Women in Irrigation

Case Studies of Schemes in the Gambia, Kenya and South Africa

F Chancellor

(TDR Project R 6062)

Report OD/TN 82
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Summary

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Case Studies from the Gambia, Kenya and South Africa are investigated to determine the role of women in irrigated farming. Data relating to women and opinions of men and women farmers are investigated at twelve sites. A summary of findings in each of the three countries is presented.

Acronyms

CRD	Central River Division
IFAD	International Fund for Agricultural Development
JPSP	Jahaly Pacharr Smallholder Project
PIU	Provincial Irrigation Unit
RIDEP	Rice Development Project
SISDO	Smallholder Irrigation Support and Development Organisation
SISO	Smallholder Irrigation Support Organisation
SSWCP	Small Scale Water Control Project
VISCA	Village Savings and Credit Association

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1. INTRODUCTION

Little information is recorded on smallholder irrigation schemes in Africa. Most of the information which does exist relates either to the area of land irrigated or volume of production. On farmer managed schemes, recorded information generally relates to the financial needs of the system. There are virtually no data relating to the activities of men and women separately.

Many of the views expressed about women in irrigation have been based on small intensive studies of a sociological nature whose focus has often been the economic status of women. The disadvantaged status of rural women has been widely discussed during the Women in Development decade and the importance of social determinants of women's participation in irrigation is well recognised. In recognition of their needs, women's projects were favoured during that period. Only recently has it become recognised how important women are to successful and sustainable irrigated production. Women provide the majority of the human effort which contributes to irrigated production on a day-to-day basis. In addition, the number of women who lead rural households in Sub-Saharan countries appears to be increasing.

In projects where more than three quarters of the end users are women it is not uncommon to find that women have a minimal or nominal role in planning and continue to have a minimal role in operating, managing and developing the system and in controlling their productive resources.

It was clear that more information was needed about the role of women in existing schemes before measures to assist them in improving performance were considered.

This study aims to:

- develop tools to identify gender roles in smallholder irrigation
- identify links between design and O&M and the way in which tasks are assigned to gender
- develop a Guideline for assessing the impact on system performance of technology transfer to and training of women

This Technical Note presents the investigative tools developed (Appendices 1.1 and 3.1) and describes the findings in twelve case studies. The cases studied in three Sub-Saharan countries, The Gambia, Kenya and South Africa were chosen to represent smallholder irrigation typical of the country, or province in the case of South Africa. Three of the twelve schemes were "women only" developments and a further two adopted policies to favour women. The remaining schemes could be regarded as lacking any specific gender policy. Although all the schemes are smallholder schemes, a variety of irrigation methods were employed, different institutional arrangements are represented and a wide range of cropping systems included.

The case study findings are presented on a country basis to provide data for use in those countries. Where possible, the information gathered for the study was augmented with existing information. This background information was collated from a number of sources and is presented in Appendices relating to each country. The basic method was amended to take account of local conditions and particular requirements of counterpart researchers in those countries.

In general, the study has been hampered by the lack of existing data and by the lack of data disaggregated on the basis of gender. Socio-economic data was not readily available in South Africa, but in Kenya, socio-economic information was available for the schemes from an earlier HR Wallingford study. Although the findings from the case studies and additional available material are presented here, the implications will be identified and discussed in the Guideline to be produced shortly.

The main findings to be noted at this stage include:

- The number of women-headed households on smallholder irrigation schemes is often as high as 40%, (influenced)/affected in some countries by cultural features such as migrant work and multiple marriages.

- Women constitute more than half the labour force in irrigated agriculture and individual women contribute more hours than men.

- Women lack influence in farming decisions such as crop choice and allocation of resources to irrigation.

- Women are increasingly seen as reliable re-payers of production loans and credit is likely to become more available for women producers.

- Women are responsible for family food security, provision of domestic water and energy sources. As a result they choose different crops from those selected by men.

- Women work in irrigated fields in addition to existing duties. They tend to abandon activities which traditionally provide them with private incomes such as brewing and crafts, and have little cash as a result.

- Women lack education relative to men and have difficulty in finding time to take advantage of training opportunities that may be offered.

- Men and women who are relatively more educated rely less on the extension services.

- Women are interested in controlling water delivery systems and recognise the potential importance of being able to influence water management.

- Men and women face different practical constraints. Both sexes must be addressed in scheme design and choice of irrigation equipment - taking a middle course is unlikely to provide effective benefit.

- Gender-specific needs are site-specific, thus participation of both genders at the outset of all developments is essential to correct identification of design requirements.

2. CASE STUDIES

2.1 Gender in Smallholder Irrigation - The Gambia - 1995

In the Gambia, the resources that are made available for irrigation, especially labour, are influenced by a particularly complex network of rights and obligations in rural society. Women in rural communities play an important role in the allocation of family labour to food production tasks. Despite this role women are often stressed because old traditional obligations are upheld in new situations. Gender roles are further complicated where the priorities of production do not coincide with family and individual aspirations. The introduction of irrigation, or technical formalisation of existing water-use systems, is, in most communities, a change which involves change in the traditional farming system.

Development planners seek to favour women beneficiaries, however, outcomes have not fulfilled expectations, perhaps because the advocates of change have come from outside the irrigating communities.

In the Gambia, women are major participants in irrigation at field level. There is scant evidence to suggest that they participate significantly in water management or policy decisions at system, regional or national levels. The present study aims to identify existing constraints and assess the need for training in reducing constraints to women's effective participation.

2.1.1 The study

Attention to gender issues has been integral in Gambian smallholder irrigation development for more than a decade. The study investigates sites from the rice growing sector and the horticultural sector. Three rice projects, Jahaly Pacharr Smallholder Project (JPSP), the Rice Development Project (RIDEP) and the Small Scale Water Control Project (SSWCP) are included. Horticultural gardens, which are close to urban areas around Banjul and tourist developments on the Atlantic coast, are represented by Lamin and Bakau gardens. These small irrigated perimeters were especially suited to development by women and are frequently used by women exclusively. It is hoped that a full picture of the Gambian women's opportunities will be achieved.

2.1.2 The Projects

The present section includes a brief summary of the conditions/characteristics of the five schemes investigated. Appendix 1.2 includes more detailed information on the schemes.

Jahaly Pacharr Smallholder Project (JPSP)
This project is based at Sapu in Central River Division (CRD). It has been in operation since 1980. The original aim was to increase rice production. The total irrigated area, including the double cropping pump-fed and tidal rice areas, is approximately 1200 ha and benefits some 22,000 people. Currently, high yield is achieved in the areas which receive pumped water. Between 4 and 7 tons/ha is expected rather than the 3 - 4 tons achieved in the tidal areas. It has been partially successful but performance has been inconsistent and generally below expectations. In the course of the project, the patterns of access to land and distribution of benefits have undergone a number of changes (Dey 1990, Carney 1988). Registration of project land in women's names has had only a limited impact on the power bases of men and women.

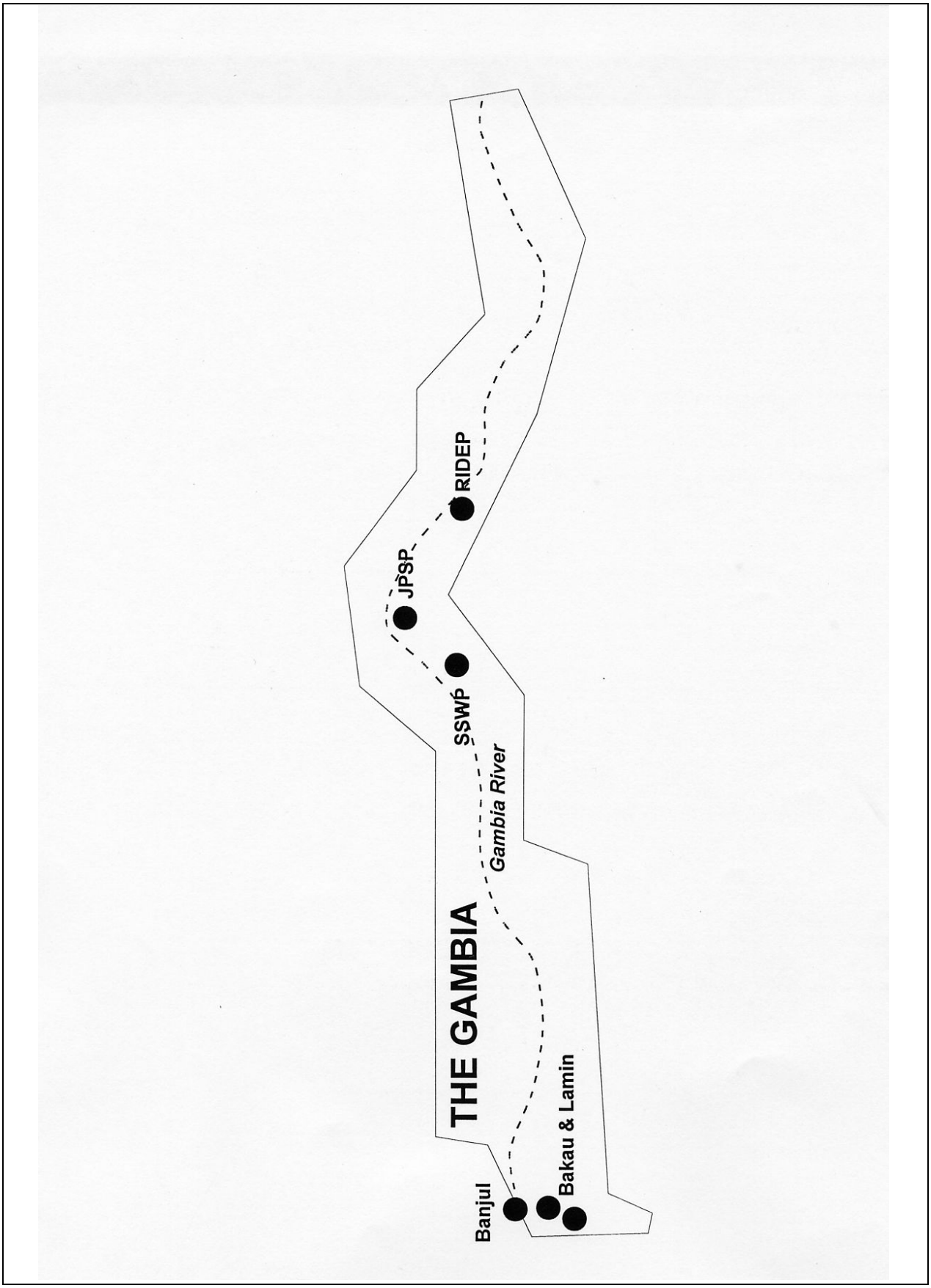

Figure 1 Location map – Gambia

Although the focus is on women and their representation on farmer committees, and women were intentionally favoured in education programmes, the education and training offered is limited to literacy programmes. Technical training content and management skills are not included. A Community radio station recently established at Sapu, is expected to improve communication and provide a popular forum for farmers to discuss irrigation issues. Community facilities are well developed, providing health care, child care, primary education and access roads between villages and swamps. Alternative employment is seasonal and essentially agricultural. There is a labour constraint in the wet season when upland areas and rice fields are cultivated simultaneously.

Land preparation is a key activity for which farmers depend on the services offered by the project. The project currently appears to be unable to meet the demand for land preparation services. In past years, rice prices have been too low to attract people to prepare by hand. When the rice price is high enough, plots are prepared by hand.

Rice Irrigation Development Project
This project has addressed the rehabilitation of a number of pumped irrigation perimeters in CRD. The objective was to rehabilitate the numerous deteriorating rice irrigation schemes to provide double cropping and to encourage self sufficiency in operation and maintenance. The scheme began in 1988. It was planned to rehabilitate and develop 1250 ha. and benefit 25,000 people by 1996. Some 315 ha. has been developed to date. Although the area developed is substantially less than projected, activities have included project management funding, land development, equipment, tools, inputs and provision of technical assistance and training. Training in operation and maintenance of power tillers is offered to both men and women who are selected by their fellow villagers.

Small Scale Water Control Project
Also sited in CRD, the SSWC double cropping, IFAD funded, tidal scheme project began in 1991 and has support until December 1996. Drawing on lessons learned earlier in the JPSP, the project has emphasised farmer involvement from the outset. The total irrigated area is 482 ha., which is substantially less than originally planned. There are a number of problems including poor water quality, poor land levelling, maintenance and water management. Salinity problems encountered in the early stages of the project increased costs and slowed progress greatly. As a result little has been achieved on the North Bank. These technical difficulties give rise to a number of social and institutional problems. Prior to formal handover, IFAD is training farmers to enable them to cope with some of the technical problems and sustain the system. The training includes technical skills, operation and maintenance and on-farm water management.

Lamin Horticultural Project and Bakau Horticultural Project
These horticultural gardens are situated in the Western Division relatively close to Banjul in densely populated areas. Continuous cropping on small irrigated areas produces a more or less constant flow of vegetables for sale. The gardens were developed using donor funds and the emphasis was on women growers.

At Bakau, water is obtained from shallow wells by bucket and is applied by hand to the surrounding beds. Participants own up to 20 beds each, so that an average plot is between 0.01 and 0.03 ha. Cultivation and marketing are undertaken on an individual basis by the women who typically invest the proceeds in feeding, clothing and educating their families. The main problems facing the women are poor water quality, lack of marketing structures and the heavy workload.

At Lamin, a good supply of sweet water is obtained from boreholes using solar power supplemented by a small generator. The garden is 15 ha in area, about half is devoted to individual irrigated vegetable plots and half to a communal orchard. Previously, the plots were supplied with water pumped by diesel power but this proved to be an unsustainable cost, although a greater area was irrigated.

Extension advice is available in both gardens but is more intensive at Lamin. There the resident extension officer addresses marketing problems in addition to advising on cultivation and pest control.

2.1.3 The survey

A questionnaire survey of farmers was undertaken in the five sites in July 1995 by HR Wallingford with assistance from the Department of Agriculture in the Gambia and project staff at Sapu. A series of meetings were conducted in the following year to record the views of farmer committees and project personnel.

Respondents

A random sample was chosen from each of the smallholder irrigation schemes giving a total sample of 30, of which 6 were male and 24 were female. All the men were heads of their households. Amongst the 24 women respondents 16 claimed to be head of their household. There were no unmarried adults among the respondents.

Table 2.1.1 Respondents, gender and household position

	Jahaly Pacharr	RIDEP	SSWCP	Lamin	Bakau
Male	3	3	0	0	0
Female	9	3	6	3	3
Total no.	12	6	6	3	3
Female household heads	8	3	1	1	3

Demography

Respondents' age varied in the range between 33 and 75 and, in general, the men who were interviewed were older than the women. Thus, the views gathered were those of people with long farm experience and possibly conservative views. Household size was similar in the different schemes and in different marital situations, averaging approximately 8 people overall, though the range extended from 2 to 20 persons per household. 13 women function on their own accounting for 55% of the women interviewed, or a third of all respondents.

Table 2.1.2 Types of households in the sample at each scheme

Family type	Jahaly Pacharr*	RIDEP	SSWCP	Lamin	Bakau	Average no. of people in house
Women with no male in residence	3	0	5	2	3	8
Women in a marriage	3	0	1	1	0	9
Men in a marriage	3	3	0	0	0	8
Average household size	8	9	9	6	10	8

* 3 respondents gave insufficient information to be classified

Decision-making
Decisions relating to crop production were taken by both genders. Men and women both select the crops to be cultivated on the plot for which they are responsible. However, more men than women took decisions about inputs purchased and labourers hired. Women took decisions relating to deploying household labour and marketing. At Bakau and Lamin, women dominated the decision process, although some crop and input decisions were male dominated, in most cases by a son. At Jahaly, the pattern of decision-making appeared to be equitable apart from the household labour sector where women led. Equal participation in decisions was also a hallmark in the SSWC project. Overall, the Gambia showed high participation of women in agricultural decisions.

Land Tenure
Land tenure in the Gambia is complex and, although there is a well studied traditional system, it has been disturbed by irrigation projects. JPSP is notorious for initially proposing a transfer of land, formerly regarded in the female domain, into male control. Although the error was later corrected, much of the real control still remains with men, especially in the double cropping pump-fed area.

Irrigated land is commonly owned and inherited, mainly passing down the female line. This pattern follows from swamp rice cultivation traditionally undertaken by women. Horticultural gardens are generally considered to be part of the female domain. Vegetables were exclusively grown by women, many of whom inherited plots from mothers and grandmothers. Women working in the vegetable gardens also cultivate swamp rice in the wet season. Although they continue to garden in the wet season, gardens have relatively more importance in the dry season.

Income
Exact income is particularly hard to establish in the rice schemes because many payments for services are made in rice at various stages of harvesting and processing. There is considerable variation in the amounts retained, distributed and sold.

Production in the irrigated perimeters is thought to be higher than the country average. The average yield for the Gambia was approximately 3 tons/ha in 1992/3. Staff in the projects report that incomes from rice are low because a high proportion of the rice produced (approx. 4 - 7 t/ha) is kept to meet the needs of the family. Marketing is often undertaken only to obtain cash for specific payments. Women may offer rice for sale to the men of the compound who will buy it to fulfill their obligation to meet family needs. If the men do not buy the rice, then it is sold in the local market.

Women do not necessarily control benefits in proportion to the work they contribute, especially when they work on "maruo" fields which produce for family needs. Their "kamanyango" fields benefit them directly and it is from these fields that they can sell to the male household head. They can also contribute voluntarily to the household and many women do so, thereby reducing their own private resources.

Responsibilities
Responsibilities for different tasks are set out in Table 2.1.3.

Table 2.1.3 Gender dominance in agricultural tasks

Tasks	Jahaly Pacharr	RIDEP	SSWCP	Lamin	Bakau
Land preparation	F	E	F	E	E
Planting	F	E	F	E	E
Weeding	F	E	F	M	E
Watering	E	E	E	E	F
Maintenance Farm Scheme	 M M	 E E	 M E	 M E	 F F
Harvest	M	E	E	E	F
Post harvest	F	E	E	E	F
Marketing	F	E	E	E	F
Domestic	F	F	F	F	F
Animals	M	M	M	M	F

Source: HR Survey 1995

Tasks in the JPSP area were often gender-based, only application of water to the field drawing equally on men and women. Domestic work was clearly gender specific in all locations while farm maintenance and animal husbandry were strongly associated with men, but not exclusive to them. The task-gender links were perimeter based rather than task based. In this case, perimeters also represented different projects obscuring any direct linkage between either project or village and task-gender links.

Expenditure Decisions
Decisions in expenditure are made according to the pattern shown in Table 2.1.4.

Table 2.1.4 Gender dominance in expenditure decisions

Expenditure decisions	Jahaly Pacharr	RIDEP	SSWCP	Lamin	Bakau
Food	M	F	E	M	F
Education	M	M	M	M	F
Goods	M	E	M	F	F
Travel	M	M	M	M	F
Fuel	M	M	E	F	F
Social	M	M	E	M	F

Clearly, the pattern of decision-making varies widely according to location. Bakau and Jahaly Pacharr represent extreme situations with total domination by one gender. The remaining schemes show more liberal regimes except in regard to spending on travel and education.

Education
None of the women at Lamin had been to school, but they were the oldest of the women respondents, so this is not surprising. Low education rates were also evident in Jahaly and in the SSWCP samples, where less than 20% of the people interviewed had any education at all. At best, two thirds of interviewees at Bakau and RIDEP had been to school. Respondents assessed the relevance to farming of their schooling as very low indeed. Only one person deemed their education to have been any use at all. Adult literacy programmes are in place countrywide. Thus, literacy may be higher than an assessment based on school attendance. Education among children was common at all sites, and overall 70 % of the sample had children currently in school.

Extension
Men and women had more or less equal access to extension and the frequency with which they had contact with the extension service was similar for both genders. Everybody thought that the gender of the extension officer was secondary to his or her professional and communication skills. Good extension and relatively easy access to water at Lamin resulted in good quality vegetable production. Extension advice at Lamin included attention to marketing and applying market information to devise strategies such as staggering planting to avoid overproducing for the weekly market. This contrasted with the situation of women in the Bakau garden who had little advice and complained of both quality difficulties and market glut problems.

It was evident that few people had ever had contact with a female extension officer. Male extension staff appeared to do a good job and women in all locations were on good terms with the extension workers. The number of women in the extension service is low and there are no women at professional level in the irrigation service.

Water User Groups
All of the interviewees said they belonged to Water User Groups. Half of them felt that men and women contribute differently to the activities of the group. At JPSP, the main reason given for this was that their high earnings enabled them to do so. It appears that respondents in Jahaly interpreted the word "contribution" in monetary terms. Some interviewees responded by identifying attributes, as at RIDEP, where female virtues such as hard work and concentration were mentioned. The interpretation at JPSP hints at underlying dissatisfaction with the distribution of benefits as five women said that the contribution was different and four of those put a monetary interpretation on the question. Broadly speaking, responses from Lamin and RIDEP indicated that women made a positive contribution.

Men and women both wanted to have more influence in group decision-making. Of the 70 % who expressed a desire to be more involved, half recognised that there was a need to improve the way in which the committee functioned. Most of the remainder were interested to participate as a way of improving production.

Water Management
Where women dominate field tasks, they should be involved in allocation of water to help ensure a good match between crop needs and available supply. Adequate water control is needed if this is to be achieved. This was certainly the case at Lamin and was to some extent true in Bakau. Women in Bakau achieved only partial control because they could not prevent salt water intrusion into their wells at times of peak demand. Water control in the rice schemes was mainly done by men, either male project staff or male farmers.

Training needs
People were more interested in learning about scheme operation and management than about in-field water management. They feel competent to manage if the required water arrives at the time it is needed. They justified this view in a number of ways and three main themes emerged. The most frequently mentioned reasons were:

- increasing personal skills relating to technical aspects
- capacity building at group level,
- improving production and living standards.

Less mentioned, but nonetheless important, were:

- control of water,
- equity
- and reliability.

Women at Lamin want to learn how to operate the pumps and undertake other technical tasks which are outside the extension workers remit. The women were unclear how training of this type could be provided.

Training was provided by the RIDEP project which recently trained 56 people in the operation and maintenance of power tillers. The training targeted equal numbers of men and women. The women were enthusiastic about the training and looked forward to using their new skills. Sadly, their enthusiasm was not shared by the older men of the village who clearly disapproved of women handling power tillers and commented that they did not want women coming home too tired to do other duties.

Impact on women
Women claimed that they worked much harder than previously as a result of the introduction of vegetable gardens and improved rice schemes. However, women continued their effort in irrigated farming, even in difficult conditions. Motivation to continue irrigating arises from the combination of a number of factors:

- women are obliged to provide for families, although they are usually not the sole providers. In the rice growing areas, in recent years, women's contribution to the family requirements has increased relative to that of the men.

- women are keen to raise funds to educate their children

- alternative sources of income are limited especially in the rural areas.

2.1.4 Discussion

Women have a strong tradition of rice cultivation and a good but informal skills base. Until recently this experience has been ignored. The government is now making a conscious effort to include gender awareness in projects in the hope that women will regain some of their former roles. Rural women have well established work groups, in which they assist in each others fields on a rotational basis, on which improved institutions and training programmes could be based.

In some areas the increase in female involvement in individual commercial growing is reducing their commitment to communal work groups (Barrett 1995).

It is recognised that women lack education, especially technical training and it is important to address this need, by building on their existing experience.

Women have limited control of the production system. They face resentment from men where projects overtly target women. It is unlikely that men will simply offer control. Negative situations need to be

avoided. Irrigation development faces the challenge of encouraging men and women to identify positive aspects of pooling or complementing their individual human and material resources.

Horticulture offers women an opportunity to generate income from small areas of land, especially in the urban and semi-urban areas. Women develop Village Saving Associations (VISCAS), which have become increasingly popular, to improve access to inputs

Effective participation of women may be hard to achieve in the short term. At a village meeting of JPSP farmers, called to discuss the role of women, no women were present. The men explained that they were at work in the field and did not have time for discussions. However, at another village, women were actively involved in discussions.

There are varying cultural norms in different villages and within different ethnic groups.

In the past, women were rarely afforded educational opportunities. This results in shortage of educated women in senior posts, particularly in technical fields such as irrigation. Many women who had access to education and training fill posts in health care, teaching and domestic skills. These factors contribute to a situation where women have had difficulty in voicing their needs and in having their views considered even at the lowest policy making levels.

Recent projects, such as SSWCP, have made considerable advances in involving women at village level but have been hampered by technical difficulties in the projects undertaken.

2.1.5 Conclusions

Women need to ensure that their requirements are understood by decision takers (project management or farmer committee) and trainers. The majority of rice growers are female, therefore the greater part of training should be directed to them for maximum impact.

Women are clearly keen to learn and improve their skills if relevant training is offered in locations and at times where they could participate without adding to their already heavy workloads. If these conditions are fulfilled the adoption rate may rise substantially.

Women face particular constraints which lead to problems in defining their training needs:

- cultural preferences for assigning tasks to genders
- already heavy workloads leading to constraints in time afforded for training
- severe time constraints make location of training important
- cultural complexities

Women may need assistance in defining their training needs.

Project management need to be gender-aware and may be assisted in this by involving more females in project work, especially extension. There appears to be a shortage of suitably trained women for recruitment.

Marketing strategies are effective in improving incomes for women, particularly in the horticultural sector where attention to quality and timing have improved economic performance. Widespread improvement in production standards and use of market forecasts to assist in crop choice could result in greater price stability for horticultural produce. Improvements in quality, in conjunction with market structuring, should assist in capturing part of the market for fresh produce supply to hotels.

Women's participation in irrigation-related activities such as bookkeeping and contracts would encourage use of literacy and numeracy skills, and serve to promote participation in an area of decision-making

hitherto not accessible to them. Added benefit would come from increases in individual's confidence and women's reputation in the community as a whole. .

Multidisciplinary balance in irrigation development is needed to bring together the successes of institutional and technical aspects to promote cost effective and sustainable projects. Engineering, agriculture and socio-economic disciplines require to be supported by gender and business specialists. SSWCP and RIDEP have gone some way towards offering wider support for irrigators.

2.2 Gender in Smallholder Irrigation - Kenya 1995

Cultivation in Kenya has always relied heavily on women's labour. Irrigated agriculture is no exception. The Women in Irrigation research project investigates the roles played by women in three smallholder schemes. Background information already available for the schemes is used to augment information gathered. Data collection methods are detailed in Appendix 1.1

2.2.1 The schemes

Kibirigwi

A horticultural scheme of approximately 100 ha. in Central Province which has been in operation since the late seventies. Water is in good supply and is delivered to farmers fields by a high pressure sprinkler system. The irrigated areas are not contiguous and layout of the pipework was determined by existing farm boundaries. The delivery system is agency managed with the cooperation of the farmer committee. Marketing has been channelled through the agency but farmers have been dissatisfied with the arrangements and lately adopted alternative practices.

The scheme includes extensive facilities for management and extension staff, grading and sorting sheds for produce, repair shops for pipework and machinery, demonstration plots and accommodation for meetings. Hand-over of system management from the Ministry of Agriculture to the farmer committee is under discussion.

Approximately 52% of the labour force is female, however, the elected farmer committee at the time of the study was entirely male. There are a number of women groups which are becoming increasingly active and provide credit facilities for irrigated and other agricultural production. Credit is used for purchasing inputs and for financing zero-grazing units for dairy cattle to improve milk production and breeding programmes.

Farmers are substantially dependent on irrigation for their income which accounts for more than 55% of total farm income after production costs have been met. The average irrigated net income per farm in 1995 was approximately Ksh11,500/-. Non-agricultural income was the next largest contribution to farm income. Other agricultural activities produced little or no income but contributed to subsistence needs. The average net farm surplus after essential family expenditures were met was negative in the year of investigation, which is clearly unsustainable. Normal horticultural output, well marketed can provide a healthy positive income for all participating farmers.

New Mutaro

New Mutaro is located in the Kenya Highlands in semi-arid land which supports cattle ranching. The site is approximately 55 km from the nearest towns but, poor road conditions make it relatively inaccessible. The scheme comprises intake structures, an open channel delivery system, approximately 135 ha. of irrigated land and around 400 ha. of grazing. Formerly two private farms, the area is now farmed by almost 200 farmers, producing a mixture of subsistence and cash crops. Returns to irrigation at New Mutaro are low despite a fairly adequate and equitable water supply. Long laterals give rise to distribution problems and intermittent flooding is a problem in some areas.

Women were prime movers in acquiring the land for this scheme and female leaders coordinated activities in each of the three villages. A 1985 study suggested that around 40% of households consist of unmarried

women with unmarried daughters also with children. At this time, income from non-agricultural jobs was important in the typical household economy and as these were mainly held by men, women-headed households were probably chronically short of cash. Irrigation was used to cultivate subsistence crops. Exchange of information between the committee and farmers was observed to be poor, which constrained farmers' participation in decision-making.

Nowadays, vegetable growing is a major activity and a major source of cash for the farmers. Net income from sales of irrigated produce in 1995 was around Ksh11, 500/- per farm, representing a substantial increase over the decade. Marketing at this remote site is difficult, particularly in the wet season and restricts revenue for the farmers.

Arombo
Arombo is a small rice growing scheme in the Kano plains on the eastern shores of Lake Victoria. The scheme is close to the town of Ahero where a good range of facilities is available. The scheme is one of a cluster supplied with irrigation water by South West Kano Irrigation Project which is managed by the Smallholder Irrigation Support Organisation (SISO). There are three clusters and a total of 21 schemes. Farmers pay an annual maintenance fee to SISO which covers the costs of maintenance of the main canal intake, main canal and cluster off-takes.

Arombo scheme now has an assured water supply where previously farmers irrigated using water from the Nyatini drain from the nearby National Irrigation Board scheme. Rice cultivation is well established in the area, agribusinesses cater for rice growers needs, and marketing networks function effectively.

Arombo consists of 22 hectares of contiguous irrigated fields and farmers live in homesteads outside the irrigated area. There are some 70 farmers, most of whom also cultivate rain-fed land to produce maize, sorghum, bananas and cotton. Livestock are included in the farming system. Rice is grown in one season. Rice is predominantly a cash crop although a small proportion is used by the farm families.

Water for irrigation is delivered to the scheme from the main canal via the cluster canal and distribution is controlled by division boxes. Each scheme in the cluster is farmer managed. Managing water within the system is difficult due to the small bed gradient. The farmer committee consists of 12 elected members and is responsible for distribution within the scheme. The main responsibilities are for maintenance of the channels and drains within the scheme, collection of maintenance fees and payment of dues to SISO. Schemes are represented on the board of SISO by three members.

There is no real shortage of labour although the proximity of the town possibly increases the cost of casual labour. Women provide the majority of labour required but are under-represented on the committee.

The Provincial Irrigation Unit (PIU) has encouraged participation of farmers at all stages of the SW Kano project and has explicitly required women to attend meetings and take part in decision-making. To this end, in the preparatory phase,

- meetings could only proceed if 70% of beneficiaries attended and if 50% of those attending were women.
- a "women only " meeting formed part of the preparatory process
- matters arising at that meeting were discussed by the group as a whole to reach a consensus on women's representation

Although these measures have improved women's attendance at meetings it is perhaps early to claim effective participation.

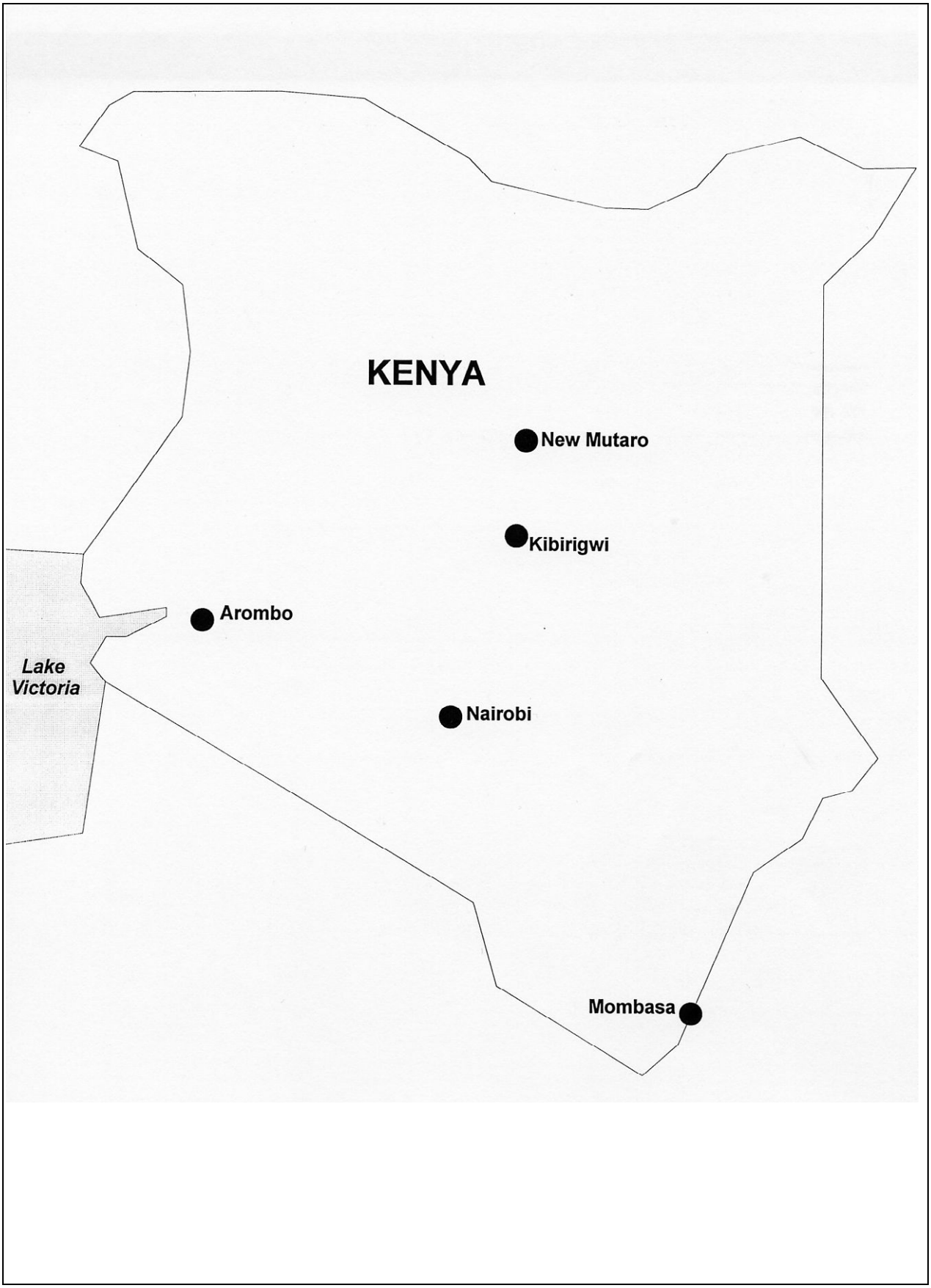

Figure 2 Location map – Kenya

Irrigated annual net income per farm was approximately Ksh 11,000/-. Other agricultural activities produced approximately the same profit in a year as the rice crop and non-farm incomes produced as much as all agricultural activities.

2.2.2 The survey

The survey took place in July 1995 and consisted of interviewing random samples of smallholders using a brief questionnaire and holding discussions with key informants and leaders of women's groups. At least two discussion sessions were held at each scheme. Information was augmented with material from socioeconomic studies conducted in the same year, where appropriate.

Respondents

In all 55 questionnaires were analyzed, of which 31 were completed by men and 24 by women. The average age of the interviewees was 46. There was no age difference between men and women, but irrigators at Arombo were older than at the other sites. Thus, information was collected from people who were likely to have a mature view. The majority of interviewees, 90% of the men and 42% of women, were heads of their households. Women who effectively managed alone (those who were widowed, divorced or whose husbands worked and lived elsewhere) accounted for 54% of women and 24% of all respondents. Approximately half that proportion of men managed alone.

Households were composed of approximately 7 people, but where women managed alone, the number fell to 5 people. The modal family size for single men was 1. Single women typically have dependants.

Table 2.2.1 Summary information relating to households in the schemes

Parameter	Arombo	Kibirigwi	New Mutaro
Average people/ household	7.4	6.9	6.2
Percentage of households effectively headed by women	15*	24	29
Average age of respondents	56	44	42

*Hulsebosch (1995) refers to 64% of plots in S.W. Kano managed by women. The figure from the present study is substantially lower.

Farm work

An assessment of gender balance was made for the main irrigation and domestic tasks. Respondents gave information about the people involved in each task. There were more men than women respondents, however there is no evidence to suggest that this has seriously distorted results. Women assigned more tasks to women as expected, since many of these women were in households where there was no resident male. In all schemes, women dominated strongly in household tasks, water provision and fuel collection, but gender balance varied both between tasks and places. On horticultural farms, where cash incentives are high, men tend to be more heavily involved in all activities. At Kibirigwi women performed relatively more than men this is explained by the disruption to horticulture in this year. The greatest equity in

workload was observed in New Mutaro. The summary, in Table 2.2.2, indicates the gender said to dominate in each task specified. More than 65% of work assigned to one gender was taken to imply gender-based job responsibility.

Table 2.2.2 is based on both men and women contributing to work. It is estimated that women work, on average, one and a half times as long as men each day. The proportion of female work was calculated using this assumption where appropriate.

Table 2.2.2 Percentage of work contributed by women to farm tasks

Task	Arombo	Kibirigwi	New Mutaro	Kenya*
Land prep.	25	37	25	M
Planting	65	59	53	E
Weeding	58	59	53	E
Water application	47	60	40	E
Farm maintenance	54	53	50	E
Scheme maintenance	59	43	47	E
Harvesting	58	59	50	E
Post-harvest processing	70	63	50	F
Marketing	50	50	50	E
Dryland	61	60	60	F
Cooking	91	82	82	F
Domestic work	91	80	82	F
Fuel gathering	95	82	75	F
Animal tending	50	70	60	E

*M denotes male dominance of the task, E denotes equal and F denotes female dominance.

Women clearly contribute heavily to the domestic tasks of the farm and dominate those tasks including the provision of water and fuel-wood. Cultivation tasks were not dominated by women but they appear to contribute more work than the men to most tasks except land preparation, where men clearly dominate. However, the method of calculation has undoubtedly underestimated the female contribution to weeding, which is an arduous and long duration task which may occur several times in a season, to which men do not consistently contribute.

Socioeconomic surveys on the same schemes produced broadly similar results, assigning 52%, 63% and 53% of irrigation work to women at Arombo, Kibirigwi and New Mutaro respectively. These surveys calculated labour contribution in terms of days. Similar figures are obtained from Table 2.2.2 when domestic tasks are omitted. These figures are, if anything, lower than expected. This may be due to the number of men in the sample or, a low estimate of the additional hours contributed by women. Some studies in Kenya suggest that a female day can comprise as much as twice the hours of a male day. Alternatively, the figures produced may be evidence of changed work responsibility in Kenyan irrigated agriculture.

Overall, women are responsible for virtually all domestic work, reproductive effort and infant care and more than half the agricultural work.

Decision-making
Despite the female contribution to work, female participation in decision-making in the farms remains low. Low participation in decision-making was particularly evident at Arombo and may reflect a local cultural tradition. However, at Arombo, the results are disproportionately biased toward male decisions due to the high proportion of men in the sample. Nyanza men in Hulsebosch's earlier study (1991) appeared to claim decisions for themselves, whereas women felt that they did participate. The proportion of households where women participated in decisions was broadly similar in the other two schemes. There is a high degree of commercialism on all these smallholder schemes and there is also a recognised tendency for men to dominate commercial decisions. In this study no comparison with subsistence producers is possible.

Generally, participation in decision-making lags behind participation in work by some 10% to 20%.

Table 2.2.3 Percentage of farms where women participate in decisions

Activity	Arombo	Kibirigwi	New Mutaro	Average
Crop choice	33	42	47	40
Inputs purchased	31	44	47	41
Labour hired	40	53	46	46
Family labour allocated	28	58	46	45
Marketing	28	50	39	40

A brief review of gender participation in irrigation expenditure decisions serves to indicate how gender affects control of resources. Although all households, with the exception of single males, used female family labour, more than fifty percent did not involve women in the key farming decisions. At Arombo the figure was nearly 70%.

Overall, women have greater influence in expenditure of the non-agricultural type considered in Table 2.2.4 than they do in the agricultural type referred to in Table 2.2.3. They participate in decisions relating to expenditure on food and fuel in line with their major contributions to cooking and fuel gathering.

Table 2.2.4 Percentage of farms where women participate in decisions relating to expenditure

Expenditure	Arombo	Kibirigwi	New Mutaro	Average
Food	70	75	85	76
Education	25	50	60	47
Goods	20	55	70	53
Travel	45	50	66	56
Fuel	50	75	90	73
Social	60	45	62	56

Female participation in expenditure decisions is generally more intense than it is in production decisions. However, participation is not proportional to work if domestic work is taken into consideration. Nonetheless, these results indicate a more liberal situation for women than is sometimes attributed to rural communities in Africa.

Extension
Extension advice was available to farmers on all three schemes, but at New Mutaro the impact was most evident. More extension contacts and visits to demonstration plots in New Mutaro result from having a resident extension officer on the scheme and the enthusiasm of the officer. The data relating to extension are reproduced in Table 2.2.5.

Table 2.2.5 Extension contacts and issues discussed: percentage of farmers involved

	Arombo	Kibirigwi	New Mutaro
Several extension contacts/year	57	50	86
Demo plots	28	45	53
Percentage of women who discuss issues			
Water Application	50	85	81
Water allocation	0	25	29
Crop choice	7	75	73
Cultivation	0	67	59
Marketing	0	5	9

Extension contact with the women respondents was less than with male respondents. At Arombo there was none at all, and at New Mutaro only a third of the women interviewed appeared to have contact, although the finding was not consistent with the good attendance of women observed at meetings. However, at Kibirigwi 80% of the women had at least one contact in the year.

The women at Arombo had, perhaps, little need to discuss crop choice or water allocation as these were not issues on this scheme. The women in New Mutaro were expected to contact the extension officer just as much as the men, given their major role in establishing the scheme.

Few Kenyan irrigators expressed preferences about the gender of the extension officers. However, some men wanted a male officer and expressed negative attitudes towards women. Only one man expressed a preference for a female officer. He did, however, give the positive reason that he thought a woman would be more conscientious.

None of the women reported any preference for female extension officers and only one preferred a male officer saying that women are "ignorant". Clearly the predominance of males in the extension service is not regarded as a handicap by Kenyan women farmers.

Education and technical interests
Most Kenyan irrigators had received schooling. On average, they had attended for eight years. Of those who had not attended school more than three quarters were women but more than half of them were over 50 years old and none of them were under 35. All the interviewees who had children of school age sent them to school.

Male irrigators were universally interested in improving their skills in field water application yet only two (7%) showed interest in understanding the scheme operation better. Men mentioned increased production as a major incentive. Women were slightly less keen to acquire field skills, 77% showed a positive interest, centred on personal skill development. A slightly higher proportion of women than men expressed an interest in improving their knowledge about how the scheme works. There was no significant difference in interest levels between the schemes, despite the apparent differences between schemes in the number of extension discussions relating to water application and water allocation (Table 2.2.5). None of the schemes are mechanised so women's interface with irrigation technology was limited to water application and management.

Impact of irrigation on women
Data are available for only two schemes. Respondents were asked to agree to some positive and negative statements.

Table 2.2.6 How irrigation is perceived to affect women; Percentage of respondents who agree with the statements

Effect	Arombo	Kibirigwi	New Mutaro
Work longer hours	65	No data available	33
More personal cash	79		66
More money of family	85		67
Better family nutrition	79		67
Less access to land	57		33
Greater dependency on husband	21		0
Less opportunity to earn own income	29		0

Although there was general agreement with statements about increased access to money at both schemes, it was clear that this had been achieved at Arombo at the cost of more work on the part of women and sacrifice of some degree of independence. The situation of the New Mutaro women was regarded as more satisfactory. The respondents were both male and female indicating that men appreciated to some extent the additional work undertaken by women.

At Kibirigwi, leaders of women's groups indicated that women who could participate in the "Inputs loan schemes" or the "Zero-grazing unit" programmes were able to generate reliable incomes for the benefit of themselves and their families. Women who took input loans faced constraints in the amount of land they could control and in the share of water they could secure for watering their crops. Their lack of representation on the farmer committee was recognised to be a drawback when it came to claiming their share of water.

Attitudes and aspirations to Irrigation Committee membership
A negative attitude was displayed by both men and women towards becoming involved in the committee at Kibirigwi. This appeared to result from the current conflict between farmers and the scheme management. The focus of the conflict was marketing, rather than water distribution. Water distribution was generally satisfactory. One women hazarded the view that women would be much better conciliators and organisers than men, but did not offer her services.

At Arombo, both the men and women were keen to take part in committee activities, all feeling that they could contribute to negotiations with SISO. Women, who did not want to exert more influence, declined on the grounds that it would be very time-consuming. It is likely that women are subject to this constraint because of their major contribution to irrigation work in addition to their domestic and child rearing activities.

At New Mutaro, women were happy to allow men to make decisions on scheme matters. They maintained that as most decisions were made in consultation and men took their needs into consideration, there was no need for them to participate more than they did already.

In all these schemes, women were clearly active within their women's groups. Women's groups meet at times and places convenient to women. This may not be true of irrigation committees. The relationships between these women's groups and the irrigation committee was not clear but undoubtedly exists. Improved communications between women's groups and irrigation committees is a strategy which should be supported generally. Women clearly held opinions about scheme management and about their irrigation needs and were anxious to develop skills in irrigated farming and in water management. However, they failed to voice opinions in farmer committees and public meetings because they were under-represented and nor encouraged to disagree, and they failed to conduct a dialogue with extension services about water allocation. Time and confidence appeared to be major constraints.

Incomes
Most respondents regarded irrigation as a way to acquire a cash reserve rather than a way to meet food needs. Some 82% of those interviewed farmed rain-fed plots which met a substantial part of the family food need. Cash was needed primarily to meet the additional costs of subsistence and the cost of education.

Women's personal income from irrigation was dependent on their control over irrigated land. In most cases control was weak and current registration practices do not encourage equality between men and women. Some women indicated that the work they devoted to irrigation tasks reduced their opportunities to generate income of their own in traditional activities such as craft or brewing.

Credit was not widely used, less than 20% of respondents had an active loan. Those who had were mainly male. Only half the loans in use were for agricultural production. The main use of credit was to finance building.

Women's groups at Kibirigwi predicted a sharp increase in female use of credit there. SISDO production loans were popular and those who had used them experienced no problems in repaying the loans. These production loans were specially targeted to women irrigators. More people wanted to use credit but failed to obtain loans. People in this situation accounted for 60% of the sample. The main problem that they reported was in finding an organisation willing to lend. At Kibirigwi people were also not confident about their own ability to repay. The problems of accessing credit seemed to apply to men as much as to women. Women have acquired a good reputation for repayment and thereby enhanced their capacity to obtain loans, despite their lack of collateral. Lack of collateral remains a problem and was cited by 10% of those who were unable to obtain a loan. None of those, however, were women. The main deterrent for women was lack of confidence about their future income.

2.2.3 Other gender studies

Joitske Hulsebosch has been active in researching women in irrigation in Kenya for several years and has a particular interest in Nyanza rice growing schemes, although she has also published material on credit for horticulture in the Kibwesi district.

In 1990, her study of Gem Rae entitled "Decision-making of women in female-headed, joint and migration households" described the situation where 30% of households were widows, a further 27% suffered migrant husbands and 43% were jointly managed by both partners. Women were active in savings groups and in contact with the extension service but took little part in meetings or in scheme organisation at any level. In ascertaining the division of labour, she found that men claimed more decisions for men, whilst women claimed more for women. This difficulty was present in the current study, but is less marked in 1995. In the intervening years gender sensitisation has been promoted by the Provincial Irrigation Unit (PIU).

A study on Arombo and two other schemes, published in 1992, "INYALO HERO: Priorities of women in smallholder irrigated rice schemes, Nyanza Province, Kenya", found women anxious to increase their ability to earn income of their own. There were two strategies that they regarded as possibilities. One

strategy was to gain access to more land, which they could do by leasing as members of women's groups. There were a number of women's groups of which about seven were concerned with rice production. The other strategy was to increase production in plots where they already had control, using credit to improve the level of input use and so increase yields.

Her later study (Hulsebosch 1995) looked at the increased participation of women in meetings and in scheme organisation as a result of the PIU regulations in the development of S.W. Kano irrigation schemes. She noted a significant increase in female participation as group representatives, especially in the roles of secretary and treasurer. Female committee members at Arombo, despite being fewer than men, were regarded as performing just as well by their fellow members. Women appeared to be more active where attention had been given to gender awareness than they were in other Nyanza schemes. Her final recommendations include "women only" meetings and making gender a concern for both men and women.

An evaluation of a women's credit programme in Kibwesi produced some interesting observations although it concluded that evaluation was premature. Firstly, women pointed out the benefit of the programme in bringing women together on a regular basis. The meetings provided them with a forum for discussing horticulture among themselves which they felt was valuable. Secondly, water availability and market opportunities had to be assured before credit assumed importance among women's priorities. In other words, credit could not be contemplated in "risky" conditions.

Annemarie Groot, in her study at New Mutaro-Gatarakwa in 1985, emphasised the need for effective participation in decision-making. She also recognised the need for farmers, both male and female, to be better informed about proposals. They need to know precisely who will benefit, how much benefit is assured and how much work will be involved. This is a prerequisite to participation. Provision of accurate information is the responsibility of local authorities and project managers.

2.2.4 Discussion

The current study supplements and supports the findings of these earlier studies. There is considerable agreement about the gender division of labour and responsibility for decision-making on the irrigation schemes in the various studies.

Women continue their role as mothers and providers of services for the household. In many families these duties still involve long hours in the demanding tasks of carrying water and fuel as well as food preparation and housework. The schemes in the study had some homes with domestic water facilities and standpipes were available in most of the villages. Nonetheless, women were short of time. Using the average of the three schemes for the proportion of each task done by women and the labour requirement figures from Groot's 1988 study, a rough calculation reveals female work contribution as a percentage of male work contribution at 164%. The time constraint for women must reduce the opportunity for them to develop new skills and activities such as those required for participation in scheme operation and policy decisions.

The tasks undertaken by women at present do not lend themselves readily to mechanisation. Although women assist in land preparation the major part of the work is still done by men, so that introduction of tractors, where the sites were suitable, would have a relatively small impact on women's work load. The main expenditures of labour for women are in domestic work, weeding, fetching water. Attention to reducing labour requirements in these work areas could free women for greater participation in water management. The sort of initiatives which might be considered are weed reduction techniques such as intercropping and selective control, and incorporating domestic water supply into basic irrigation development design. Many initiatives to reduce domestic work have been undertaken and are adopted to some extent if they are found to be appropriate. However, major constraints to adoption are the generally low standard of living and resistance to change.

Relief of time constraints alone will not assure participation. Women scarcely participate in scheme activities at Kibirigwi, although they clearly spend substantial amounts of time in their women's groups.

Agency management does not lend itself to farmer participation, but even in these conditions women could participate in the activities of the farmer committee. The chairman had no fundamental objection to women members. Although the institutional set-up allows voting rights to women attending meetings, in practice this has little impact as women tend to avoid these meetings because of the highly charged political atmosphere. Women who work on their husband's plot tend to be excluded. In addition, women's minor role in expenditure decisions does not motivate them to improve performance.

Participation of women in farm decisions and activities is more equitable in New Mutaro where women have taken a leading role in development activities for at least a decade. Women here were positive in their interaction with extension. The farmers at New Mutaro regarded the impact of irrigation on women in a more positive light than those at the other schemes. Average yields at New Mutaro had doubled between the 1985 study and 1995, although there are large variations between farms.

Although data were not gathered at Kibirigwi, the women groups felt that parallel activities such as the zero-grazing units were of more direct benefit to them than the irrigation scheme itself. They were optimistic that the input-loans would help them make more use of the irrigation facilities provided they could gain access to plots. Scheme performance was currently poor and attention to the institutional needs of the scheme crucial. This crisis could provide an opportunity for changes which would encourage and enable women's participation in management and policy decisions.

Participation of women at Arombo has been forced, by the action of the PIU. Women perform well in their new roles but it is early yet to assess the impacts on irrigation performance or sustainability of female participation. The performance of the scheme in terms of water distribution was good but there were minor problems relating to the new institutional arrangements.

Cultural differences between the Nyanza and Mount Kenya areas contribute to differences in the women's relationship with the irrigation organisation and the interest shown by women in water management. Changes in scheme performance occurred for a number of different reasons including the new supply regime and the land preparation changes. However, at New Mutaro, there appears to be evidence of change in scheme performance and change in the work pattern towards a more equal participation of men and women in irrigated cultivation. This brief study did not provide evidence of a causal relationship between this observation and the central role of women at the outset of the project. Further investigation is recommended.

Participation of workforces in formulating policy and assuming responsibility is widely recognised as a successful management strategy in many countries and in many spheres of industry, agriculture and research. Not only do workers enhance their motivation through their role as stakeholders but, they obtain opportunities for personal capacity building and thereby for greater contributions. Women's enthusiasm for women groups and women centred meetings indicates high motivation to participate.

The constraints which face women in participation in water management in smallholder schemes appear to fall into three categories:

- Social obligations and traditions which discourage women from public debate with men,
- Lack of time due to the multiple obligations fulfilled by women,
- Lack of motivation and confidence stemming from poor rewards and poor access to resources.

2.2.5 Conclusions

The lead given by PIU in S.W. Kano in incorporating gender balance early in a project and institutionalising that balance throughout the project, has had a positive result in most of the cluster

schemes. It suggests that support may need to be explicitly targeted towards women until such time as their role has become established.

In view of constraints to women's participation the effectiveness of strategies already in use to relieve the constraints should be monitored. For example, the strategy of incorporating a "women only" meeting into the early stages of project identification, used in Nyanza, providing a forum in which women can determine the needs of female stakeholders and refine their supporting arguments before presenting them to a mixed meeting. This allows women to present their case and to leave disagreement to men if that is indeed more socially acceptable. Representing women's groups on irrigation committees could assist in providing women with fora from which their decisions could be legitimately disseminated to combined meetings.

Irrigation developers should consider parallel developments to assist in relieving time constraints met by women, such as in carrying domestic water and in travelling between the irrigated fields and the homesteads.

The positive contributions of increased involvement of women in decision making towards improved production and sustained irrigation development for both men and women should be emphasised where possible. Over time, positive outcomes will tend to reduce the social and cultural constraints faced by women.

The study indicates that women regard personal capacity building as important. Self respect and confidence will improve their skills in all aspects of their work. At the same time, men must be helped to appreciate the positive aspects of explicit attention to women's participation and discouraged from regarding increased female participation as a threat.

Where women identify training needs relating to irrigation, careful consideration is needed to ensure success. The following points merit attention. Convenient timing is crucial to success; explicit provision for training women may be required; training should relate closely to reducing female work loads or enhancing female decision-making skills. It must be focused such that opportunity is open for women to exploit newly acquired skills.

Using credit groups as units for extensive activities has proved useful in some places. Water management training could be linked to female job opportunities in water control.

Opportunities for careers in irrigation for women are few at present. The proportion of female students entering public universities in 1995 was 26.4% (Economic Survey 1996), the estimate for the proportion of women in agricultural engineering is 5%. Agricultural extension has a higher proportion of women entrants but there is little opportunity to specialise in irrigation. A new initiative scheduled to run for the next five years at Jomo Kenyatta University of Agriculture and Technology is called Country Training of Women Group members in Sustainable Agriculture for Women Farmers. It includes irrigation in the curriculum. This type of course will certainly fill a need.

Further work is needed to review effectiveness of training and to determine training opportunities.

2.3 Gender in Smallholder Irrigation - South Africa - 1996

Smallholder irrigation development is likely to fulfill a key role in developing capacity-building skills in rural areas as well as in increasing food production and economic activity. Essentially a community development, it involves technical, managerial, institutional and social ability. Cultivation relies heavily on the labour of women. Former developments lacked participation of end users in design and policy planning, however, gender considerations have been recognised in more recent developments.

2.3.1 The Study

This document describes the data gathered in four South African smallholder irrigation schemes in Northern Province. Two of the schemes were almost exclusively farmed by women. Data collection methods are detailed in Appendix 3.1.

2.3.2 The schemes

A full description of the schemes has been provided by the Institute of Agricultural Engineering of the Agricultural Research Council in Pretoria and is attached in Appendix 3.2. The following summaries are based on the information provided there.

Malavuwe
Situated in the former Venda homeland, the total area of the scheme is 25 hectares and virtually all the area is registered in women's names and farmed by women. The Northern Province Agricultural Corporation is responsible for management, assisted by a representative committee of the women irrigators. Water is abstracted from the Mutshundudi river by electric pump. Draglines and sprinklers are used to distribute the water on the farms. Pipes connect the draglines to the pump. The farmers are responsible for financing replacements.

Maize and groundnuts are grown in summer and vegetables, including tomato, cabbage, spinach, carrot and beetroot in the winter.

Typical problems include:

- flooding of pump and intake
- sediment entering the system
- high recurrent costs
- lack of support services

Tshiombo
Also situated in Venda region, Tshiombo has an area of approximately 1,100 hectares and serves over 800 farmers of whom about a quarter are women. Water is supplied from the Mutale Irrigation Scheme and the Department of Water Affairs is responsible for delivery of water to the field edge .

Typical problems include:

- sediment and poor maintenance
- inequity and conflict
- lack of support services

Veeplaats
Veeplaats is a 410 hectare scheme near to Pietersburg on the Olifants River. Water is supplied from the Piet Gouws dam via a canal which feeds reservoirs on the scheme. There are about 180 farmers, of whom about half are women, and water is delivered by pump to their land through centre pivots and portable sprinklers. The scheme is managed by the Lebowa Agricultural Corporation.

Typical problems include:

- frequent breakdown
- low returns and farmer motivation
- labour shortage

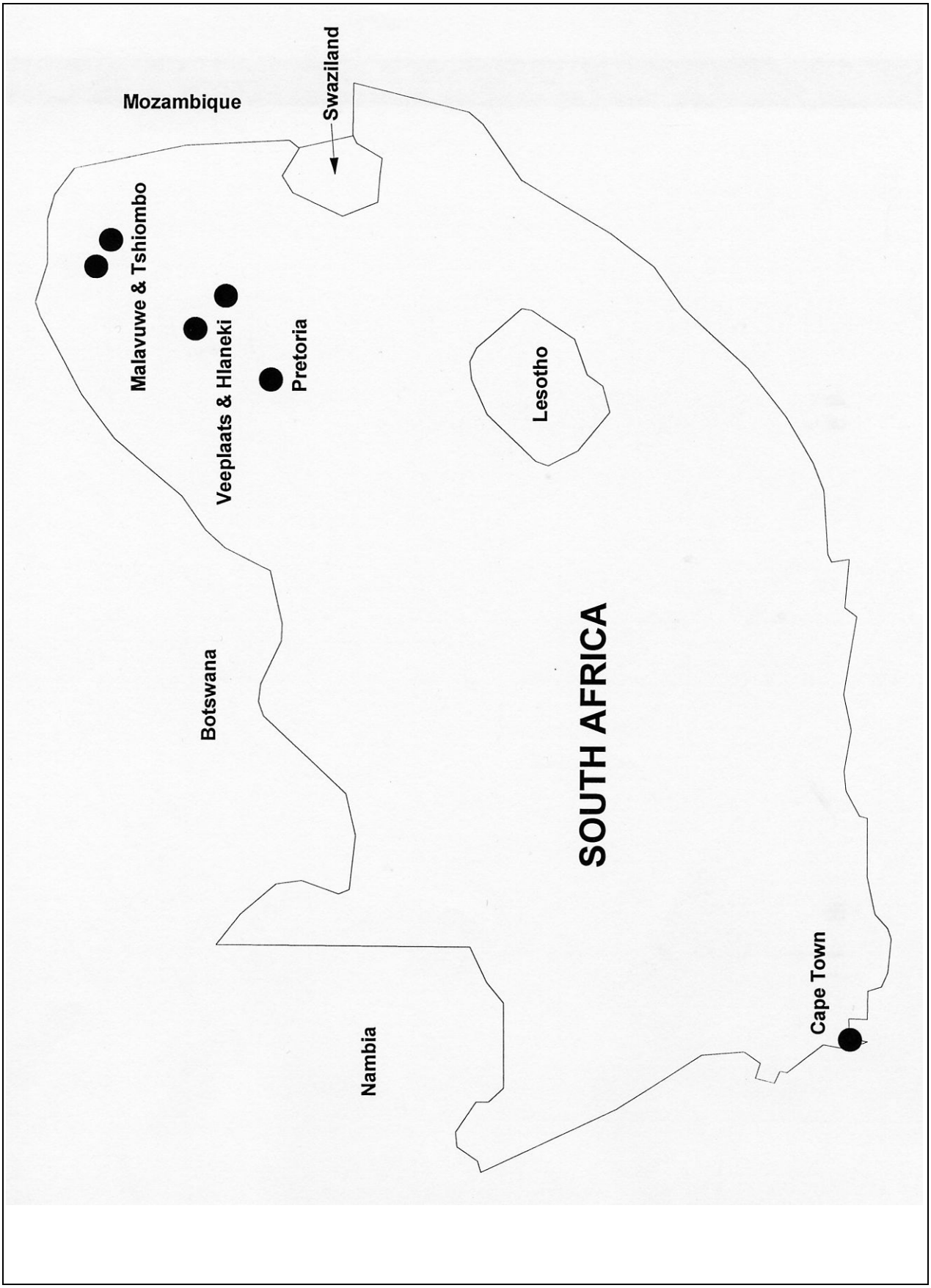

Figure 3 Location map - South Africa

Hlaneki
This scheme of approximately 440 hectares is one of three which receive water from the middle Letaba dam. Water is pumped to the scheme There are over 60 farmers, fewer than ten are women. Most of the farmers use portable sprinkler irrigation but a few use furrows and the chief has a centre pivot. The scheme is managed by the Northern Province Department of Agriculture

Typical problems include:

- water shortage
- excessive dependence on government support
- poor farmer motivation

2.3.3 The survey

The survey took place in 1996 and was conducted by the Directorate of Agricultural Economics in Pretoria under supervision of Denis Armer. The survey was led in the field by Fulufero Mavhandu also of the Directorate.

Respondents
The data base is composed of information given by 106 irrigators in response to a questionnaire about their family, their farm, their farming system and decisions about various activities that form part of everyday farm life. The respondents are from four schemes comprising forty two men and sixty four women.

A random sample was selected from lists of farmers provided by the extension officers of the schemes. On two of the schemes all the irrigators were women, which resulted in a larger number of women respondents overall. The male respondents are slightly older than the women with an average age of 53 compared to the women, whose average age was 47. Table 2.3.1 details respondents and family size.

Table 2.3.1 Respondents and family size

	Veeplaats	Tshiombo	Hlaneki	Malavuwe	Total
Male	0	18	24	0	42
Female	31	14	6	13	64
Family size	4.7	5.3	5.5	5	5.3

Demography
Family size varies little from scheme to scheme. The difference in family size is greater if calculated according to gender of the head of household was used to group answers. Male-headed families were around six persons on average and female headed families were between four and five.

In all, there are 63 male-headed households and 43 female-headed households. The female-headed households consisted of 24 women who were either divorced or widowed, 3 single women and 14 who were married but with husband living away from home (women in this case lead the day to day decisions). There were a further 2 female-headed households reported by male respondents who farmed in their mother's household.

Table 2.3.2 details the number of respondents in different categories. The composition of the sample is influenced by the characteristics of the sample frame. In most schemes, the list of farmers records the

person from the family who bears some legal responsibility for the land farmed. This tends to be biased toward male farmers except where schemes are specifically targeting rural women.

Table 2.3.2 Household situation of respondents

Category	Male respondent	Female respondent	Total
Single	0	3	3
Married, 1 partner in residence	26	22	48
Married partner away	0	14	14
Married, more than 1 partner	14	1	15
Divorced/widowed	2	24	26
Male headed households	35	42	77
Female headed households	2	22	24
Female lead households	2	41*	43

*including female-headed households, single women and those women whose partner lived elsewhere.

It is possible that including female headed households, single women and those who had a partner living elsewhere, women with absent husbands were also women in marriages where there was more than one wife, but this is not detected by the questionnaire.

Decision-making
Results for decision-making relating to agricultural production are summarised, on a scheme basis, in Table 2.3.3. The marked difference between schemes is due largely to the institutional set-up at Veeplaats, where the agency controls the agricultural management, and at Malavuwe, which was set up specifically as a women's scheme. At Hlaneki and Tschiombo, where the irrigators have a greater degree of autonomy about decision-making, there appears to be a bias towards male decision-making. This bias is less evident at Tschiombo. Factors influencing this apparent difference may include the more sophisticated irrigation technology and greater commercialisation of Hlaneki scheme.

Table 2.3.3 Agricultural decision-making

Activity	Veeplaats	Malavuwe	Hlaneki	Tshiombo
Crop decisions	Agency	female	male	male
Inputs purchased	Agency	female	male	male
Labour hired	female	female	male	male/female
Family labour	female	female	male/female	male/female
Market sales	Agency	female	male	male/female

Land ownership
Eighty three respondents (78%) regarded themselves or their families as outright owners of the irrigated plots. Very few plots appeared to be rented. It appears that the different land descriptions adopted may not have been clear to the interviewees. The European concept of individual ownership does not equate with the traditional system in South Africa. However, clearly farmers regard their tenure as so secure that it can be regarded as ownership. In most schemes farmers have the right to occupy land which is obtained through the local tribal authority. The chief of the area thus has considerable influence on who occupies the land. Even on schemes that were not specified as "women's" schemes, some women were the registered occupiers.

Plots varied considerably in size. The standard plot at Veeplaats is 6.25 acres or 2.5 hectares, at Malavuwe 2.5 acres or 1 hectare, at Hlaneki 21.25 acres or 8.5 hectares and at Tshiombo 3.2 acres or 1.25 hectares. Gender of the occupant does not appear to have a bearing on plot size. Very few respondents reported rain-fed farms, only 13 in all, mostly from Hlaneki. The pattern of decision-making relating to irrigation will therefore tend to reflect the overall pattern of responsibilities and obligations in the households.

Income
Most irrigators are keen to generate enough cash to educate children in addition to providing for basic cash requirements. There is also a perceived need to provide gainful employment for the family. Small-scale irrigators are seldom subsistence farmers, and market as much produce as they can. Despite commercial orientation, credit is not widely used. Around one third of the respondents, 39 people, have loans, of which 24 used money for inputs. The greatest use of credit was at Malavuwe where 77% of the women used production loans. The remainder of credit users had taken loans to help buy equipment or services, except for two which were to finance education. Informal discussion established that most loans were obtained from parastatals like the Northern Transvaal Development Corporation.

The main difficulties encountered by those taking loans arose from lack of security to obtain the loan and delays in administration of the loan. Few farmers obtained loans from private financial institutions. Delay in allowing credit was a commonly mentioned problem in Malavuwe. Lack of access to credit and lack of confidence in future income were mentioned as reasons for not using credit, noticeably at Hlaneki but also at Tshiombo.

Although irrigation was the main source of income for most of the respondents it is not the only source of income. Other sources include sale of livestock, sale of goods and services locally, wages from permanent employment and wages from casual or seasonal employment.

Responsibility for tasks
Each respondent was asked about who undertook various tasks in their households. The responses were reviewed on a scheme basis and, where more than 65% of the people interviewed assigned the task to men or women, were classified as male dominated (M) or female dominated (F). Where there was no clear gender association the task was regarded as equally shared (E).

Table 2.3.4 Gender assignment of tasks in irrigating households

Activity	Veeplaats	Malavuwe	Hlaneki	Tshiombo
Weeding	F	F	F	E
Planting	E	F	E	F
Land prep	M	F	M	E
Water Applic.	F	F	F	E
Maint. farm	F	F	M	E
Maint. scheme	M	F	M	E
Harvest	E	F	M	F
Post harvest	F	F	M	F
Marketing	M	F	M	E
Dryland	M	N/A	E	F
Cooking	F	F	F	F
Domestic	F	F	F	F
Fuelwood	F	F	F	F
Animals	M	F	M	M

Only cooking, domestic work and gathering fuelwood are exclusive to one gender, although animal husbandry is exclusive to men, except at Malavuwe. Water application is dominated by females and scheme maintenance by males. In female-headed households, not surprisingly, agricultural and domestic tasks were mainly done by females. However, in male-headed households only land preparation, maintenance tasks and animal husbandry were male-dominated. None of the households consisted of men looking after themselves or caring for families single-handed. Some key tasks are shared, especially those requiring intensive labour input, such as planting, harvesting and marketing. The assigning of work to one gender or the other appears to relate to specific sites rather than to specific tasks. Men dominate more tasks at Hlaneki and women dominate totally in Malavuwe. Men and women dominate in different tasks in Veeplaats, whereas sharing of tasks is common in Tschiombo. The tasks that have been assigned to men in Veeplaats are those undertaken by the agency. It is probably the case that these are performed by men but this is different from tasks performed by the men of the household. It appears that men at Veeplaats are farming rain-fed land and raising livestock.

Farmers make use of hired labour. At Hlaneki over 90% of farmers hired labour, but the proportion was considerably lower in the other schemes, between 30% and 40 %. Although some farmers employed

labourers on a permanent basis it was more common to hire labour for seasonal tasks, particularly harvest, for which labour is often paid in kind.

Expenditure decisions
Table 2.3.5 defines the responsibilities for decision in formally expenditure.

Table 2.3.5 Gender dominance in decisions relating to expenditure

Expense	Veeplaats	Malavuwe	Hlaneki	Tshiombo
Food	F	F	E	F
Education	F	F	M	E
Goods	F	E	M	M
Fuel	F	F	M	F
Social	F	N/A	M	E

A similar gender dominance pattern is evident to that in Table 2.3.4. Differences between schemes follow a similar pattern, Malavuwe showing more female decision makers and Tshiombo more shared decisions. At Veeplaats, female decision taking is prevalent and at Hlaneki there are strong male influences.

Education
Although 54% of the respondents had attended school, some could still be classed as functionally illiterate. When this is taken into account the literacy rate falls below 40%. Only 35% of those who had schooling benefitted from any farming-specific content in their education.

There were substantial differences in the educational levels at the different schemes. At Hlaneki more than 70% of the farmers had been at school, some reaching tertiary level. The women in the Hlaneki sample were well educated in contrast to the women at Malavuwe where only one had progressed as far the higher primary level and more than 75% had not been to school at all. Overall, fewer women had been to school than men but a few women had progressed higher than any of the men. Approximately 28% of the women could be considered literate and 48% of the men. Malavuwe and Tshiombo had poorer educational standards than Veeplaats and Hlaneki. Hlaneki was well ahead of the others.

Most families, around 85% of those who took part in the survey, have children in school.

Extension
Extension services are available at all the schemes in the survey and most farmers claimed to be in contact with the service.

Respondents in Malavuwe have more contact with extension than elsewhere, least contact was reported at Tshiombo but even there contact is good. Demonstration plots were not considered of much value at Tshiombo.

Table 2.3.6 Demonstration plot visits and reasons for not visiting

Demo plot	Veeplaats	Malavuwe	Hlaneki	Tshiombo
Visit	61%	85%	78%	47%
Irrelevant	29%	15%	14%	44%
Too busy	10%	0	8%	9%

The most popular topics discussed with extension officers were common to all schemes. Most frequently discussed are coping strategies in times of scarcity, followed by application methods, disease control and crop choice. Links between gender, extension contact and decision-making need to be investigated.

Preference for male or female extension officers is interesting and strongly affected by people's experience or lack of it. Malavuwe is heavily in favour of male extension officers whereas Veeplaats prefers females but is more tolerant of both. Response is positive in both schemes, most people expressing a view. Hlaneki and Tshiombo were much less decided but willing to tolerate either, providing the service was equal. Male interviewees were more tolerant about gender of the extension officer than female interviewees.

Table 2.3.7 Gender preferences relating to extension officers

Preference	Veeplaats	Malavuwe	Hlaneki	Tshiombo	Males	Females
Male	29%	77%	17%	31%	22%	39%
Female	42%	8%	0	0	0	22%
Don't mind	29%	15%	83%	69%	78%	39%

Water User Groups or Association
It is not clear that all respondents understood membership of a Water User Group as a separate concept from participation in committees. Responses, which tended to imply that some respondents had confused the two notions, are shown in Table 2.3.8. These replies suggest that respondents have poor understanding of elected committees and their own role relating to them.

Table 2.3.8 Water user group membership

	Veeplaats	Malavuwe	Hlaneki	Tshiombo
Farmers who said they were Members	23%	54%	77%	13%
Main reason for non-membership	Not on the scheme	Not elected	Irrelevant	Not elected

Only 17% of respondents regarded men and women as contributing different strengths to irrigation committees or group decisions. Six comments could be categorised as pro-women, three were anti-women, four were pro-men and the remaining four merely recognised that genders contribute differently.

Lack of experience in group activity relating to decision-making may underlie this apparent lack of opinion. No comments are recorded from Malavuwe and only two from Tshiombo.

Water management decisions
At Veeplaats, it is considered that men make most of the decisions in this sector and perform the major part of the work, although by no means all of it. Women participate in water sharing, fee collection, group decisions on crops and marketing. As mentioned here the employees of the agency were male and much of the water management was undertaken by them which explains these replies from the women farmers. Generally, the women agreed that more participation would improve the quality of decisions. They wanted to have more women involved in water management.

At the other women's scheme, Malavuwe, response confirmed that women take all decisions and do all the work presently. Men were not allocated any major role in a "best" scenario, presumably indicating that the women feel confident in their abilities, although they clearly want men to share in decision-making.

At Hlaneki and Tshiombo there was considerable support for maintaining the status quo despite recognising that males perhaps contribute relatively less work. Decision-making roles which closely reflect present task responsibilities were favoured. However, male and female views about work responsibilities were different. Only 32% of respondents were female and in both schemes women respondents assigned significantly higher proportion of responsibility for water application to themselves than men assigned them.

Men, generally regarded males as major decision makers and major contributors to both agricultural and water management tasks. Men are willing to concede decisions to mixed gender groups to some extent. Similarly, women generally regarded themselves as major contributors of work, with a substantial role in decision-making. They too favour more consensus decisions but show relatively more tolerance to male decision-making.

Not everyone wanted to gain more influence, some offering excuses like lack of education and lack of time for participation in groups, but most respondents did want to express an opinion on this issue. Participation is seen as an opportunity. Men showed more desire to influence than women but women still exhibited a strong positive response with 41% in favour of gaining more influence, in comparison to the 55% positive response from men.

Technical training requirement
Over 80% of interviewees would like to increase their technical understanding of their irrigation scheme. In general, it is seen as an enabling and capacity-building opportunity by both men and women. Irrigators are confident in their knowledge of field application and want to acquire more understanding of the system.

Table 2.3.9 Irrigator's perceived needs for technical training

Technical need	Veeplaats	Malavuwe	Hlaneki	Tshiombo	Males	Females
Field	26%	0	3%	3%	5%	13%
Scheme	45%	100%	87%	72%	79%	67%
Both	3%	0	0	0	0	2%

Impact on local non-irrigators

Men and women are in general agreement that irrigation primarily benefits non-irrigators through employment opportunities. Hiring of labour provides opportunities for both men and women. Informal discussions suggest that women benefit particularly from employment in peak periods, particularly at harvest time when payment in kind is very attractive to them. Food provision is also important. Negative impacts are generally disregarded by irrigators. The results from all schemes are shown in Table 2.3.10.

Table 2.3.10 Irrigators views on local impacts

Irrigation is a source of:	% of Interviewees agreeing
Employment	77
Fresh Vegetables	50
Staple food	67
Disease	7
Competition for water	15
Competition for labour	15

Impact on women

The most positive impact in all places was the increase in food available for children. Women's schemes were particularly aware of this, and women respondents in all places emphasised this aspect more than men. However, men are also acutely aware of this fact. They also recognised that women worked longer hours but emphasised this aspect less than women. Equally they accorded less importance to the fact that women, because they worked longer hours, were deprived of opportunities to earn money for their own private use.

Table 2.3.11 Percentage of respondents agreeing with impact statements

Women have:-	**Veeplaats**	**Malavuwe**	**Hlaneki**	**Tshiombo**	**Males**	**Females**
More money	0	8	3	3	0	5
More money for children	3	8	0	0	0	5
More food for children	90	92	60	88	82	88
Less access to land	48	31	17	59	43	39
More dependent on husband	52	77	57	59	61	68
Less chance to earn own money	87	69	27	59	49	73
Work longer hours	90	85	57	81	76	85

In all, there was considerable agreement between men and women about the negative effect of irrigated farming on women. Negative effects were clearly seen by the women on the women's schemes as well as by those in other schemes.

Irrigation knowledge
Section seven of the questionnaire was designed to test the irrigation knowledge of respondents to identify possible extension opportunities. Multiple choice questions were used to group respondents into three categories. Later questions related to scheme operation, user practices and views and allow comment on existing arrangements.

The first group is regarded as having a sound grasp of irrigation principles, the second group has adequate knowledge but would benefit from irrigation-specific extension, and the third group requires extension input to make effective use of irrigation water.

In general, there is a need for extension. Approximately 19 % of respondents appeared to have sound irrigation knowledge, whereas 81 % could use extension or training to improve performance to a varying extent. Overall, approximately 50% of respondents appear to require assistance to make effective use of irrigation water. Results on a scheme basis are shown in Table 2.3.12.

Table 2.3.12 Irrigation knowledge – percentage of respondents in each group

Group	Veeplaats	Tshiombo	Hlaneki	Malavuwe
Sound	26	25	14	0
Adequate	19	31	20	54
Requiring assistance	55	44	66	46
	100	100	100	100

Table 2.3.13 Gender distribution of those scoring “sound” irrigation knowledge

Gender	Veeplaats	Tshiombo	Hlaneki	Malavuwe	Total
Males	-	28%	17%	-	21%
Females	26%	21%	0%	0%	17%

Both Veeplaats and Malavuwe have only women respondents and they appear to show very different results. However, if "sound" and "adequate" groups are taken together , Malavuwe has 55% of respondents in this group and Veeplaats has 45%. At Hlaneki and Tshiombo where women and men can be compared, women lag behind, particularly at Hlaneki. This finding is consistent with other gender based differences found at Hlaneki. However, performance is not clearly dependent on gender with only a small difference between the overall proportion of men and women considered to have sound knowledge.

Irrigators' activities and opinions

What irrigators do and what they think about their own scheme and possible changes, reveals something of how they gather ideas and apply them to their own situation. Replies are shown in Table 2.3.14. Where more than one comment occurred, the most frequently stated view is given first.

Table 2.3.14 Practices and views

Question	Veeplaats	Tshiombo	Hlaneki	Malavuwe	Overall
Who do you turn to if you don't get water?	Extension/ co-op/ self	Extension officer/ Water bailiff	Extension officer	Extension/ engine operator/ committee/ self	Extensionist is seen as key person
What to do about labour shortage?	Relatives/ hire	Work harder/ hire	Hire/ relatives	Work harder/ hire	Increased commitment Help from relatives Hiring
Who do you turn to for repairs?	Co-op	Extension/ water bailiff	Extension	Extension	Dependence on extension staff
What if neighbours don't maintain?	One suggested helping the neighbour	Act through extension or water bailiff. Direct action	N/A	N/A	No reference to committee role in maintenance
What are the advantages of your irrigation system?	Likeness to rain	Access to water	Labour saving/ small water loss	Ease of use/ likeness to rain	Ease of use
What is the disadvantage?	Pipes too heavy	Not enough water	Disease in tomato and cabbage / control difficult	Not good for tomatoes/ control difficult	Site specific answers
What would you like to change?	Heavy pipe moving	no clear idea	Change to drip irrigation	no clear idea	Lack of ideas
What systems do you know?	Furrow, sprinkler	Sprinkler	Pivot, furrow, sprinkler, drip	no consistent reply	Knowledge level undefined
What system do you think is best for you?	Sprinkler - known	Furrow - simple, direct. Sprinkler - water saving	Sprinkler - water saving, Pivot - labour saving	Sprinkler, ease of use	Positive responses without technical basis

Responses suggest that committees do not play a major role in operating the schemes. Few responses referred to any measured parameters, either physical or economic, and give a general impression that farmers lack information about their own systems and possibly lack yardsticks by which to compare different systems.

2.3.4 Discussion

Does gender have an impact on views given?
It is only possible to compare directly at Hlaneki and Tshiombo. There was little difference in responses given by men and women relating to action taken in specific circumstances. In general, women displayed less knowledge about other systems than men and made fewer positive suggestions for change, either to the existing system, or, to another system. Only 36% of the women offered suggestions compared to 55% of the men.

Yes it does

Does women's situation affect their views?
Women at Veeplaats and Malavuwe tended to say that the status quo was best, whereas at Tshiombo and Hlaneki, 50 % of women were interested in change.

Yes it does

Possible relationship between situation, knowledge and functioning, which may in future be worth investigating are:

- literacy/decision-making
- decision-making in homes where husband is present/ not present
- husband not present/females otherwise alone
- irrigation knowledge /literacy/training requirements
- irrigation knowledge/irrigation decision-making
- irrigation knowledge/desire to influence committee
- literacy/committee influence
- extension contact and content/desire for training

Gender, literacy, participation in decision-making and training will be investigated for correlation.

Notes
Many of the respondents answered questions relating to institutional arrangements, and functioning of committees in such a way that their understanding of the questions is in doubt. This result may follow from poorly formulated questions, or lack of experience on the irrigators' part which restricts their views and opinions.

Men offered a selection of reasons for wanting more influence in a committee, only fourteen could be directly related to committee activities. Some answers appeared related more to extension activities. Given the importance of extensionists as a resource for irrigators, both in relation to agricultural and technical information, it is understandable that this confusion occurs.

Women were relatively less keen to exert influence, although the number of women was actually greater than the number of men. Women offered more cogent reasons for wanting more influence in committee activities. Malavuwe and Veeplaats already have female committees, thus women there have experiences which affect their attitudes.

2.3.5 Conclusions

Women are major contributors of labour in irrigated production.

Women and men appreciate that women□s contribution to irrigated agriculture has increased food production but has also decreased women□s independence and opportunities to control a private income.

Despite disadvantage in literacy skills women have sound irrigation knowledge.

In mixed groups of irrigators men take more decisions than women.

Women see a need to improve their participation in water management through training and participation in committee activities. This finding was true in all the systems regardless of gender composition of the farmers.

Women are constrained by their workloads in devoting time to committee activities. Inappropriate irrigation design and equipment contribute to their heavy workload.

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Appendices

Appendix 1.1

Questionnaire used in Gambia and Kenya

WOMEN IN IRRIGATION SURVEY

Scheme: ☐

Plot No: ☐

Location: ☐

PERSONAL DETAILS:

1.1 NAME .....

1.2 AGE ☐ 1.3 GENDER M ☐ F ☐

1.4 Marital Status

Single	☐	Single	☐
Married - 1 wife	☐	Married (husband at home)	☐
Married - more than 1 wife	☐	Married (husband away)	☐
Widower/divorced	☐	Married (co-wife)	☐
Resident	☐	Widow/divorced	☐
Working away	☐		

1.5 **HOUSEHOLD COMPOSITION** (all members except the interviewee) indicate who is considered head of household if it is someone other than the interviewee.

1.3a Are you the head of your household? Yes ☐ No ☐

Person	Relationship to interviewee	M/F	Age

LAND OWNERSHIP

2.1 Do you own the irrigation plot? YES ☐ NO ☐

Is the plot registered in your name? YES ☐ NO ☐

If no, who is the owner?

.....

Do you have the right to occupy	
Is the plot rented	
Registered in someone else's name	

2.2	What is the area of the plot you cultivate	
2.3	How many years have you been irrigating on this scheme	
2.4	Do you also cultivate rainfed land, if so what hectarage	
2.5	Do you keep livestock	
2.6	Does anyone else in your household have other land	

If yes,				
	irrigated		rainfed	
	where		where	
	What area		What area	

2.7 How did you get your irrigated plot?

.....

.....

INCOME

3.1. Does **irrigation** provide for your needs in

Food	
Cash	

3.2.1. Which **other sources of income** does your household have?

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

3.2.2. Does your household get cash from any of the following:-

-	irrigation	
-	dryland farming	
-	animals sold	
-	permanent employment	
-	casual work	
-	a small business	
-	remittances from relatives	

3.3. Which is most important for you to obtain from **irrigating**

Food	
Cash	
Both equally	

If cash is important why is that?
.....
.....

3.4. Which two of the following are most important in creating cash needs (Please tick ONLY TWO of the boxes below)

I/we have to support children and pay school fees	
I/we have to support other relatives	
dryland farming does not provide enough cash	
there are not enough opportunities for casual work or for non agricultural jobs	

RESOURCES

4.1 Have you had a loan in the last 5 years? YES ☐ NO ☐

If yes,

1. What was it for? .....
2. Was it easy to organise? .....
3. Tell us about any problems in getting the loan .....

.....

.....

4. Were you able to keep up payments? .....

.....

If no,

1. Did you want one?..... .....
2. Did you have problems with any of the following :

clear information about loans	☐
access to credit institutions	☐
lack of confidence in future income	☐
family opposition	☐

5. How often did you take a loan?.....
6. Where did you get the loan from?.....

4.2 If you had disagreement with the family, who opposed your plans and why? .....

.....

.....

.....

(please state the relationship of the main opposer to the interviewee, eg mother, husband, etc)

4.3 Apart from money, what other resources for irrigation gave you problems?

.....

HOUSEHOLD RESPONSIBILITIES

5.1 Do you cultivate the plot on your own

YES ☐
NO ☐

If no,

Who helps?

Husband(s)	☐	Hired labour(s)	☐
Wife(s)	☐	Son(s)	☐
Old relatives	☐	Daughter(s)	☐

5.2 Who does what?: Enter the number of people in each category doing the job, indicating gender where necessary. Distribute task proportionately where necessary using 1 unit ≡ 10%.

	HUSBAND	WIFE	SONS	DAUGHTERS	EMPLOYEES (M or F)	OTHERS
Weeding						
Planting						
Land Preparation						
Water application						
Maintenance						
- on farm						
- Scheme						
Harvesting						
Post harvest processing						
Marketing						
Dry land farming						
Cooking						
Domestic water provision						
Fuelwood and collection						
Animal husbandry						

6. EXPENDITURE

6.1 Who makes the decisions relating to:-

	HUSBAND	WIFE	SONS	DAUGHERS	EMPLOYEES	OTHERS
Crops planted in the irrigated plot						
Inputs to be purchased						
Labour to be hired						
Household labour						
Market Sales						
Farm investment						

Put a tick in the appropriate box. Please indicate gender and number if the answer is employees or others.

6.2 Proportion of production cost:

Inputs to be purchased	
Labour hired	
Household labour	
Market sales	
Farm investment	

(One unit = 10%, ditribute the cost as indicated by interviewee)

6.3 Expenditure:-

	HUSBAND	WIFE	SONS	DAUGHTERS	EMPLOYEES	OTHERS
Food						
Education						
Clothing						
Fuel/Energy						
Social celebration						
Goods						

6.4 Proportion of income spent on:

Food	
Education	
Clothing	
Fuel/energy	
Social/celebrations	
Goods	

IRRIGATION QUESTIONNAIRE

Answer for one crop that you grow. **Choose one only**, if you grow more than one answer about the crop you grow most of

7.1. During which growth stage of maize/tomato/rice is water supply most critical?

Maize	Tomato	Rice
* Establishment	* Transplanting	* Transplanting
* Vegetative	* Vegetative	* Vegetative
* Flowering	* Flowering	* Flowering
* Yield formation	* Yield formation	* Yield formation
* Ripening	* Ripening	* Ripening

7.2. Can too much water applied to the field ever be a problem? YES ☐ NO ☐

7.3. Which one of the following do you consider the most important factors affecting the amount of water that should be applied to a crop.

- o crop type
- o crop stage
- o soil moisture before irrigation
- o temperature
- o rainfall in previous week
- o time of day
- o interval since last irrigation of days since you last irrigate)

Why do you choose this one?.....

7.4. Which actions would you carry out when part of your land is waterlogged? choose **one** only

- o irrigate as before
- o reduce the amount of water to that area
- o improve the drainage

7.5. When plants are young, would you : Choose only **one**.

- o apply water in the same quantity and at the same interval as for other stages
- o apply the same quantity more often
- o apply a smaller amount more often
- o apply a smaller amount at the same interval
- o apply as much water as possible

Why do you say that?.....

.....

.....

ON YOUR IRRIGATION SYSTEM

7.6. What do you do or who do you turn to if:-

- you don't receive water on your turn

. . . . . .

. . . . . .

7.7. What do you do or who do you turn to if:-

- you do not have enough labour to plant/weed or harvest

. . . . . .

. . . . . .

7.8. What do you do or who do you turn to if:-

- you feel the canal is not working properly because of damage and major repair is needed

. . . . . .

. . . . . .

7.9. What do you do or who do you turn to if:-

- your neighbour will not clear his/her part of the canal or ditch

. . . . . .

. . . . . .

7.10 What are the advantages of this system?

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

7.11 What do you not llike about the system?

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

7.12 If you could change something about the system, what would it be?
List everything and give your reasons.

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

7.13 Which type of irrigation systems do you know?

.....

7.14 Which is the best type for you and why?

.....
.....

EDUCATION AND EXTENSION

8.1. Have you been to school? YES ☐ NO ☐

8.2. What level did you reach? .....

8.3. How many of your children are at school? ☐

8.4. How helpful was your schooling for your life as an irrigating farmer?
Choose only **one**.

- Yes, but not directly ☐
- Yes, I learnt something about farming ☐
- No, it was not useful ☐
- I learnt about water control ☐

8.5 How often do you speak to an extension officer?

Several times a year ☐ Once a year ☐ Not at all ☐

8.6. What do you talk about most?

.....

.....

8.7 If you get advice on any of the following, from whom do you get it?

water application methods	
what to do if water is scarce	
when to irrigate	
crop choice	
fertilizer use	
disease control	
harvesting	
processing	
marketing	
financial management of scheme. From whom?	

8.8. Do you visit demonstration plots?

No: - not relevant

- too far away/I am too busy

Yes I do

8.9. Would you prefer your extension officer to be a man or a woman? M F Don't mind

Can you explain why you feel that way?

.....

.....

.....

.....

8.10 What plans do you have for improving overall production on your farm?

.....

.....

.....

COMMUNITY AND GENDER ISSUES

9.1. Are you a member of an irrigating farmers group or water users association?

YES ☐

NO ☐

Which one?.....

If no, why not?

.....

.....

.....

.....

If yes, is the group composed of

A **Men only**
B **Mostly men**
C **Equal numbers of men and women**
D **Mostly women**
E **Women only**

9.2. Do men and women contribute differently within a group?

YES ☐

NO ☐

If yes, can you explain this.

.....

.....

.....

.....

.....

9.3. Indicate for the listed activities who **makes the decisions**, who **does the work** and who you think should decide. Enter A, B, C, D or E according to Question 1 classification, enter 0 if activity is **not** undertaken.

Group Activities	Who makes decisions	Who does the work	Who would be best to decide
Water sharing			
Maintenance of canals			
Fee collection			
Formulating rules and by-laws			
Resolving conflicts within group			
with other groups (.....)			
Group decisions on crops			
Marketing activities			
Other activities : specify			

A **Men only**
B **Mostly men**
C **Equal numbers of men and women**
D **Mostly women**
E **Women only**

9.4. Would you like more influence on the committee? YES ☐ NO ☐

Why?

. . . . . .

. . . . . .

. . . . . .

. . . . . .

9.5. If you were able to participate in making decisions about how irrigation is organised, how would that benefit you?

. . . . . .

. . . . . .

9.6. Would you like more technical understanding of how to control irrigation water?

on your field	☐
in the irrigation scheme as a whole	☐

Why?

. . . . . .

. . . . . .

. . . . . .

9.7. How does irrigation affect other people in the community who do not irrigate?

. . . . . .

Would you say it was:-

a source of employment	☐
a source of fresh vegetables	☐
a source of staple food	☐
source of disease	☐
competes for water otherwise needed for domestic or animals	☐
competition for labour	☐

9.8. How has irrigation affected women?

. . . . . .

. . . . . .

Do you agree with any of these statements:	YES	NO
Women work longer hours		
Women have more food for their children		

	YES	NO
Women have less access to land than before		
Women are more dependant on their husbands		
Women have less opportunities to earn some income of their own		

9.9 Would you like your daughter to be an irrigator?

YES	NO

Why?

. . . . . .

. . . . . .

. . . . . .

. . . . . .

9.10 Would you like your son to be an irrigator?

YES	NO

Why?

. . . . . .

. . . . . .

. . . . . .

. . . . . .

STRUCTURED INTERVIEWS

1) Are women happy to be involved in irrigated agriculture?

2) What do they think are the main advantages?

3) Do problems arise?

4) What, when and why?

5) What could be changed to make the job easier?

6) Were many women involved in deciding how this irrigation scheme was set up?

7) Why?

8) Nowadays do women want to get more involved in deciding about new farming techniques such as irrigation?

9) Why?

10) What special skills do you think women can offer to improve the management and sustainability of irrigation?

11) Is there a need for special training facilities for women?

12) If you took up training or participated more in deciding things on the irrigation scheme, how would your situation change?

Appendix 1.2

Gambian Scheme Backgrounds

Information in this Appendix was supplied by Katherine Jones, School of Environment and Applied science, University of Derby.

The Gambia background report

Physical location between 13 - 14°N on southern fringes to Sahel region
Topography - riverine flats and swamps intersected by tidal creeks
The soils are mostly ferralatic and of ferruginous tropical nature (laterites); well drained, moderately well structured but with medium to poor fertility.
Average annual rainfall 800 - 1000 m
Cultivatable land = 147, 600 ha
Land area = 1466.5 km^2

Social

Population 1993 = 1.025 m will exceed 2 m by 2-020 natural population growth rate = 3% per annum over ½ population < 15 years (40% more girls < 15 ha women between6 & 35 years)
Population density 93 persons per km^2
Population density per km^2 of agricultural land = 300 in 1988
Most irrigation takes place in Central River Division
Women cultivate over 90% of land devoted to rice production
Total commercial and food aid imports for 1995 for milled rice in metric tonnes into The Gambia = 93,072.
Airport - Banjul (Yundum) WD
Official language: English
Tribal languages: Mandinka, Fula, Woolof, Julla, Serahuli and Aku.
National literacy rate = 20%
1988 National Enrolment rate 68% boys and 46 % girls.
Regional disparities - urban areas larger female participation than rural areas.
Macroeconomic reform under Economic Recovery Program (ERP) and SAPs set out to promote efficient irrigated farming in order to decrease the dependency on rainfed agriculture

Jahally Pacharr Smallholder Project(JPSP)

Water Source: River Gambia

Intake type: Gates (tidal), channel outflow (pump irrigation)

Distribution system: Main secondary tertiary quaternary.
The field road network and civil works infrastructure (canals, drains etc) covers a total of 103 hectares. ∴ Target development area = 1510 ha + total developed cultivable area = 1407 ha.

Application: Basin
No sprinkler

Irrigated area:

Total irrigated area	Jahally (ha)	Pacharr (ha)	Total (ha)
Purely rainfed	6	115.60	121.60
Single cropped	49	272.00	321.00
Tidal (double cropped)	112	292.40	404.00
Pump (double cropped)	441	120.00	560.00
	607	800.00	1407.00

Rainfed tidal total 167 ha Jahally
680 ha Pacharr

Beneficiaries: 67 project villages with an estimated population of 22,000 farm family inhabitants.

Typical problems: Poor yield and reduction in irrigated areas

Management: Government agency managed.

Land: Project land leased by the Gambian Government in 1980 for 99 years. Land Allocation Committee allocates land based on family size. At village level the village he distributes plots to Dabadas. Land registered is usually registered in women's names. Within the project area land benefits from irrigation in varying degrees for example the Pacharr area consists of :

:

Double crop = 43% - inclusive of rainwater(293 ha)
Single crop = 40% - dry season(273 ha)
Purely rainfed = 17% - rains only(116 ha)

The area is administered in Units

Unit 1 = 161 ha
Unit 2 = 166 ha
Unit 3 = 90 ha
Unit 4 = 204 ha
Unit 5 = 61 ha
682 ha

Organisation: Farmer committee members are elected at village level - male and female representation, but supposed to be more females.

Education: JPSP runs a non formal education service to provide all farmers in project with basic literacy and numeracy. No farmer training on technical machinery.

Yield data : Overall average 4 - 4.5 tons of rice per hectare ;
Pumped area 5 - 7 ton/ha
Tidal and rainfed 3 -4 ton/ha

Clearly farmers benefit significantly more from land in the pumped area.

Crop calendar

Month	Activity no.	Activities	
January	1, 2, 3, 4, 5	(1)	Clean tertiary and quaternary canal
February	6, 7, 8	(2)	Pre-Irrigation (priming)
March	9, 10	(3)	Raise nursery-beds
April	11	(4)	Soaking, inculcation of seeds
May	12	(5)	Sowing nursery
June	Post-harvest	(6)	Soaking plots
July	1, 2, 3, 4, 5	(7)	Spot levelling
August	6, 7, 8	(8)	Transplanting
September	9, 10	(9)	1st weed and area application (fertilizer)
October	11	(10)	2nd weed and area application (fertilizer)
November	12	(11)	Cleaning tertiary and quaternary drains
December	Post-harvest	(12)	Harvesting

Social characteristics: Village hand pumps Village wells
1 clinic at Jahally and dispensary at Birkama Ba
4 Primary Health Care Centres in project villages.
Child Day Care Centres at village level
Access roads provided from villages to swamps
Local markets

Inputs: Available through Agricultural Inputs Organisation (AIO) at Cape Point in Bakau
Department of Agricultural Services (DAS) Government provides services and advice.

Small Scale Water Control Program (SSWCP)

Central River Division (CRD)
Funded by International Fund for Agricultural Development (IFAD) for 6 years. Funding finishes December 1996.

Water source: River

Intake type: Gates (2 installed in total on all 8 sites - expect Kudang - still building)

Irrigation type: Tidal

Structures: Dykes 39.1 km (manual), 7.3 km (machine)
Main and secondary channels unlined - 22.3 km
Tertiary 16.52 unlined

Application: Flood

Total irrigated area: 482 ha

Swamp name	Area (ha)	No. of villages
Dankunku I	90	7
Dankunku II	97	
Waddu I	60	16
Waddu East	15	
Kununku	37	1
Karantaba	10	4
Kundang	70 (planned)	1
Tuba North	45	1
Sambeli Kunda	58	1

Project planned to irrigate 1,500 ha in CRD have achieved only 482 ha in 6 years only on south bank of CRD - not developed the potential irrigated lands on north bank.

Typical problems:

- Now that project has handed over the scheme to the beneficiaries, all earthen structures need urgent attention by the farmers if the scheme sites are to be sustained for rice production under water control.
- Leakage points in dykes are a problem (seepage).
  The ineffectiveness of field channels and bunds has lead ineffective plot water management.
- River Water Salinity
- Female access to agricultural inputs

Management type: - farmer

From the outset in 1991 SSWCP has involved the farmers in every aspect of the scheme. During the consolidation phase, the project equips the beneficiaries with the necessary training to sustain the scheme after IFAD funding ceased December 1996.

Operation: Water on demand

Performance assessment::

Water supply adequate
Drainage needed in wet season
Efficiency - fair
Equity - fair
Co-operation - between farmers good
Maintenance - project has trained farmers in maintenance of dykes- fair

Yield data: 7.5 tons/ha per season

Crop calendar

Month	Activity
January	prepare nursery bed
February	prepare permanent bed
March	transplant
April	water, fertilize, weed, pest and disease control
May	harvest
June	post harvest - prepare land
July	prepare nursery bed
August	prepare permanent bed, transplant
September	water, weed
October	fertilize, pest control disease
November	harvest
December	post harvest - prepare land (plough, puddle/level)

Commercial activities:
Individuals market rice at "Lumas" (weekly market in nearby town)

Technical training: Agronomy
Maintenance
On-farm water management
Related skills: WUA training
Swamp development committees

Training on irrigation principles, tides and levels, planning and operations of tidal irrigation systems was also offered.

Institutional Arrangements
Land Tenure - 3 types of rural land tenure
(1) communal
(2) farm land
(3) individual

Ownership of (1) is legally vested in District Authority for common benefit of the people. (2) owned by village or individual families (clan) and are inheritable like individual land.

Land held under farm land tenure system is administrated by village Alkalo or head of the clan. It is passed from one generation to the other through lineage. Traditional roles are heritable by the oldest (male/female) of lineage. It is usually a male though even if a female is older.
Most rice growing for SSWCP is farm land.

5 variants of use rights/access to land under farm tenure system:

a) owning through cleaning of virgin land
b) inheritance
c) buying
d) renting
e) borrowing

The schemes are generally owned and operated by women, except in the case of Jarreng WADDU SSWCP, where plots are allocated to men, but largely cultivated by women.

Farmer committee status - elected

Farmer committee composition - a large proportion of women
1994-1995 Number of women groups formed 36 and 33 strengthen
Number of women engaged in income generating activities 302
Number of women engaged in vegetable gardening = 735

Rice Development Project RIDEP

Source: River

Intake: Gates and canal outflow/permanent

Application: Basin

Total irrigated area: 200 ha

Bansang/Bantanto	= 26.20 ha
Bansang/North 1 & 2	=(1) 8 ha (2) 4.28 ha
San Kuley Kunda	= 64 ha
Tabbanni	= 30 ha
Janjangbure Complex	= 25.10 ha
Dobang Kunda	= 40 ha
Nema Kemo Fatty	= 6.50 ha

Management: Project has provided land development and inputs and assistance
Project maintains two major structures:-
Pump and main canal
Farmers responsible for restoring bunds and cleaning canals

Operation : Individual demand

Typical Problems : Inequity of water supply
maintenance of channels

Project has provided inputs and assistance only to old sites

Sariya free outfall 1	= 4.15 ha
Sariya free outfall 2	= 10.40 ha
Wellingara Musa	= 10.50 ha
Kerewan Manding No. 2	= 5.3 ha

Performance assessment: Supply - good
Adequacy - yes, good
Efficiency - good drainage means wastage is captured back to river and water is recycled
Equity - poor

Yield data: wet season 1995

Bansang/Bantanto	= 6.74 tons/ha
Bansang North 1 & 2	= 6.53 tons/ha
San Kulay Kunda Pump 1	= 4.79
San Kulay Kunda Pump 2	= 2.88
San Kulay Kunda Pump 3	= 5.28
Nema Kemo Fatty	= 5.56
* Tabannani/Tumani Fatty	= 9.27*
Janjangbure	= 6.66

Kerewan Mandinga = 5.94
Sanija FOF No.2 = 5.94
Sanija FOF No. 1 = 4.77

*Indonesian assistance with new HYV = IR64

1996 Dry Season (still harvesting)
Bansang/Bantanto = 7.80 tons/ha
Kerewin/Nandingo = 8.43
Nemo Kemo Fatty = 6.94

Commercial activity: Individual marketing
Local markets

Agribusiness: Provided by project.
Credit: Interest 7.5% per ½ year or crop season

Typical problems: Labour seasonal constraints (wet season)

Institutional arrangements:-

When project rehabilitates a perimeter

- the original farmers still own their land.
- villages decides who gets share of land (Land Allocation Committee - LAC) depending upon family size and total labour per dabada (household).the village committee made up both of men and women.
- project prepares the land for the village to distribute to its farming families (maximum 15 plots per family)
- project trains and educates farmers on principles of irrigation (water efficiency) and field sanitation (cleaning of canals /bunds, pest and insect control)

RIDEP has trained a total of 56 (male and female) farmers. These contact farmers disseminate information and knowledge to other farmers in the field. These 56 farmers have now also been trained on the mechanics of pumping machines, power tiller, threshing and milling machines to operate them. Next stage repairs and maintenance.

Central River Division (CRD)

Much of the irrigated land is found in Central River Division. The Sapu Research Station is a focus for activities and houses headquarters and records of for several projects. Irrigation has mostly developed south of the river where conditions tend to favour development activities.

The annual variation in rainfall affects the river regime. In years of low precipitation, saline intrusion makes the water from the river less suitable for irrigation.

Rainfall levels (mm) at Sapu 1994	
Month	mm

May	0
June	48
July	206
August	359
September	268
October	102
Total	982

Total rainfall in Sapu in (mm) 1990- 1995	
1990	543
1991	490
1992	596
1993	793
1994	982
1995	752
Average	692

Ethnic - Mandingos, Fulas, Serahules, Wollofs
Division ÷ into 5 districts
Dabada population of 6,177 Dabadas (country total 46,386)*
(*Dabada - group of people who pool their resources to grow crops or raise livestock and is headed by 1 person who takes management decisions (farm production unit). Average dabada size, by gender, in CRD = 6 males, 5 females)
Agricultural population of 35,385 males, 32,392 females (NASS 1995/1996)

CRD South	No. of villages	No. of Dabadas
Niamina Dankunku	25	566
Niamina West	30	583
Niamina East	45	1194
Fulladen West (1)	84	2346
Fulladen West (2)	110	1488
Total 5	294	6177

Production: In 1995 women cultivated 94% of the area and owned 91% of the plots in CRD. Women

cultivated 97% of the plots where upland rice was cultivated and 92% of the swamp rice area. Three quarters of the households consume all the rice they produce.

Yield data: CRD south 1995

Cultivated area ('000 ha)	1.037
Harvested area ('000 ha)	0.994
Yield (kg/ha)	1.858
Production ('000 tonnes)	1.848

Population growth: Rate CRD = 1.2% in 1973 - 1983 working population grew more slowly than total population which has led to an increased proportion of children and elders on the farm (also because of rural → urban irrigation).

Infrastructure: Roads - Tarmac on South and North Bank
Hospitals in all divisions - in CRD - Bansang
Government Offices at Sapu

Credit opportunities :
Village Saving Schemes (VISACAs)
Gambia Cooperative Union (GCU)
Markets - local

Agribusiness
Inputs - Government no longer subsidises inputs
Services - Government provides
Advisory - Extension Services through Government Department of Agricultural Services (DAS)

Main non-farm employment :
male - urban migration
female - soap making, tie and dye, sewing (vegetable gardens)

Appendix 2.1

Kenyan Scheme Backgrounds

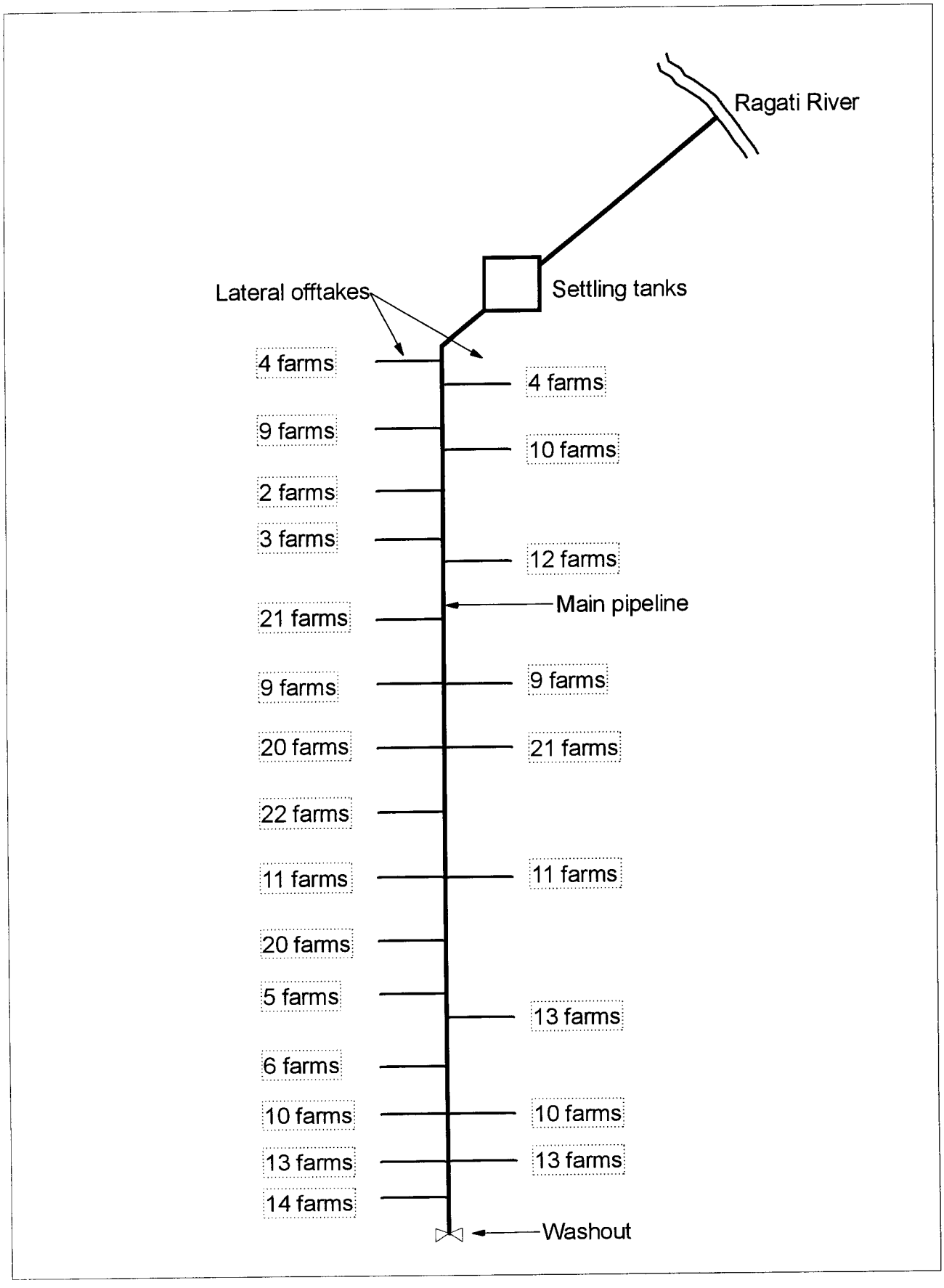

Figure A1 Kibirigwi Irrigation Scheme

Kibirigwi Irrigation Scheme, Kenya

Location and background

Kibirigwi scheme is in Kirinyaga district of Central Province in Kenya. The scheme straddles the main Sagana - Nyeri road for some three kilometres, about 7 km south of Karatina town.

Kibirigwi scheme was constructed in the late seventies for sprinkler irrigation tapping the Ragati river to irrigate during the dry months so that year-round production could be achieved. It was designed to be run by a management agency which would operate and maintain the system, provide extension to the farmers and market the horticultural produce.

The surrounding countryside is well populated and rain-fed farming of coffee and food staples is the main occupation in the area. Infrastructure is adequate and the scheme benefits from being on a main road.

Scheme characteristics

Kibirigwi takes water from the Ragati river using a concrete weir upstream of the scheme. A 12" pipe takes water to the settling tanks from where it is distributed through distribution laterals to the in-field hydrants. Each hydrant supplies a maximum of three farmers. Each farmer has a maximum of 1 acre or 0.4 ha. of irrigated land and up to 4 acres of dryland.

The system irrigates an area of 114 ha in total. The irrigated areas are divided into six blocks, corresponding to the laterals, each of which serves approximately 50 farmers. Irrigated areas are not contiguous and pipework was determined by existing farm boundaries. There are 280 farmers in all.

The system is operated by the Ministry of Agriculture, and was designed to allow watering on demand. Rotation of watering times has become necessary for part of the time when shortage is thought likely. Head, middle and tail rotate water-use on a two day schedule, using the remaining day to satisfy scheme-wide demand.

Kibirigwi has extensive on-site facilities with office accommodation for Ministry of Agriculture (MOA) staff, for extension workers and artisan workshops for repair of pipework and machinery. There are also facilities for meetings, for grading and storing produce and for cultivation of demonstration plots.

Kibirigwi initially specialised in production of vegetables, some of which were grown on contract for processors. French beans, cucumbers and tomatoes are popular on this scheme. However, marketing has been a source of difficulty. Considerable bad feeling and distrust between farmers and the agency has resulted. The farmers also face problems from both plant disease and water shortage.

The farmers elect a committee of nine members consisting of representatives from each block plus chairperson, treasurer and secretary. Despite women forming at least half of the work force, no women are committee members. The committee assists management in matters of policy, fee collection and maintenance. Hand-over of management from MOA to the farmer committee is under discussion. A cooperative group, KIFCOS began in 1994 with a small membership and shareholders initiated a seed bank. It is hoped that their activities can expand to bulk purchase of fertilizer which would enable farmers to take advantage of substantial discounts.

Main findings

Operation and management

Adequacy of supply at Kibirigwi is good (Table1). The system abstracted 1.6 times the amount of water required as original design provided for extra water use to ensure flexibility. There was no evidence of severe water shortage, monitored supply was adequate for 50 weeks of the year. However, characteristics vary dependent on location. Table 1 shows the advantaged supply at the tail.

Table1 Irrigation performance indicators for Kibirigwi

Indicator	Scheme	Head	Middle	Tail
Supply	1.63	0.87	1.36	2.95
Adequacy	0.97	0.74	0.88	0.99
Dependability	0.08 (good)	0.36 (poor)	0.22 (fair)	0.03 (very good)
Efficiency	0.56	0.74	0.62	0.40
Equity	0.16 (good)	-	-	-
Sustainability	1.00	1.00	1.00	1.00

Farmers take water at will during their irrigation turn. Each farmer has two sprinklers although some are believed to operate four. The recent change to sweet potato, which uses a lot of land, may mean some farmers attempt to water greater areas, although not necessarily using more water. Women use relatively small areas of land for French beans but water-use is more intensive. Water demand for French beans peaks during January, February and March and again in September and October which tend to be relatively water-short periods. Women at the head and middle of the scheme complain of water shortage.

Operation and maintenance of the scheme is undertaken by the agency; farmers contribute labour especially for emergency repairs.

Agricultural production

Until the recent conflict between farmers and agency over marketing produce, the farmers grew a range of horticultural crops which were graded and marketed on-site. The consequent distrust has resulted in farmers cultivating sweet potatoes in the survey year, replacing the usual vegetables . Kibirigwi is evidently a busy scheme, virtually all land appears to be in use. In the year of investigation less than 40% of the irrigated area was devoted to horticultural crops. Women were the main growers of horticultural crops, particularly French beans, and many use input loans arranged through their women's groups. Maize and sweet potato occupied almost half the planted area. The chairman explained that the margin on sweet potato was favourable and few inputs were required so that farmers were able to grow the crop without credit. The crop was also attractive because of relatively steady demand and easy marketing. Sweet potato was mostly grown by men. Findings of the 1995 survey are, therefore, atypical of the economic performance of this scheme.

Yields and marketing

French beans, which are grown by the women at present, do well (Table 2). Maize and beans which are usually regarded as subsistence crops perform poorly. Other vegetable crops give poor results except onion and sweet potato. Tomatoes are particularly prone to disease and produce poor yield.

Table 2 Crop yields for Kibirigwi (kg/ha)

Crop	Percentage of planted area	Average yield (kg/ha)
Sweet potatoes	24	6500
Maize	25	2200
Beans	12	8400
French beans	11	940
Kales	5	2000
Onions	4	14300

Inputs
On average farmers spent KSh 11,500 per irrigated hectare on purchasing inputs. For the average plot that involved a layout of some KSh 7000, higher levels were associated with inputs for French beans. It is expected that inputs will be higher in years when horticultural produce occupies a greater proportion of the irrigated area.

Income
It must be emphasised that present conditions are atypical. It is noticeable that expenditure level is high relative to income (Table 3) and this probably indicates a lag between lower income and reduction in spending. Kibirigwi is unlikely to continue a strategy which results in overall loss.

Irrigation is the greatest single generator of income even in present circumstances. If the marketing dilemma is resolved then, even with endemic price fluctuation, net irrigated income would rise. Low margins in dryland farming and negative livestock income are testimony to the fact that irrigated margins subsidised other agricultural activities in past years.

Table 3 Gross margins and farm incomes for Kibirigwi (Ksh)

Revenues / costs (KSh)		**SCHEME**	**Head**	**Middle**	**Tail**
Irrigated gross margin (KSh/ha)		28750	14000	27500	47500
Irrigated net income	(KSh/farm)	11500	5600	11000	19000
Dryland net income	(KSh/farm)	1850	2800	2400	50
Livestock net income	(KSh/farm)	-2450	-3800	-3800	1000
Other inflows[1]	(KSh/farm)	10200	18400	7500	4700
Costs[2]	(KSh/farm)	27500	26300	26300	31100
NET INCOME PER FARM	(KSh/farm)	-6400	-3300	-9200	-6350

Source: HR Survey 1989
[1] Other businesses, employment, remittances from family members
[2] Support to relatives, school fees, travel, health, tools

Environmental impacts
Positive social impact is achieved through the general rise in income and employment. Negative impact in riparian terms is probably low as the volume abstracted from the river is relatively small. Excess water is returned to the river. There is no evidence of either erosion or waterlogging.

Conflict/ complementarity
Conflict with other agricultural enterprises was not apparent at Kibirigwi. Complementarity between livestock and irrigation is being encouraged with the "Zero grazing units" promoted by SISDO. Milk production from stall fed cattle will generate income for women who may have limited access to land but who can use crop residues and fodder crops planted as land boundaries for this profitable enterprise. SISDO loans capital in the form of a cow, repayment from milk and calf sales is a realistic target.

Sustainability
The irrigation infrastructure has been supported since inception by stocks of replacement pipe and repair materials. As the system ages it is likely that repair will become more frequent and at the same time more expensive. It is possible that the scheme is entering a high cost era. There is no reason why high costs should not be met if marketing is developed successfully and horticultural demand remains stable.
Water supply from the Ragati river is assured. Equity in terms of water supply is good at this scheme, which is a positive precondition for cooperation between farmers. Indeed conflict with present management may have had the effect of further uniting farmers, prospects for sustainability appear good.

Present initiatives in input credit and "zero grazing" by SISDO fulfill a multi-function of improving credit access, dealing with gender imbalance in access to productive resource and reducing possible adverse.

Design issues
Sustainability and development hinge on marketing, if marketing is to be achieved through an agency, basic issues must be addressed:

- transparency is crucial
- market knowledge is essential for farmers
- institutional arrangements must ensure the agency is answerable to the farmers

Sprinkler schemes are often regarded as unsuitable for farmer management, however:

- overall efficiency at 56% is superior to the open channel systems
- farmers are competent in the use of sprinkler equipment and operate the system without problems.

Support environment considerations

- credit is an important secondary issue.

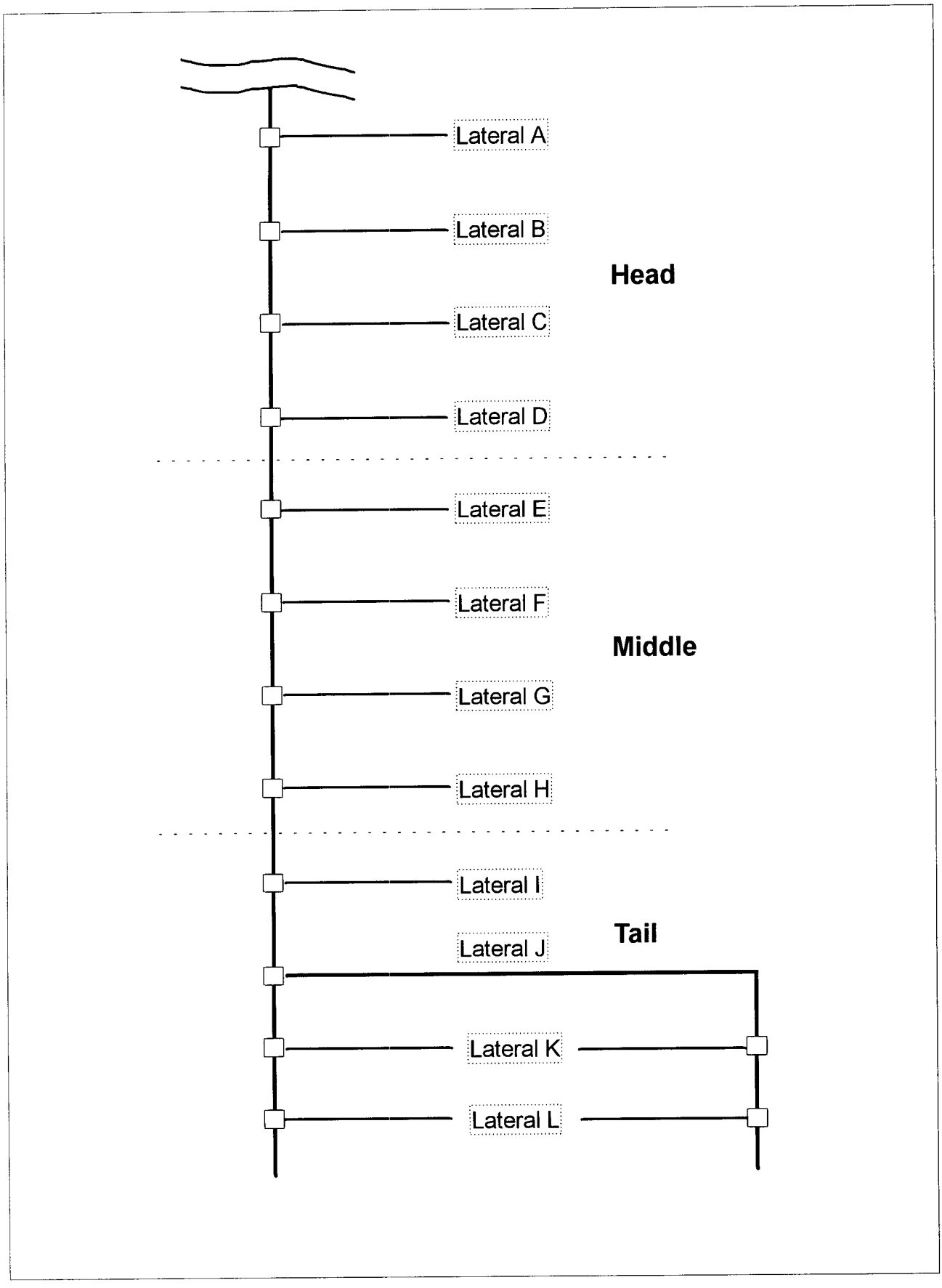

Figure A2 New Mataro Irrigation Scheme

New Mataro Irrigation Scheme, Kenya

Location and historic background

New Mataro Irrigation Scheme is located in the Kenyan Highlands, almost on the equator at an altitude of 1950 m, west of Mount Kenya and in Laikipia District . The towns of Nyeri and Nanyuki are about 50 and 60 km distant respectively although only half these distances are on tarmac roads. Average annual rainfall amounts to approximately 700 mm whilst total annual reference evapotranspiration is about 1750 mm. The surrounding area is classified as semi-arid with a low potential for rain-fed agriculture and as such the prevailing land use is for cattle ranching.

The upper part of the valley in which the scheme lies is narrow with a gently undulating relief with slopes of up to 2%. Downstream the scheme widens to about 1 km and the slopes decrease. The soils consist of clay-loams and clays with areas of black cotton soils in the lower areas. According to a survey carried out in 1986 the soils are moderately fertile. Water for irrigation is drawn from the Ngobit river which originates from the Aberdare mountain range. Flow is perennial but exhibits wide seasonal variations.

New Mataro scheme is composed of two distinct parts termed Gatarakwa and New Mataro. Gatarakwa occupies part of a former privately owned settler farm bought in 1977 and divided between 27 farmers most of whom also owned land close to Nyeri. New Mataro however was obtained in 1976 by wives of the farm workers of the settler. They sub-divided the area into 132 plots consisting of about 1 ha of irrigated land and 2.5 ha of grazing land. A basic irrigation network had been implemented previously but rehabilitation and improvement started in 1983 with a diversion weir constructed across the river, realignment of part of the main canal and construction of twelve division boxes. The farmers were responsible for excavating the lateral canals and shaping the main canal. Funding was provided by the European Community.

Scheme characteristics

The intake to New Mataro is well-constructed including a weir across the river and a gated culvert to the main canal which has a total length of 4.15 km. Along its length are 12 concrete division boxes that control the flow of water using proportional weirs . These were observed to be in good condition with little sign of tampering. Also along the main canal are two road-bridges, a sideweir to convey excess water back to the river and a number of drop structures. The overall condition of the canal is good and it appears to be fairly well maintained along its length.

Main findings

Operation and management

Adequacy of supply at New Mataro is fairly good at 86% overall with water being shared equitably between blocks (Table 4). Inequity was observed, however, along laterals; some farmers had stopped irrigating due to lack of water. Lateral lengths were too long for the low flow rates. To counter this, some farmers had resorted to siphoning water directly from the main canals. Problems also exist in organising rotas for water sharing. Farmers choose not to understand that irrigation times should be divided if land allocations are divided. Maintenance of main channels is good and the presence of a resident extension officer has helped to raise the general level of scheme management.

Table 4 Irrigation performance indicators for New Mataro

Indicator	SCHEME	Head	Middle	Tail
Supply	1.12	1.57	1.07	1.02
Adequacy	0.86	0.86	0.80	0.85
Dependability	0.25 (poor)	0.34 (poor)	0.35 (poor)	0.26 (poor)
Efficiency	0.46	0.41	0.50	0.53
Equity	0.17 (fair)	-	-	-
Sustainability	1.00	-	-	-

Agricultural production

The irrigated area is split almost evenly between production of subsistence crops such as maize and beans and vegetables crops such as tomato and onion for sale to merchants (Table 5). Considerable extension effort goes into this scheme and includes close attention to disease control and to marketing. The extension officer is resident at the scheme and organises a variety of group activities in addition to visits and demonstrations. Parallel developments such as rainwater harvesting are encouraged to improve facilities generally and to free womens' time for productive tasks. Female labour is crucial to development of intensive horticultural production.

Table 5 Crops grown at New Mataro

CROP	Maize	Beans	Onions	Tomato	Potato	Cabbage	Other
% of planted area	40%	18%	16%	14%	7%	4%	1%

Yields and marketing

Table 6 demonstrates that substantial differences in crop yield can occur despite allocation of adequate water to the irrigated area.

Table 6 Crop yields for New Mataro (kg/ha)

Crop yields (kg/ha)	SCHEME	Head	Middle	Tail
Onions	9361	4836	12348	12700
Tomatoes	10229	2420	19116	11131
Maize	2439	2297	2684	2342
French beans	635	619	694	605

Low yield in the head of the scheme is largely due to distribution problems. Farmers in the end of laterals have poor supply and are often water short. Some of the area also suffers flood problems which can be drastic for the horticultural crop. Post-flood humidity favours the spread of disease , also reducing yield. Yield in the middle and tail is significantly greater for the horticultural crops but subsistence crops perform evenly over the scheme.

Marketing took place both on and off the scheme. Middlemen bought from the farm gate striking bargains with individual farmers, although farmers say that the prices offered are now more or less consistent, whereas earlier price had varied greatly from farmer to farmer. Most farmers felt that the prices were low and undoubtedly this was a penalty for the distance that had to be travelled. It was possible for farmers to hire a pick-up to drive produce to Nairobi or elsewhere. The cost and the length of absence that would be needed from already labour-short farms presumably was the reason that this was common practice.

Weekly auctions had been suggested as a method of increasing farmers' bargaining power.

Labour

On irrigated land generally, there were approximately four workers to each hectare. Less labour is devoted to irrigation on farms where rain-fed land is cultivated. The study revealed a difference of 25%. The gender balance was almost even. The sample contained 15% of female headed household which is low for rural Kenya. Women had almost exclusive responsibility for food crops and more than 50% had responsibility for some or all of the cash crop too. About 20 % took responsibility for allocation of water.

Income

Income from irrigation is dependent on crop choice, yield and price and the proportion of production which the farmer can sell. Poor agricultural performance in horticultural crops carries over to poor income in the head reach (Table 7). As well as suffering poor yield, some farmers in the head were unable to irrigate the full area.

Table 7 Gross margins and farm incomes for New Mataro (KSh)

Revenues / costs (KSh)		**SCHEME**	**Head**	**Middle**	**Tail**
Irrigated gross margin	(KSh/ha)	19100	10330	23500	26830
Irrigated net income	(KSh/farm)	12450	6200	14100	16100
Dryland net income	(KSh/farm)	1500	180	5170	-175
Livestock net income	(KSh/farm)	4100	960	7450	4250
Other inflows[1]	(KSh/farm)	19300	6940	16560	32970
Costs[2]	(KSh/farm)	26500	17000	32250	30540
NET INCOME PER FARM	(KSh/farm)	10800	-2720	11030	22605

Source: HR Survey 1995

[1] Other businesses, employment, remittances from family members

[2] Food and fuel plus support to relatives, school fees, travel, health, tools etc.,

The importance of other income sources at this scheme is substantial. Families in the head are unfortunate in receiving less income from this source in addition to their low agricultural incomes.

Conflicts / complementarity

The major cause of low income from rainfed land in the head of the scheme is probably the small proportion which is sold. Fewer farmers at the head of the scheme conduct rainfed agriculture (which contribute to low averages). It is less clear why farmers in the middle perform better on approximately the same areas as those in the tail given equivalence in water supply. Labour demand for rainfed farms does reduce the amount of labour devoted to irrigation.

Environmental impacts

There were no significant environmental impacts of irrigation, however, flooding is a persistent problem which may deserve attention. Wildlife has been excluded from the scheme using a solar powered electric fence which is only partially effective.

Sustainability

There is sufficient water to supply the scheme. The good organisational foundations currently being laid will improve sustainability, particularly if distribution problems in the head reach can be addressed to produce an effective and acceptable schedule for each lateral.

Design issues

- Long laterals make scheduling water between farmers difficult. When the flow rates are small, most of the water is lost in seepage.

- The use of small diameter PVC piping to convey water from the main canal to lower areas remote from its alignment was an effective and attractive solution which could have application elsewhere.

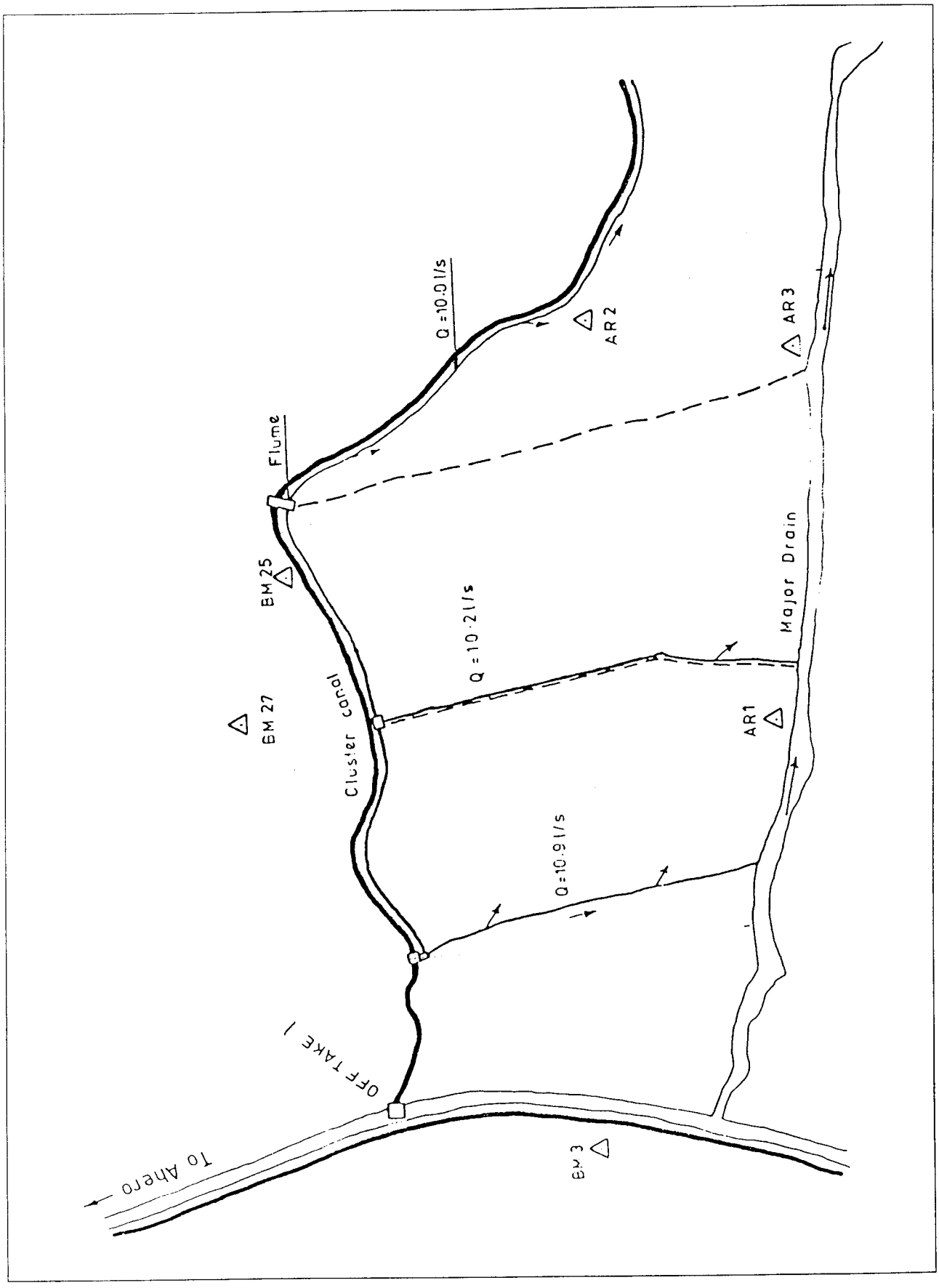

Figure A3 Arombo Irrigation Scheme

Arombo Irrigation Scheme, Kenya

Location and historic background

Arombo is a small rice-growing scheme in the Kano plains on the eastern shores of Lake Victoria. The scheme is close to the town of Ahero where a good range of facilities is available. The plain is very flat and slopes gently towards the lake. The scheme is one of a cluster supplied with irrigation water by South West Kano Irrigation Project which is managed by SISO (Smallholder Irrigation Support Organisation). There are three clusters and a total of 21 schemes. Farmers pay an annual maintenance fee to SISO which covers the costs of maintenance of the main canal intake, main canal and cluster off-takes. The South West Kano Irrigation Project began construction in 1991 and irrigation water delivery began in 1993.

Water is abstracted from the Nyando river and distributed to schemes where farmers share the water between their irrigation plots. Arombo scheme now has an assured water supply where previously farmers irrigated using water from the Nyatini drain from the nearby National Irrigation Board scheme. Rice cultivation is well established in the area, agribusinesses cater for rice growers' needs and marketing networks function effectively.

Annual rainfall is in the region of 1200 mm with rain occurring mainly in April and November, although the timing is erratic and drought and flood are common. Soils are heavy dark clays suited to rice cultivation, with depths in the range of 90 cm - 120 cm.

The area is well populated. Social organisation favours multiple marriage so family size tends to be large. There is no shortage of hired labour although the nearby town possibly increases the cost of casual labour for farmers.

Scheme characteristics

Arombo scheme consists of 54.4 acres or 22 hectares. The irrigated fields are contiguous and farmers live in homesteads outside the irrigated area. There are some 70 farmers, most of whom also cultivate rain-fed land to produce maize, sorghum, bananas and cotton. Livestock farming is included in the farming system. Rice is grown in one season although it is expected that expansion to double cropping will take place. Rice is predominantly a cash crop although a small proportion is used by the farm families. Arombo scheme is relatively new and conflict arises between the farmer committee and SISO on a number of matters including land registration, fee collection and availability of tractors for land preparation. There are other issues which seem to arise from general conflict and mistrust.

Water for irrigation is delivered to the scheme from the main canal via the cluster canal. Water flows to the scheme over a duck-billed weir and distribution is controlled by division boxes. The scheme functions in three blocks. Managing water within the system is difficult due to the small gradient.

The scheme committee consists of 12 elected members and is responsible for distribution within the scheme. Each block is represented on the committee. Their main responsibilities are for maintenance of the channels and drains within the scheme and collection of the maintenance fee and payment of dues to SISO. The schemes of the clusters are represented on the board of SISO; there are three board members to represent the interests of all the schemes.

Main findings

Operation and management

Delivery of water to the scheme is managed by SISO. So far the only delay in delivery has resulted from the farmers' failure to pay dues to SISO. It is management policy to withhold delivery until payment is made. Delay in planting is generally held to result in reduced yield so farmers have an incentive to pay fees on time.

Water delivery at Arombo appeared good with an adequate supply and no evidence of serious inequity. Arombo is a new scheme and as such is expected to show equitable distribution. Complaint about the volume and reliability of water delivery was minimal. The available hydraulic data were inadequate to conduct an analysis of supply.

Yield appeared to be slightly higher in the middle reach of the scheme but differences were not statistically

significant. Regression analysis implied that yield was more sensitive to differences in inputs than to differences in location, which supports the view that all areas receive an adequate supply of irrigation water.

Agricultural production

Arombo grows one irrigated rice crop per year. All the irrigable land is in use. Cost of inputs and hired labour was approximately KSh 2000 per farm. The maintenance fee to SISO is KSh 3500 per hectare so the average farmer paid a fee of around KSh 1200. Although the current rice price was quoted as KSh 12 per kg. some farmers obtained less, the average price from the survey was KSh 11 per kg. In general farmers bought seed and applied fertilizer, but those who did not achieved significantly lower yield, averaging less than 2.5 t/ha. Opportunities do exist for farmers to obtain credit for inputs. Care International operates in the area and channels credit substantially through women's groups. Women are major participants in field tasks.

Most of the rain-fed crops are produced for home consumption. Maize, sorghum and millet take up most land. Cotton and sugar cane are grown for cash but on small areas. Most households have some livestock but numbers are small with the average farm keeping 4 - 6 cattle, 6- 8 small stock and a dozen or so chickens.

Yields and marketing

The overall average yield of rice reported was 4.6 t/ha in line with the estimate of 18 bags/acre given by the farmers committee. It was, however, less than the 7 t/ha that SISO estimated from their observation of the harvest. This yield is equivalent to 27 bags per acre. It appears from the original proposals that yield of 16 bags/acre was common prior to development. Farmers assert yield prior to 1993 was higher, around 20 bags/acre and that present yield is lower than 1993 yield. The HR/IDB survey found yield of 18 bags/acre reported. An increase of two bags/farm at current prices does little more than cover than average farm maintenance fee. The issue of true yield has become a major source of conflict. Standard deviation of the reported yield from the mean value (in brackets below figures in row one of Table 8) suggest that yield was only moderately variable. The correlation between inputs and yield was strong and supports the view that the data are genuine.

Table 8 Rice yields, costs and revenues for Arombo

		SCHEME	Head	Middle	Tail
Rice yield	(kg/ha)	4630 (2740)	3735 (1562)	6090 (3460)	4110 (2125)
Revenue	(KSh/ha)	41300	42300	48690	30850
Production costs	(KSh/ha)	6345	4444	8840	5612
Irrigated gross margin	(KSh/ha)	34955	37856	39850	25382
Maintenance fee	(KSh/ha)	3500	3500	3500	3500
NET INCOME	(KSh/ha)	31455	34356	36350	21880

Gross margins in the tail are reduced by a combination of factors; cost per ha was higher than in the head and the percentage of the crop sold was lower than both head and tail. Yield in the tail is slightly better than in the head so that it is unlikely that water shortage exists.

Marketing of rice is done through individual bargains and through wholesalers. Although the price varies through the season the price at any given time appears to be within the range of eight percent either side of the average. Markets are stable and predictable. Wholesale buyers visit the scheme thus marketing costs are borne by the traders.

If indeed yield has only increased 12% (16 bags -18 bags) then farmers are little better off after paying fees and those achieving a less than average yield may have less cash left than previously.

Table 9 Income generation for Arombo (Ksh)

Revenues / Costs (KSh)		SCHEME
Irrigated net income	(KSh/farm)	8375
Dryland net income	(KSh/farm)	7800
Livestock net income	(KSh/farm)	4710
Employment	(KSh/farm)	15580
Business	(KSh/farm)	4260
Other	(KSh/farm)	610
Costs [1]	(KSh/farm)	31460
NET INCOME PER FARM	(KSh)	9875

Source: HR Survey 1989
[1] Support to relatives, school fees, travel, health, tools

Conflict / complementarity
Conflict of interest between dryland or rain-fed crops and the rice crop was reported by 60% of the farmers. The two problem periods are January/ February when rice is harvested and July/August when maize is harvested. Some difficulty may arise from the fact that conditions on neighbouring schemes are different to those on Arombo where irrigation was already in progress with Nyatini drain water. Arombo may feel that the cost of the new water supply is high relative to the advantage brought.

Environmental impacts
As the scheme has only been in operation for two seasons environmental impacts are not yet apparent. Any impact is likely to result from the cluster development rather than from one scheme.

Sustainability
The management of SISO are disappointed that farmers at Arombo are not more willing to pay their fees. The system will be unsustainable if conflict continues and SISO refuse to supply water. An effort must be made to resolve the problem so that farmers and SISO can work together.

Design issues

- Irrigation infrastructure must add significantly to production and income, otherwise farmers will be reluctant to pay either repayments or service fees.
- In designing cluster irrigation systems it may be important to match operational conditions to the needs on individual schemes.
- Management and farmers may need to investigate a more flexible approach to dealing with each other in order to ensure sustainability. Farmers now deprived of Nyatini drain water and not yet achieving higher yields will not achieve results if irrigation water is no longer available.

Appendix 3.1

Questionnaire used in South Africa

1419

WOMEN IN IRRIGATION SURVEY

Scheme: MARAXWE (Tshiumbe)
Plot No: 164
Location: TALE

PERSONAL DETAILS:

1.1 NAME LANHENSWA JOSEPH

1.2 AGE 38 1.3 GENDER M [X] F [ ]

1.4 Marital Status

Single	[ ]	Single	[ ]
Married - 1 wife	[X]	Married (husband at home)	[ ]
Married - more than 1 wife	[ ]	Married (husband away)	[ ]
Widower/divorced	[ ]	Married (co-wife)	[ ]
Resident	[ ]	Widow/divorced	[ ]
Working away	[ ]		

1.5 HOUSEHOLD COMPOSITION (all members except the interviewee) indicate who is considered head of household if it is someone other than the interviewee.

1.3a Are you the head of your household? Yes [X] No [ ]

Person	Relationship to interviewee	M/F	Age
ALICE	WIFE	FEMALE	30
TENDANI	SON	MALE	10
ARETHA	DAUGHTER	FEMALE	12
DESMOND	SON	MALE	9

LAND OWNERSHIP

2.1 Do you own the irrigation plot? YES [X] NO [ ]

Is the plot registered in your name? YES [X] NO [ ]

If no, who is the owner?

....

Do you have the right to occupy	
Is the plot rented	
Registered in someone else's name	

2.2 What is the area of the plot you cultivate — 1.286 ha

2.3 How many years have you been irrigating on this scheme — 8 YEA[RS]

2.4 Do you also cultivate rainfed land, if so what hectarage — NO

2.5 Do you keep livestock — NO

2.6 Does anyone else in your household have other land — YES

If yes,

irrigated	X	rainfed	
where	MARAXWE	where	
What area		What area	

2.7 How did you get your irrigated plot? THROUGH LOCAL COUNCIL

INCOME

3.1. Does irrigation provide for your needs in

Food	X
Cash	X

3.2.1. Which other sources of income does your household have?

N/A

3.2.2. Does your household get cash from any of the following:-

- irrigation	YES
- dryland farming	NO
- animals sold	NO
- permanent employment	NO
- casual work	NO
- a small business	NO
- remittances from relatives	YES

3.3. Which is most important for you to obtain from irrigating

Food	X
Cash	
Both equally	X

If cash is important why is that?

I have to support children and pay school fees and ascertain the family ration process.

3.4. Which two of the following are most important in creating cash needs (Please tick ONLY TWO of the boxes below)

I/we have to support children and pay school fees	X
I/we have to support other relatives	X
dryland farming does not provide enough cash	
there are not enough opportunities for casual work or for non agricultural jobs	

RESOURCES

4.1 Have you had a loan in the last 5 years? YES / NO X

If yes,

1. What was it for? .....
2. Was it easy to organise? .....
3. Tell us about any problems in getting the loan .....
4. Were you able to keep up payments? .....

If no,

1. Did you want one? YES
2. Did you have problems with any of the following :

clear information about loans	YES
access to credit institutions	YES
lack of confidence in future income	YES
family opposition	NO

5. How often did you take a loan? N/A
6. Where did you get the loan from? N/A

4.2 If you had disagreement with the family, who opposed your plans and why? .....

N/A

(please state the relationship of the main opposer to the interviewee, eg mother, husband, etc)

4.3 Apart from money, what other resources for irrigation gave you problems?

SHORTAGE OF TRACTORS AND WATER

HOUSEHOLD RESPONSIBILITIES

5.1 Do you cultivate the plot on your own

YES [X]
NO [ ]

If no,

Who helps?

Husband(s)	[ ]	Hired labour(s)	[ ]
Wife(s)	[X]	Son(s)	[X]
Old relatives	[ ]	Daughter(s)	[ ]

5.2 Who does what?: Enter the number of people in each category doing the job, indicating gender where necessary. Distribute task proportionately where necessary using 1 unit = 10%.

	HUSBAND	WIFE	SONS	DAUGHTERS	EMPLOYEES (M or F)	OTHERS
Weeding	1.5	1.3	1.1		←	1.1
Planting	1.5	1.3			←	1.2
Land Preparation	1.10					
Water application	1.10					
Maintenance						
- on farm	1.10					
- Scheme	1.10					
Harvesting	1.2	1.5			←	1.3
Post harvest processing	1.2	1.5			←	1.3
Marketing	1.10					
Dry land farming	0					
Cooking		1.10				
Domestic water provision		1.10				
Fuelwood and collection		1.10				
Animal husbandry	1.10					

6. EXPENDITURE

6.1 Who makes the decisions relating to:-

	HUSBAND	WIFE	SONS	DAUGHERS	EMPLOYEES	OTHERS
Crops planted in the irrigated plot	X					
Inputs to be purchased	X					
Labour to be hired	X					
Household labour		X				
Market Sales	X					
Farm investment	X					

Put a tick in the appropriate box. Please indicate gender and number if the answer is employees or others.

6.2 Proportion of production cost:

Inputs to be purchased	2
Labour hired	3
Household labour	0
Market sales	0
Farm investment	5

(One unit = 10%, ditribute the cost as indicated by interviewee)

6.3 Expenditure:-

	HUSBAND	WIFE	SONS	DAUGHTERS	EMPLOYEES	OTHERS
Food		X				
Education	X					
Clothing	X					
Fuel/Energy		X				
Social celebration		X				
Goods	X					

6.4 Proportion of income spent on:

Food	5
Education	3
Clothing	1
Fuel/energy	0
Social/celebrations	0
Goods	1

IRRIGATION QUESTIONNAIRE

Answer for one crop that you grow. Choose one only, if you grow more than one answer about the crop you grow most of

7.1. During which growth stage of maize/tomato/rice is water supply most critical?

Maize	Tomato	Rice
• Establishment	• Transplanting	• Transplanting
• Vegetative	• Vegetative	• Vegetative
✓ Flowering	✓ Flowering	• Flowering
• Yield formation	• Yield formation	• Yield formation
• Ripening	• Ripening	• Ripening

7.2. Can too much water applied to the field ever be a problem? YES [ ] NO [X]

7.3. Which one of the following do you consider the most important factors affecting the amount of water that should be applied to a crop.

- o crop type
- o crop stage
- o soil moisture before irrigation
- ✓ temperature
- o rainfall in previous week
- o time of day
- o interval since last irrigation of days since you last irrigate)

Why do you choose this one? Poor production

7.4. Which actions would you carry out when part of your land is waterlogged? choose one only

- o irrigate as before
- ✓ reduce the amount of water to that area
- o improve the drainage

7.5. When plants are young, would you : Choose only one.

- o apply water in the same quantity and at the same interval as for other stages
- o apply the same quantity more often
- ✓ apply a smaller amount more often
- o apply a smaller amount at the same interval
- o apply as much water as possible

Why do you say that? To prevent plant to be in waterlogged

ON YOUR IRRIGATION SYSTEM

7.6. What do you do or who do you turn to if:-

- you don't receive water on your turn

Extension officer

7.7. What do you do or who do you turn to if:-

- you do not have enough labour to plant/weed or harvest

~~Extension officer~~
Look for the Labour

7.8. What do you do or who do you turn to if:-

- you feel the canal is not working properly because of damage and major repair is needed

Water Bailiff

7.9. What do you do or who do you turn to if:-

- your neighbour will not clear his/her part of the canal or ditch

Water Bailiff

7.10 What are the advantages of this system?

It gives water where is nee ded in time

7.11 What do you not llike about the system?

The canal is not working propely if somebody infront of me closed the canal

7.12 If you could change something about the system, what would it be? List everything and give your reasons.

I've got no idea

7.13 Which type of irrigation systems do you know?

Sprinkler spray, FAROW Dripspray

7.14 Which is the best type for you and why?

FAROW → more water to the plant

EDUCATION AND EXTENSION

8.1. Have you been to school? YES [X] NO [ ]

8.2. What level did you reach? STANDARD EIGHT

8.3. How many of your children are at school? [three]

8.4. How helpful was your schooling for your life as an irrigating farmer? Choose only one.

Yes, but not directly	[NO]
Yes, I learnt something about farming	[ ]
No, it was not useful	[ ]
I learnt about water control	[ ]

8.5 How often do you speak to an extension officer?

Several times a year [X] Once a year [ ] Not at all [ ]

8.6. What do you talk about most?

The shortage of tractor & water
How to control disease & pests

8.7 If you get advice on any of the following, from whom do you get it?

water application methods	FO
what to do if water is scarce	FO
when to irrigate	FO
crop choice	FO
fertilizer use	FO
disease control	FO
harvesting	SEH
processing	SEH
marketing	SEH
financial management of scheme. From whom?	SEH

8.8. Do you visit demonstration plots?

No:	- not relevant	X
	- too far away/I am too busy	
Yes I do		

8.9. Would you prefer your extension officer to be a man or a woman? M [ ] F [ ] Don't mind [X]

Can you explain why you feel that way?

As long as he/she learn

8.10 What plans do you have for improving overall production on your farm?

I plan to be a businessman

COMMUNITY AND GENDER ISSUES

9.1. Are you a member of an irrigating farmers group or water users association? YES [ ] NO [X]

Which one?.....

If no, why not?

I was not present that time when the committee is selected. But I know a little bit about the committee I can tell something about it

If yes, is the group composed of

A Men only
B Mostly men
✓C Equal numbers of men and women
D Mostly women
E Women only

9.2. Do men and women contribute differently within a group? YES [X] NO [ ]

If yes, can you explain this.

Men contribute more, higher than women. Women are just relaxing without thinking of a thing. After a time she opposed.

9.3. Indicate for the listed activities who makes the decisions, who does the work and who you think should decide. Enter A, B, C, D or E according to Question 1 classification, enter 0 if activity is not undertaken.

Group Activities	Who makes decisions	Who does the work	Who would be best to decide
Water sharing	C	C	C
Maintenance of canals	C	C	C
Fee collection	A	A	A
Formulating rules and by-laws	C	C	C
Resolving conflicts within group	D	D	D
with other groups (.....)	A	C	C
Group decisions on crops	A	C	C
Marketing activities	B	B	B
Other activities : specify			
.....			
.....			

A Men only
B Mostly men
C Equal numbers of men and women
D Mostly women
E Women only

9.4. Would you like more influence on the committee? YES [X] NO [ ]

Why?
TO AVOID CONFLICT

9.5. If you were able to participate in making decisions about how irrigation is organised, how would that benefit you?
EQUAL WATER SHARING DURING THE TIME IN IRRIGATION SYSTEM

9.6. Would you like more technical understanding of how to control irrigation water? NO

on your field [ ]
in the irrigation scheme as a whole [ ]

Why?
N/A

9.7. How does irrigation affect other people in the community who do not irrigate?
POOR WATER USAGE

Would you say it was:-

a source of employment	YES
a source of fresh vegetables	YES
a source of staple food	YES
source of disease	YES
competes for water otherwise needed for domestic or animals	YES
competition for labour	NO

9.8. How has irrigation affected women?
WOMEN WORK LONGER HOURS, SHE WANTS TO GETS MORE FOOD FOR THE CHILDREN

Do you agree with any of these statements:	YES	NO
Women work longer hours	X	
Women have more food for their children	X	

	YES	NO
Women have less access to land than before	X	
Women are more dependant on their husbands		X
Women have less opportunities to earn some income of their own		X

TOTAL P. 13

9.9 Would you like your daughter to be an irrigator?

YES	NO
X	

Why?

She wants here to be one of the irrigator because there is a shortage of the number of the irrigation people

9.10 Would you like your son to be an irrigator?

YES	NO
X	

Why?

He learn more about how to produce a product. This lead to a higher income and also improve standard of living.

GROUP/ KEY INFORMANT INTERVIEWS

It is useful to have a number of standard topics from which to expand to the issues which are specific to the scheme under discussion. Information from key informants can be merged to form an overview later but lacks the spontaneous responses which can give insight to the relationships which exist between holders of different points of view. Where groups are used they should consist of at least one representative of the scheme management, one extension officer, one farmer committee member and two women farmers. It is probably best to limit numbers to no more than eight, of whom two are yourself and another recorder. It is a good strategy to record only what the group agrees upon on each issue and to add personal observations later.

1. Are women happy with their current role in irrigation?

In view of the number of female respondents who assert that they work harder, have less chance to earn their own money and are more dependant on their husbands, it is reasonable to say there is evidence of dissatisfaction. Do people agree with this assessment?

Lead on to elicit suggestions for change, and build on any advantages such as better food supply for the family.

2. What problems arise relating to irrigation work? Issues such as the time taken to apply water, the timing of attendance to equipment in the field, or the physical effort involved in tasks, may be important.

Problems relating to conflict with women's existing workload should be discussed and hopefully lead to suggested solutions.

3. What changes would help women? If no discussion is forthcoming suggest areas for discussion such as management, credit, decision making in crop choice etc.,

4. When this irrigation scheme was set up, were women consulted? If the answer is no, would things have been different if women had been asked ? In what way? If yes what good features have resulted from their involvement.

5. Women have indicated that they are keen to understand better how irrigation schemes work and to participate in the control and allocation of water. What skills do women bring with them? What training are women going to need? How can this be achieved, given that women already have many calls on their time? What would be the best format, or how can the best format be determined? Day courses or videos or demonstrations or what?

6. What are the likely advantages women would benefit from if they participated more in irrigation scheme management ?

7. If women increase participation in water management and the result is increased income per hectare of irrigation, will women benefit in relation to the extra effort they make? Ask for justification of the answer.

8. What are the main factors which constrain women from being active on water user groups and farmer management committees? Are these constraints likely to be reduced by training or are fundamental changes needed in the constitutions of irrigation committees?

9. What does the committee on this scheme do ? Does it take part in decisions relating to water allocation, maintenance, input provision, fee collection, discipline among water users through formulation of bye-laws, allocation of irrigated land, etc.?
Who votes for the committee, who stands for election, how often are elections held ? Do women have the same rights as men? Are women on the committee ? How many ? What role do they play and what are they good at?

10 . What stops women participating more? How could it be made easier for women to take part?

11. Women tend to stay at their homes more than men because of their family responsibilities. If women took a greater part in irrigation scheme operation and management, would schemes be more sustainable?

12. If women were motivated to put more effort into irrigation by receiving a fair share of profits, do you think irrigation would generate higher incomes than at present ? Please explain why you think this.

Appendix 3.2

South African Scheme Backgrounds

Women in Irrigation

Agricultural Research Council
Institute for Agricultural Engineering

A BACKGROUND REPORT ON

VEEPLAATS IRRIGATION SCHEME

SOUTH AFRICA - NORTHERN PROVINCE
(FORMER LEBOWA)

Compiled by:

Chris Stimie
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Willem van Rooyen

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Fax. no.: (012) 804-0753

April 1996

1. *SYSTEM*

1.1 Physical system

Veeplaats Irrigation Scheme is situated next to the road between Pietersburg and Stoffberg, at the Olifantsriver.

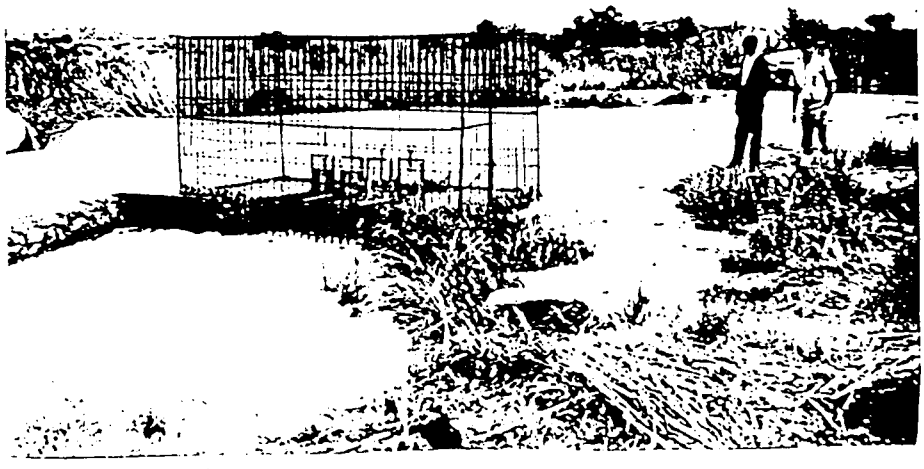
1.1.1 Source

The water for the Veeplaats Irrigation Scheme is provided by the Piet Gouws Dam. The dam is usually filled during each rainy season.

The overflow of the Piet Gouws Dam

1.1.2 Intake type

Water from the dam is let out into a river with pipes through the dam wall. A weir in the river, approximately 3 km further downstream diverts irrigation water for the scheme into a concrete canal. This canal is approximately 7 km long. The volume of water can be measured at the outlets of the pipes, but an annual volume is not known. Reservoir dams on the scheme are filled with water from the canal.



The weir diverts water from the river to the canal

Reservoir from which irrigation takes place

1.1.3 Irrigation type

About 410 ha are under irrigation. The total number of farmers is 179, of which 104 farmers use portable sprinkler systems and three centre pivots provide 75 farmers with irrigation water. Two pivots cover 60 ha each, and the other, 30 ha. The portable sprinkler system (hop-along) is responsible for irrigating 260 ha. The average holding area (per farmer) is calculated at 2,5 ha. About 50 % of the farmers are women.

A pumpstation for sprinkler irrigation

1.2 Typical problems

1.2.1 Regular electricity breakdowns result in poor water distribution management.

1.2.2 A large number of the farmers are part-time farmers and do not depend on the farm for an income, therefore the full potential of output is not achieved.

1.2.3 The irrigation scheme is far away from where the farmers live. Thus, traveling time consumes a fair number of daylight hours.

1.2.4 The chief has the responsibility of distributing land to the applicants. This may result in unequal and unwanted circumstances.

1.3 Management

Management of the scheme is done by the Lebowa Agricultural Corporation (LAC). Water distribution management is done on scheduled areas with a 3,5 day cycle.

2. *PERFORMANCE ASSESSMENT*

2.1 Co-operation

The co-operation between farmers is generally good. The moving of pipes between farmers is a potential cause for arguments. The pipes are moved by the farmers themselves, and naturally, this does not always take place on schedule. The next farmer, therefore, has a shorter standtime and, as a result, receives less water.

The farmer / agency relationship is good. During harvest, friction occurs over crop prices. The farmers feel that the agency is not paying a market-related price, because the farmer's debt for input costs is deducted by the agency before payment.

2.2 Maintenance

All maintenance on pump equipment, canals, pipes and electricity is done by the LAC.

2.3 Trend

Farming activities and production are increasing. However, the cotton cultivation is neglected. Most of the cotton farmers are part-time farmers and show little or no interest, because farming is not their main source of income.

3. *CROP PRODUCTION*

3.1 Crop calender

Maize is produced in summer, while wheat is grown in winter. Cotton is planted under irrigation from the centre pivot in summer. If the season allows for the cotton to be harvested before the planting date for the winter season, wheat is produced in winter.

3.2 Yield

Maize	3-4 t/ha
Wheat	3 t/ha
Cotton	2,5 t/ha

3.3 Marketing

LAC uses the Northern Transvaal Co-operative (NTC) to market products. The Co-operative is well developed in the Northern Transvaal, and is supported by most commercial farmers in the area.

3.4 Climate

The climate of the surrounding area may be described as warm with enough rain until the end of January. Climatic zone: Bushveld. The area around the scheme is fairly densely populated.

3.5 Inputs

The farmers are able to obtain all inputs from the LAC. Seeds, fertilizer, chemicals, harvesting and planting equipment are obtained on credit and paid for from the yield at the end of the season.

3.6 Labour

Most of the farmers have other jobs and only farm part-time. The dense population provides for labour availability when extra labourers are needed during harvesting or planting times.

3.7 Education

The owners of the land are mostly teachers, Government officials etc. and are therefore well educated. The workers on the fields, mostly women, are not well educated.

4. *INSTITUTIONAL ARRANGEMENTS ON SCHEME*

4.1 Committee structure

The farmers get right-to-occupy (RTO) by paying an annual rent for irrigated land. The local chief is mainly responsible for issuing RTO's. A representative of each block is elected by the farmers in that particular block to represent them on the committee. The committee comprises farmers, the chief and his staff, and representatives from the LAC. Currently, 6 women and 1 man represent the farmers on the committee.

This committee's primary task is to form the link between the farmers and the managing agency, the LAC. The elected people are mostly the hardworking farmers. However, well educated people are elected for superior positions.

5. *SOCIAL CHARACTERISTICS*

5.1 Language

The people in this region speak Northern-Sotho. Some farmers are speak English and / or Afrikaans, mainly because of their education level, and the older farmers learned these languages from their previous working experiences at large commercial farms.

5.2 Influences

5.2.1 Religions

Religious practices do not influence productivity. The farmers are willing to work on Sundays, when necessary.

5.2.2 Tradition

The traditional farming system is still widely accepted, and the farmers have difficulty in adopting modern farming methods.

6. *GENERAL DEVELOPMENT*

Other irrigation schemes in the area: Wonderboom Irrigation Scheme and Olifantsrivier Irrigation Scheme. Both scheme's are managed by the LAC.

The Wonderboom Scheme is smaller and more effective in relation to Veeplaats, because the farmers live on their land and are therefore much closer to farming activity.

The Olifantsrivier Scheme is much larger and more widely spread along the Olifantsrivier, from where it draws its irrigation water.

7. *CONTACT PERSON*

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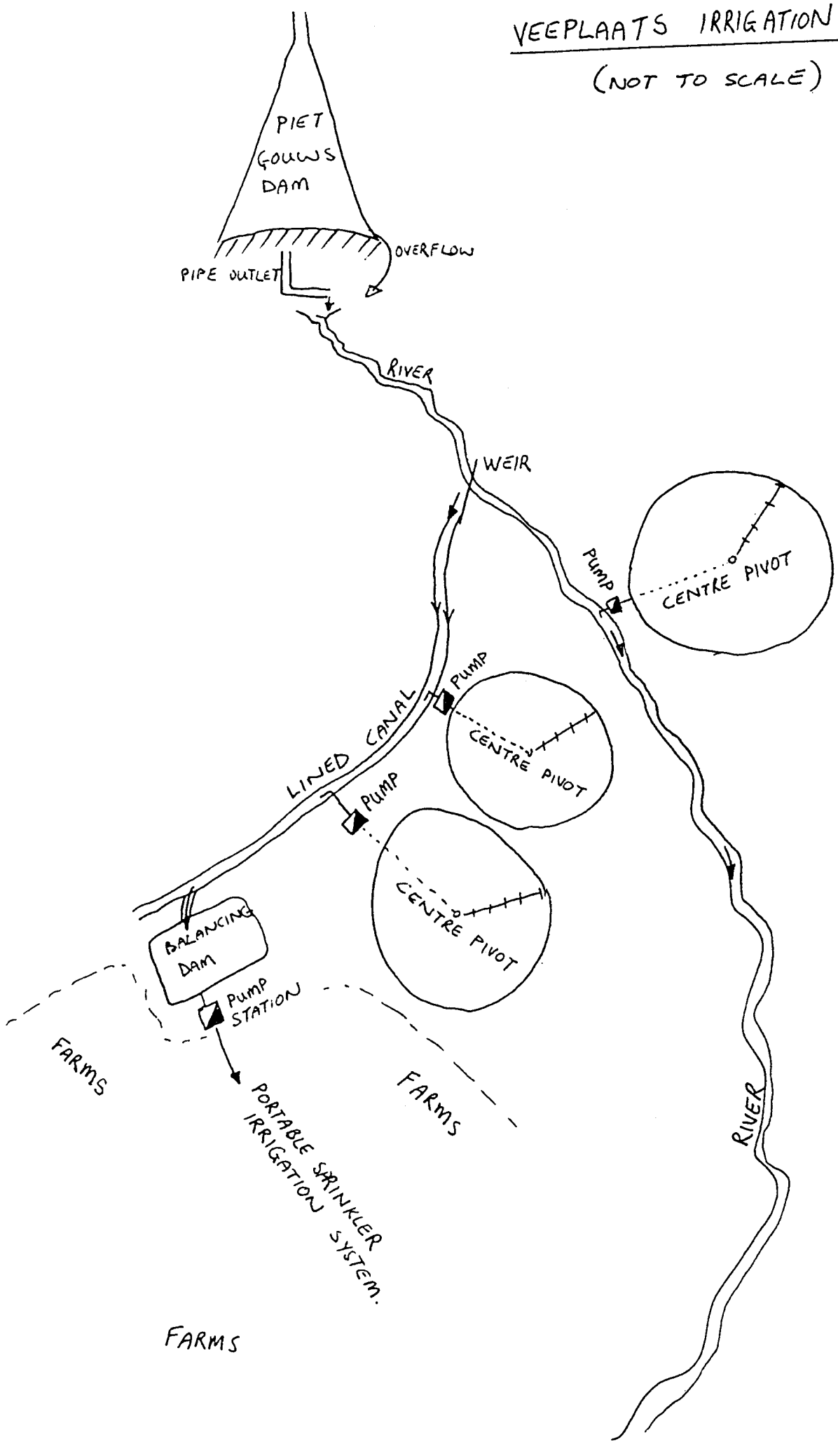
SCHEMATIC ILLUSTRATION OF THE

VEEPLAATS IRRIGATION SCHEME.

(NOT TO SCALE)



Women in Irrigation

Agricultural Research Council
Institute for Agricultural Engineering

A BACKGROUND REPORT ON THE

MALAVUWE IRRIGATION SCHEME

SOUTH AFRICA - NORTHERN PROVINCE
(VENDA REGION)

Compiled by:

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April 1996

1. *PHYSICAL SYSTEM*

The Malavuwe irrigation scheme is about 40 km North-East of Thohoyandou, next to the Mutshindudi river. Malavuwe is a relatively small irrigation scheme, designed and managed by Agriven. It uses an electric pump for pressure to operate the dragline sprinkler system. (See the diagrammatic sketch for the layout of the scheme.)

The entrance of the scheme

1.1 Water source

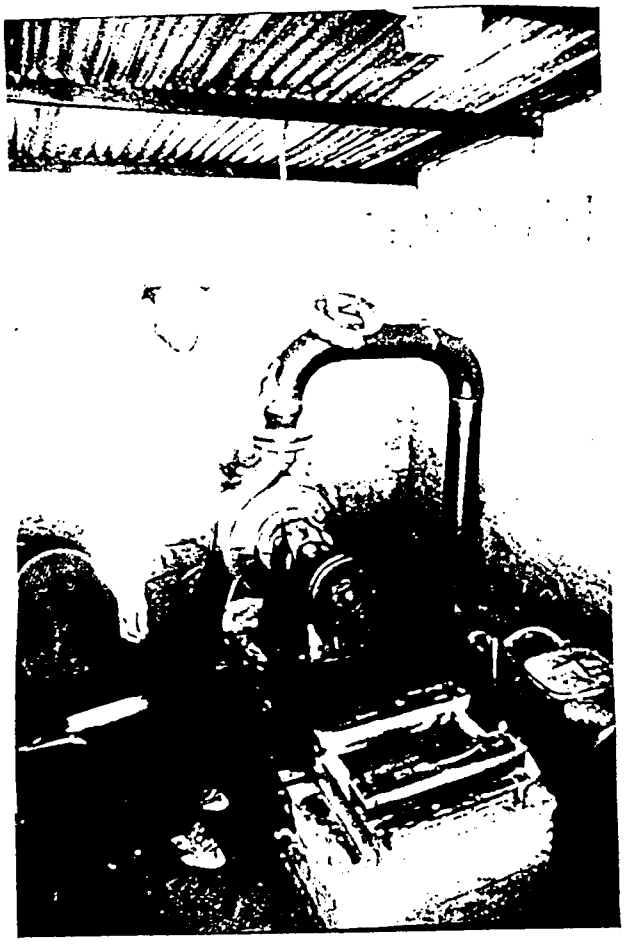
Water is pumped from the Mutshindudi river. The pump is situated on the bank of the river about 6 m above the normal river level. The end of the suction pipe is suspended in the stream without any special structure.

No control is exercised over pumping volumes and it seems that the pump runs daily except in wet weather. Provision was made for a flow meter in the pipework but it has not been installed.

1.2 Irrigation system

The system was designed and installed by Agriven and consists of the following:

- a directly coupled centrifugal pump and electric motor.
- a buried pipe network for the distribution of water.
- 9 hydrants per ha with hydromatic valves.
- 9 x 36 m draglines per ha.



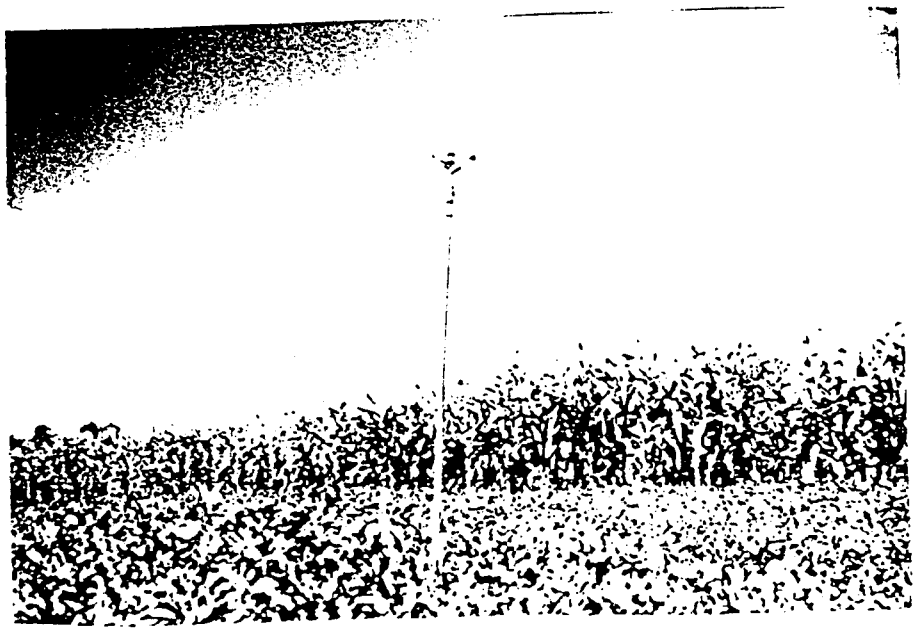
The pumphouse at Malavuwe

1.3 Scheme outlay

The total area of the scheme is 25 ha of which 22,5 ha is irrigated and the rest is taken up by roads, the co-operative and office area.

There are 24 farmers on the scheme of which 22 are women. The following table shows the distribution of holdings to farmers.

Number of farmers	Area of holding (ha)
16	1
2	0,75
6	0,25



Well established crops on a farm

1.4 Typical problems of the system

1. Flooding of the pumpstation. At the time of visit the electric motor had been taken out to be repaired after the heavy rains in February 1996.

2. Sand is sometimes sucked into the system which then blocks the sprinklers at the furthest end. This does not seem to cause a major disturbance.

3. Farmers are unhappy about the high electricity bill. With correct scheduling, a significant cost-saving could very likely be realized.

4. The availability of tractors for ploughing is also a serious problem. This is due, not only to the numbers of tractors available, but also because of the ploughing services operating system. For example, if the tractors cannot plough a field in a particular week because of rain, that field will not be ploughed, because the tractors are booked somewhere else the following week.

1.5 Management

Farmers make their own decisions but in close consultation with the Agriven officials. At least one official is at the scheme daily during working hours. The Agriven co-operative (shop) on the scheme provides all inputs for farming and this is managed by the scheme officials. Farmers would usually choose from the variety of seeds or plants available at the co-operative.

1.6 Operation

All sprinklers operate at the same time, five days a week and, when it is very hot, six days a week. The normal return cycle for irrigation is 3,5 days.

Farmers receive water on demand, but use a fixed cycle to irrigate their crops.

2. *PERFORMANCE*

2.1 Adequacy of supply

The information available is inadequate to calculate the water supply parameters.

2.2 Co-operation

The co-operation between farmers is good and they seem to work as a team. The co-operation between farmers and Agriven is also good. Some friction exists between the farmers and the Venda Electricity Corporation because of the high electricity cost.

2.3 Maintenance

Agriven does all maintenance on the pump and main pipe lines. Farmers are responsible for the maintenance of the drag lines and sprinklers.

2.4 Income

The gross margin seems to be increasing as the farmers gain experience.

3. *CROPS*

Farmers choose crops from the list of available crops from Agriven and seem to be satisfied with the arrangement.

The following table gives an indication of the crops cultivated.

Main crops	Total area (ha)	Total irrigated area %	Estimated average yield/ha.	Average gross margin R/ha
Maize	11	50	5 t/ha	2000
Groundnuts	5,5	25	28 Bags/ha	2 800
Vegetables	5,5	25	*	*

* Different between farms, because of farming skills

3.1 Crop calender

Maize is planted in summer, and vegetables, in winter.

3.2 Marketing

Only individual marketing is done at the local community. All products are sold locally, but chillies do find their way to Johannesburg, occasionally.

4. *SURROUNDING AREA*

The climate in this region is hot to very hot. Stock farming is the main agricultural activity but a few gardens are found along the river.

The population density is low and people live in small villages and not on schemes like Malavuwe.

4.1 Agribusiness

As Agriven supplies all inputs ploughing and advisory services no outside agribusiness takes place at Malavuwe.

4.2 Non-farm income

Farmers are occupied full time on their farms, but some do receive pensions.

4.3 Labour

No labour shortages occur.

4.4 Education

The literacy status of farmers is low. Informal technical training, in terms of looking after sprinklers, pipes, and input production is provided to farmers by Agriven.

5. *INSTITUTIONAL ASPECTS*

5.1 Land tenure

Farmers have right-to-occupy (RTO) "ownership". They pay rent to the local council for the land. The tribal authority made the land available to the local council and also issues the RTO'S.

5.2 Farmer committee

The farmer committee is elected each year and comprises 7 members. In 1995, five members were women, and two were men. However in 1996 all seven are women. All the farmers on the scheme have more on less the same social standing and education.

5.3 Gender differences

Because women are by far the majority, they have much more influence than the male farmers.

6. *SOCIAL ASPECTS*

6.1 Language

Venda is generally spoken, with some Afrikaans as well.

6.2 Traditional farming

The farming method with sprinklers is relatively new, but Agriven provides on-field assistance.

6.3 Religion

Religion does not seem to influence farming practices.

6.4 General development

In general, the trend seems to be towards greater success.

7. *CONTACT PERSON*

This report is largely based on the information supllied by:

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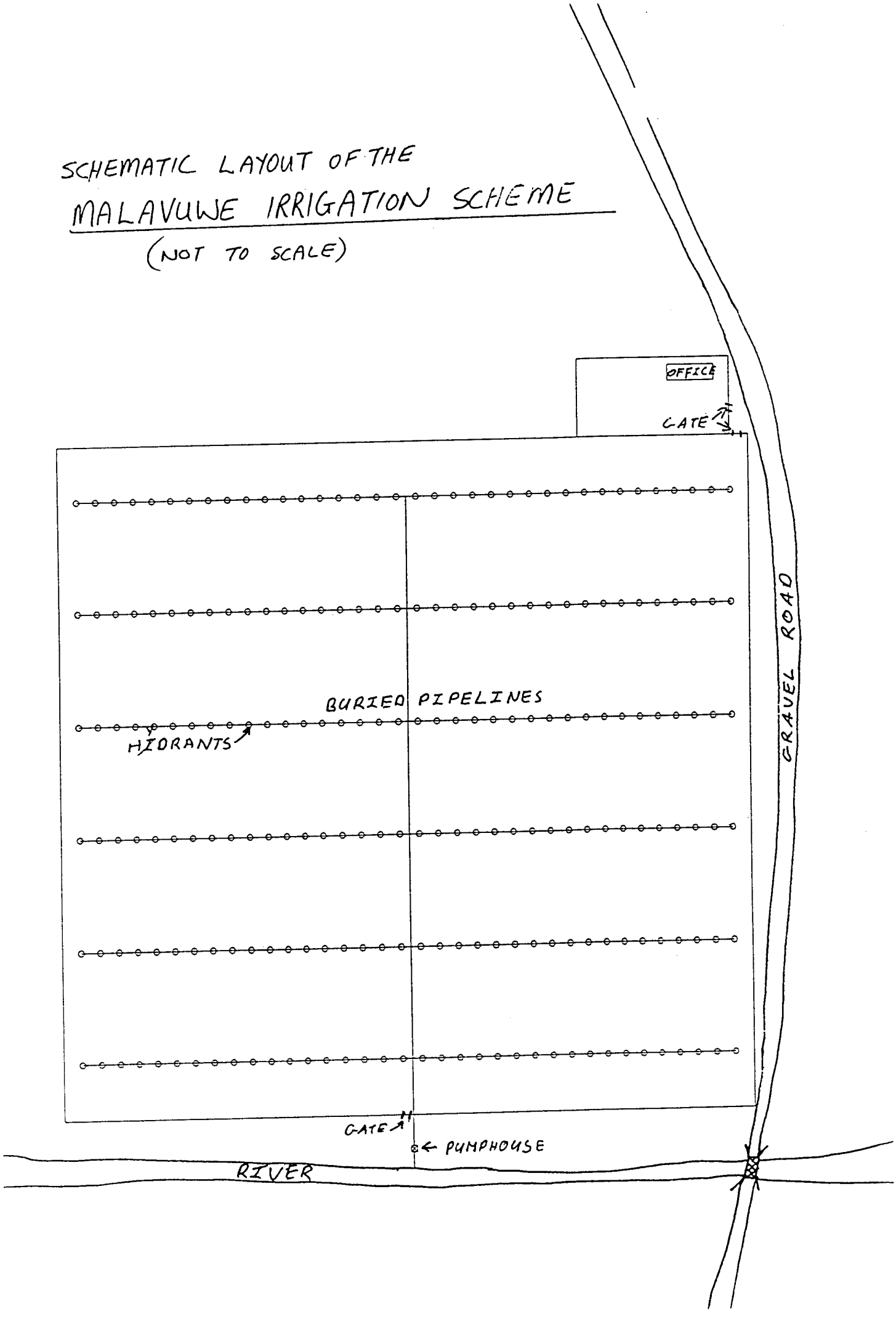
SCHEMATIC LAYOUT OF THE

MALAVUWE IRRIGATION SCHEME

(NOT TO SCALE)



Women in Irrigation

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A BACKGROUND REPORT ON

MID-LETABA IRRIGATION SCHEME

SOUTH AFRICA - NORTHERN PROVINCE
(FORMER GAZANKULU)

Compiled by:

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Willem van Rooyen

Tel. no.: (012) 804-1540
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April 1996

1. *SYSTEM*

1.1 Physical system

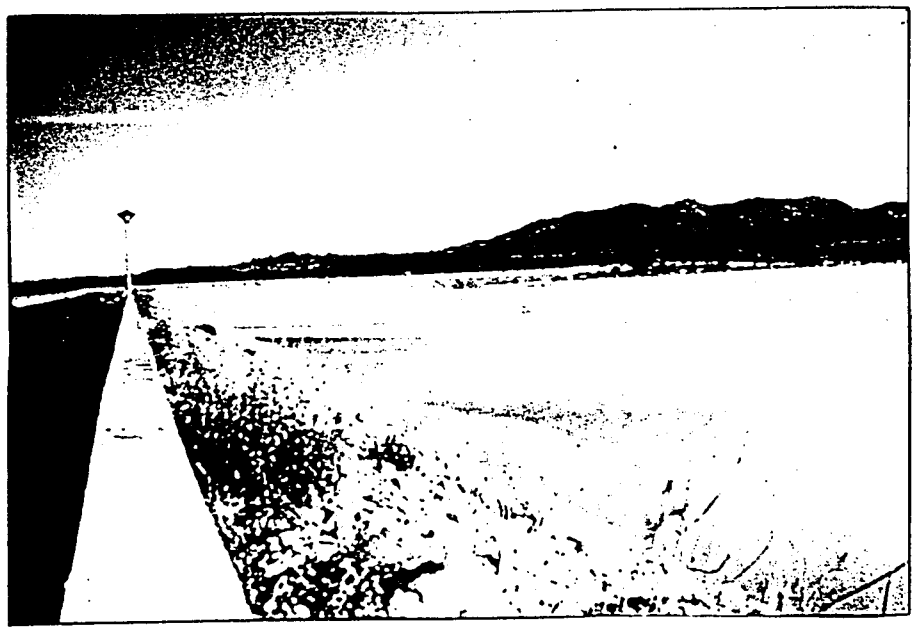
The Mid-Letaba Irrigation Scheme is situated on both sides of the road from Giyani to Louis Trichardt, approximately 30 km from Giyani.

The scheme consists of three different schemes. The Homu Scheme, Bend Scheme and the Hlaneki Scheme. (See schematic layout of the scheme.)

1.1.1 Source

The background report consists mainly of information gathered from the Hlaneki Scheme.

The water for the Mid-Letaba Irrigation Scheme is provided by the Mid-Letaba Dam. This year, in March 1996, approximately the dam was 90 % full, and for the first time, more than 50 % full since it was built in 1983. It is predicted that no water restrictions will be implemented for the next four years.

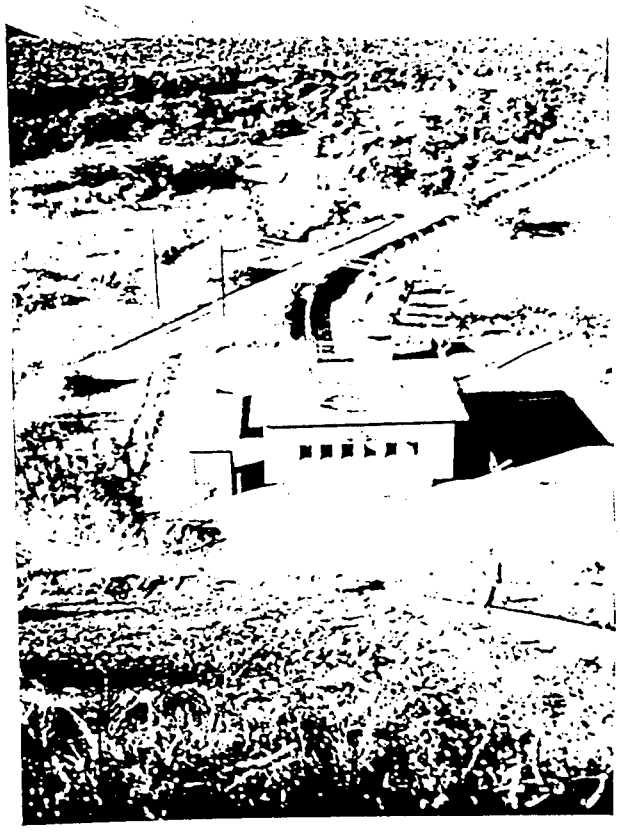


The Mid Lethaba Dam

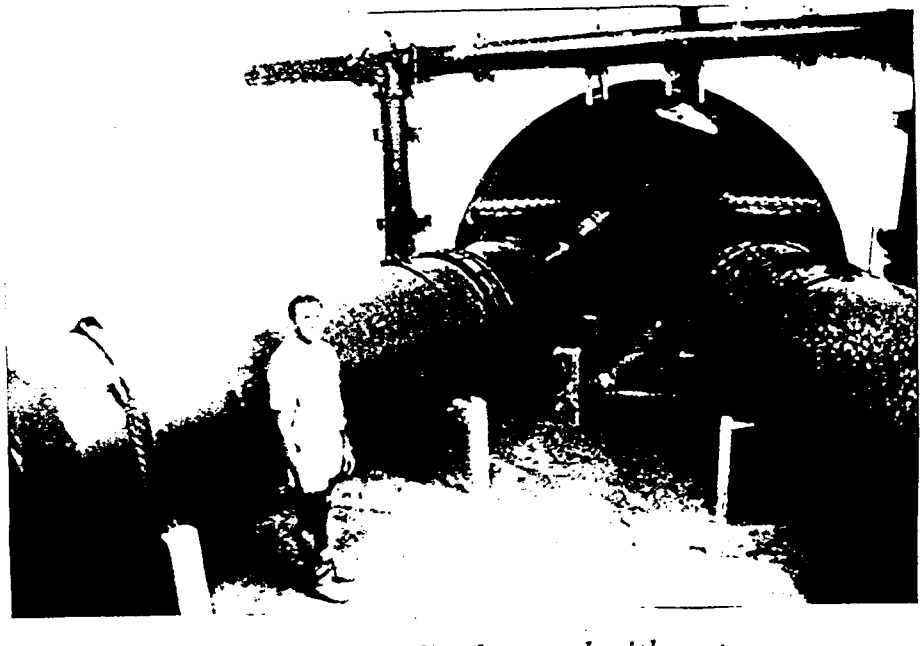
1.1.2 Intake type

A controlled pipe outlet feeds the lined canal which leads to the irrigation schemes. Three cement-lined balancing dams are used to manage the water distribution between three irrigation schemes. The total length of the lined canal of the Mid-Letaba Irrigation Scheme, from the source, to the three different schemes, is approximately 70 km. Adequate facilities are available to

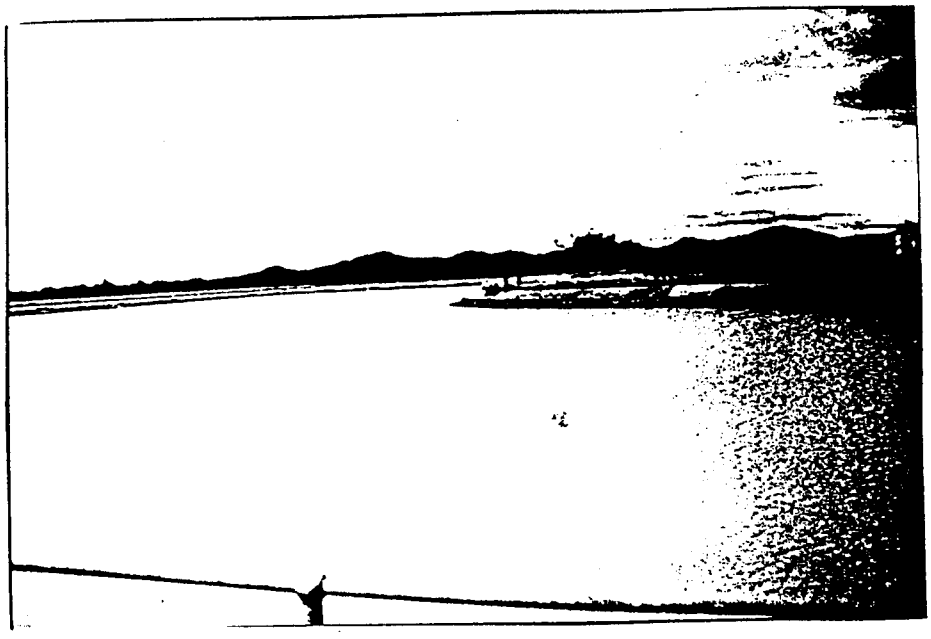
measure the flow of water in the canal, but they are not in use. Therefore, no annual volume is known. There are 14 pump-stations on the Hlaneki Scheme.



The controlled pipe outlet seen from the dam wall



The pipe outlet provides the canal with water



Balancing dam

A valve controlling volumes water in the main canal

1.1.3 Irrigation type

The total area under irrigation in the Hlaneki Scheme is 396 ha. There are 61 farmers on the scheme, of which less than 10 are women. The average irrigated area, per farmer, is estimated at 5 ha.

Various types of irrigation methods are practised on the scheme. A micro-irrigation system is used to irrigate 5 ha of mango trees. There is one centre pivot on the scheme, belonging to the chief, who has 60 ha of irrigated land. Furrow irrigation is used in some cases, where tomatoes are produced. However the main irrigation method, which is used to irrigate 70 % of a average farmer's land, is a portable sprinkler system.

Mango plantation being irrigated

A typical scheme on a farm

One of the 14 pump stations at Hlaneki

1.2 Typical problems

1.2.1 In previous years, farmers could only irrigate a one third of their land, due to a water shortage.

1.2.2 In some cases, flooding occured during 1996. The rainfall was exceptionally high and the wet season much longer than normal.

1.2.3 The repairing of mechanical equipment (tractors, pumps etc) takes a long time, because permission must be obtained from the Government. This lengthy procedure adversely influences farming productivity.

1.2.4 Most of the farmers are part-time farmers and do not depend on the farm for an income, therefore full potential farming output is not achieved.

1.2.5 Farmer Days, organized by the Government, where farming education and exchange of information takes place, are not supported by the farmers.

1.2.6 Farming is not considered as a promising career by the youth.

1.2.7 The Government support, supplying tractors to farmers was stopped, and this led to a shortage of available tractors.

1.2.8 Pests, diseases and weeds are a general problem.

1.2.9 Financing schemes are not available to enable the farmers to buy inputs.

1.3 Management

Management of the scheme is done by the Provincial Department of Agriculture. Water under pressure is available by individual demand.

2. *PERFORMANCE ASSESSMENT*

2.1 Co-operation

The co-operation between farmers is good. The occassional theft of draglines and pipes causes friction between neighbouring farmers.

The farmer / Government relationship is considered good by the Government. However, the Government officials lose confidence in the farmers, due to their inability to be independent. The farmers continuously rely on the Government for all forms of support.

2.2 Maintenance

All maintenance is done by the Government. Some of the farmers do not even go to the trouble of cleaning their own blocked sprinklers. The Government handles minor repairs on pipes and pumps but major repairs are contracted out to private companies.

2.3 Trend

The production trend is generally increasing, especially tomatoes, because of the upward trend in the market.

3. *CROP PRODUCTION*

3.1 Crop calender

There is no specific crop calender. Different crops are planted throughout the year, according to the climate.

3.2 Yield

The main crop is tomatoes, and covers about 80 % of the total irrigated area. The estimated yield is 2 000 boxes/ha. Other irrigated crops are maize and vegetables. Mangos are also produced.

3.3 Marketing

Individual marketing is done by the farmers in order to market their produce. A number of farmers make use of a marketing agent. In order to be able to pay the high cost of transporting tomatoes, for example, to distant markets, farmers will form a group and hire a truck, thus keeping the costs low and affordable. Women sell other produce next to the road, or in town. Government co-ops market maize and wheat. The remainder of the produce is sold locally, by hawkers.

3.4 Climate

The climate of the surrounding area can be described as warm and dry with fertile soils. Climatic zone: Lowveld, almost sub-tropical.

A weather station at the Co-op is equipped with a rain gauge and a class A-evaporation pan. Readings are taken daily, but cannot be considered as accurate, because of the imperfect placing of the equipment.

3.5 Inputs

All inputs are provided by the Co-op. Advisory services are done free of charge by the Government. The offices of the extention officers are at the Co-op. A few independent farmers buy their inputs from the private sector, and do their own repairs on the irrigation sytem.

3.6 Labour

There are no labour shortages during the year. For example, on a 18 ha farm, 24 permanent and 3 seasonal labourers are employed.

3.7 Education

Most of the farmers have other permanent jobs, e.g. teachers and Governments officials. Most women are teachers and housewives.

The current literacy status of the farmers can be considered as good, because of their education. Due to the fact that these farmers are not really interested in farming, their irrigation-related skills are poor.

4. *INSTITUTIONAL ARRANGEMENTS ON SCHEME*

4.1 Committee structure

The farmers get permission-to-occupy (P.T.O.) on irrigated land, and are renting the land. The Government receives 60 % of the rent, and the other 40 % goes to the tribal authority. (Rent is ± R200/ha). P.T.O. is handled by the Board. The Board comprises the chief and the headmen. The chief has the final decision in the issuing the P.T.O.

The farmer committee is elected by the farmers and comprises men only. The general trend, is to vote for the teachers and Government officials, because they are seen as more influential.

5. *SOCIAL CHARACTERISTICS*

5.1 Language

The people in this region speak Tshonga or Shangaan. Some people speak English and / or Afrikaans, because of their education level and their schooling.

5.2 Influences

5.2.1 Religious

Religious practices do not influence productivity.

5.2.2 Tradition

The traditional farming methods are still well accepted. Mechanisation plays an important part in modernisation of farming methods.

6. *GENERAL DEVELOPMENT*

The Mid Lethaba Irrigation Scheme consists of the Hlaneki-, Homu- and the Bend Irrigation Scheme.

The Homu Scheme is the smallest prodicing mainly bananas. The Hlaneki Scheme is the largest of the three. About 100 ha of the Hlaneki Scheme is rented by Anglo American, on a permanent basis for the production of bananas. The Bend Scheme is used for the production of mangos, bananas and cash crops.

7. *CONTACT PERSON*

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GUETTE NKONYANE - TECHNICIAN
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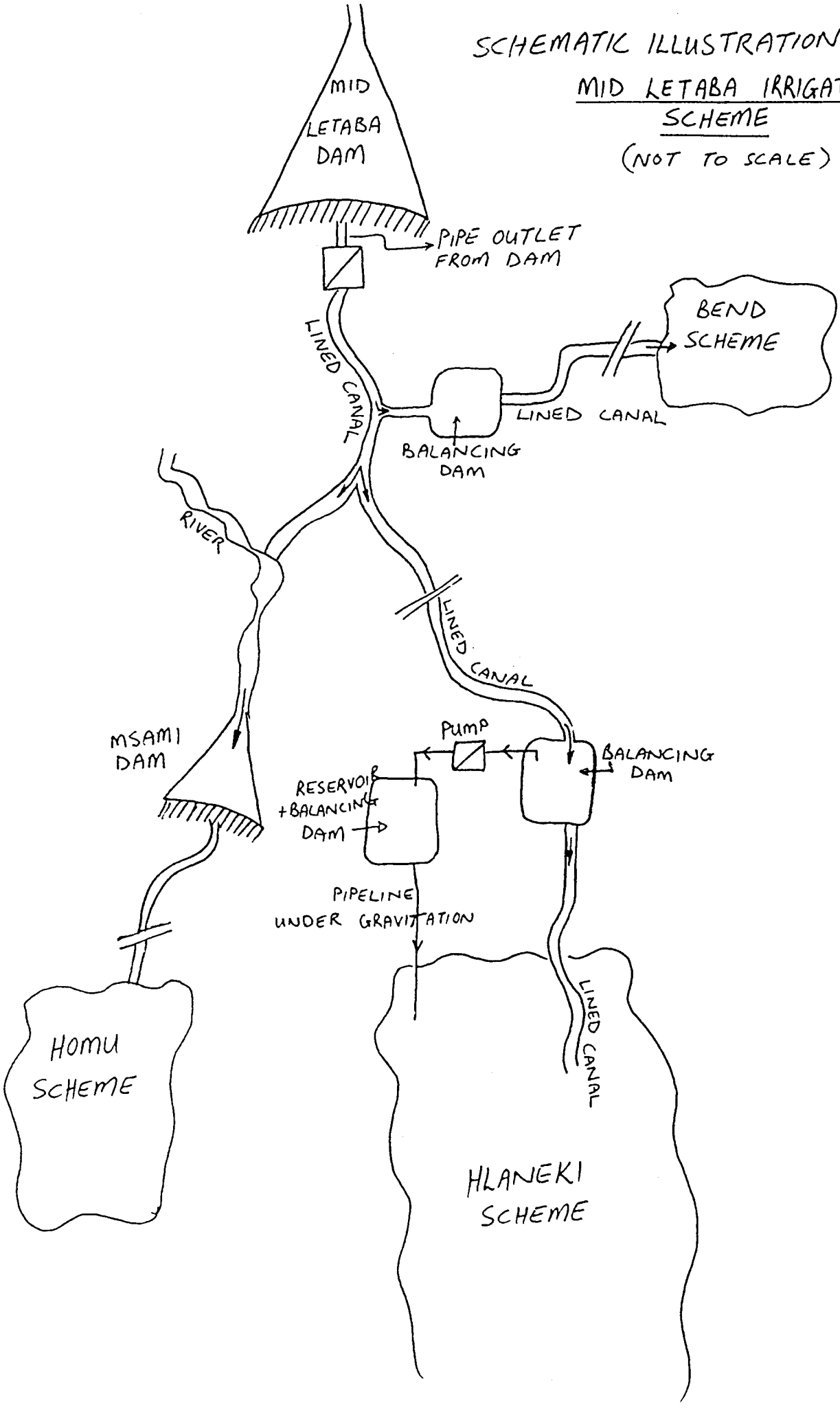
SCHEMATIC ILLUSTRATION OF THE MID LETABA IRRIGATION SCHEME

(NOT TO SCALE)



Women in Irrigation

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A BACKGROUND REPORT ON THE

TSHIOMBO IRRIGATION SCHEME

SOUTH AFRICA - NORTHERN PROVINCE
(VENDA REGION)

Compiled by:

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April 1996

1. *PHYSICAL SYSTEM*

The Tshiombo Irrigation Scheme is about 30 km North of Thohoyandou. Tshiombo is divided into 4 blocks each, of which is again divided to form 12 sub-blocks. See attached sketch for a plan view of the scheme.

1.1 Source

The Mutale river is the water source for the scheme, which was commissioned in 1963. The river is a reliable source, because it has only stopped running 3 times since 1963. Water for the scheme is conveyed in a canal which is fed by a outlet behind a concrete weir in the river. Although a licenced annual volume may exist officially, extra water is freely taken from the river, without control, thus reducing the accuracy of the official figures.

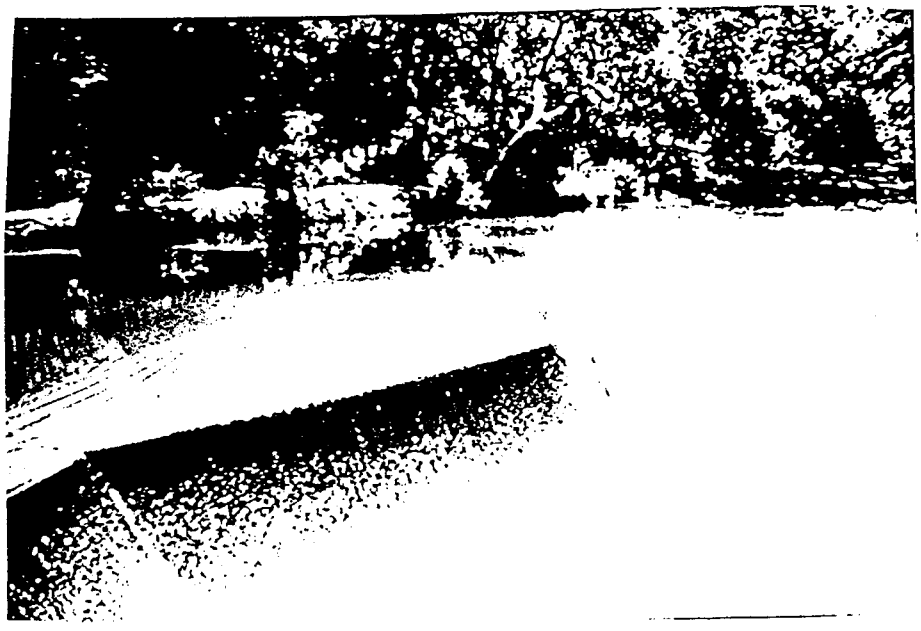
1.2 Distribution system

A concrete lined canal, about 15 km in length, conveys water from the river to the scheme. The canal feeds the smaller perpendicular, but also lined, canals about 500 m in length, which provide water to the upper end of irrigation beds. Water not drawn from these canals, returns to the river. The irrigation beds are, on average, 8 m wide and 120 m long, and are laid out to slope away from the small canal, to both sides of it. The ends of the beds are bordered by a road.

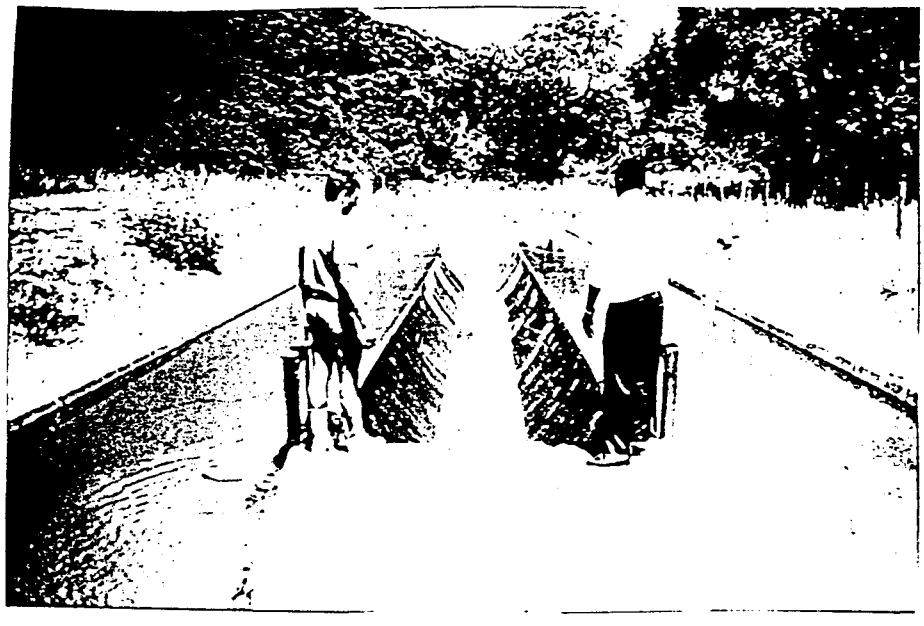
The major problem with the distribution system does not seem to be the canal capacity, but unequal distribution of water along the canal, as well as maintenance of the canal.

1.3 Irrigation system

The scheme of about 1 200 ha is irrigated with short furrow irrigation, almost without exception. The short furrows are formed by hand-made cross-furrows from the tractor-drawn long furrows. This creates furrow-basins, 6 m - 11 m long, which are filled individually by the cross-furrow and the supply furrow, which is the one remaining full length furrow on the side of the bed. This irrigation system provides much more flexibility and is less sensitive than an ordinary long furrow system. The system seems to have been developed locally at Government schemes, probably because of erratic water availability and differences in slope along beds.



The weir in the Mutale River



A part of the main canal, almost completely silted up

The total irrigated area is 1 161 ha with plots of 1,3 ha each. Each plot is divided into 10-14 irrigation beds of about 120 m x 8 m. Of the 833 farmers, 602 are men and 231 women. In Lahiff's report, a fairly detailed account of the irrigation community make-up is given. One important aspect is that it seems that most farmers do not utilize more than half of their plot of 1,3 ha. This is probable caused by lack of water, low management skills and difficult access to markets.

1.4 Typical problems

❶ Farmers lower down the canal do not get their proper share of water because farmers higher up take more than their allocation.

❷ The canal is not well maintained and is probably leaking. After the heavy rains in January, a section of the canal, close to the weir, silted up almost completely. This would greatly reduce the capacity of the canal.

❸ Unavailability of tractors is common at peak demand periods. This is not only because of shortages of tractors, but also tractors out of use because of minor problems.

❹ Tractor/implement combinations pose some problems at tractor breakdowns, because different tractors are often used with the available implements, which are not suitable.

❺ Maintenance of the main and secondary canals is not satisfactory.

❻ Most farmers are pensioners and the local youth usually look for work away from schemes.

❼ Co-ordination between the Departments of Agriculture and Water Affairs is madequate.

❽ Farmers damage the concrete structure of the canal in order to irrigate their crops, by stealing other farmers water supplies.

Balancing dam

Inlet at the balancing dam

1.5 Management

The scheme is managed by the Government. The Department of Water Affairs (DWA) is responsible for the delivery of water to the edge of the irrigation plots. The maintenance of all concrete-lined canals is the responsibility of the DWA. Blocks receive water at fixed times, but exceptions are made in hot, dry seasons.

The Department of Agriculture (DA) is responsible for the technology transfer to farmers for production of crops and management of water distribution.

The chief and his committee deal with land tenure issues.

2. *PERFORMANCE*

2.1 Water supply

No measurement of water flow or volume is done, or is available at the scheme. If measurements are needed, they may be taken at the scheme to obtain rough estimates of the flow in canals.

2.2 Co-operation

Co-operation between farmers is generally good, but friction does occur because of water distribution.

Co-operation between farmers and the extension officers is good, because the superintendent lives on the scheme.

2.3 Maintenance

The DWA maintains all concrete canals, but farmers are requested to care for secondary canals.

2.4 Income

The gross margin for the different crops are unknown, but is seems to have an increasing trend.

This canal provides farmers with irrigation water

An outlet from the main canal

3. *CROPS*

3.1 Cultivated crops

More than 70 % of the irrigated area is used for the production of maize. Other crops cultivated are groundnuts, sweet potatoes and vegetables.

3.2 Crop calender

Summer - maize
Winter - tomatoes

3.3 Marketing

Farmers market individually and locally to hawkers and the community. A recent development is contractors from Durban who collect chillies on the scheme for KwaZulu-Natal.

Tomatoes are often collectively marketed by a group of farmers to the large fresh produce markets in Gauteng.

3.4 Surrounding area

See Lahiff's report.

3.5 Agribusiness

The closest agribusiness on the scheme is the co-op which provides inputs.

3.6 Non-farm employment

The most young and middle-aged men work in big cities in Gauteng and the Northern Province. They usually send money to the family throughout the year and visit about twice a year.

Most women work in their households and irrigation plots.

3.7 Labour availability

Labour seems to be in over-supply and is mostly used for planting and harvesting.

3.8 Education

The literacy status is low amongst plot "owners".

The irrigation farmings skills of farmers vary. "Good" farmers tend to learn from farmers in the vicinity and from extension officers.

No post-harvest processing is currently done at the scheme.

4. *INSTITUTIONAL ASPECTS*

4.1 Land tenure

Plots are held with a right-to-occupy (RTO) system which is issued by the chief and his committee. Although the chief has the power to take a plot away from the tenant, this hardly ever happens.

4.2 Farmer committee

The farmer committee is elected and would typically comprise two thirds and the rest, women. Committeemembers are elected according to their farming performance, i.e., usually hardworking people, and not necessarily well-educated people.

4.3 Gender differences

Women seem to enjoy the same legal status as men, but not an equal standing socially.

4.4 Theft protection

When theft of produce is suspected, a specially-formed theft protection group would sleep in the field, in order to catch thieves red-handed.

4.5 Activity groups

Mrs Hildah T Ndou, an extension officer, handles RDP projects, which includes skills-training for women, to enable them to earn extra income.

5. *SOCIAL ASPECTS*

5.1 Language

Venda is, by far, the most common language of the area. Afrikaans is also quite common, because people used to work on big commercial farms. English would be used by the educated.

5.2 Farming system

Farmers are willing to adapt their crop production methods if they are convinced the changes are beneficial.

5.3 Religion

The traditional ancestral beliefs are still practised. Farmers usually rest on Sundays.

5.4 General development

As Lahiff comments, the scheme is probably at a critical stage, which can advance towards rejuvenation and development, or decline and degenerate.

6. *CONTACT PERSON*

This report is largely based on the information supplied by:

FRANK MUVHULAWA NETSHIDZAZE (SUPERINTENDENT)
HILDAH THIFHULUFHELWI NDOU

TSHIOMBO IRRIGATION SCHEME:

SCHEMATIC LAYOUT (NOT TO SCALE)