligible as a pilot site for the Community Production Centre (CPC) Program of the National Department of Public Works (NDPW). Under the CPC Program, the main goal of the project was to develop agricultural production activities and infrastructure that are controlled by the Ndaya community and linked to the expenditure of R2.5 million was made for Phase 2 of the program. This funding was earmarked for training, project management and engineering fees, construction of agricultural production infrastructure, social facilitation and training of the community.

For the financial year, 2002/2003, the NDPW has made available further funding of R 400 000 for Phase 3. This funding is mainly meant to provide support for setting up the management body of the farm. Funds will also be used for limited investment in infrastructure development. The main objectives for this phase are to establish firm institutional arrangements; provide support for establishing a system for a market linked crop production program; use the productive assets created in phases 1 and 2 to create sustainable incomes for the direct beneficiaries; and establish the Ndaya CPC as a business entity for benefit of the direct beneficiaries. There are currently 75 direct beneficiaries.

A2.2.3 Land Tenure

The land falls under the traditional leadership and jurisdiction of Tribal Authority iSimahla under iNkosi Z. Mkhize. Within the provisions of a communal land tenure system, the original community land users are considered to be the families of Dube, Zulu and Majola, who have cultivated land where the garden is located for many generations. These landowners donated the land for development purposes. Subsequently, the iNkosi allocated the land to the Ndaya CPC through a Permission To Occupy (PTO).

A2.2.4 Local institutions and scheme management

The Ndaya CPC falls under the Vulamehlo Municipality. There are several institutional structures. There are Local Government councilors, the iNkosi and induna, community development committees and women clubs. iNkosi Z. Mkhize and his indunas are responsible for keeping law and order in the community and for the administration of communally owned land on behalf of the community.

According to the Vulamehlo Integrated Development Plan, only limited economic nodes exist in the area such that the locals consider the garden as a significant contribution for economic activity specifically for the Ndaya area. The CPC is in close proximity to proposed developments for the iSimahla Tribal Authority such as a comprehensive Technical High School, a clinic and a multipurpose centre. The infrastructure will be constructed in the near future. The main road leading to Ntenjane School that links the project site to the district road D978, is ear-marked for upgrades which will ease

access to the site (see map). In addition, the farm is also in close proximity to Mfume, which is approximately 10 km from Ndaya farm and is fast becoming an important economic centre for the area.

A central committee called the Ndaya CPC committee provides leadership and general management of the farm. According to the scheme members, the committee lacks the necessary expertise and resources to manage the farm effectively. The committee is experiencing great difficulty with the timely collection of funds from scheme members to pay for operational and maintenance costs (purchase of diesel to run the engine). There is a reluctance to pay for the services from some scheme members. It is envisaged that in the future a Farm Manager will be responsible for the day-to-day management of the farm. The business plan for the scheme recommends the use of mentors to assist with various aspects of farm management. Currently, an agricultural graduate assists the farmers with the running of the farm, identifies markets for the produce, facilitates the procurement of inputs, etc. The graduate is paid by the Department of Public Works.

Critical processes are underway to facilitate the development of the farming business, including the design and establishment of cropping plans, a marketing and processing plan, a farm management plan, a farm business sustainability plan and institutional structuring. A site layout plan together with a rotational plan has been developed to guide farm management and operation.

A2.2.5 Farming systems

The total land area available for cultivation is 18 ha. However, only 15 ha of it are available for use by the CPC. A 0.3 ha area, located in the middle of the garden, belongs to a widow. The CPC members resolved that the widow should be allowed to use the land to grow food crops as there was no alternative land to offer her. Another 2.7 ha belongs to one of the original owners who had initially agreed to be part of the scheme but pulled out prematurely. The community is afraid to use this piece of land and although it forms part of the garden, it is currently fallow.

The majority of scheme members (77%) practice both livestock and dry-land and irrigated crop production. The scheme members own the following livestock, chickens; goats; cattle; donkeys; dogs; and ducks.

Maize, beans, pumpkins, sweet potatoes, peanuts, chillies, cabbage and Irish potatoes are the main crops grown at the scheme. Other crops grown include tomatoes, bananas, amadumbe, green pepper, onions, indlubu, brinjals, paw paws, sugarcane, avocado pears, carrot, peaches, mangoes, water crest, dale and peas.

Ploughing is done by tractor, hired from one of the community members. Currently the CPC does not own any agricultural implements and equipment such as spades, hoes, knapsack sprayers etc. Each member brings whatever implements they have for use at the CPC. Scheme members own various types of equipment necessary to carry out their farm work, in decreasing number as follows: hand hoe; grass slasher; bush knife; fork; spade; rake; pick; and tractor.

Production inputs such as fertilizers and seeds are obtained from nearby towns such as Isipingo, Amanzimtoti, Durban and Pietermaritzburg. Some seedlings are produced at the CPC nursery.

A2.2.6 Household size and income

The average number of dependents per family at Ndaya CPC is 6 and ranges from 0 to 18 dependents per family. The main sources of income, in decreasing importance, are as follows: sale of agricultural produce; pension; remittances by spouses; temporary job/casual labour; sale of craft or self employment; inheritance and financial support from son or daughter. The main uses of income, in decreasing importance, are the following: food; clothing; school fees; doctor's fees; purchase of inputs; and household needs.

There is a high level of unemployment in the community. The projects have provided opportunities for short-term and long-term jobs in the community. Eighty percent of scheme members have dependents that help with farm work. The rest have dependents that are either too young to help with farm work or dependents that go to school.

A2.2.7 Services

Services like hospitals, shopping centers are very far away from the scheme. The nearest clinic is Banyena Clinic which is 10 km away and the nearest hospital is Mshiyeni which is 65 km away. The nearest shopping centre is Isiphingo, located 60 km away from Ndaya.

A2.2.8 Market system

Markets are available within the area but are not adequate to handle the quantities of produce generated at the scheme. A small quantity of the produce is sold to the local market, pension points, and direct from the farm. The nearest major market, other than the Durban Market, is Clairwood which is 67 km away. The hawkers' market is also well established. The hawkers buy directly from the farm and farmers need to inform the hawkers at least 2 months before harvesting in order to negotiate prices in time. The produce is mainly sold fresh at the farm gate. Some of the produce is sold to the local residents. We gathered that produce such as dry beans is packed and sold to shops in Mfume and Mnini as it has got a ready market.

The area is easily accessible during the dry season but access is difficult during the rainy season. The gravel road gets slippery in places. When the road is impassable during the rainy season, produce gets rotten at the scheme as it cannot easily be transported to the market.

A2.2.9 Catchment and water management

There is currently no catchment management plan for this area. The community considers the water to be "free" and there is no control measure on its use, either in terms of quantity or quality.

A2.2.10 Extension and training

There is an Extension Worker assigned to the area. However, from the observations during our extended stays it was apparent that the farmers could not depend on the extension service to provide them with critical information because the Extension Worker services a large area and is therefore not dedicated to the irrigation scheme. When the Extension Officer was available he advised the communities on market information, crop production practices and irrigation. The extension worker only visits once per month and the service is deemed inadequate. It was reported that farmers are not trained on any aspect of production or business management.

ANNEXURE 3 CHECKLIST

ANNEXURE 3: CHECKLIST FOR THE RECONNAISSANCE SURVEY

Community Physical Infrastructure

Social facilities
Police stations
Industrial developments
Roads
Electricity
Hospital and clinics
Markets or farm stalls
Telephone, cellular network

Institutional structure

Traditional structure
Governance developments CBO's and NGO
Parastatals
Regional Institution
Private Sector
Community Groupings

Biophysical information

Catchment condition
Topography
Soils
Climatic conditions
Water
Land Use (non-agriculture)

Socio-Economic setting

Livelihood setting (common source of information)
Population Dynamics
Migration activity
Health
Education
Resource management (access to resources)

Information Systems

Information sources
Decision making process

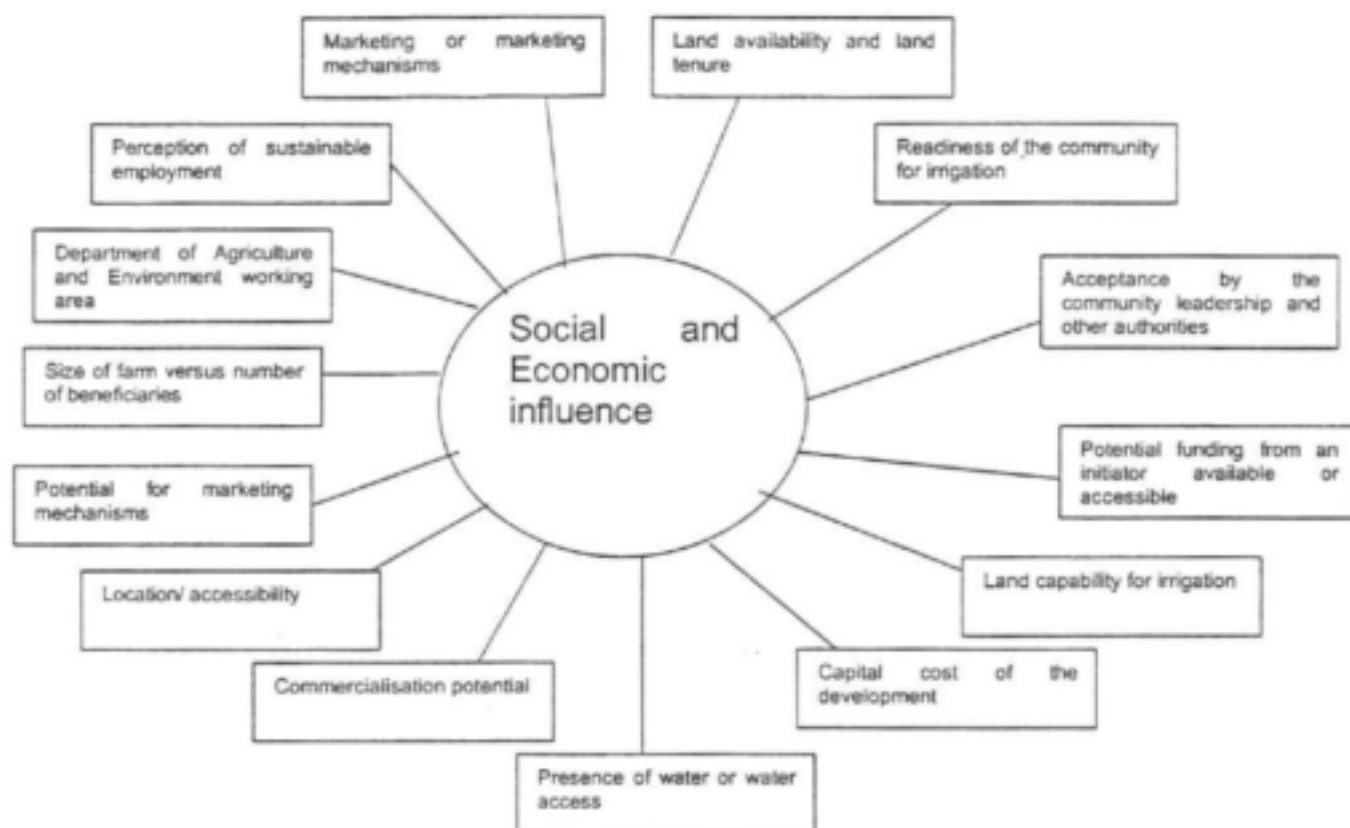
Development History of the area

What development projects have been carried out before
What irrigation projects have been carried out before
Who were the funders
Where did the scheme members come from

Farming Systems

Land use
Planting regimes/methods
Types of crops, cropping systems
Types of farming systems
Gender distribution of farmers
Land tenure systems

ANNEXURE 4 SELECTION CRITERIA



ANNEXURE 5 QUESTIONNAIRE

ANNEXURE 5: QUESTIONNAIRE

INVESTIGATION INTO THE POTENTIAL FOR IRRIGATION IN BLACK DEVELOPING COMMUNITIES IN TWO SUB-CATCHMENTS THE CASE OF THE NDAYA COMMUNITY PRODUCTION CENTRE AND ESIPHONGWENI (KEATESDRIFT)

Questionnaire No. : _____

Date : _____

Name of the interviewer : _____

Name of the scheme : _____

Introduction:

Briefing about who are we and what we want to achieve

1. Name of Respondent _____

2. Gender (tick on the appropriate space)

M		F	
---	--	---	--

3. Age of Respondent.....yrs

4. What do you consider to be your main employment?

(NOTE: If the respondent's answer is farming the ask question the following question)

Employment	Rating in order of Importance

5. Please rank the following in order of importance in its contribution to your income.

Activity	Rank
Crop Production	
Poultry	
Beef	
Dairy	
Other (specify)	

6. Among the work that you do and sources of income that you have which one do you consider to be the greatest contributor to your livelihood? (This refers to survival of the household)

Employment /sources of income	Rating

In what way

School fees	
Labour for my farm	
For buying fertilizer	
Others (specify)	

7. How long have you used the river for agriculture production?

Years		Months		Days	
-------	--	--------	--	------	--

8. What are your expectations for using the river for agriculture purposes? (Indicate what difference having the river makes in crop production)

9. Do you easily have access to land for agricultural use?

Yes	
No	

10. Do you own agricultural land adjacent to the scheme apart from your plots at the scheme?

Yes	
No	

11. What sizes are they and what do you currently use them for?

Piece of Land	Size (ha) (unit measure foot ball fields)	Use of land
1		
2		
3		
4		
5		

12. How would you obtain extra land if you wanted to increase your land size?

Method of Land Acquisition	Tick	Which one is the easiest means	Which one is more secure
Borrowing			
Buying			
Tribal authority			
Through inheritance			

Secure means one they can keep the land for a long time.

13. What land size would be adequate to meet your needs for commercial production?

.....number of football grounds

or

.....number of hectares

14. Which one of these are you practicing currently (tick in the appropriate space) and why do you use that system?

Type of system	Tick	Why
Mono/ sequential cropping		
Double-cropping		
Inter-cropping		
Multiple-cropping		
Others (specify)		

15. Can you read or write?

	Read	Write
Yes		
No		

If yes, what was your highest standard of education?

16. What are you trained to do?

17. Does the irrigation infrastructure satisfy your needs for commercial crop production?

Yes	
No	

If Yes, How?

If No, Why?

18. What limitations do you experience with the current irrigation infrastructure for commercial crop production?

19. Describe the characteristics of irrigation infrastructure that would satisfy your needs for commercial crop production.

20. What equipment do you use for crop production?

List of crop production activities	
Field preparation	

Planting	
Fertilizer application	
Harvesting	
Processing	

21. Are you able to complete the tasks required for commercial crop production on time using this equipment?

Yes	
No	

If yes, how

If no, why

22. Can you make suggestions on how these crop production activities can be made more efficient?

Examples of institutional arrangements include:

- rules and regulations;
- extension support;
- literacy classes;
- marketing systems;
- credit facilities/financial management;
- conflict resolution;
- community structure; and
- those listed in the proposal.
- systems for maintenance;
- system for water resource management;
- agricultural training.
- farm management

23. Do you get assistance from any member of the family?

Yes	
No	

If yes, what type?

Farm management

24. Would you, as a farmer, like to be involved with the management of the scheme?

Yes	
No	

If yes, why?

If no, who should manage the scheme?

25. What qualities do you think a manager of a scheme should have in order to run the scheme to your satisfaction?

Crop Plan

26. What determines which crops you will grow in the scheme for the year?

27. Who in your opinion should be responsible for determining which crops you grow in the scheme for the year?

Inputs

28. What is the procedure for obtaining inputs currently? This includes who, how, where)

How	Where	Who	When

Credit

29. What is the procedure for obtaining credit?

How	Where	Who	When	Conditions

Joining scheme

30. What is the current procedure and what should be the procedure for incorporating new members into the scheme?

Current	Desired Procedure

Working arrangement

31. How would you like to work on the scheme and why?

a) Own my own ☐ (Tick)

Why

b) In a group of _____ people. (Record number of people in the box)

Why _____

Water Management

(Water as a main resource for irrigation should be well managed to maintain its supply)

32. How does the quality and quantity of water in the river affect your production?

33. What do you do in order to maintain and/or improve the water in terms of quality and quantity?

34. What sources of information about irrigation scheme maintenance, water use for irrigation and management of water for irrigation do you have?

(Our interest is extension support provided to the irrigation farmers in terms of water use and management)

Source of information	Maintenance	Water Use	Water management
Farmers weekly			
Television/ radio			
Farmers group discussions			
Agricultural Field Days/Farmers Day			
Others specify			

35. Which ones are most important sources in supplying you with information regarding irrigation scheme maintenance, water use for irrigation and management of water for irrigation?

Source of information	Maintenance	Water Use	Water management
Farmers weekly			
Television/ radio			
Farmers group discussions			
Agricultural Field Days/Farmers Day			
Others specify			

36. What critical issues around irrigation scheme maintenance, water use for irrigation and management of water for irrigation do these sources assist you with?

37. If you were to change any aspects of the important sources of information for irrigation scheme maintenance, water use for irrigation and management of water for irrigation what would these be and why?

Aspects to be changed	Why

Maintenance and repairs

38. Is there a system for maintenance of the irrigation infrastructure?

Yes	
No	

39. Who do you think should pay for maintenance and repair costs and how should maintenance and repair costs be shared?

WHO	HOW
Maintenance costs	Repair costs

40. Beyond water use and management do you have support for the following:

Technical services (planting crops, new cultivars, disease control, land preparation)	
Managerial services	
Financial services (budgeting, pricing, bookkeeping)	
Others (specify)	

41. Are there any on-farm demonstrations on the scheme regarding water use and management?

Demonstrations	Tick
On-farm demonstrations	
Field experiments	
Others (specify)	

(Explain what is meant by Catchment Water Management Strategy)

42. Do you have any knowledge about Catchment Water Management Strategy that is required by Department of Water Affairs?

Yes	
No	

43. If yes, what are its functions?

1.

44. How do you think the Catchment Water Management Strategy can assist in improving and/or maintaining water quality and quantity?

(Explain what is meant by Water User Association)

45. Do you have a Water User Association for the irrigation scheme?

Yes	
No	

46. And what is its function?

1.

47. What do you think the Water User Association will assist you with in crop production?

Crop Production

48. What systems do you use to control quality of produce?

Produce	During production	After production

49. Who is responsible for the following tasks on your plot?

Planting _____
 Irrigating _____
 Weed control _____
 Harvesting _____
 Selling _____

Training

50. Have you ever attended any training on the following farm skills? How did you use the training that you acquired?

Skills	Yes	No	How is training acquired used
Mixed Farming Skills			
Managerial Skills			
Processing Skills			
Crop Production methods			
Grading			
Fertilization			
Pesticides			
Others (specify)			

If no, do you wish to acquire training on these activities?

Yes	
No	

51. How would you like to be trained on any one of these aspects or what method of training would be most useful to you?

52. Would you like to be engaged in irrigation farming for commercial purposes?

Yes	
No	

53. What are your reasons for wanting to become a commercial farmer for irrigated agriculture?

Reasons	Tick
Generating cash income	
Eradicate/reduce poverty	
Improve living standards	
Other (specify)	

54. Where else have you worked before you settled permanently into the community?

55. Is there any member of the family who has abandoned farming?

Yes	
No	

If yes, Why ?

56. If an opportunity of other employment apart from farming became available, would you also leave farming?

Yes	
No	

If yes, why?

If no, why?

(Interviewer to check first if respondent has children below 21 years then ask)

57. Do you involve your children (below 21 years old) in agricultural activities?

Yes	
No	

If no, why?

If yes which activities and why?

58. Does your marital status affect your commitment to irrigated agriculture?

Yes	
No	

If yes, how

Other related WRC reports available:

Developing sustainable small-scale farmer irrigation in poor rural communities: Guidelines and checklists for trainers and development facilitators

M de Lange; J Adendorf; CT Crosby

Appropriate training courses cannot be designed without first-hand knowledge and understanding of the circumstances within which the training will be applied. This implies a thorough understanding of the agricultural resources and irrigation infrastructure; the nature, availability and reliability of agricultural inputs and support systems; and, most importantly, the farmers' needs, aspirations and constraints.

The focus of these guidelines is the development of the marginalised rural poor. The trainer and developer must become aware of the fears that have emerged among the rural poor, owing to a lack of contact with and knowledge of the outside world. It is of fundamental importance to understand something of the difficulties involved in escaping from the trap of poverty and the resistance to change which is inherent in survival strategies.

Attempts to stimulate development will be fruitless unless people's fears are addressed first. The training process can be used to overcome resistance to change and to stimulate a bottom-up development. The trainer should establish principles such as voluntary participation, open discussions and long-term involvement for the trainer and the training group in the beginning and reinforce them as often as necessary.

These guidelines have identified a wide range of role-players in smallholder irrigation development and information that is typically overlooked in the implementation of a development initiative. The checklists which are provided can be broadened and further refined through feedback after field experience with the practical application of the guidelines.

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Water Research Commission
Private Bag X03, Gezina, 0031, South Africa
Tel: +27 12 330 0340, Fax: +27 12 331 2565
Web: http://www.wrc.org.za