

USAID/World Vision, Inc.

**FINAL EVALUATION
OF THE
MORULEM IRRIGATION SCHEME
PROJECT [PHASE II (1997-2001)]**

A USAID-funded PL480 Title II Program

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LIST OF ABBREVIATIONS

ADP	Area Development Plan
AIC	African Inland Church
ALP	Arid Lands Project
ASAL	Arid and semi-arid lands
CHW	Community Health Worker
CIP	Children in Program
DAP	Development Activity Proposal; Title II Food Aid
DCDO	District Cooperative Development Officer
DLMO	District Livestock Marketing Officer
DLPO	District Livestock Production Officer
DTO	District Trade Officer
FAO	Food and Agricultural Organization
FFW	Food for work
FY	Financial Year
GOK	Government of Kenya
HA	Hectares
IGA	Income generating activities
IWC	Irrigation Water Committee
Ksh	Kenya Shillings
KG's	Kilograms
LUA	Livestock users association
MED	Micro Enterprise Development
MIS	Morulem Irrigation Scheme
MOALDM	Ministry of Agriculture, Livestock Development and Marketing
MOCD	Ministry of Cooperative Development
MT	Metric tons
MWG	Morulem Women's group
MWUA	Morulem Water Users Association
N/a	Not available
PRA	Participatory Rural Appraisal
SEC	Scheme executive committee
Shoats	Sheep and goats
STAP	South Turkana Agricultural Project (started by AIC)
TERP	Turkana Emergency Relief Program
UN	United Nations
USAID	United States Agency for International Development
VIP	Ventilated improved pit latrine
WFP	World Food Program
WVK	World Vision Kenya
WVUS	World Vision United States

EXECUTIVE SUMMARY

Morulem irrigation scheme (MIS) is situated in the Kerio river basin, in the Lokori division of the Turkana district in Kenya. The area is arid and largely inhabited by pastoralists. MIS was started in 1979 with the assistance of the African Inland Church (AIC). The church withdrew their support in 1984 and in 1990, the Morulem farmers approached World Vision to ask for assistance in the rehabilitation and expansion of the scheme. Subsequently World Vision secured DAP Title II funding from USAID for the period FY1992 to FY1994. During Phase I, existing canals on 150 acres were rehabilitated and the scheme was expanded to cover a total area of 307 acres. Not all the goals and objectives of Phase I could be achieved within the allocated time. World Vision approached USAID for a second time, requesting financial support for an additional four years.

Phase II of the Morulem Irrigation Scheme Project was approved in 1997 by USAID (Title II Resources) for the period FY1997 to FY2001. The four main objectives of the second phase of the project were:

- To increase agricultural production to achieve adequate household level grain production during years of normal rainfall to supply 80% of household food grain needs.
- To ensure that all households have sufficient land resources (increasing the minimum land holding from $\frac{1}{4}$ to $\frac{1}{2}$ acre) and yields to meet household food needs.
- To maximize the effective utilization of food among Morulem households.
- To enhance management and maintenance of scheme assets and activities by the beneficiaries.

This report summarizes the results of the Final Evaluation of Phase II of the Morulem Irrigation Scheme Project. The general *objective of the evaluation* was to determine the extent to which the original program goals and objectives of Phase II (FY1997-FY2001) were met. It was also important to identify best practices and lessons learned in order to improve the design, planning and implementation of future programs.

The Learning Process Approach was used for the evaluation. One of the planned outcomes was the production of an evaluation report. However, this was not the main focus of the exercise. Far more important was the *process* that took place during the week 16-20 July. During this week, the emphasis was on mutual learning and exchange of ideas between the evaluation team, participants and MIS staff. Key words to describe this process are: participatory, holistic, multi-disciplinary and inclusive. The evaluation was comprehensive and the team looked at resources allocated to the project, strategies and methods used during implementation, the achievements and impact of the project and its sustainability. Finally, the team reviewed the extent to which the findings of previous evaluations have been implemented.

In general the evaluation team found that MIS has been a successful project. The staff, financial and other *resources* that were allocated to the project were appropriate and adequate for project implementation. Staff training and skills development was a big priority and the quality of implementation was good. Changes were recommended for the engineering, accounting, and Nairobi staff structures. These may help to streamline the implementation of similar projects in future. The new position of DAP coordinator needs to be filled by a strong individual with good monitoring, evaluation and reporting

skills. A few problems related to staff salaries and the procurement of assets, such as for example hand-pumps were identified. The team recommended that WVK make a distinction between ADP staff members and DAP Title II project staff members in terms of their salaries and other benefits. The main motivation for this is that the skills level, accountability, responsibility and deadline requirements for these two kinds of interventions are significantly different.

The project cooperated closely with all relevant Government Departments and local NGO's throughout the life of the project. This will undoubtedly contribute towards its sustainability.

One of the strengths of this project is the continuous and meaningful participation of the farmers during all stages of planning and implementation. The project team had a flexible, learning based approach towards project planning and this made a significant contribution towards project success. This approach was also made possible by the flexibility of the donor (USAID Title II Resources). The absence of a baseline survey has hampered the monitoring and evaluation of this project and has made it very difficult to provide reliable and accurate indicator information for the Performance Indicator tracking Table. Several suggestions were made towards improving the monitoring and evaluation of future projects.

World Vision gave advice on land allocation, but did not interfere in the actual allocation process. This is one of the key issues on which the success of this project was built. By not changing or interfering with the existing social organization, World Vision harnessed the strengths of that system. The high degree of compliance to scheme by-laws is undoubtedly the result of an organizational system rooted in traditional methods of social control. The evaluation team found that the methods and strategies used to implement extension, soil management, agro-forestry, animal traction, water, health and sanitation were basically sound and testified of commitment and dedication of the project staff. A variety of strengths/best practices that could be replicated in future projects were also identified. Some problem areas were highlighted and specific recommendations were made. The most important lessons learned and recommendations are:

- Various appropriate design modifications were made to the *irrigation infrastructure* to solve specific problems and increase project sustainability
- The possibility of using furrow irrigation and combine several basins need to be investigated for future irrigation schemes
- The *extension* agents are well trained and motivated. WV should assist them to resolve some of the problems related to their relationship with the MWUA before withdrawal. In future, consideration should be given to transferring the extension agents to the SMC earlier in the life of the project, so that the SMC can 'practice' being responsible for extension before WV withdrawal
- World Vision promoted a wide variety of appropriate, sustainable and practical methods that could be used by farmers to enhance *soil fertility* and yields. For future projects, composting as an alternative for farmers with a few animals should be considered. Before withdrawal, WV needs to ensure that MWUA has a mechanism in place that will ensure that the monitoring of soil fertility and salinity continues.
- The implementation of *agro-forestry* activities was participatory. The use of multiple-use trees do not just remove the pressure from existing trees, but also serve as a source of income for farmers. The evaluation team recommends that trials, testing the suitability of *Calliandra spp.* And *Tithinia spp.* should be

- included in future projects. Bio-degradable bags for tree seedlings can also be introduced as an alternative to the black, non-degradable bags used at present.
- The selection of farmers for *animal traction* was more successful when selection was based on farmer interest and the ownership of donkeys. The evaluation team recommends that the committee be assisted with business management skills training and that linkages with ASAL be established before withdrawal. The possibility of continued support for animal traction (perhaps from the ADP) should also be investigated. Animal traction will be an important aspect of the future sustainability of the scheme. In future projects, the technology should be introduced earlier so that the farmers can get used to the idea long before the withdrawal of WV.
 - Even though *marketing and income generating* activities were not included in the key objectives of Phase II, several groups have been established and trained in small business management and technical skills. Generally the evaluation team feels that business skills, especially pricing, needs strengthening on the part of the interest groups and the SEC. Before withdrawal, WV needs to continue to establish linkages between the MWUA and potential buyers of the grain that is paid in kind as a maintenance fee.
 - A lot has been achieved during Phase II in the field of *health, nutrition and sanitation*. A specific area that needs improvement is the monitoring and evaluation of these aspects.
 - The privatization of the *handpumps* (9 in total) is a good idea, but has not progressed as expected. Future projects should ensure that potential operators are fully informed by the SMC about the positive and negative implications of the venture. There is also a need for mediation (before World Vision withdrawal) between MWUA and the Water Committee. The two parties need to establish a memorandum that spells out exactly what the responsibilities of each of the parties are. Mechanisms that can resolve the problems related to non-payment of the water fee by farmers, and the non-payment of rental fees to MWUA by the hand-pump attendants, should also be identified. World Vision also needs to assist the Pump attendants to develop a lockable system that will protect the wells against illegal withdrawal of water by non-payers.

The most significant project impacts on the farmers and surrounding area can be summarized as follows:

- The scheme has diversified (and will continue to diversify) the local economy by creating jobs (part-time and full-time) for both scheme and non-scheme members. This is happening in an area where there are no other job creators besides the Government, a few local shop owners and the missions.
- Most scheme farmers are able to produce enough grain to feed their family throughout the year. Surpluses are sold on the local market, making grain more readily available to non-scheme members than before.
- Scheme members have security of tenure with the possibility of title deeds in future. This may set the precedent for farmers who are members of other similar schemes.
- Vegetables and fruits are being sold on the local market in an area where it has never been available before.
- The large numbers of multiple-use trees planted on the scheme provides fruits and by-products that can be used by the farmers and sold on the local market. It provides the farmers with an income and makes products e.g. paw-paw, neem

available in an area where it has never been available before. Many of the tree species planted, especially the nitrogen fixing varieties, are improving and will continue to improve soil fertility in the area.

- Trees are also for sale to non-scheme members and their benefits are available to the community at large. A private tree nursery was started as a result of the scheme activities. The owner of the nursery also benefited from the technical skills taught to scheme members.
- Large numbers of community motivators and farmers have been trained in a variety of technical, management and leadership skills. These skills will continue to be of benefit to the farmers and the community at large.

The main objective of the project, namely to increase household food production so that 80% of their annual grain requirements be met, has been met and exceeded by World Vision. The average household grain production during the past year, supplied 138% of the household's grain needs. The 30% of households with the smallest land sizes (1/2 acre) managed to produce 72% of their total household grain requirements, in spite of the severe drought of the year 2000. Tenure security has been enhanced by the issuing of identity cards and land allotments registered in the name of individual farmers. During Phase II, a total 1528 farmers (300 more than originally planned) were given access to at least 0.5 acres each.

The main reasons for the consistent yield increases during the life of the project are: Consistent training in improved agricultural practices and the high adoption rates of these practices by the farmers. As a result of the encouragement given by WV, Farmers have also started to plant a greater variety of different crops and the percentage of farmers who sold cash crops increased significantly since the 1999 mid-term survey. Cow peas, green grams and tomatoes are the most important cash crops. The agro-forestry initiative in the project has been particularly successful. A total of 26,394 tree seedlings and 16,829 fruit tree (mainly paw-paw) were planted during Phase II. Two woodlots, comprising 4 acres in total were also established in the areas where the excess irrigation water drains. Significant progress has also been made in the areas of nutrition (vegetable and fruit consumption), the provision and use of water from safe sources, health and sanitation. The local economy has diversified as a result of the investment made in MIS. The project contributed towards the creation of a conservatively estimated 938 jobs (full and part-time) in the area. The number of direct beneficiaries of the jobs created is estimated at 5630.

The sustainability of the project was evaluated from four perspectives: institutional, environmental, infrastructural and financial. The evaluation team believes that a lot of effort has been invested into the training and strengthening of the organizations involved in scheme management. The team concluded that the project is institutionally, environmentally, infrastructurally and financially sustainable. A few minor concerns were identified that may need to be addressed before the end of project, to further ensure that the project will continue to function effectively after the withdrawal of World Vision.

Most of the recommendations of the Final Evaluation of Phase I and the mid-term evaluation of Phase II were implemented successfully. The evaluation team also concluded that most of the original objectives of the project were met and in some cases even exceeded. The project can therefore be regarded as successful.

CHAPTER 1: INTRODUCTION & METHODOLOGY

1.1 Introduction

The Morulem Irrigation Scheme (MIS) was started in 1979 by the residents of Morulem, with the assistance of the African Inland church (AIC). The AIC withdrew its support in 1984 and the scheme continued to function independently. By 1990, the scheme came near collapse due to shortcomings in the initial design, ineffective scheme management, lack of technical know-how and declining soil fertility. At the time, the community approached World Vision for assistance in expanding and rehabilitating the scheme. This assistance was formalized in 1992, when the first PL 480 Title II funding was approved for the program. Initial activities focused on the rehabilitation and expansion of the irrigation scheme and on providing technical assistance. Subsequent activities included the introduction of a privately funded child sponsorship program.

The most recent program period, which is the subject of the present evaluation, was approved for FY1997 to FY2001. The key objectives of this period focused on increasing household food security and institutionalizing the processes needed for the scheme to be self-sustaining in the long-term. This was to be achieved through:

- Expansion of the area under cultivation from 307 to 614 acres in order to double the land area allocated to each of the 1228 participating households.
- Technical assistance in the areas of water management, agricultural production, marketing, household nutrition and water and sanitation.
- Strengthening the scheme institutions and management.

1.2 Geographical context

The Morulem Irrigation scheme (MIS) is situated in the Lokori Division of the Turkana District in Northwestern Kenya (see Map1). It is located in the Kerio river basin and is supplied with water by the *Kerio river*. The river is seasonal and passes through a flood plain of alluvium soils for a distance of approximately 40 km's until it drains into Lake Turkana. Most of the water in the river comes from the highlands that border the *Rift Valley*. The rainfall in the Lokori division ranges between 250-500 mm per annum and the area is classified as arid and semi-desert. Average daily temperatures are 36.5 degrees C and fairly uniform throughout the year. Vegetation is sparse, except along the river margins where Acacia trees dominate. The sandy loam soils are slightly to moderately alkaline and well supplied with most nutrients, except nitrogen.

Turkana district has always been known for its nomadic pastoralists and the majority of the people in the district still largely depend on their flocks of cattle, camels, goats and sheep for survival. Despite its arid nature, the region has also been supporting dryland crop cultivation for many generations. As a result of low rainfall, this kind of crop production is confined to the flood plains along seasonal river basins. Most dryland crop producers in these areas, plant their crops in the residual moisture that is left after the river flooded its banks.

Map 2: The geographical location of the Morulem Irrigation Scheme

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1.3 Historical background of MIS

1.3.1 General

There are a number of other irrigation schemes along the same river, some of which were also started with the assistance of AIC. Of all these schemes, MIS is the most upstream. Until now, the WV Lokori ADP has been assisting some of the other schemes on a small scale. In May 2001, WVK submitted a FY2002-FY2006 DAP proposal to USAID for Title II funding to assist the schemes directly below MIS (Lokwi and Lokubae).

Table 1: Major milestones in the history of MIS

Date	Major milestone/event
1976	African Inland Church initiated South Turkana Agricultural Project (STAP)
1977	Morulem farmers started to expand (clear and level) land for dry land farming
1979	Digging of the first canals started
1982	AIC first phase, flood irrigation scheme complete: consist of 85 acres
1983	Initiation of AIC second phase of the project: scheme expanded to 150 acres;
1984	Bumper harvest: AIC withdraws its support from the project without establishing mechanisms to ensure its sustainability and expansion
1988	Community seek assistance from WVK to expand the scheme and assist with technical problems
1989 1990	WVK conducts feasibility and baseline studies
1991	Procurement of funding from USAID TITLE II Resources
1992	October 1991, initiation of First Phase: existing canals on 150 acres rehabilitated; 1228 farmers
1993	Scheme expansion from 150 acres to 307 acres
1994	First Phase complete; plot holdings per farmer increased from 1/8 to 1/4 acres; bumper harvest; final evaluation
1995/ 1996	WVK established a child sponsorship program/ADP. USAID suspends ¹ its Food Aid Title II activities in Kenya. Support to MIS reduced as a result of limited funding.
1997	Start of Phase II funded by USAID. Implementation delayed due to delayed monetization proceeds.
1999	Reorganization and accommodation of pirate farmers; farmer numbers increase from 1228 to 1528; Mid-term evaluation.
2000	Expansion of scheme from 307 acres to 764 acres complete. First harvest from Phase II plots.
2001	Construction of new inlet complete. End of Phase II. Final evaluation.

1.3.2 Phase I (FY1992 to FY1994;USAID:Title II Resources)

The initiation of the first phase started in 1992. Its main objective was to develop an effective, efficient and sustainable seasonal irrigation scheme on 614 acres. This initiative had to modernize and extend the existing scheme in order to provide 1228 farmers with a minimum of half an acre each. Other objectives included:

- To strengthen and improve the MIS management to ensure optimal water usage
- To provide MIS with the necessary agricultural technology, skills and practices in order to increase average irrigated plot productivity.
- To introduce sustainable conservation and agro-forestry practices among the scheme population.
- To promote community participation, self-reliance and empowerment through training and awareness creation.
- To drill three shallow boreholes on the MIS.

¹ The suspension was related to the taxation of Food Commodities by the GOK.

USAID Title II invested a total of US\$ 1,241,109,00 during Phase I. Towards the end of the project period, it was realized that it would not be possible to reach all these objectives within the time period allocated to the project. USAID Title II approved a project extension in principle. This would have allowed WV to complete the work started, but national events overtook them. At the time, USAID decided to suspend their Food Aid Title II activities for the whole of Kenya. The suspension was eventually lifted in the second quarter of FY1997 and World Vision managed to secure support for Phase II (FY 1997 to FY 2001) in February 1997.

1.3.3 Phase II (FY1997 to FY2001;USAID:Title II funding)

Even though the project funding was approved for FY 1997-FY2000, delays in the monetization of Title II food commodities², resulted in the first staff being appointed in the last quarter of FY1997. Actual implementation only started at the beginning of FY1998. As a result of the late start, USAID decided to extend the project period with one year, to FY2001.

The design of Phase II was based on lessons learned during Phase I and aimed to build on and complete the work started. The specific objectives and interventions of Phase II (FY1997 to FY2001) were:

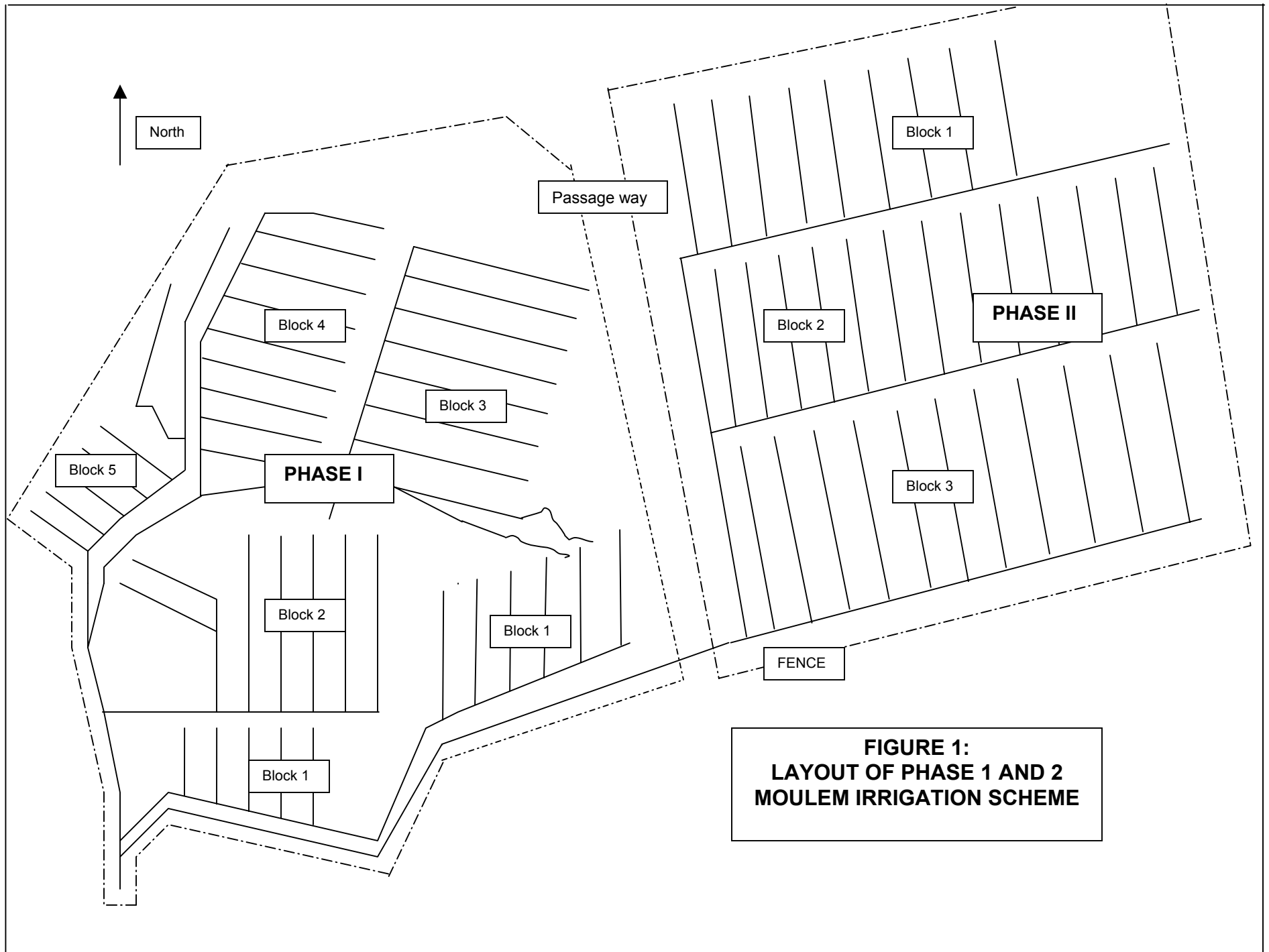
Objective one:

To increase agricultural production to achieve adequate household level grain production during years of normal rainfall to supply 80% of household food grain needs.

Main interventions aimed at achieving this objective:

1. Increase diffusion and adoption of improved agricultural practices through: farmer training, demonstrations, on-farm visits, farmer field days, visits to other irrigation schemes, dissemination of extension packages and messages to farmers and collaboration with research institutions.
2. Strengthen scheme management and maintenance institutions in the following skills: accounting record-keeping and enforcement of water by-laws.
3. Ensure that all FY97-2001 MIS activities are compliant with USAID environmental procedures. This is done through collaboration with their agencies; establishment of community wood-lots and planting of tree and fruit tree seedlings; conducting of training sessions; facilitating and promoting activities that would enhance the survival of tree/fruit seedlings; establishment of an Environmental Conservation Committee.

² Title II projects are funded through the sale of donated Title II commodities on the local market.



**FIGURE 1:
LAYOUT OF PHASE 1 AND 2
MOULEM IRRIGATION SCHEME**

Objective two:

To ensure that all households have sufficient land resources and yields to ensure adequate access to food for household needs.

Main interventions aimed at achieving this objective:

1. Training and mobilizing farmers to start with income generating activities
2. Formalizing land tenure

Objective three:

To maximize effective utilization of food among Morulem households.

Main interventions aimed at achieving this objective:

1. Training on and demonstration of four key nutritional messages
2. Improving access to clean drinking water
3. Promoting improved agricultural storage

Objective four:

To enhance management and maintenance of scheme assets and activities by the beneficiaries.

Main interventions aimed at achieving this objective:

1. Promoting farmer participation in project implementation, project review and planning sessions, surveys and meetings.
2. Providing on-going technical support to staff and farmers groups
3. Promoting networking between project, other NGOS' and Government departments.

1.4 Objectives of the final evaluation

1.4.1 General

The general objective of the final project evaluation was to determine to what extent the original program goals and objectives of Phase II (FY1997-FY2001) have been met. It was also important to identify best practices and lessons learned in order to improve the design, planning and implementation of future programs.

1.4.2 Program design

The program design was evaluated in terms of:

- The appropriateness of the activities in terms of addressing the original problems and needs in the community
- The appropriateness of the monitoring and evaluation system
- The program's ability to maximize participation and sustainability
- Appropriateness of overall annual targets, staff plan information systems, remuneration packages and budgets

1.4.3 Program implementation

The main factors considered in program implementation were:

- Strategies used to accomplish the planned activities
- Identification of the ways in which strategies had to be modified as a result of experience gained in the field.
- The suitability of the staffing and organizational structure to the demands of implementation
- An analysis of the DAP'S integration and linkages with the Lokori ADP.
- The degree and effectiveness of coordination and cooperation with appropriate Government Departments and officials

1.4.4 Quality, outcome and sustainability of specific outcomes

Other aspects considered:

- Degree to which stated objectives and intermediate results have been met
- Effectiveness of Community mobilization, participation and empowerment
- Understanding of the project staff/community members of the most important components of a sustainable approach
- An analysis of the possibilities of continued support from the Lokori ADP to ensure sustainability

1.4.5 External and internal factors

- Positive and negative effects of project activities and applied mitigation measures
- Internal and external factors that affected program implementation and outcomes
- Limitations and potential of the project to overcome negative external forces

1.5 Evaluation Methodology

1.5.1 Principles

This evaluation was based on the Learning Process Approach. One of the planned outcomes was the production of an evaluation report, however, this was not the main focus of the exercise. Far more important was the *process* that took place during the week 16-20 July. During this week, the emphasis was on mutual learning and exchange of ideas between the evaluation team, participants and MIS staff. The focus was on maximizing learning from what has happened during the preceding five years. Key words to describe this process are: participatory, holistic, multi-disciplinary and inclusive. Individual team members and external consultants had to move comfortably between various disciplines (in addition to their own).

1.5.2 Modus operandi

The week in the field consisted of field visits to inspect project sites and interviews with farmers and committee members. Before we went to the field, each external consultant was teamed with another team member and each pair took responsibility for a specific section of the evaluation questions/groups to be covered that day. All outings were preceded by a short brief/background introduction (10 minutes) on the aspects that would be covered that day.

The evaluation team was relatively large and not only consisted of external consultants, but also of project beneficiaries, several World Vision Staff members and two representatives of USAID. This was an important departure from conventional evaluations, where a group of external consultants move in, move out and present their report. The whole process was participatory and the views and contributions of all the team members (and sometimes co-opted team members) were consolidated/ integrated during the team's debriefing sessions. These meetings were done each day, after the field visits and were attended by the evaluation team, and WV staff members who were co-opted as required (thus 10-15 people at any time). The role of the external consultants was to give a fresh, but also positively critical, perspective on what happened during planning and implementation. This however, was done in an interactive manner to maximize appropriateness and mutual learning from the evaluation process. The team leader had to facilitate the process in such a way that all participants were actively engaged and that mutual learning was maximized. It was expected of each of the external consultants to produce short 5-7 page reports on their specific area of specialization³.

1.5.3 Review and analysis of key project documents

The team studied all key documents that were generated throughout the life of the project in order to get some insight into the planning and implementation processes. Other documents, such as for example the final evaluation of Phase I of the project and the mid-term evaluation report, also formed part of the documentation studied.

1.5.4 Review and interpretation of the household and other survey data

A Household questionnaire survey was conducted in May 2001. The team used the findings of the survey to learn more about the changes that took place at household level. Since only a limited amount of baseline information was available, the main focus of the impact assessment was on comparative questions in the 2001 questionnaire. Farmers were asked to compare their present situation, with that of 1996. It was decided against using a control group methodology for the questionnaire survey, mainly because it would have been practically difficult to identify and locate enough non-participating households in Morulem to constitute a valid control group. It would also have significantly increased the time and resources needed of the survey. Data from other surveys that were conducted between 1994 and 2001 were also used to compare the situation before and after project implementation.

1.5.5 Field visits to project sites

³ All these reports are attached in Appendix D. Unfortunately the report of the economist could not be completed, because of problems related to accessing the necessary information about Relief in time for the report deadlines.

The field visits focused on direct observation of ongoing and completed project activities. During the field visits the team held interviews and group discussions with committee members, farmers, project staff and stakeholders.

CHAPTER 2:RESOURCES

2.1 Introduction

Chapter two describes and analyzes the resources needed to implement the project. The resources that will be considered include staff, organizational structure, remuneration, financial resources, assistance received from external organizations and coordination within World Vision and between World Vision and the donor.

2.2 Staffing

2.2.1 Lessons learned

- The present structure is adequate with the exception of the reporting system of MIS Project Manager to Grants Manager and the engineering, accounting and Monitoring and Evaluation functions. In the case of engineering and monitoring and evaluation, existing staff did not have the time to devote to all the duties required.
- Despite the fact that the qualifications of the project staff was adequate for project implementation, a significant amount of time and resources was invested in further developing their skills. It is clear that there is a wealth of knowledge and practical experience that could be of benefit in the development of similar irrigation projects.
- The community motivators received technical training and their skills will continue to be of benefit to the community.
- Staff salaries and grading has been a problem and are much lower than the original budget and staffing plan.

2.2.2 Recommendations

- In future projects, more authority should be devolved to MIS staff members to make them less dependent on the WV Nairobi office. The new position of DAP coordinator that was proposed for the Lokubae DAP, needs to be a position of authority and filled by a strong person with good monitoring, evaluation and reporting skills.
- The project accountant should be based in Morulem.
- The inclusion of an irrigation technician to assist the irrigation engineer during the early stages of project implementation will greatly enhance the implementation of future projects.
- The evaluation team felt that WVK should seriously consider the possibility of having separate grading systems for ADP's and projects. This project is different from an ADP because of: the big investment/responsibility, the strict deadlines, the high technical requirements of implementation, temporary nature of the project (staff have fixed time period contracts) and the importance of having good staff members on board.

2.2.3 Organizational structure

The evaluation team felt that the staffing structure was suitable and appropriate for the implementation of this project. However, there were four areas where the team had some reservations: engineering, grants manager, program accountant and monitoring and evaluation.

- Given the fact that the engineering division was responsible for the development of all infrastructure (not only irrigation infrastructure), the team felt that the staff structure was a bit thin on the engineering side. The inclusion of an engineering technician, during the initial stages of project implementation, would have significantly increased the ability of the engineer to do his work – especially since he also had to fulfill the duties of assistant project manager. This would have freed some time for the engineer to devote more attention to other aspects, such as the development of maintenance plan for buildings and issues such as the privatization of wells.
- The existing staff did not have adequate time for all the duties required for effective Monitoring and Evaluation.
- Even though frequent visits to Nairobi may be necessary, the team felt that the project Accountant should be based in Morulem, rather than Nairobi.
- The reporting structure to WV Head Office in Nairobi did not seem to work effectively, with vague reporting lines within the operations division and a direct reporting line of the Project Manager to the Grants Manager. Even though the project manager did not express serious reservations about this structure, USAID became involved on a number of occasions in the case of procurement and Human Resources to help get resources from WV Head Office to the project. This would not have been necessary if the present structure was functioning well.

2.2.4 Staff qualifications

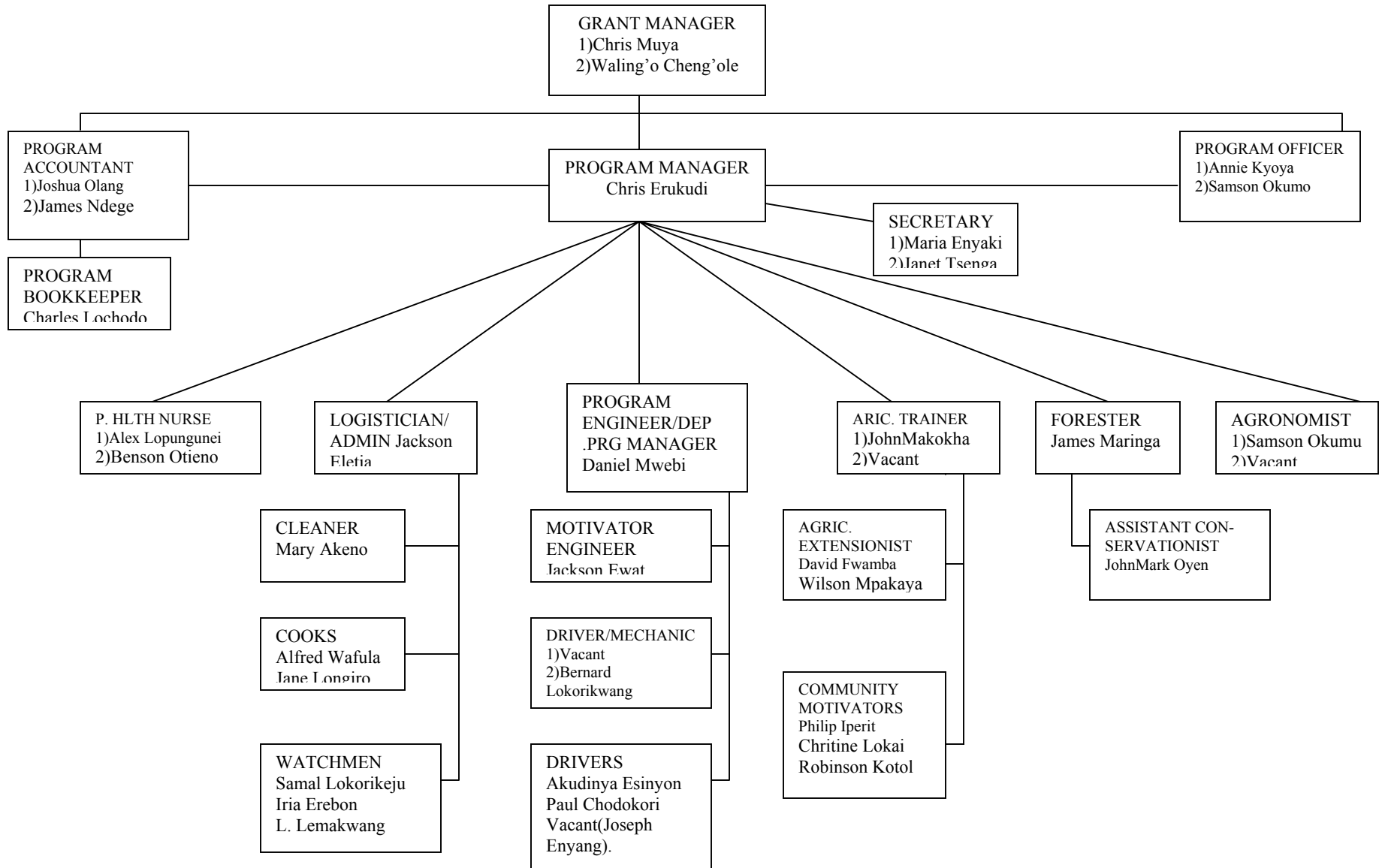
The evaluation team found that most staff members were adequately qualified and competent to fulfill the positions they occupied. Most of the staff also attended additional training courses to strengthen their ability to implement the project effectively. Training needs were usually identified through training needs assessments that were associated with the quarterly performance appraisals. Table 1 in Appendix C summarizes the kinds of courses attended by staff. Training courses ranged from leadership and management to more technical aspects such as gender and development, sustainability and Participatory Rural Appraisals amongst other topics. Training has been a priority, with a total of 321 training weeks⁴ spread across a project period consisting of 260 weeks.

2.2.5 Occupancy rates of staff positions

⁴ A one week training course attended by five people was counted as five training weeks

With the exception of the agricultural trainer, public health nurse and agronomist, the key technical positions were occupied for the biggest part of the implementation period.

FIGURE 2: MORULEM IRRIGATION PROJECT ORGANIZATIONAL CHART



The only position where implementation was hampered by vacancies and staff changes, was that of the Public Health Nurse⁵, whose part of the program only really took off after the second incumbent to the position was appointed in the third quarter of 1999.

Support positions that were vacant for four quarters or more, were that of secretary and mechanic/driver. Generally MIS Project Management did not find it too difficult to fill positions, but when someone gets an offer to work elsewhere, they normally accept. The main reason for this is that the living conditions in Morulem are difficult.

Table 2: MIS staff occupancy rates

	FY97				FY 98				FY99				FY2000				FY2001			
	Q 1	Q 2	Q 3	Q* 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 2	Q 3

Grant manager																				
Program officer																				
Program accountant																				

Nairobi positions

Program manager																				
Program bookkeeper																				
Program engineer/assistant pgm manager																				
Agric. Trainer																				
Forester																				
Agronomist																				
Public Health Nurse																				
Logistician/admin																				
Motivator/engineer																				
Agricultural extensionist																				
Assistant conservationist																				
Community motivators																				
Secretary																				
Driver/mechanic																				

MIS positions

* Most of these positions were filled in the last month (September 1997) of the last quarter.

2.2.6 Grading and Remuneration

⁵ The project tried to find a Turkana to fill this position. Even though the first incumbent was a Turkana, he stayed for a short time and could only be replaced in mid 1999.

There have been problems with the grading and remuneration packages of the staff working at the scheme. The main problems revolve around (according to the staff) incorrect grading and the fact that WVK considers the positions and grading of ADP posts as being the same as Projects such as MIS. The staff felt that the Human Resources division does not adequately address their concerns. Even though a thorough grading review was done in 1999, and staff grades were adjusted during the year 2000, there are still some discrepancies between appointment letters and actual positions held. At the time of the evaluation, WVK embarked on a salary review and it is expected that the concerns of the staff will be addressed.

At one point, the USAID representative found that the total salary expenditure at MIS was only 30% of the approved budgeted amount⁶. WVK response to this was to reduce the salary budget accordingly and to move the allocated funds to other expenditure items.

2.3 Finances and procurement

The nature of monetization funding (usually the sale of donated Title II commodities on the local markets), can put certain limitations on project implementation. Some of these problems may be related to a low demand for Title II commodities on the local market, resulting in slow sales and cash flow problems, or the planned prices may not be realized and the project may be under-funded. Table 3 summarizes the budget and expenditure from FY1997 to July FY2001. During times when there is slow monetization and cash flow problems for implementation, World Vision uses its system of internal borrowing and private funding to assist projects. According to the USAID representatives on the team, World Vision coped well with the demands of monetization.

The procurement of capital items such as vehicles, computers, radios etc. has been a problem. Not only did the procurement process take long, but the WV Nairobi office at one time also provided equipment of substandard quality. An example of a lengthy process is the two way radio (absolutely essential for contact with Nairobi and the outside world) which took nearly two years to be installed. When approached for comment, the procurement office said that the delays were largely the result of external difficulties. The main reason for the delay in the installation of radio equipment was the long time it took for the issuance of permits and frequencies. In the case of vehicles, new GOK tax and importation regulations that were introduced while the MIS vehicle was being shipped to Kenya, resulted in the vehicle being sold to WV Tanzania and by allocating a vehicle of another WV project to MIS. Examples of substandard equipment include: poor quality hand-pumps and the hiring of consultants that did not address the needs of the project nor USAID (for example Marketing Survey). Since then, WV in Nairobi has adjusted the system so that specialists

⁶ According to the Human Resource representative of WVK, some of the variation between budgeted and actual expenditure for staff salaries can be attributed to the fact that some positions were vacant for some time, medical allowances are paid against actual claims and the cost of some Head Office staff, who devote part of their time to the project, was not deducted against MIS expenditures.

and users are required to review quotations and specifications before any items are bought or services contracted.

Table 3: Project budgets and expenditure from FY1997 to July of FY 2001

<i>Consolidated Line Items</i>	Monetiz'n Approved	Adjusted Budget	Monetiz'n Actual	Section 202e Approved	Section 202e Actual	PVO Funds (Private) Approved	PVO Funds (Private) Actual	Local Gov't Approved	Local Gov't Actual	Total Approved	Total Actual	Variance US\$	Variance %
	Budget	as per actual	Expended	Budget	Expended	Budget	Expended	Budget	Expended	Budget	Expended		
	<i>LOA</i>	<i>Income Received</i>	<i>LOA</i>	<i>LOA</i>	<i>LOA</i>	<i>LOA</i>	<i>LOA</i>	<i>LOA</i>	<i>LOA</i>	<i>LOA</i>	<i>LOA</i>		
LOA Opening Balance	-		-	-	-	-	-	-	-	-	-	-	-
Income - new funds	2,893,889	1,971,366	1,971,366	119,576	110,796	139,546	139,546	885,885	160,247	2,381,955	2,381,955	-	-
Income - interest	21,473	59,521	59,521	-	-	-	-	-	-	59,521	59,521	-	-
Total LOA Income	2,915,362	2,030,887	2,030,887	119,576	110,796	139,546	139,546	885,885	160,247	2,441,476	2,441,476	-	-
Funds Available in LOA	2,915,362	2,030,887	2,030,887	119,576	110,796	139,546	139,546	885,885	160,247	2,441,476	2,441,476	-	-
Expenses													
A. Salaries and Benefits	1,117,898	787,489	449,310	-	-	-	-	-	-	787,489	449,310	338,179	43
B. Training	97,084	76,012	96,318	24,231	10,284	-	-	83,908	10,750	97,046	117,352	(20,306)	(21)
C. Travel and Transportation	331,497	244,878	326,534	20,882	18,244	-	-	-	-	263,122	344,778	(81,656)	(31)
D. Expendable Commodities	595,273	376,846	822,933	-	-	-	-	703,667	135,497	512,343	958,430	(446,087)	(87)
E. Insurance, Repair & Maintenance	46,083	33,970	49,896	-	-	-	-	-	-	33,970	49,896	(15,926)	(47)
F. Local Office Operating Costs	52,746	37,412	18,609	-	-	-	-	-	-	37,412	18,609	18,803	50
G. Other Direct Costs	34,244	26,093	12,295	-	-	-	-	-	-	26,093	12,295	13,798	53
H. Professional Fees	38,692	22,382	17,600	60,441	24,265	-	-	98,310	14,000	60,647	55,865	4,782	8
I. Project Audit Fees	37,076	29,895	1,285	-	-	-	-	-	-	29,895	1,285	28,610	96
J. Non - Expendable Procurement	21,500	17,214	76,598	-	-	139,546	115,893	-	-	133,107	192,491	(59,384)	(45)
sub-total	2,372,093	1,652,191	1,871,378	105,554	52,793	139,546	115,893	885,885	160,247	1,981,124	2,200,311	(219,187)	(11)
NICRA	543,268	378,696	407,045	14,022	15,692	-	-	-	-	394,388	301,232	93,156	24
LOA Total Expenses	2,915,361	2,030,887	2,278,423	119,576	68,485	139,546	115,893	885,885	160,247	2,375,512	2,623,048	(247,536)	(10)
LOA Closing Balance	1	-	(247,536)	-	42,311	-	23,653	-	-	65,964	(181,572)	247,536	375

2.4 External organizations

2.4.1 Lessons learned

- The project cooperated closely with all relevant Government Departments and local NGO's throughout the life of the project. This will undoubtedly contribute towards the sustainability of the project.

2.4.2 Situation analysis

The manager of the project is a member of the District Development Committee and he attends (when possible) their meetings held in Lodwar. In July the Project manager participated in the development of the 2002-2008 district plan. The District Commissioner is very positive about the project and the contribution that it is making to development in the Lokori Division and the district as a whole.

The project has cooperated with various Governmental and non-Governmental institutions during the past five years. These include the regional and local representatives of the Ministry of Agriculture (e.g. sedimentation and siltation study; soil survey), Agricultural Engineering for the design of the new inlet, public works for the rental of earth moving equipment for canal construction, Ministry of Water Affairs for the identification of well sites, Ministry of Health in the training of CHW's and Local Government for land entitlements.

The evaluation team interviewed a group of stakeholders during the field visits. Their main findings were:

- The stakeholders were all positive about the scheme and its benefits to the Morulem community and Lokori division
- WV was praised for involving the farmers from the very beginning.
- The project was seen as a way of making people food secure without making them dependent on handouts.
- Some of the stakeholders believe that the settlement provides some security – after livestock raids many destitute families move here to find food or employment.
- There has been MOA staff members based at the scheme since 1998. However, high turnover rates did not result in continuity and the present MOA representative only arrived in the year 2000. It was felt that the sustainability of the scheme would have been higher if the same person was present from the beginning to the end of implementation. An agricultural engineer should also ideally be present during the handover phase so that he can continue to assist the community after the withdrawal of WV.

The project is particularly proud of the many University Interns who have done their internships there. They usually come during their vacations and stay for 2-3 months. Since 1999, they had one agricultural extension trainee per year (from Egerton); in 1999 and 2000 they had two environmental specialists from Kenyatta University and at present there is a civil engineer from Moi University.

2.5 Coordination

2.5.1 Lessons learned

- The organizational structure did not give MIS staff a powerful enough representation at WV Head Office in Nairobi. Without that, communication and coordination problems with specifically HR and procurement developed.

2.5.2 Recommendations

- In future projects, more power should be devolved to MIS staff members to make them less dependent on the WV Nairobi office. The new position of DAP coordinator that was proposed for the Lokubae DAP, needs to be a position of power and filled by a strong person with good monitoring, evaluation and reporting skills.

2.5.3 Situation analysis

The team could not find evidence that there are any coordination problems between WV and the external organizations that it is dealing with. Both MIS management and USAID felt that they have open communication lines and a good relationship. USAID has been playing a mentoring role towards MIS project management and has often confronted WV in Nairobi to try and resolve problems on behalf of MIS. Within World Vision, there have been some problems. According to MIS, coordination between them and the Operations department in Nairobi is good, but they have problems with Human Resources and Procurement.

CHAPTER 3: STRATEGIES & METHODS

3.1 Introduction

This chapter describes and evaluates the strategies and methods used to implement the project. The findings are based on interviews with project staff, farmers and observations in the field.

3.2 Planning process

3.2.1 Lessons learned

- The project team had a flexible, learning based approach towards project planning. They relied heavily on lessons learned during implementation when modifying existing plans.
- Participation of a variety of role players, especially the farmers, played a central role in the planning process.
- The flexibility of USAID enabled the project team to follow their flexible, learning based approach towards project planning.

3.2.2 Description of the process

The evaluation team found that the planning process had the following characteristics:

- The planning on which the project proposal was based, was done at short notice within a limited time period (see Chapter 1). The actual proposal was submitted during the first quarter of FY1997. There was therefore not enough time for intensive consultation with farmers. Some key staff members were involved in the process and the document was largely based on the learning experiences of the first Phase and the recommendations of the final evaluation of Phase I. In many ways Phase II was just an extension of activities that were already started during Phase I.
- Detailed planning and design was done later, as implementation progressed. A variety of stakeholders were involved in planning during the different stages of implementation. In most cases the staff and community were involved. Sometimes (for example in the siting of the new inlet) external and Government consultants were asked to assist. At other times, relevant Government Departments were involved, for example when leveling had to be done
- The implementation of plans was hampered by the slow supply of capital goods such as vehicles, computers etc. Thus, planning in so far as the acquisition of capital goods is concerned, appears to have been inadequate.
- Plans were modified to increase their sustainability and suitability to local conditions. The DAP annual amendments gave WV the opportunity to modify initial plans based on their experiences in the field. USAID exhibited a lot of flexibility in their handling of the DAP amendments. He for example allowed the original design to be expanded from 614 to 764 ha, in order to accommodate 300 more farmers than originally planned.

3.3 Monitoring and evaluation

3.3.1 Lessons learned

- A variety of sources were used for the purpose of monitoring.
- Staff received training in monitoring and evaluation
- During the life of the project some problems with for example crop cut standards were identified and improved with the assistance of internal consultants.
- The absence of a baseline survey has hampered the monitoring and evaluation of this project and has made it very difficult to provide reliable and accurate indicator information for the Performance Indicator tracking Table.
- Some indicators were not very specific and could not reflect the situation on the ground, partly because of the reporting format that was used in the records on which they were based.
- It is important to decide beforehand whether an indicator will be reported per household or per farmer. This decision should be based on what will give a true reflection of what needs to be measured in order to monitor/evaluate whether a specific objective has been met. It should also be based on whether it will be practically possible to measure that indicator.

3.3.2 Recommendations

- All documentation, questionnaires, reports and databases related to monitoring and evaluation should be stored in a central place and safeguarded by one particular individual.
- If the nutritional status of children is monitored in future projects, it is recommended that weight for height measurements be taken before rather than after the harvest as it will be more sensitive to changes in the length and nature of the hunger period.
- Since photocopying is a problem in Morulem, all important documents and records about the project, should also be kept in Nairobi.
- For future projects, more mechanisms (similar to that used for the monitoring of tree survival) are needed that will enable farmers to monitor their own progress after WV has left.

3.3.3 Monitoring and evaluation system

The following was observed about the system:

- Information for monitoring was obtained from scheme records, progress reports and surveys.
- No household questionnaire survey (only a household census) was done at baseline.

- Agricultural productivity was measured through crop cuts (WV 1996:43). Until 1999, no standard, scientific method was used to determine yields. This was identified as a problem and an internal consultant was asked to train staff on how to standardize and use an improved method of estimating yields.
- The environmental committee was trained to monitor the planting and survival rates of trees planted. This is a good way of building local capacity and ensuring that the farmers can continue to monitor their own progress after WV has left.
- Survey reports and questionnaires were not stored in one place, in a coherent system. No copies could be found of the survey done in 1994 during the final evaluation. No copy of the database of the midterm survey that was done in 1999, could be found within World Vision.
- The Morulem record and documentation system was found to be good. Project documentation systems in Nairobi need improvement⁷. The Nairobi archives are used as a depository of documents and there is no way of accessing/finding documents. Neither Nairobi nor Morulem had complete records of Phase I project documents.

3.3.4 Assessment of monitoring and evaluation indicators and measurements

The main findings on specific indicators were:

- The data reported in the indicator tracking table was in some cases not very specific. For example, indicators aimed at improving an aspect related to the household, were reported per farmer rather than per household. Examples include: % of household food obtained from the farm, % of households with food in the communal grain store, % of households paying maintenance fees.
- Some indicators were not specific enough or the reported figures that did not capture the essence of the indicator or the objective being monitored/evaluated. For example, the % of households with food in the communal grain store. The reported results in the indicator performance tracking table (Results report for FY2000) included farmers 'who stored grain paid as maintenance fee'. Once the maintenance fee is paid, the grain belongs to the MWUA and can therefore not be regarded as grain stored by a household/farmer.
- Some indicator values/reporting of indicator values did not reflect the true situation in the scheme. For example, reportage on the % of household food obtained from the farm is based on the assumption that each household has ½ acre, whereas in fact 70% of households have more than half an acre.

⁷ At the time of the evaluation this problem was identified and some individuals started to collect documents in order to improve the situation

3.4 Land tenure and land allocation

3.4.1 Lessons learned

- World Vision gave advice on land allocation, but did not interfere in the actual allocation process. The farmers made all their own decisions. This is one of the key issues on which the success of this project was built. By not changing or interfering with the existing social organization, World Vision harnessed the strengths of that system (such as sanctions and control of group behavior) to be mobilized for the benefit of the scheme.
- Advising the farmers to group relatives together in one block has significantly improved the enforcement of scheme by-laws and the optimum use of irrigation infrastructures. Traditional extended family obligations are being harnessed to ensure that communal work such as the clearing of canals, opening of irrigation gates etc. continue even if a farmer is ill or traveling.

3.4.2 Strategies used

Even before World Vision's involvement in the scheme, the sizes of the landholdings were different for each household. Original allocation was based on interest and the amount of land that each household was willing or able to cultivate. In a survey that was done in 1992, it was found that 17% of Scheme plot holders were dependents living with their parents (WV 1996:11). When the scheme was rehabilitated during Phase I, the rehabilitated fields mirrored the situation found by World Vision when it arrived. At the time the land belonged to the Government and the MWUA was given the right to use the land.

In the project proposal for Phase II, the following was said about land tenure (WV 1996:11):

- It will be ensured that new allocations maximize access for those having less than ½ acre per household
- Scheme registration will issue farmers with identity cards
- Registration will be accompanied by a series of community meetings to build consensus on the need to provide adequately for all scheme households.

During Phase I & Phase II, World Vision gave advice to the farmers before land allocation took place. WV basically recommended the following:

- If relatives are grouped together on a block, the control and enforcement of rules and regulations will be easier.
- Each household should have at least 28 basins or ½ acre

After that, World Vision did not take part in land allocation. The farmers decided jointly who their neighbors will be and how much land each of them will have. During the year 2000, World Vision also assisted the MWUA with the issuing of farmer identity cards. At present, the holder of an identity card has the right to use ½ acre or 28 basins of farmland on the scheme. The farmers have *Letters of Allocation* that were issued by the Turkana County Council. The Council is looking at the possibility of issuing title deeds to each card holder.

3.5 Irrigation and irrigation infrastructure (also see Appendix D)

3.5.1. Lessons learned

- The design and quality of the infield-structures and road crossings are good.
- Modification to the designs were introduced to solve specific problems, e.g. lockable gates to reduce problems with unregulated flow.
- Various design modifications have been made to increase sustainability (see section 5.4)

3.5.2 Recommendations

- The plans to calibrate existing division boxes to convert them into measuring structures should be implemented
- If the new main canal is lined as planned, it will improve the water conveyance efficiency
- For future schemes, the furrow irrigation system, as an alternative to flood irrigation be investigated (on the demonstration plots). The main advantage of this system is that moisture is conserved. It can also be introduced as an improved tillage system alongside the adoption of animal traction.
- If mechanization is promoted in future irrigation schemes, the possibility of joining 4 or 5 basins should be considered, as the small basin sizes inhibit the efficient mechanization of operations.



Picture 1: A division box in the Phase II part of the scheme. It clearly shows the lockable gates and cement re-enforcements to protect the canal banks.

3.5.3 Observations about planning and implementation

- The quality of the road crossings were judged to be adequate and appropriate to the overall scheme design philosophy.
- The design specifications for the main canal specify that it should be lined, but it has not yet been done.
- Excavated soil has not been moved to some distance from the canal to prevent it from falling into the canal
- The design drawings of in-field structures were found to be good and appropriate to the overall scheme design philosophy
- There are no measuring structures to help with flow-regulation: some incidences of scouring just behind division boxes have been noted – this was the result of unregulated flow. This problem was corrected by installing locks on the gates so that nobody can interfere with the opening and closing of the gates.
- The quality of the construction of the in-field structures is good

3.6 Agricultural Extension

3.6.1 Lessons learned

- The extension agents who were interviewed, appeared to be well trained, motivated and equipped for their task. They were also confident about how they will continue to operate once World Vision is not there anymore.
- There appears to be some problems related to the recognition and use of the extension agents by the SMC.

3.6.2 Recommendations

- In other similar projects, it may be advisable if the transfer of extension agents to the SMC takes place earlier in the life of the project. This will give the scheme management an opportunity to practice to be 'responsible for their own extension' in advance of withdrawal.
- During the phase-out WV should assist the Extension committee to clarify and strengthen their working relationship with MWUA.

3.6.3 Strategies used

The thrust of the extension effort revolved around the extension agents and contact farmers. These agents are also farmers, but they were selected by their colleagues to be extension agents. There are 3 agents per block – giving a total of 15 agents for the whole scheme (since being trained one left so there are only 14 who remained). They were trained for a period of three months at Manor House Agricultural Training Center, in Kitale. Their training included the theory and practice of a broad range of agricultural practices.

Their working methods during the past 2-3 years can be summarized as follows:

- They identified farmer training needs
- Then they developed a farmer training program for the year with WV staff members
- The extension agents then trained the contact farmers, who in turn train the farmers. There are a total of 80 contact farmers (two per secondary canal).
- They also demonstrate improved practices and varieties on the demonstration plots and do on-farm trials.

The extension agents felt that they will be able to continue with the demonstration plots and will introduce farmers to new technologies after WV has left. According to them they will learn about new technologies from the MOA Agricultural Extension Officer, magazines and by attending agricultural shows. One of their problems at the moment is that they feel that MWUA is not appreciating their work and the contribution that they can make towards the development of the scheme. They are concerned that they have to pay a rental of Ksh 3000 (38US\$)⁸ to MWUA for the demonstration plots, whilst they are providing a voluntary service to all the farmers.

3.7 Soil

3.7.1 Lessons learned

- World Vision promoted a wide variety of appropriate, practical and sustainable methods that could be used by the farmers to enhance soil fertility and yields.

3.7.2 Recommendations

- Farmers with only a few animals need an alternative such as composting to help them improve their soil quality. In a new scheme this technique should be considered as a possible complement to animal manure.
- A mechanism is needed that will enable MWUA to continue to monitor soil fertility and salinity after World Vision's withdrawal. The next soil survey is due in the year 2005 (ideally should be done every 5 years) and can be done at a relatively low cost by the Ministry of Agriculture.

3.7.3 Description of interventions

The maintenance of soil fertility, has been recognized as one of the key factors in project sustainability and the maintenance of food production. WV commissioned a soil survey in the year 2000. It was executed by the Kenya Soil Survey, which is based at the Kenya Agricultural Research Institute (Muya and Gachini 2000). They concluded that the levels of salts and sodium in the survey area has not exceeded critical levels, but that it may continue to build up beyond the crop tolerance limits. The soil fertility was rated as adequate and suitable for the cultivation of most crops.

⁸ The Kenia Shillings (Ksh) /dollar conversion rate used throughout the report is Ksh 78 to 1US\$.

Specific interventions promoted by WV that was aimed at improving/maintaining soil fertility were:

- The multiplication and planting of trees with nitrogen fixing properties.
- Deep tillage that allows the plant roots to reach for nutrients at all levels
- Use of crop rotation
- Intercropping, especially with nitrogen fixing crops
- Incorporation of crop remains (maize and sorghum stalks)
- Use of animal manure

3.8 Agro-forestry (also refer to Appendix C)

3.8.1 Lessons learned

- The implementation of tree planting activities were participatory and the community is in full control of these exercises
- The use of multiple use trees not only reduce the pressure on the existing trees, but can also serve as an additional source of income for farmers.
- Establishing woodlots where excess water drains not only increases their chances of survival, but also takes care of the excess water.

3.8.2 Recommendations

- Trials testing the suitability of *Calliandra spp.* and *Tithonia spp.* to the area are recommended. Both these species are being promoted by ICRAF at the moment and are good nitrogen fixers and drought resistant.
- The burying of the non-biodegradable plastic bags is not a sustainable waste management option. Alternatives such as clear bio-degradable bags should be explored.

3.8.3 Description of interventions

The main focus of the agro-forestry initiative has been on the promotion of tree planting along the canal banks and in the drainage canals. Two woodlots for firewood and fruit production are nearing completion. A community tree nursery, with the capacity of producing 25 000 tree seedlings was also established.

The planting of trees was included in the project design for a variety of reasons:

- Trees can enhance soil fertility.
- Planted as hedge rows along canal banks they stabilize the banks and serve as windbreaks
- Multiple use trees can provide animal fodder, construction materials and firewood. This can be for farmer's own use and as an additional source of income.
- Fruit trees can assist farmers in improving their diets and could be a source of income.
- Some species promoted, e.g. *Moringa spp.* and Neem respectively help with water purification and pest control.

The woodlots were established at the point where excess water drains out of the irrigation system. A Conservation committee has been trained to collect seed, propagate seedlings, monitor and organize tree planting and keep a general eye on conservation issues on the scheme. The implementation of all these activities was participatory and the conservation committee is in full control of the situation.

3.9 Animal Traction

3.9.1 Lessons learned

- The initial attempt to get animal traction going was not successful and a second attempt that focused on people who owned their own donkeys and were really interested, appears to have a bigger chance of success.

3.9.2 Recommendations

- This initiative is not yet well-rooted and accepted in the community. Further support mechanisms are needed for the period after WV withdrawal, perhaps in the form of support from the ADP.
- Animal traction will be an important factor in the long-term sustainability of the scheme: its use will enhance the ability of farmers to do deep tillage (nut-grass control and better use of nutrients by plants) and to haul animal manure from their homesteads to their farms.
- The Committee needs to be assisted in the development of their business skills
- In future projects, farmers should be exposed early on in the project to animal traction, so that there is a longer period of support for the adoption of the technology. Opportunities should also be identified/created to build animal powered transport into the daily course of events at an early stage, so that people will become used to the idea of using donkey carts before the end of the project and WV's withdrawal.
- Possible linkages with the Arid Land Resource Management Project (Office of the President) in relation to the construction of lighter donkey carts need further exploration.
- It is recommended that conservation tillage, using animal drawn-tined tools, rather than the animal drawn mould board plough be used.

3.9.2 Description of interventions

The animal traction initiative is relatively new and focuses on the promotion of donkeys for transport and ploughing. It was started after some farmers saw animal traction in action while visiting another area and showed some interest in using it. In the year 2000, World Vision staff and the extension agents trained 20 farmers in the use of animal traction. The initial group of 20 farmers was not really that interested in the technology and little progress was made. In order to resolve the impasse, the SEC did a second selection of 10 farmers based on farmer interest and donkey ownership. The 10 farmers who form the Animal traction committee at the moment, each own at least two donkeys of their own. They were taken to Kitale in March 2001 to get practical training on the farm of a farmer using oxen for ploughing.

After their return, they held several demonstrations over a three week period to promote animal traction amongst their colleagues. Since 1999, World Vision has bought a total of 22 ploughs, 10 sets of harnesses, 3 donkey carts and 12 yokes for oxen. These were given to the MWUA with the idea that the Animal traction committee will rent the equipment from MWUA. They could then use the equipment for their own use or as an income generating opportunity.

3.10 Marketing and Income generating activities

3.10.1 Lessons learned

- Marketing has not been one of the focus areas of the program objectives. Its importance has grown as implementation has advanced and the new Lokubae DAP makes specific provision for this component. The proposed integrated strategy for the marketing of farm produce in the whole region will also benefit MIS.
- The original project proposal only said that alternative income generating activities should be explored, however WV has achieved much more than that by actively promoting the formation of income generating groups.



Picture 2: Maintenance fees paid in kind being stored in the communal grain store. The isolation of Morulem and relief distributions⁹ are two of the most important factors that contribute towards the difficulties of finding buyers for the grain.

⁹ Relief distribution to people who do not produce their own grain has depressed the local demand for grain.

3.10.2 Recommendations

- World Vision should continue with its efforts to assist MIS to link with potential buyers for grain.
- Specific recommendations for income generating activities follow under the heading for each sub-sector e.g. animal traction, water pump attendants etc.

3.10.3 Description of interventions

The original project proposal made provision for two aspects related to marketing (WV 1996:12):

- The commissioning of a marketing study for FY 1997 to specifically look at the feasibility of cooperative marketing and to explore alternative marketing mechanisms.
- The promotion of local marketing through the production and sale of vegetables and fruit.

Consultants were hired to do a marketing study in 1999. Their report was subsequently rejected by both MIS management and USAID (also see discussion in section 2.3 on finances and procurement). The terms of reference for a second marketing study was since then developed, but the study has not yet been done. This may be done as part of the Lokubae DAP.

One of the activities promoted by WV is cash crop (vegetable) production. There is quite a good demand for these products on the local market. WV tried to stimulate this by making the seeds available and encouraging crop diversification. It was also hoped that production and sales would be stimulated as a result of the promotion of the consumption of vegetables through the nutrition education program.

The marketing of grain, paid in kind as part of the maintenance fee, has been a problem. Since August last year a total of 270 bags of sorghum and 12 bags of maize have been received, but the MWUA has not been able to sell much of it. The local market, which normally is small, has been depressed even further by the distribution of relief food in the area.

In the case of alternative income generating activities, the original project proposal stated that it should 'be explored to mitigate adverse climatic conditions' (WV 1996:7). Alternative income generating activities that have been supported by the scheme or developed as a result of the scheme's presence include:

- Women's group: They have a small kiosk (selling soap, biscuits etc.), they also sell agricultural produce and improved jiko's to raise funds. They received assistance from WV in the form of training in basic business skills and record keeping.
- Animal traction committee: Even though they have not yet started to earn money from their enterprise, it is envisaged that other farmers will use their services in the future. They only received technical training.

- Water pump attendants: the water pumps were privatized and the attendants should receive Ksh 50 (0.62US\$) per month from each household using their services.
- A small private tree nursery was established. The owner started the nursery as a result of seeing the success of the WV agro-forestry initiative and he benefited from WV technical expertise.
- The Posho mill was bought from joint contributions by the farmers and is operated by the Posho mill committee (under MWUA) to generate income for the Association.
- The community pharmacy not only give people access to basic medicines, but the small profit margin also supply MWUA with some income.
- The MWUA will benefit from rental income from the buildings erected by WV in the form of rental e.g. training hall and office.

3.11 Health and nutrition

3.11.1 Lessons learned

- The groundwork has been laid for health and nutrition by the training of some of the CHW's during Phase I. During phase II a lot has been achieved in a relatively short time in terms of the acceptance of basic health and nutrition messages by the mother's in the community (also see Chapter 4).
- The close cooperation that this sub-sector had with other Government Ministries from the start, will make a significant contribution towards the sustainability of this aspect of the project.
- The establishment of a community Pharmacy has met a very specific community need and has been praised by farmers and non-farmers.

3.11.2 Recommendations

- Specific improvements in the monitoring of the nutritional aspects of the program are recommended in the section on monitoring and evaluation

3.11.3 Description of interventions

During Phase I, the officials from the Ministry of Health used to train CHW's and TBA's. The CHW's were appointed by the farmers – who basically identified volunteers in their blocks. This part of the project's work only took off after the mid-term evaluation in 1999, when Mr. Otieno was appointed into the position of Public Health Officer. Before that, there was only limited activity as the position of Public Health Officer was filled for a short time period and vacant for 6 months. The main functions of the CHW's and TBA's are to train mothers (scheme and non-scheme participants) on the basic health and nutrition messages, to identify cases that need referral to nearby health facilities, to encourage mothers to attend antenatal clinics and immunize their children, to inspect pit latrines, train community members about safe water supply/ environmental sanitation local disease control and basic home economics (e.g. food preservation).

The four key nutrition and food supply messages taught to mothers are:

- Utilization of locally available foods
- Food classification into food groups
- Nutritional needs of special family members (e.g. children under 5, antenatal mothers, post natal mother's etc.)
- Nutritional deficiencies (Kwashiorkor, marasmus, marasmic kwashiorkor), their long term effects and prevention.

The program worked closely with the District Home Economist and officials from the Ministry of Health. Most of the training of CHW's and TBA's was done by officials from these Departments.

3.12 Water

3.12.1 Lessons learned

- Before privatizing the water pumps, the interested people were not fully informed about the venture they entered into. They also did not know about its possible positive and negative effects. The lack of information may have attracted the wrong kinds of volunteers to this venture. The team also questioned the wisdom of making groups of two or three people responsible, instead of only one.

3.12.2 Recommendations

- In the few months ahead, WV should identify ways of trying to help resolve the deadlock and problems between MWUA and the hand-pump attendants. There should be a clear memorandum of understanding between the two parties about the responsibilities of each. Bylaws, including issues such as fees charged and what happens when someone abandons a well, should also be instituted.
- Attendants who have abandoned their wells, should be replaced by entrepreneurs interested in the venture.
- The flat rates charged by MWUA for the pump rental should be reviewed in the light of the fact that some pumps have more users than others. The possibility of pro-rata payments based on good record keeping, should also be given consideration. This is another indication that MWUA needs some more training in business skills.
- The evaluation team felt that WV should also assist the attendants to find better ways to secure the pumps and protect it against non-payers.
- Water quality of wells should be tested once more before WV withdrawal.

3.12.3 Description of interventions

WV installed 3 wells during Phase I and 3 during Phase II. In May 2000, these six wells and 3 wells installed by the Government of Kenya, were privatized to ensure its maintenance after the withdrawal of World Vision. The 22 people responsible for the wells were not told what they were getting into – initially MWUA only asked them for volunteers to be trained in hand-pump maintenance. Twenty two volunteers (approximately 3 per well) were trained in the maintenance and operation of hand-pumps. Thereafter they were told that the pumps will be rented to them and they will have to pay a rental fee of Ksh 300 (3.85US\$) per month to the MWUA. The rental fee was only fixed in June 2001 – so the whole concept is still relatively new to the committee. Since then only two groups have paid their Ksh 300 to MWUA.

The Water Committee has a variety of problems – most of which are related to the fact that there was no proper agreement between them and the MWUA about their mutual responsibilities. Some pump attendants feel that MWUA should be responsible for spare parts. People also do not pay the Ksh 50 (0.64 US\$) per household per month for the water and when the committees try to lock the pumps, the locks are broken. Some pump attendants (2 of the 9 groups) have become so discouraged by their problems that they have abandoned their wells. Some people also want to pay in kind rather than with money, but MWUA does not accept payment in kind from the pump attendants.



Picture 3: A MIS staff member and member of the evaluation team with children who are collecting water from a privatized hand-pump

3.13 Sanitation

3.13.1 Lessons learned

- The sustainability of this intervention will be enhanced by the fact that the design was adjusted to local conditions, low cost alternatives have been identified and that the use of latrines was promoted by the CHW's.

3.13.2 Description of interventions

The risk of waterborne diseases and poor sanitation practices in the community made sanitation a very important part of the project interventions. The main thrust of the sanitation interventions focused on the construction of pit latrines on the scheme and the promotion of pit latrines in the settlements. As a result of the instability of the sandy soils in the area, the VIP method with culvert/concrete blocks being used to stabilize the pit was introduced. The maintenance and cleaning of the pit latrines is the responsibility of the CHW's, who also promote its use amongst farmers and mothers. The latrines were handed over to the MWUA in April 2001. The acceptance of the idea has been slow (partly because of cultural taboos), but has improved over the years. At the moment there is a demand for them. The development of low cost alternatives (between Ksh 1000 (12.82 US\$) and Ksh 3000 (38.46 US\$) has been a priority, as most of the farmers cannot afford the models based on the scheme design.

3.14 Implementation of the recommendations of the mid-term survey

Table 4: Degree to which the recommendations of the mid –term (Phase II FY1997- FY2001) were implemented

Main Recommendations, Phase II Mid-term evaluation: (Ondolo et al. 1999)	Degree of compliance
To start with on-farm research to identify more suitable crop varieties	10 conducted since 2000
To accelerate the engineering activities to complete Phase II	Fully
To standardize the procedures to measure crop cuts	Fully
To measure water flows using flumes/gauging station	When new inlet is complete
To train the scheme management committee in a variety of aspects	Done still need strengthening in business management skills
To expand the income generating activities and appoint a business development/marketing specialist	Not done
To conduct a survey to quantify the level of knowledge of mothers about health and nutrition	Done
To sink three planned wells and rehabilitate the broken well (phase 1)	Done
To identify community counterparts to WV staff and assign responsibilities	Done
To involve stakeholders such as the ministries of Health and Agriculture in order to ensure continuity beyond the project period	Done
To hold consultative meetings between stakeholders to provide a forum for continued capacity building	Done
To adopt exit mechanisms which could be carried out systematically	Done
To establish through a survey the characteristics of in-migrants	Done

The main recommendations of the mid-term survey that was conducted during 1999, are summarized in Table 4 on the previous page. The recommendation that was made to appoint a business development /marketing specialist was not implemented, because of other implementation priorities and the fact that Income generating Activities and marketing was not one of the major thrusts of the original project proposal. The approval of the adjacent Lokubae DAP will enable them to do another marketing survey which may indicate whether it is necessary to appoint such a specialist.

CHAPTER 4:PROJECT ACHIEVEMENTS & IMPACT

4.1 Introduction

This chapter discusses two aspects of project impact:

- a) The effect of the project on the scheme participants
- b) Its impact on the wider community or region.

The discussion is largely based on the findings of the household questionnaire survey conducted in May 2001, other surveys conducted by World Vision and progress reports. Where possible this is compared with survey data for 1994 and 1999. In cases where no previous information is available, comparisons are made with the situation in 1996 as recalled by the farmers in the May 2001 survey. The above data is augmented with information from secondary sources such as ADP documents, PRA research and Government statistics.

4.2 Conclusions

The project impact on the scheme farmers and surrounding area can be summarized as follows:

- The scheme has diversified (and will continue to diversify) the local economy by creating jobs (part-time and full-time) for both scheme and non-scheme members. This is happening in an area where there are no other job creators besides the Government, a few local shop owners and the missions.
- Most scheme farmers are able to produce enough grain to feed their family throughout the year.
- Scheme members are producing surplus grain for sale on the local market.
- As a result of the scheme expansion, a viable alternative to livestock for household survival has been created. Even during Phase I, farmers still relied heavily on livestock because they produced too little to sustain their families. Phase II effectively eliminated their vulnerability and the threat to their food security posed by livestock raiders and rustlers.
- Most farmers know and use the improved agricultural practices that they have been taught. They in turn can disseminate this knowledge further to other farmers and relatives.
- Scheme members have security of tenure with the possibility of title deeds in future. This may set the precedent for farmers on other similar schemes.
- Vegetables and fruits are being sold on the local market in an area where it has never been available before.
- The consumption of vegetables and fruit amongst farmers is significantly higher than it was before Phase II started.
- Trees are also for sale to non-scheme members and their benefits are available to the community at large. A private tree nursery was started as a result of the scheme activities. The owner of the nursery also benefited from the technical skills taught to scheme members.

- The large numbers of multiple-use trees planted on the scheme provides fruits and by-products that can be used by the farmers and sold on the local market. It provides the farmers with an income and makes products e.g. paw-paw, neem available in an area where it has never been available before.
- Many of the tree species planted, especially the nitrogen fixing varieties, are improving and will continue to improve soil fertility in the area.
- Large numbers of community motivators and farmers have been trained in a variety of technical, management and leadership skills. These skills will continue to be of benefit to the farmers and the community at large.
- Mothers (scheme and non-scheme) have been taught basic health and nutrition messages. Adoption rates are high.
- Scheme and non-scheme members have access to safe drinking water. The use of unsafe water sources has decreased dramatically since the project started.
- Environmental sanitation and the use of pit latrines have increased dramatically since the start of the project. The demand for VIP latrines in the villages is increasing steadily.

Table 5: Project achievements

Objective	Main achievements	Comment
To increase agricultural production to achieve adequate household level of grain production during years of normal rainfall to supply 80% of household grain needs by the end of 2001	The average household grain production during the past year supplied 138% of the household's rain needs; The 30% of households with the smallest land sizes (1/2 acre) managed to produce 72% of their total household grain requirements	World Vision exceeded its original objective. This happened against the backdrop of severe drought and famine relief in most of Turkana district.
To ensure that all family households have sufficient land resources (at least 0.5 acres) and yields to ensure adequate access to food for household needs	1528 farmers on the scheme have access to at least 0.5 acres.	300 more farmers were accommodated than the 1228 in the original project proposal
	Land allotments have been registered in the names of individual farmers and identity cards have been issued	Even though the land is still owned by the State, rights to tenure is more secure than it ever was in the history of the scheme.
	Yields of especially sorghum have increased consistently. Consistent training in improved agricultural practices and the high adoption rates of practices is the main reason for these yield increases	Yields increased despite low river levels/limited water supply during the past season.
	Farmers planted a significantly greater variety of different crops compared to 1999	

Table 5 (continued): Project Achievements

Objective	Main Achievements	Comment
<p>To ensure that all family households have sufficient land resources (at least 0.5 acres) and yields to ensure adequate access to food for household needs</p>	<p>The sale of cash crops has increased significantly since 1999. 72% of the farmers sold at least one crop during the past season. Cow peas, green grams and tomatoes are the most important cash crops</p>	<p>The sale of grain, especially that paid in kind as a maintenance fee is still a problem. Partly because they are competing with relief distributions, which depresses the local grain market.</p>
	<p>A total of 26 394 tree seedlings and 16 829 fruit tree (mainly paw-paw) has been planted during Phase II.</p>	<p>Multiple use trees provide fodder, firewood, building materials, food and improve soil quality. Thus it increases the households resources, but can also be a source of income when sold.</p>
	<p>The local economy has diversified as a result of the investment made in MIS. The project contributed towards the creation of a conservatively estimated 938 jobs (full and part-time) in the area. The number of indirect beneficiaries is estimated at 5630.</p>	<p>The local economy has been based on agriculture, but due to the division's isolation and poor transport and communication, there has been limited growth and development opportunities. Besides the Government, WV, the missions and shop keepers the Lokori division has no other job creators.</p>
<p>To maximize the utilization of food among Morulem households by the end of FY2001</p>	<p>The percentage of households growing and consuming vegetables and fruits (when in season) has increased significantly. The percentage, who eat leafy vegetables at least once a week when in season increased from 13% in 1996 to 81% in 2001. Legume consumption increased from 10 to 60% and fruit consumption from 10 to 56%.</p>	

Table 5 (continued): Project Achievements

Objective	Main Achievements	Comment
To maximize the utilization of food among Morulem households by the end of FY2001	69% of households (compared to 9% in 1996) get their drinking water from a safe water source (well fitted with hand-pump).	WV installed a total of six wells during Phase I&II. There are 6 more operational wells in the target area that were installed by the Government.
	91% of mother's interviewed, know and apply the 8 basic health messages that formed part of the CHW training.	38 CHW's have been trained since 1999.
	There have been no cases of water borne diseases such as cholera and bilharzias reported in the area. Disease profiles in the scheme area are similar to that of the rest of the division.	
	Overall sanitation practices have improved significantly. While on the scheme, 69% of the farmers reported using pit latrines. There is also a growing interest to install more VIP in the villages. At the moment 17% of the farmers have access to a latrine near their homesteads.	WV installed a total of 30 VIP pit latrines; some cultural beliefs hamper the adoption of this sanitation practices.

4.3 Food Security Achievements and Impact

4.3.1 Introduction

Household Food Security is defined by World Vision (World Vision 1996:7), as a situation whereby:

- Households have adequate access to food
- Households have sufficient food available to meet household food needs
- The utilization of food within the household is maximized.

WV's proposed interventions aimed at improving Household Food Security included (World Vision 1996:8-14):

a) Food availability:

- Expansion of food acreage with a minimum of ½ acre per household
- Agricultural extension and field trial activities to increase farmer yields
- Improved water and soil management

b) Access to food:

- Registration of scheme members and improved security of tenure
- Food for work was to be used to achieve work tasks on the scheme expansion

- Raising of household income through support to the cultivation and marketing of horticultural crops, animal traction and small enterprises under the management of organized community groups
- c) Utilization of food
- Promotion of nutrition and health education amongst women members of the scheme
 - Completion of modern grain store and the promotion of its use
 - Rehabilitation of three existing wells and installation of three additional ones
 - Construction of an additional 12 VIP latrines in the expansion area and encouragement of the construction of VIP latrines at household level.

In this section we will firstly look at the food security context around the scheme in order to put the achievements of this project into perspective. World Vision's contribution towards diversifying and increasing household income, its impact on food consumption and nutrition and finally household food production.

4.3.2 Food security context

The achievements and impact of this project on household Food Security needs to be viewed and evaluated within the context of the food security situation in the region as a whole. Even though approximately 60% of the Turkanas are pastoralists (ETC 2000:1), the farmers at Morulem have been involved in mixed farming systems for many generations. Many of them have always derived a proportion of their household food requirements from both livestock and crop production. A prominent feature of the district economy and *food security* system, is the loss of life and livestock due to livestock raids by the neighboring Pokot and internal rustling by local bandits (*Ngorokos*) (ETC 2000:2)). If pastoralists survive these raids, they become completely destitute as a result of the loss of their only means of survival - livestock. The raids and internal rustling appear to have increased during the past few years, as a result of the deteriorating economic situation and the drought.

The Turkana district is one of the least developed districts in Kenya with a poor road and communications network. The district is also prone to extremes and natural disasters. After serious flooding¹⁰ in 1997, the whole region entered another cycle of drought¹¹. The drought reached its zenith during the year 2000. By November 2000, two thirds of the Turkana district and the biggest part of the Lokori Division were classified as in the *Alarm* and to some extent, *Emergency* drought stages. In September 2000 over 330,000 people were receiving famine relief food aid across the Turkana district (ADP 2000:10).

¹⁰ These floods were caused by the El Niño phenomenon. Even though several parts of the district were flooded, Morulem and MIS were not affected.

¹¹ Other recent droughts were experienced in 1984-1985 and 1992-1993. Both these droughts resulted in large losses of human life and livestock (World Vision 1996:2)

The WV Lokori Area Development Program (ADP), which surrounds the Morrulem Irrigation Scheme, had to convert its normal development resources and activities into the mitigation of famine relief (ADP 2000:ii). In March 2000 the Lokori ADP was feeding up to 45,000 people in the Lokori, Lomelo and parts of Lockichar districts (ADP 2000:10).

For non-scheme members, the effect of the drought was significant. They were affected by a reduction in grazing for livestock and livestock numbers, reduction of wild food source availability and if they had dryland crops, crop failure. As a consequence, pastoralists started to move to villages and communities where they could find water, food and employment.

MIS farmers were affected by the drought on three levels: Firstly the little rain that normally augment irrigation, became significantly less. The river flow was also lower than normal, as a result of below average rainfall in the catchment areas. As a result of this, some irrigation scheduling and water rationing became necessary during the year 2000. The second way in which MIS farmers were affected by the drought is through a decrease in fodder availability for their livestock. Last, but not least, the in-flow of pastoralists to the area in search of food and water for themselves and their livestock, put additional strain on the normal coping mechanisms used by MIS farmers.

4.3.3 Food availability:

4.3.3.1 Food production

Program efforts aimed at improving food security focused on increased household food production. According to the original proposal, this goal would have been achieved using two strategies: increasing the quantity of food available by increasing landholdings and secondly, by improving yields through the adoption of better agricultural practices. MIS achieved the following during the period FY1997-2001:

- Their efforts to improve food production was internationally recognized in October 2000, when they received the *World Food Day Award* from the Food and Agricultural Organization (United Nations) for '**outstanding performance in the field of food production**'.
- Grain yields¹², especially that of sorghum, has improved consistently throughout the life of the project. Sorghum yields per ½ acre have increased from 194 in 1998 to 699 kg's in 2000 and maize yields per ½ acre increased from 428 kg's to 632 kg's during the same period (Schmidt 2001). Improved yields over the project period can be attributed to extension training, the use of certified seeds by the farmers, adoption of deep tillage in order to suppress nut-grass and improve nutrient utilization by plant roots, use of proper spacing which helped with proper weeding and plant growth and the adoption of practices to improve soil fertility.

¹² Crop cuts were used to standardize grain yields. The methods used during Phase I of the project did not provide reliable statistics and were reviewed and standardized in 1999. More details about standards and calculation methods can be found in Schmidt 2001.

- Yields per ½ acre, of both sorghum and maize, came very close¹³ to the 700 kg's that would be needed to satisfy 80% of the household's grain requirements¹⁴. This happened despite the fact that the drought in the river catchment area in the year 2000 made it necessary to do some water rationing at the scheme.
- 15 extension agents and 80 contact farmers have been trained
- Crop diversification has taken place. People do not only produce more food, but they also produce a greater variety of food. The mean number of different crops grown per farmer increased from 4 to 6.8. There has been an increase in the percentage of households who grow legume and vegetable crops. The biggest increases are visible in¹⁵ (1998/1999 compared with 2000/2001): cow pea (1 to 94%), onions (15 to 53%), green grams (1 to 87%), tomatoes (8 to 63%) and watermelon (12 to 86%).



Picture 4: A MIS staff member with a healthy stand of sorghum. In the year 2000, sorghum yields per ½ acre supplied 80% of the annual grain requirements of a household consisting of six people.

¹³ Sorghum yield/1/2 acre in 2000 was 99.8% of the required 700 kg's and that of maize was 90.2%.

¹⁴ The original project proposal aimed to increase agricultural production during years of normal rainfall to supply 80% of household grain needs by FY2001.

¹⁵ Source of 1999 data :Kamau 1999:15; Source of 2000 data: Schmidt 2001.

4.3.3.2 Cereal self sufficiency

The table below shows that despite the serious drought experienced during the year 2000, and the fact that most of the other inhabitants of Turkana district were surviving on Relief distributions, most households in the project area were able to produce sufficient food to feed their families. Households with the smallest landholdings (30% have ½ acre) managed to produce 72% of their household grain requirements during the year 2000/2001.

Table 6: Total grain production per household in the year 2000/2001

GRAIN PRODUCTION	30% hholds with ½ acre		All households	
	Grain in kg's	% of total needs ¹⁶	Grain in kg's	% of total needs
Mean(SD) kg's produced per household	631(72)	72	1210(664)	138

Source: Schmidt 2001

4.3.4 Access to food

4.3.4.1 Landownership and security of tenure

World Vision has made some significant contributions towards improving landownership and security of tenure in the project area. The most significant contributions were:

- Total land under irrigation was expanded from 307 to 764 acres (exceeded planned total of 614 acres by 150 acres)
- The minimum plot size per farmer has increased from a ¼ to ½ acre.
- The number of farmers increased from 1228 to 1528 (No increase in farmer numbers was planned in the original project proposal, but 300 pirates were accommodated during scheme expansion)
- Total land area allotted to the MWUA by the Turkana County Council is 1500 acres. Prior to Phase II, they were using State land by mutual agreement, but no official allotment was made.
- Security of tenure has improved: each farmer has been registered and has a Letter of Allotment from the Turkana County Council. This letter gives each of them tenancy rights, as the land is still owned by the State (before 1997 there was only an agreement between the MWUA and the Turkana County Council)
- The Government has promised that they will investigate the possibility of issuing title deeds. This may open the way for increased security of tenure for farmers on other similar irrigation schemes.
- The land distribution has been uneven even before World Vision was approached to assist with the scheme rehabilitation and expansion.

¹⁶ Unicef/World Food Program standards of 400g of grain per person, per day was used. Thus at MIS, with an average household size of six people, annual needs per household is 876 kg's.

- World Vision did highlight the skew distribution of resources to the farmers, but did not actively interfere with land allocation (one of the strengths of the project as pointed out in section 3.4). A comparison of the landholdings that the surveyed households were using in 1996 (retrospective) with the land being used at present, yields some interesting results. Even though land distribution is still inequitable, some progress has been made in reducing inequality. The percentage of households with only the minimum land allotment (0.25 acres in 1996 and 0.5 acres in 2001) has decreased from 55 to 39% (Schmidt 2001).

4.3.4.2 Household income

Degree of dependence on various income sources for survival

During Phase II of the project, the land sizes of the farmers were doubled and in a few cases trebled. The first harvest from the increased land sizes was harvested during the year 2000, resulting in a change in the relative contribution that crop production is making towards household food security and survival. This change was confirmed by the findings of the household survey (Schmidt 2001). It showed that there has been a significant shift, not so much in whether a source is contributing to household survival, but in the degree to which the source contributes. Generally, households depended less on livestock for survival than they did before Phase II of the project was started.

The main changes since 1996 (recall) are:

- Livestock: the percentage of farmers for whom livestock contributed a lot to survival *decreased* from 51 to 10%
- Crops: the percentage for whom crops contributed a lot to survival *increased* from 15 to 42%
- Relief/ free food distributions: the percentage for whom relief contributes a lot, *decreased* from 25% to 3%. This confirms the fact that scheme members have become non-eligible and independent of the relief distributions taking place in the district.

Given that the area is prone to livestock raids and internal rustling, the increased security provided by crop production as opposed to, being largely dependent on livestock can be seen as positive change for the farmers at MIS.

Employment and income generating activities

Employment opportunities are limited in the area. The main employers are the Government/NGO's (teachers, nurses and extension agents) and owners of small shops. The original project proposal suggested that support measures to alternative income generating activities should be explored, in order to cushion the impact of periods when adverse climatic conditions reduce agricultural production (World Vision 1996:12). Even though this was not the focus of World Vision's efforts, there is some evidence that they have made a direct and indirect contribution towards the creation of more income generating opportunities in the Lokori division. Table 7 summarizes these opportunities:

Table 7: Direct and indirect beneficiaries of income generating initiatives started at MIS

Activity	# of Jobs created	Direct beneficiaries
Expanded crop production : increased labor requirements ¹⁷	840	5042
Privatization of water pumps	22	132
Women's group/loans and income from Kiosk and jiko sales	60	360
Animal traction	10	60
Employment created by MWUA	5	30
Private tree nursery started	1	6
TOTAL	938	5630

The household survey confirmed the fact that local employment opportunities increased and diversified during the past 5 years (Schmidt 2001). There has been a 14% increase in the percentage of households who have an employed family member (from 13% in 1996 to 27% in 2001) and a 10% increase (from 10% in 1996 to 20% in 2001) in the percentage of households who are involved in self-employment activities. Thirty three percent of the households reported that they received remittances from friends or relatives who live/work elsewhere during the past year.

Livestock as a source of household income

Livestock ownership in the community has not changed dramatically since 1996. The percentage of households who own goats and sheep have remained the same at 84%. There has been a small reduction in the percentage of households who keep cattle and donkeys, whilst the percentage of camel owners has dropped from 36 to 22 percent (Schmidt 2001). Even though it is difficult to get reliable information on herd sizes, it appears as if there has been a slight decrease in the number of livestock owned per household during the implementation of Phase II. This may be a result of the drought and decreased availability of grazing or it could indicate that farmers are voluntarily reducing herds, because their alternative source of food/income, namely crop production has increased significantly.

Crop sales as a source of household income

There has been a significant increase in the percentages of households who get an income from the sale of cash crops. The progress in the sale of cash crops since the mid-term survey (1999)¹⁸, can be summarized as follows:

Cow peas (1 to 44%); green grams (1% to 40%); tomatoes (8% to 36%)
Onions (15 to 25%); watermelon (12% to 24%)

¹⁷ The survey showed that besides normal assistance within the extended family and work parties, 55% of the farmers needed to hire additional labor during the past season. If we assumed that each of them only hired one person per season, the number of direct beneficiaries are 840.

¹⁸ Source of 1999 data (Kamau 1999)- no data on sales is available, percentages quoted here are the percentage of framers who grew the crops in 1999 assuming that the percentage who sold will be the same or less; Source of 2001 data (Schmidt 2001)

4.3.5 Utilization of food

4.3.5.1 Food Consumption

Achievements since the start of the first Phase include:

- There has been a significant increase in the percentage of households who consume vegetable and fruit crops (Schmidt 2001). The percentage of households who consume leafy vegetables at least once a week or more often (when in season) increased from 13 to 81%; the percentage who consume legumes with the same frequency increased from 10 to 60% and the percentage who consume fruits has changed from 10 to 56%.
- In a survey that was done amongst a sample of 108 mothers in Morulem, it was found that 97% said that they have heard about the nutrition messages and an average 87% said that they are using the knowledge (Otieno 2001).
- The reduction of post harvest crop losses can significantly improve food security levels. Communal grain store completed in FY1998. The store is being used for the storage of farmer grain, Maintenance Fee grain and Food For Work grain.

4.3.5.3 Health, water and sanitation

Achievements to date:

- 38 community health workers have been trained and they have been training mothers in the four basic health messages¹⁹.
- The average adoption rate of the four health messages is 91% (Otieno 2001). No cases of cholera or bilharzias (disease sometimes associated with irrigation schemes) have ever been identified.
- During Phase I & II, a total of 30 pit latrines were constructed at the scheme and are functional – this is six more than originally planned.
- When at the irrigation scheme, 69% use pit latrines
- In the villages, 17% of households have access to a pit latrine at or close to their homes.
- World Vision rehabilitated the 3 wells sunk during Phase I, and installed 3 additional wells with hand-pumps as originally planned.
- Of the 22 wells sunk in the area by various organizations only 14 (64%) are operational. In most cases broken handpumps are given as the reason for non-functioning (Source: WV 2001). Nine of the operational wells (including the six sunk with USAID Title II resources) have been privatized under the auspices of the Water Committee, MWUA.
- Twenty two water pump attendants were trained in the maintenance of hand pumps

¹⁹ The four health messages are: environmental sanitation and personal hygiene; use of safe water supplies; basic disease prevention (diarrhea, malaria and respiratory tract infections); immunization of children under 5.

- Most of the households (69%) are using safe water sources at the moment and the use of the river as the main source of water has dropped from 67% in 1996(recall) to 16% in 2001 (Schmidt 2001).
- Seventy eight percent of households felt that there has been a change in their household water supply since 1996. The change mentioned by most of them, is that the water is cleaner (72%), this was followed by the water is nearer (59%) and there is more water (52%) (Schmidt 2001).

4.4 Achievements and impact on Knowledge and skills

4.4.1 Farmer literacy levels

Even though there are no specific schooling objectives for Phase II of this project, the project management encouraged and promoted farmer literacy and education. The World Vision ADP program has helped with the construction of classrooms in the area and through its sponsorship program is paying school- fees for a number of children from Morulem. In the 2001 survey (Schmidt 2001) 75% of the farmers interviewed said that they have at least one WV sponsored child in their household. Between 1998 and March 2001, MIS also employed three full-time adult literacy trainers who gave adult literacy training to the community at large. All these efforts are reflected in the fact that the percentage of farmers who have neither formal education, nor basic literacy skills has decreased from 79% in 1994 (Ondolo et al. 1994) to 58% in 2001 (Schmidt 2001).

4.4.2 Community resource person training

The MIS training and extension approach centered around the training of community resource persons, who then in turn trained farmers/mothers. The table below illustrates the extent to which local capacity was built during the period FY1997 to FY2001.

Table 8: Numbers and kinds of community volunteers and resource persons trained by World Vision

Kind of community resource Person	Total number trained ²⁰
Community Health Workers	38
Extension agents	15
Contact farmers	80
Conservation agents	10
Animal traction	10
TOTAL	153

Source: World Vision records

²⁰ The nature of the training received by these volunteers is summarized in Chapter Five.

The evaluation team interviewed representatives from all these groups and found that they appear to have the skills and knowledge to continue without the assistance of World Vision. The only area where all groups and resource persons need more training is in business management skills.

4.4.3 Agricultural extension

Ninety Five Percent of the interviewed farmers reported receiving an on farm-visit from someone giving agricultural advice in the year preceding the survey. This corresponds well with the reported figure of 93% for the 1999 survey (Kogi-Makau & Mugo 1999:5). In addition to on-farm training by the extension agents and Contact farmers, various other activities were aimed at increasing the exposure and experience of farmers. These were (Source: WV records):

- 66(4%) of the farmers were taken to agricultural shows
- 112(7%) were taken to similar irrigation schemes
- Since 1999, 10 on-farm demonstrations and 1 general farmer demonstration were held per annum

The adoption rates reported in the household questionnaire survey indicate that most of the farmers are using the agricultural practices that they have learnt. Most of the improved agricultural practices that were promoted by WV, are used by 85% or more of the farmers. The lowest adoption rates were recorded for intercropping (67%), the use of animal manure (79%), agro-forestry (81%) and the incorporation of crop remains to improve soil fertility (84%).

4.5 Environmental achievements and impact (also see Appendix D)

The design of the second phase incorporated several mitigating measures that would prevent negative environmental impacts. All of these have been implemented by the scheme. Their achievements since 1997 are:

- The promotion of the planting of multiple use trees to act as windbreaks, protect the canal banks and provide wood for fuel and construction. A total of 26,294 tree seedlings and 16,829 fruit seedlings were produced and distributed in the scheme so far. The average survival rates of the trees are high, with 82% for tree seedlings and 80% for fruit trees.
- 89% of the farmers reported having planted paw-paw trees and 64% have planted other general use trees on the scheme. Eleven per cent of the farmers also planted some trees close or near their homes.
- A private tree nursery was started. The owner of the nursery benefited from the technical knowledge taught at the scheme.
- Ten conservation agents have been trained and the community has been effectively involved in all the activities.
- Excess water from the irrigation plots is drained into the two woodlots (a total of 4ha) rather than the river. Thus river water quality further downstream is not affected by the scheme.
- Canals are kept weed free and deep enough for continuous water flow.
- The silt removed from the canals is used to stabilize the canal banks.
- The community received health education that sensitized them to the danger of water borne diseases and the importance of keeping the canals weed free to prevent these diseases.

- The yield increases reported in section 4.3 and the absence of white crested soils all give an indication that farmers are using proper soil management techniques.
- The only potential negative impact that could be identified at the time of the evaluation, was the disposal of non-biodegradable plastic bags by means of burial. It was felt that this is not sustainable in the long-run and if not properly done can pose a health risk to especially goats in addition to the pollution hazard.



Picture 5: Tree seedlings recently (July 2001) transplanted into drainage canals in Phase II of the Project. Note how barren the area is.



Picture 6: Young trees that were planted a year ago along a drainage canal in Phase II

4.6 Non-beneficiaries: their impact on the scheme and the impact of the scheme on them

4.6.1 Introduction

As a result of time-constraints, it was not possible to do a household questionnaire survey amongst non-participants. However, the evaluation team did interview two groups of non-participants. The one group consisted of nine people and the other of ten. The vast majority (84%) of the non-participants came to Morulem between 4 and 5 years ago. The remaining sixteen percent arrived during the past two years. Most came because of 'hunger' and/or because they were left destitute as a result of livestock raids.

They all said that they chose to come to Morulem because they heard that there is enough food and that there are some employment opportunities. Most of them do not have livestock at the moment. Their main means of survival are:

- Burning and sale of charcoal
- Collection and sale of building materials
- Provision of casual labor both on-farm and as domestic servants
- Collection and sale of firewood
- Food donations from farmers on the scheme
- If there is enough rain, they plant some crops (dryland) along the river margins

4.6.2 Effects of the scheme on non-participants

When they were asked how they are affected by the scheme, they were all positive, saying that the scheme has brought many benefits to them. The benefits listed by the two groups were:

- There is enough food in the area (they receive donations from farmers and sometimes buy/barter).
- They are able to get jobs from scheme farmers. They either do domestic work or help with farm work. For land preparation, they receive Ksh 30 (0.39 US\$) per basin, for weeding Ksh 20 (0.26 US\$) /basin and 5-10 head of sorghum for harvesting.
- They can use the Posho mill.
- The community pharmacy is not only for the scheme farmers, but also for the non-members.
- They benefit from the adult literacy training that was given at the scheme.

Some of the participating farmer groups were also asked what the potential scheme benefits for non-participants are. They identified most of the above benefits, but also added that they allow non-scheme members to cut the crop residues on their fields to use as livestock fodder or for resale. Some have to pay for the residues, while others are allowed to cut for free.

4.6.3 Effects of the non-participants on the scheme

The participants identified a few positive and negative effects that the non-scheme members may have on the scheme:

- They provide labor
- Some break/damage the fences to let their animals graze in the scheme
- Some break/damage the fences to extend the canals and use pirated water for their fields
- MIS farmers have to provide them with food, as part of their extended family obligations
- The influx of outsiders has increased problems with theft of livestock, crops and other goods

CHAPTER 5: SUSTAINABILITY

5.1 Introduction

One of the key objectives of Phase II of the project was to develop and strengthen the capacity of the MIS farmers to run and manage the irrigation scheme. This would have been done in such a manner that the irrigation scheme would continue to function effectively after World Vision's withdrawal.

The evaluation team looked at the sustainability of the project from four perspectives. These perspectives are:

- Institutional sustainability
- Environmental sustainability
- Infrastructural sustainability
- Financial sustainability

5.2 Institutional sustainability

5.2.1 Lessons learned

- The main institution that is responsible for the day to day running and implementation of scheme by-laws and water scheduling, is the block committee. WV ensured their success by building on the existing social organization and cultural practices. When the farmers allocated plots, WV encouraged the idea that relatives should share a block. Thus, social mechanisms already used by the extended family to regulate and control behavior, are harnessed at block level to regulate and enforce the scheme by-laws.
- The farmers developed the scheme by-laws, determined the fines for their transgression and the system that will be used to enforce them. As a result, compliance is high and the possibility that it will continue after World Vision has left is good.
- By encouraging the inclusion of a maximum period of two years in any one position of leadership and by supporting the development of a wide variety of local organizations, WV has succeeded in exposing a large number of farmers to positions of leadership and management and also provided them with training.
- World Vision encouraged the farmers to develop a system whereby leaders are elected on merit and leadership rather than on gender and as a result the gender distribution of the block foremen and SMC is exactly 50:50, which is quite close to the actual gender distribution within the scheme.
- There was some concern about the ability of the SMC to manage so many block and functional committees. However, it appears as if the appointment of three permanent staff members (all local community members, talented and well suited to their jobs), will go a long way in overcoming this possible weakness.

5.2.2 Recommendations

- Even though business management skills formed part of the training program that was followed by World Vision, many committees, especially the SMC need further strengthening in this area.

5.2.3 Approach towards institutional sustainability

In the original project proposal, it was acknowledged that the single most important factor that will determine the sustainability of MIS, will be the capacity of member farmers to run the scheme. Compliance to scheme by-laws, payment of maintenance fees and the strengthening of the institutional capacity of the various organizations active in the scheme, are just some of the ways in which sustainability was to be ensured. Most of the routine scheme maintenance during Phase II, was organized and done on a voluntary basis by the farmers. Food for Work was only used for the opening up and development of new canals.

The focus of WV's institution building efforts was on the *training and facilitation* of group formation and development. They encouraged the MWUA to hold regular elections and advised them to restrict the maximum term that any farmer can hold a specific position of leadership to two terms of one year each. This was done to encourage as many people as possible to become involved in the management of the scheme and develop leadership skills. During Phase II, a lot of attention was also given to the strengthening of existing groups and the establishment of new groups e.g. environmental committee, water pump committee and the *Posho mill* committee. Since 1996, the percentage of farmers who are committee members, has increased from 8 to 29%. Presently, 17% of the farmers are office bearers in some or other committee (Schmidt 2001).

The general philosophy that WV used, was to let the farmers make their decisions themselves, even on controversial issues such as land allocation. One of the aspects that WV introduced in order to increase the sustainability of the scheme, was to build on existing cultural practices. When the redesign of Phase I was complete, the farmers were encouraged to allocate land in such a manner that relatives become neighbors within a block. This arrangement ensured that if someone had to go away, one of his/her other relatives could be responsible for the absentee's, communal irrigation responsibilities and could take care of their fields without significant additional effort. Thus, traditional practices of providing support to each other, within the extended family network, are harnessed to improve the functioning of the scheme. An additional benefit is that most people on a block are related and that disciplinary action related to the transgression of scheme by-laws can in many cases be resolved by relatives.

5.2.4 MWUA institutional structure

The management structure of the MWUA is depicted in figure 4. It shows that all farmers are represented via democratically elected block committees. Representatives from these block committees form the scheme management committee, who in turn elect a scheme executive committee. The figure is followed by a table which shows the function of each committee and the training they received.

Figure 3: Morulem Water Users Association Management Structure

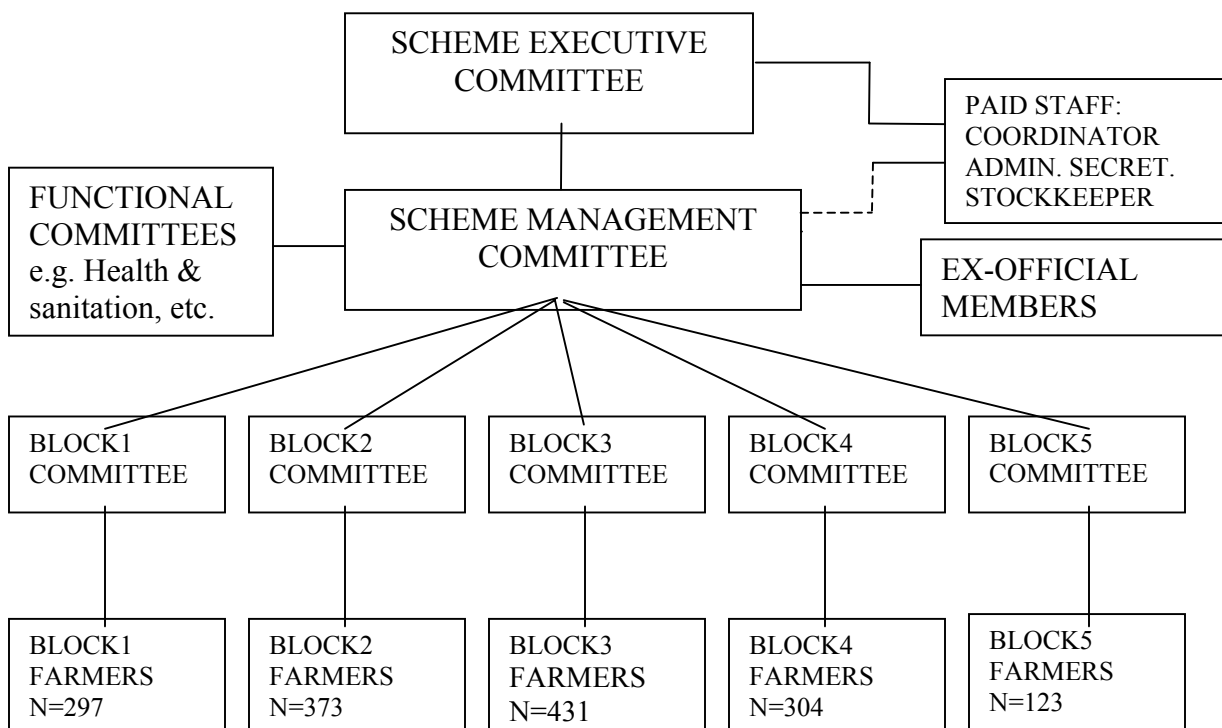


Table 9: Role and functions of the SEC, MSMC, BC

Name of the committee	Date established	# of members	Frequency of meetings	Frequency of election	Main functions	Training received
Scheme executive committee	1994	6	Once per week	Every two years	Overall management of the scheme	Trained on roles and financial management Record keeping and leadership skills Asset management
Morulem Scheme management committee	1979	78	Once per month	Every two years	Represent the farmers (2 per secondary canal: 1 foreman and 1 committee) Water control /scheduling Mobilize farmers for communal work Report to block committee any defaults	Leadership, record-keeping, water management, conveyance system
Block committee	1998	10 (2 per block)	When needed	Every two years	Overall management of block activities Water control Enforce rules and regulations Link between the executive and scheme management Reports any problems to scheme executive	Trained on their roles, record-keeping, water management, leadership, formation of by-laws

The evaluation team interviewed the scheme executive committee and found that the members knew their roles and responsibilities well. There was no indication that they would be unable to continue functioning after the departure of World Vision. However, there is some evidence that the committee needs some more assistance with business management skills. The pricing of for example the rental of hand-pumps, demonstration plots and the training hall seems to have been done without due consideration of all the factors at play.

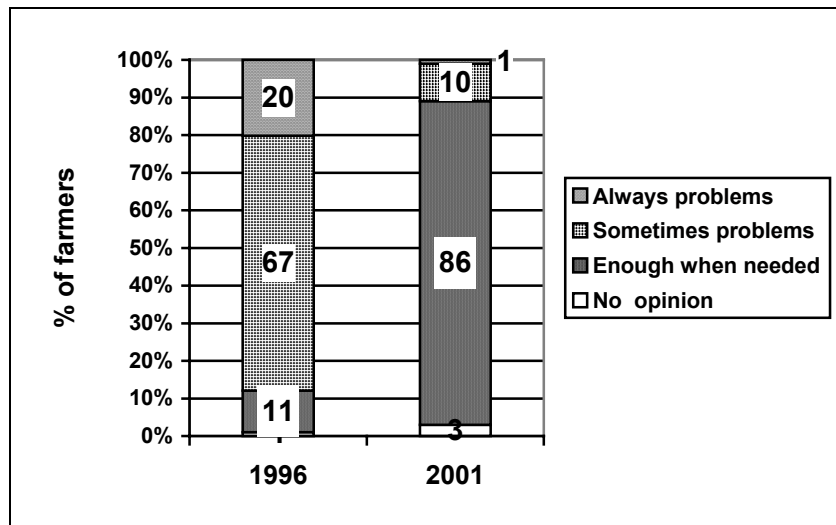
5.2.4 Functioning of block committees, water regulation and scheme by-laws

In terms of the general running of the irrigation scheme and the enforcement of scheme bylaws, the ability of the *block committees and the SMC* to control the situation has improved significantly. During the final evaluation of Phase I, some problems in regard of water supply and scheduling were identified. Some of these problems included (Ondolo 1994:44):

- Leaving inlet gates open overnight, leading to flooding of plots
- Collapse of some embankments
- Problems with irrigation water scheduling

In 1994, farmers were asked to assess the situation on the scheme in terms of water management. At the time, 43% felt that the situation was the same as before Phase I started, 40% felt that it was better and 17% said that it was worse (Ondolo 1994:44). Since then, the situation has improved dramatically, as shown in Graph 4 (Schmidt 2001). The percentage of farmers who get enough water when needed, increased from 11% in 1996 (recall) to 86% in 2001.

Graph 1: Farmer perceptions about the amount of water they get when scheduled to get water



The fact that the vast majority of farmers (86%) feel that they get enough water, when scheduled to get water, is a good reflection of the level of functioning of the block committees. The last 2 years had below average rainfall (in Lokori and the river catchment area), and some water rationing had to be applied on a demand basis. The overall positive response in the survey shows an improvement in water management, despite the more complicated scheduling requirements

during times of water rationing. Progress has been made on the level of an increased understanding for the need to regulate water supply. At present, the vast majority of the farmers (95%) rate the performance of the Block Committees (irrigation water scheduling) as *good or excellent*. When these same farmers (based on recall) rate the IWC's functioning before Phase II started, only 21% could rate their performance as good or excellent (Schmidt 2001). These findings are confirmed by the statistics on income from fines. These statistics show that in 2000/2001, no farmer has been fined for water related offences. In contrast to this, flooding offences earned the MWUA Ksh1705 (21.86 US\$) in 1999/2000 (MWUA Secretary, 2001).

Another indicator of the success of the institutional structures at MIS, is the degree of compliance and enforcement of by-laws. First of all, the by-laws and fines were developed by the farmers themselves – thus not only do they know the by-laws, but they also know the consequences of not adhering to them. When considering data on the fines levied at the scheme it becomes clear that laws are rarely violated.²¹ The by-law most frequently transgressed is the one prohibiting animals from entering the scheme. During the year 2000/01 the MWUA earned, Ksh 1050 (13.46 US\$) (21 cows) from the owners of impounded cows, Ksh 5910 (75.77 US\$) (197 goats) from the owners of impounded goats and Ksh 500 (6.41 US\$) (10 donkeys) from the owners of impounded donkeys. The only other by-law that needed to be enforced via fines, was the refusal to assist with the desilting of the canals for which one farmer was fined Ksh 300 (3.85 US\$). The amount of income from livestock related offences nearly quadrupled since 1999/2000. The total received for livestock related offences at the time was Ksh 1782 (22.85 US\$) as opposed to Ksh 7460 (95.64 US\$) in 2000/2001. According to the farmers this is one of the consequences of the severe drought in the area, which has left little, if any grazing for the animals (MWUA Secretary 2001).

5.2.5 Functional committees

Various functional committees were formed by the MWUA and farmers. These include: the women's group, health and sanitation committee, environmental committee, Water Committee, Posho mill committee, Animal Traction committee and the assets committee. More details on these committees and their functions are supplied in Table 2 in Appendix C. The evaluation team found that all the functional committees are functioning independently and participated in a variety of training courses offered by WV and other institutions. However, some are not as strong as others and there are certain aspects, especially those related to business management skills that need further attention.

5.2.6 Gender and leadership

Initially, scheme management was dominated by men in leadership positions. In order to make the committees more representative of the farmer gender distribution (67% women), WV encouraged the farmers to select leaders based on their leadership qualities, abilities and literacy level, rather than on their

²¹ Fines levied give a good indication of transgressions, because most rule violations are detected by the block committees and fined.

gender. At the moment the ratio men:women amongst the block foremen and the SMC is exactly 50:50. According to MIS staff, the general attitude towards women in Turkana is very positive. This is encapsulated in a comment made by the chairman of the SEC when he said : *' women are the front and center of development'*.

5.3 Environmental sustainability

5.3.1 Lessons learned

- WV involved the farmers at all stages of planning and implementation – this participatory approach is the key to the future environmental sustainability of this project.
- The high degree of sensitivity towards environmental issues is the result of appropriate and persistent training
- The Conservation committee members have been empowered to monitor aspects such as tree survival rates. Monitoring and the use of monitoring information are important contributors towards environmental sustainability.

5.3.2 Recommendations

- It will be important that mechanisms be put in place (before WV leaves) that will ensure that the soil fertility and salinity be checked every five years. The Ministry of Agriculture provides this service at low cost.
- Pest monitoring, during all stages of production including storage, should be built into the farm monitoring systems of the extension agents. Integrated Pest Management techniques should be applied where necessary.

5.3.3 Discussion

The environmental sustainability of this project has been greatly enhanced by the involvement of the farmers from the very beginning. The conservation committee was trained and has all the technical knowledge necessary to collect/select seeds from mature trees in the area; grow and care for seedlings; organize and monitor the transplantation of tree seedlings; monitor the survival rates of the trees and control tree cutting.

At the moment the sedentary community have access to sufficient dead wood along the river bank – so there is no need for the cutting of live trees. It is also expected that by the time population pressures are such that dead wood supplies are no longer sufficient, the two new woodlots that were established (4 acres) will help to preserve the natural tree cover by supplying firewood. The project also successfully promoted the use of energy saving 'jiko'/stoves. It is expected that the demand and use of these stoves will continue to grow and will continue to make a contribution towards the conservation of trees.

The quality of river water for downstream users is being protected by the fact that drain water is not pumped back into the river. Excess drain water is being used for the woodlots. Waste management of silt deposits is adequate although the evaluation team is concerned about the long-term sustainability of burying the black non-biodegradable plastic bags in which the tree seedlings are planted.

The sustainability of the project from an environmental point of view, largely depends on the ability of farmers to maintain and improve soil fertility levels and prevent salt accumulation. There are no salinity problems at the moment, nor is there evidence of nutrient depletion (yields are increasing even under adverse irrigation water conditions). The farmers have been taught a variety of appropriate and sustainable measures to maintain and improve soil fertility²². All indications are there, that they are aware of the potential problems that may develop if they do not care for the soil.

At the moment no chemicals are used in the communal store and there is no evidence of pest build-up. The store is kept clean and well-ventilated. However, there is a very real possibility that weevil populations may increase as time goes on and may start to pose a serious threat to the stored crops. Some precautionary measures such as crop dusting may be necessary.

5.4 **Infrastructural sustainability**

5.4.1 Lessons learned and recommendations

- In designing the irrigation infrastructure WV included various features that will reduce the siltation problem, reduce the labor needed to maintain and clean the irrigation system and increase the long-term sustainability of the scheme. This can be replicated in other schemes.
- The engineer trained local persons on masonry skills and irrigation technology and they are now able to construct structures and canals with little supervision.

5.4.2 Recommendations

- The transfer of buildings and wells to the SMC is largely complete. The SMC has started to implement mechanisms to earn income from these structures, but they have not developed a maintenance plan for the buildings. The team suggests that World Vision assist the SMC with this before withdrawal.
- The team recommends that WV make sure that all assets are in a good condition/good working order before hand-over.

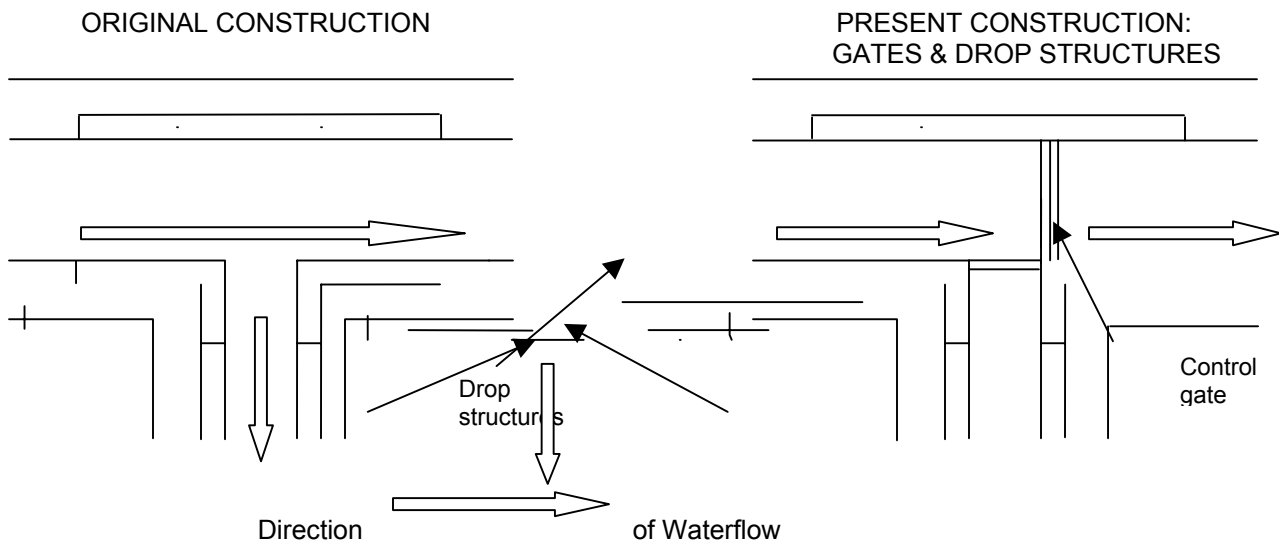
²² The water from the Kerio river always has a silt load, because it is a seasonal river and flows over quite steep terrain. In the process, it washes top soil in its path. While no analysis has been done to determine the nutrient load of the water, it can be reasonably argued that the muddy water deposits essential nutrients on farmer's plots, thus contributing to the maintenance and improvement of soil fertility.

- The business management skills of the SMC and Asset Committee, in relation to the management and determination of the rental rates of buildings and wells, needs further strengthening.

5.4.3 Irrigation infrastructure

A total of 764 acres of irrigation infrastructure was rehabilitated and developed during Phase I and II of this project. One of the problems the project faced, before the start of WV involvement in 1992, was the high degree of canal siltation and the amount of work needed to keep them clear. One of the contributory factors to this problem was the site selected for the main intake from the river. The fact that it was located on a bend in the river and on an unstable part of the riverbank, increased the amount of silt that was let into the system (MOA 1998:6). World Vision constructed a new intake approximately 800 upstream from the original inlet, at a section of the river that is straight and has more stable banks. They also modified the general design of the system in various ways to reduce the need for maintenance and increase the sustainability of the system.

Figure 4: Design modifications made to division boxes to reduce siltation and maintenance work



The most important modifications that were made to ensure sustainability, were:

- The inlet has a settling basin and back-flushing mechanism to reduce the amount of silt that enters the system.
- Division boxes were constructed to eliminate the need for farmers to block the canals with soil in order to divert water into their basins.
- Every division box was equipped with a drop structure. This allows the sediment to settle at various points so that less silt is carried as the water progresses along the canals. When clearing takes place – it only needs to be done at specific points, rather than at the whole length of the canal.

- Irrigation practices were modified so that irrigation starts at the end secondary canals and then move backwards towards the tertiary canals. This not only reduces the amount of seepage and losses, but also increases the effectiveness of water distribution.
- Lockable gates reduce tampering with the gates and canal scouring as a result of unregulated water flow.

When World Vision started to work in the area, there were no people with masonry skills. The engineer trained local people to construct the irrigation diversion boxes, canals and even buildings. Their presence will add to the ability of MWUA to maintain and repair existing infrastructure.



Picture 7: Original intake constructed in the late 1970's



Picture 8: New intake constructed during Phase II (FY 1997-FY2001). Sustainability features include a settling-basin and back-flush mechanism to reduce siltation and maintenance work

5.4.3 Other scheme infrastructure

During the life of the project, a variety of buildings and other infrastructure were developed. Most of these were handed over to the SMC during FY2001. Others, such as for example the office building, will only be handed over at the end of Phase II. Table 10 summarizes the non-irrigation infrastructure that was developed during the life of the project.

Table 10: Non-irrigation infrastructure developed throughout Phase I and II and dates when handover took place

INFRASTRUCTURE	QUANTITY	WHEN HANDED OVER TO SMC	REMARKS
Water wells	9 in total 3 in Phase I 3 in Phase II 3 constructed by TRP	2000	Operated by 21 pump attendants on behalf of MWUA
Demonstration plots	3	April 2000	Leased to Manor House trained farmers/extension agents
VIP latrines	30 in total 12 in Phase I 18 in Phase II	Phase I – 1999 Phase II – April 2001	Health and sanitation committee manages it with the CHW's
Stores and tools	1 tool store with a variety of tools	April 2001	Hand tools (spades, jembes, buckets, basins) given to farmers, balance is kept in store bank
Agroforestry nursery	1 with assorted tools	April 2001	Conservation committee is managing
Training Hall	1 equipped with solar energy and furniture	May 2001	Asset committee is managing it on behalf of MWUA
Community Pharmacy	1 equipped with furniture and stocked with essential drugs	April 2001	Health committee oversees operation on behalf of MWUA
Grainbank store	1 equipped with measuring scale	2000	Operated by MWUA
Office building	1	September 2001	This will be rented by the MWUA to the Lokubae DAP WV staff

The evaluation team found that:

- An asset committee was elected by the MWUA in March 2001. Their main responsibility will be to take care of the assets when WV is not there anymore.
- The SMC (through the Asset Committee) already have mechanisms in place to maximize benefits from these buildings, demonstration plots etc. through rentals to farmers, committees and outsiders. The SEC expressed the intention to use the income from these rentals for the maintenance of the non-irrigation infrastructure.
- There appears to be some problems with the way in which rental prices have been developed and the team felt that the business skills of the SMC needs further sharpening.
- The Asset Committee has no maintenance plan in place.

5.5 Financial sustainability

5.5.1 Lessons learned and recommendations

- A comparison between scheme income and expenditure indicates that the scheme is financially viable
- The main source of income, namely maintenance fee payments, is well regulated and compliance is high. This trend is likely to continue beyond the withdrawal of WV.
- The marketing of grain paid in kind is a problem. Finding a solution will be important to ensure their financial sustainability.
- The fact that WV advised the MWUA to involve the District Cooperative Officer in audits and budgeting was a good idea as he can continue to provide this kind of support after WV's withdrawal.

5.5.2 Recommendations

- Before withdrawal WV should actively look at ways to facilitate the problems related to grain marketing, linking potential buyers with MWUA.

5.5.2 General

Since the beginning of FY2001, WV has dramatically reduced its involvement in the budgeting process. WV also advised MWUA to commission official audits of their books, before the bi-annual elections of officials. The first audit was carried out during the first half of 2001 by the District Cooperative Auditor (DCA)²³. He identified a few small problems, but basically concluded that the books are in good order. In addition to doing the audit, the DCA also assisted MWUA with the budgeting process for the year 2001/2002.

²³ The DCA works in the Ministry of Cooperatives that resorts under the ministry of Agriculture and is based in the Turkana district.

5.5.3 Actual and expected income

11 summarizes the actual income and expected income of the MWUA for the years 2000/2001 and 2001/2002. Since the budget for 2001/2002 was drawn up, several changes have occurred:

- Rental of demonstration plots: Has been reduced from Ksh 5000 (64.10 US\$) per plot to Ksh 3000 (38.46 US\$) per plot as a result of complaints by the Extension Agents: thus expected income reduced from Ksh 15,000(192.31 US\$) to Ksh 9,000(115.39 US\$).
- The present WV office building will be handed over to MWUA in September 2001. The office will then be rented by WV for the implementation of another irrigation project downstream (if project is officially approved). This will provide a rental income of between Ksh 40,000 (5112.82 US\$) and Ksh 60,000 (769.24 US\$).
- The privatized hand pump system is not operating as planned/expected and there still is a lot of confusion about expected roles and responsibilities. It is possible that this expected income may not be completely realized. Neither the farmers are paying their Ksh 50 per month to the attendants, nor are the attendants paying their Ksh 300 to MWUA.

Table 11: MWUA actual income and expected income for 2000/2001 and 2001/2002

ITEMS	Actual	Expected*	COMMENTS
	2000/2001	2001/2002	
Demonstration plot fee	0	15,000	Rental paid by extension agents for 3 demonstration plots in 2000/2001 these plots were not yet their property
Maintenance fee	1 330,664	1 528,000	2000/2001:Ksh 615 per 1/2 acre 2001/2002:Ksh1000 per1/2 acre: assuming that all farmers pay
Receipt form debtors	0	34,000	
Donations	180,000	100,000	UNDP or other organizations
Fines	7,627	4,000	
Receipts from water	2,823	42,000	Supply on commercial basis
Training hall	0	8,000	2000/2001: not yet the property of MWUA
Posho mill	0	152,000	Ran at a loss in 2000/2001
Tree nursery	7,617	54,000	New conservation levy of Ksh 30 per farmer introduced for 2001/2002
Community Pharmacy	0	306,600	
Miscellaneous income	0	4,000	Hire of farm implements: initiative started in 2001
Bank interest	21,179	20,000	
TOTAL	1 549,910	2 267,600	
Adjusted expected income (see notes below)	-	2301,600	

*Source: Official MWUA budget. Their financial is from April 1 to March 30.

Sixty six percent of the expected income of the MWUA will be derived from the maintenance fee. Other sources include fines, hand-pumps etc. The evaluation team found that the MWUA has sound mechanisms in place to ensure that farmers pay the maintenance fee. Non-payment is usually dealt with by the block committees. If a farmer still refuses to pay, the matter is referred to the SEC. They then evaluate the situation of a specific farmer. If they find that the farmer

could not pay the whole fee (most defaulters pay at least part of the fee), the farmer may be exonerated on humanitarian grounds. However, in cases where it is clear that the farmer has the ability to pay, he/she can be denied the right to continue farming until the fee has been paid. At present, farmers are expected to pay Ksh1000 (12.82 US\$) per annum per ½ acre land. Those who want to, can pay in the form of grain. The grain equivalent of the maintenance fee is 50 kg's of maize or 30kg's of sorghum. According to the minutes of the AGM of the MWUA (March 2001) maintenance fee non-payment rates have increased slightly during the past three years. Non-payment rates of maintenance fees are very low. In 1998/1999 only 2% of the farmers did not pay while 7% did not pay in 1999/2000. Payments for 2000/2001 are still not complete. To date 76% of the farmers have paid fully, while most of the remainder have paid in part. The deadline for final payments for the past year is October 2001.

Initially, the MWUA found it difficult to convince farmers about the need for a maintenance fee. MWUA and MIS staff spent a considerable amount of time explaining to the farmers how non-payment will affect their ability to sustain the irrigation scheme in the long run. At the time of the survey, 97% of the farmers thought that it is necessary to pay maintenance fees. Fifty five percent of those who considered the charge as necessary, said that they have no problem with the amount charged. Thirty nine percent think that the fee is too high and 5% said that it is too low. As explained in Chapter Three in the section about marketing, the maintenance fee paid in kind, continues to be a problem, as there are not enough local buyers. WV is looking at ways of assisting the farmers to establish links with possible buyers in Lodwar and elsewhere.

5.5.4 Actual and expected expenditure

Table 12: MWUA actual and expected expenditure for 2000/2001 and 2001/2002

ITEMS	Actual @	Expected*	COMMENTS
	2000/2001	2001/2002	
Casual laborers	4,720	80,000	
Repair/maintenance	92,696	132,000	
Stationary	1,660	4,000	
Shows/field days	-	47,000	
Gunny bags	-	15,000	
Purchase of seeds	2000	360,000	
Transport	300	120,000	
Committee travel/subsidies	12,394	21,000	
Salaries/wages	52,450	468,000	Waterguards, coordinator, stock controller, secretary etc.
Seminars/workshops	0	60,000	
Adult education	0	70,000	
AGM expenses	0	50,000	
Audit fees	0	30,000	
Fuel (posho mill)	2,000	0	
Photocopies	235	570	
Bank charges	3,060	4,600	
Miscellaneous expenses	2,272	60,320	
TOTAL	173,487	1 522,490	

*Source: Official MWUA budget.

@ Expenditure in 2000/2001 is significantly lower than in the budget for 2001/2002 because a lot of these costs have been carried by WV

CHAPTER 7: REFERENCES

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APPENDIX A

TERMS OF REFERENCE

Final Evaluation of the Morulem Irrigation scheme
Terms of Reference
World Vision Kenya/USAID

1. Background

The original Morulem Irrigation Scheme was started in 1979 by the Morulem residents, with assistance from the African Inland church. By 1990, the scheme came near collapse due to shortcomings in the initial design, ineffective scheme management, lack of technical know-how and declining soil fertility. The community approached World Vision for assistance in 1990. This assistance was formalized in 1992, when the first monetized Title II proceeds were awarded to the program. Initial activities focused on the rehabilitation and expansion of the irrigation scheme and technical assistance. Subsequent activities included the introduction of a privately funded child sponsorship program.

The most recent program period, which will be the subject of the present evaluation, was approved for FY97 to FY2001. The key objectives for this period revolved around increasing household food security and institutionalizing the processes needed for the scheme to be self-sustaining over the long-term. This was to be achieved through:

- Expansion of the area under cultivation from 307 to 614 acres in order to double the land area allocated to each of the 1228 participating households.
- Technical assistance in the areas of water management, agricultural production, marketing, household nutrition and water and sanitation.
- Strengthening the scheme institutions and management.

A mid-term evaluation was conducted in 1999 to assess the progress of the project. The main recommendations of the mid-term evaluation were:

- To start with on-farm research to identify more suitable crop varieties
- To accelerate the engineering activities to complete Phase II
- To standardize the procedures to measure crop cuts and to measure water flows using flumes/gauging station
- To train the scheme management committee in a variety of aspects
- To expand the income generating activities and appoint a business development/marketing specialist
- To conduct a survey to quantify the level of knowledge of mothers about health and nutrition
- To sink three planned wells and rehabilitate the broken well (phase 1)
- To put mechanisms in place to ensure follow-up and implementation of decisions taken.
- To identify community counterparts to WV staff and assign responsibilities
- To involve stakeholders such as the ministries of health and agriculture in order to ensure continuity beyond the project period
- To hold consultative meetings between stakeholders to provide a forum for continued capacity building
- To adopt exit mechanisms which could be carried out systematically

The general objective of the final project evaluation will be to determine to what extent the original program goals and objectives have been achieved. It will also be important to identify best practices and lessons learned in order to improve the design, planning and implementation of future programs. The evaluation team will consist of nine members: One from WVUS, one from USAID, two from WVK, one external consultant, three Kenyan based external consultants and a representative of the Morulem Irrigation Scheme.

2. Objectives of the program

The focus of the evaluation will be on measuring the extent to which the initial objectives of the program have been met. These objectives are:

Objective one:

To increase agricultural production to achieve adequate household level grain production during years of normal rainfall to supply 80% of household food grain needs.

Specific interventions aimed at achieving this objective:

4. Increase diffusion and adoption of improved agricultural practices through: farmer training, demonstrations, on-farm visits, farmer field days, visits to other irrigation schemes, distribution of extension packages and messages to farmers and collaboration with research institutions.
5. Strengthen scheme management and maintenance institutions in the following skills: accounting record-keeping and enforcement of water by-laws.
6. Ensure that all FY97-2001 MIS activities are compliant with USAID environmental procedures. This is done through collaboration with their agencies; establishment of community wood-lots and planting of tree and fruit tree seedlings; conducting of training sessions; facilitating and promoting activities that would enhance the survival of tree/fruit seedlings; Environmental Conservation Committee.

Objective two:

To ensure that all households have sufficient land resources and yields to ensure adequate access to food for household needs.

Specific interventions aimed at achieving this objective:

1. Train and mobilize farmers to start with income generating activities

Objective three:

To maximize effective utilization of food among Morulem households.

Specific interventions aimed at achieving this objective:

4. Training on and demonstration of four key nutritional messages
5. Improve access to clean drinking water
6. Promoting improved agricultural storage

Objective four:

To enhance management and maintenance of scheme assets and activities by the beneficiaries.

Specific interventions aimed at achieving this objective:

4. Farmers are participating actively in project implementation, project review and planning sessions, surveys and meetings.
5. Provision of on-going technical support to staff and farmers groups
6. Promote networking between project, other NGOS' and Government departments.

3. Objectives of the final evaluation

3.1 Program design

The program design will be evaluated in terms of:

- The appropriateness of the activities in terms of addressing the original problems and needs in the community
- The appropriateness of the monitoring and evaluation system

- The program's ability to maximize participation and sustainability
- Appropriateness of overall annual targets, staff plan information systems, remuneration packages and budgets

3.2 Program implementation

- Strategies used to accomplish the planned activities
- Identification of the ways in which strategies had to be modified as a result of experience gained in the field.
- The suitability of the staffing and organizational structure to the demands of implementation
- An analysis of the DAP'S integration and linkages with the Lokori ADP.
- The degree and effectiveness of coordination and cooperation with appropriate Government Departments and officials

3.3 Quality, outcome and sustainability of specific outcomes

- Degree to which stated objectives and intermediate results have been met
- Effectiveness of Community mobilization, participation and empowerment
- Understanding of the project staff/community members of the most important components of a sustainable approach
- An analysis of the possibilities of continued support from the Lokori ADP to ensure sustainability

3.4 External and internal factors

- Positive and negative effects of project activities and applied mitigation measures
- Internal and external factors that affected program implementation and outcomes
- Limitations and potential of the project to overcome negative external forces

4. Specific questions that will form part of the final evaluation

4.1 Program design

- How appropriate were the activities in terms of addressing the original problems and needs in the community
- What project components were missing/redundant
- Was the Monitoring and Evaluation system appropriate to measure the intended indicators
- Were the indicators appropriate to the objectives/activities
- How reliable or what is the quality of the monitoring and evaluation information collected during the life of the project
- To what extent were planned overall annual targets, staff plan information systems and budgets appropriate
- Did the project design take specific recommendations of the final evaluation of Phase I into account?
- What lessons were learnt
- Recommendations for future project design

4.2 Program Implementation

- How appropriate were the strategies used to accomplish the planned activities
- Was it necessary to modify strategies as a result of experience gained in the field. If yes, in what way.

- The suitability of the staffing and organizational structure to the demands of implementation: also consider staff turnover
- What are the linkages between the DAP'S and the Lokori ADP
- Were the ways in which the monitoring indicators measured, practical and did it provide quality information
- Were the appropriate Government Departments and officials involved
- Should more/less coordination/collaboration with counterparts be sought, at what level and in which areas
- What are the stakeholders' opinions about the nature and quality of project implementation
- How did the project impact on the environment (positive and negative)
- The extent and quality of the implementation of the recommendations of the mid-term evaluation
- What lessons were learnt
- Recommendations for future project design

4.3 Quality, outcome and sustainability of specific outcomes

- How successful was the project in accomplishing each of the four objectives
- How well have the various committees been functioning
- What is the likelihood that these institutions will continue to function after the end of the project
- Was there a commitment to staff capacity building
- Do all the project staff/committees know the most important components of a sustainable approach
- Do all the project staff/committees use these components/approaches in their interaction with farmers
- Will the Lokori ADP be able to continue to provide networking and technical support when needed
- What lessons were learnt
- Recommendations for future project design

4.4 External and internal factors

- What are the positive and negative effects of the project activities
- Which measures were taken to identify and reduce the negative effects of the project
- Which internal and external factors affected the program implementation and outcomes
- How did WV respond to external factors
- How did the existence of these factors impact on project implementation
- What are the limitations and potential of the project to overcome negative external forces
- What lessons were learnt
- Recommendations for future project design

4.5 Lessons learned and recommendations

- Synthesis of lessons learned from planning, implementation, project outcomes and the way in which internal and external factors were identified and dealt with.

5. Proposed Evaluation Methodology

5.1 Principles

This evaluation will be based on the Learning Process Approach. One of the outcomes of the evaluation will be to produce an evaluation report, however, this will not be the main focus of the exercise. Far more important will be the *process* that will take place during the week 16-20 July.

During this week, the emphasis will be on mutual learning and exchange of ideas between the evaluation team, participants and MIS staff. The focus will be on maximizing learning from what has happened during the past five years, in order to improve on what will/may follow. Key words to describe this process are: participatory, holistic, multi-disciplinary and inclusive. Individual team members and external consultants will be expected to move comfortably between various disciplines, besides their own. The final report will reflect this by focusing on the project as an integrated whole, instead of on sectoral or specialist fields.

5.2 Modus operandi

The week in the field will basically consist of field visits to inspect project sites and interviews with farmers and committee members. Before we go into the field, each external consultant will be teamed with another team member and each pair will take responsibility for a specific section of the evaluation questions (see section 4). In the field, those sections need to be covered by each pair, when they interview farmers inspect sites etc. They can however, also cover other sections if they want to. All outings will be preceded by a short brief/background introduction (10 minutes) on the aspects that will be covered that day.

The evaluation team will be relatively large and will not only consist of external consultants, but also of project beneficiaries, several World Vision Staff members and a representative of USAID. This is an important departure from conventional evaluations, where a group of external consultants move in, move out and present their report. The views and contributions of all these team members (and sometimes co-opted team members) will be consolidated/integrated during the team's debriefing sessions. These meetings will be done each day, after the field visits and will be attended by the evaluation team, and WV staff members that may be co-opted as required (thus 10-15 people at any time). The role of the external consultants will be to give a fresh, but also positively critical, perspective on what has happened during planning and implementation. This however, will be done in an interactive manner to maximize appropriateness and mutual learning from the evaluation process. The role of the team leader will be to facilitate the process in such a way that all participants are actively engaged and that mutual learning can be maximized.

5.3 Review and analysis of key documents

All team members will receive a package of documents to be reviewed before the commencement of the evaluation. These documents will include the original DAP project proposal, the annual result reports, DAP reviews and the mid-term evaluation report. External consultants will be paid for two extra days to enable them to study these documents *before* they go into the field.

5.4 Review and interpretation of the household and other survey data

Since the report of the final household questionnaire survey will only be ready at the start of the evaluation process, its findings and its discussion will form the basis of the first day of the evaluation team's work. Other reports such as the baseline and nutrition survey reports, will be made available to the team members, with other project documentation, so that they can study it before the final evaluation commences.

5.5 Field visits to project sites

The field visits will focus on direct observation of ongoing and completed project activities. During the field visits interviews and group discussions will be held with committee members, farmers, project staff and stakeholders.

5.6 Writing and presentation of final evaluation report

A close to final report will be prepared by the team leader whilst the evaluation team will provide inputs and comments. The agricultural engineer, economist and environmental expert will be

expected to prepare brief technical evaluations of certain aspects of the project. These technical evaluations should be between 5 and 7 pages long and will be added as addenda to the report. The specific areas that will be dealt with in the three technical reports are:

- *Agricultural engineer*: an evaluation of the appropriateness, sustainability and quality of irrigation infrastructure developed during Phase II
- *Economist*: an analysis of the costs and benefits of the project in comparison with the feeding schemes/food distribution projects that have been implemented in the surrounding areas
- *Environmental specialist*: an evaluation of the environmental components of the project, its appropriateness and sustainability. The soil survey analysis (2000) and other environmental assessments that were done during the life of the project should also be taken into consideration.

The main findings of the draft report will be presented and discussed with WVK staff, USAID and other stakeholders. The report will be finalized by 30 July. Hardcopies and computerized copies of these reports have to be presented to WVK (3 copies), WVUS (2 copies) and USAID (1 copy). Also see section 7.2.

6. Staffing Plan

6.1 Proposed team composition

The proposed evaluation team will consist of nine members. At this stage they will be:

Dr. Charles Owubah (WVUS) - Natural resource management

Gerald Wagana - Civil engineer (WVK)

Dr. W. Oteno - Food security (WVK)

George Mugo - USAID representative

Three local external consultants: Agricultural engineer

Development economist

Environmental specialist

Isabelle Schmidt - Research/rural development/food security (Evaluation Team Leader)

6.2 Team member qualifications

All team members should have at least 7 years rural development/food security experience. Their qualifications should at least be a masters degree. All team members should have good communication skills and the ability to work in a team.

The team leader will be responsible for planning and organizing the evaluation and should have good planning and organizational skills. The team leader should also have good writing skills as she will be preparing the final report.

6.3 Criteria for consultant selection

Senior staff from WV Kenya and WV US, in consultation with USAID, will select the evaluation team members. Selection will be based on a number of criteria as summarized below:

Number	Description	Weight
1	Experience with community based projects	25
2	Experience with irrigation projects	15
3	Qualifications	20
4	Communication skills	15
5	Ability to work in a team	15
6	Ability to work and think beyond his/her own discipline (multi-disciplinary environment)	10

7. Deliverables

7.1 The process

The process used during this evaluation will be as much an outcome as the final evaluation report. As already highlighted in 5.1 and 5.2, the emphasis will be on maximizing learning from what has happened during the past five years, in order to improve on what will/may follow. Key words to describe this process are: participatory, holistic, multi-disciplinary and inclusive. As a result of the method used, most of the findings and recommendations of the report will already be known to, accepted and internalized by WVK staff members, even before the report is presented. The actual workshop presentation of the findings, will therefore largely be a formality and it will mainly be used to ratify the process.

7.2 Evaluation report

A close to final report will be prepared by the Coordinator of the Evaluation Team with inputs and comments from the evaluation team. The report should address each section of the evaluation focus. The main findings of the draft report will be presented and discussed with WVK staff, USAID and Government counterparts for their comments and inputs. The content of the overall Evaluation report should include at minimum:

- Executive summary (4 pages)
- Summary of program/project objectives
- Evaluation methodology
- Results
- Discussion, including lessons learned
- Conclusions and recommendations

8. Timeline

The proposed activities and associated time line is as follows:

	TASKS	Time frame	Dates
1	Review of project documentation by team members	2 days	July 1-15
2	Travel of evaluation team to Turkana (7 am)	2 hours	July 16
3	Presentation and discussion of the findings of the household questionnaire survey (team & MIS staff)	4 hours	July 16
4	Meeting with WV staff	4 hours	July 16
5	Scheme management committee and site visits focusing on irrigation infrastructure and management institutions	5 hours	July 17
6	Team debriefing on day's events	2 hours	July 17
7	Agro-forestry, health and sanitation: field visits and meetings with committees	5 hours	July 18
8	Team debriefing on day's events	2 hours	July 18
9	Meeting with IGS, women's group & asset committees	3 hours	July 19
10	Meeting with stakeholders	2 hours	July 19
11	Team debriefing on day's events	2 hours	July 19
12	Team debriefing on week's events	4 hours	July 20
13	Flight back to Nairobi (3 pm)	2 hours	July 20
14	Preparation of 7 page reports (addenda) by local consultants	2 days	July 21-23
15	Preparation of final evaluation report (IS)	4 days	July 21-25
16	Draft to WVK, USAID for perusal	1 days	July 26
17	Finalization of Household Questionnaire Survey Report incorporating comments	1 day	July 26
18	Workshop presentation of evaluation findings	1 day	July 27
19	Incorporation of comments & finalization of report	2 days	July 28-29
20	Distribution of final report	-	July 30

APPENDIX B
HOUSEHOLD QUESTIONNAIRE SURVEY
METHODOLOGY

B: Sampling Framework for the questionnaire survey

B1 Target population

Even though some activities associated with the scheme also benefited the Morulem community at large, the main target group for most of the activities and expenditure was the 1528 farmers who have plots allocated to them on the irrigation scheme.

B2 Study population

The study population consisted of all the farmers who were issued with identity cards, signifying their rights to use 28 basins or ½ acre.

B3 Sample size

A random proportional sample of 20% of the farmers was selected from each of the five blocks. The farmers were selected from farmer lists, using a table of random numbers to decide which farmers would be included. The total sample size consisted of 306 farmers of the 1528 farmers associated with the scheme. The sample composition was as follows:

Block One:	59	of	297	farmers
Block Two:	75	of	373	farmers
Block Three:	86	of	431	farmers
Block Four:	61	of	304	farmers
Block Five:	25	of	123	farmers

Sample size was determined with the following formula:

$$N = d \left[\left(\frac{Z}{p} \right)^2 * \frac{P_1(1-P_1) + P_2(1-P_2)}{(P_2 - P_1)} \right]$$

If one wants to detect a difference of 10% ($p_2 - p_1$) in a given indicator from a starting value of 10% (p_1), assuming a design effect of 2.0, using a one tailed test, 95% level of significance and 80 percent power, the desired sample size is 309 cases. Since a 20% sample would be 306, the sample size was rounded of to 306 for ease of proportional calculations.

If a selected farmer was unavailable for some or other reason, he/she was replaced by the next farmer on the list. As a result of other commitments on the part of the farmers, 32(10%) of the original sample had to be substituted. The substitute group was distributed as follows amongst the blocks: five from Block 1, nine from Block 2, seven from Block 3, five from Block 4 and six from Block 5. The main reasons for substitutions were:

- Unavailability of the farmers
- Some farmers live far from the scheme and could not be traced
- Some were skeptical about the survey and did not want to participate

The representativeness of the final sample is reflected in the gender distribution (amongst other variables). Sixty seven percent of the farmers at MIS are women, whilst 67% of the sampled farmers were females. Other aspects, such as the proportion of polygamous household heads (28%) corresponds well with the mid-term survey which was conducted in October 1999 and which found that 27% of the household heads had more than one wife (Kamau 1999:3).

B4 Questionnaire design

The questionnaire was designed by the consultant, but with significant contributions from MIS staff, the enumerators and the two supervisors. Some of the questions were taken as is from the mid-term survey questionnaire or included with slight modifications. Field testing and the actual field training of the fieldworkers provided further insights for the improvement of the questionnaire.

B5 Enumerator selection and training

The questionnaires were completed by a group of 10 fieldworkers. Six of the fieldworkers were female and the remaining four male. All of them are inhabitants of the area and speak English and Turkana fluently. The group was well suited to the job. They all had:

- Prior survey experience, some having assisted with the Population Census of 1999, whilst others helped World Vision with some of its previous surveys.
- Good communication skills
- Some knowledge about agriculture and irrigation
- The ability and willingness to work in the field under difficult/hot conditions

Training took place over a period of four days, the last of which involved practice in the field. During this exercise each enumerator interviewed two farmers. A World Vision staff member and one Ministry of Agriculture representative supervised the fieldwork.

B6 Organization of fieldwork

Since none of the questions had to be verified at the homesteads of the farmers, and available time for the there was limited, it was decided to call the sampled farmers on specific days, to be interviewed at specific points, by the enumerators. This method presented some problems, even though it significantly reduced the distances that fieldworkers had to travel between homesteads and therefore reduced the time needed for interviews. Firstly, the farmers had to be told that each interview is confidential and on-lookers (other farmers waiting to be interviewed) were not welcome. Secondly, some farmers came on days that they were not supposed to come. In the beginning they were turned away, but the supervisors then realized that if a farmer is asked to come back another day, he is very unlikely to come. Thereafter they adopted a policy of interviewing all the farmers who came on a particular day, regardless whether they were actually called or not. This meant that the fieldworkers completed more than the three questionnaires originally allocated to them on some days, whilst they did less on other days. The Block officials provided assistance in notifying the selected farmers about the survey. The fact that World Vision dedicated a vehicle to the survey also made a significant contribution to the effectiveness of the survey.

APPENDIX C

DETAILED TABLES

Table C1: Staff capacity building that took place between 1997 and 2001

Nature of course	Institution/ Organization	Date	Duration	No. of staff who attended
T.O.T. Irrigation Scheme Management and leadership	Provincial Irrigation Unit	1998	3 weeks	13
Environmental compliance	USAID	1997	2 weeks	2
Sustainability workshop	Lenmac Consultancy	1998	1 week	14
Linking Relief and Development	USAID	1998	1 week	13
Conflict and conflict resolution	MMI	1998	1 week	1
Proposal writing for donor funding	VADA	1998	1 week	2
Irrigation systems	New Mexicostate University	1998	1 month	1
Gender & development	Daystar/Premese	1998- 2000	2 weeks	5
Communications for development	Daystar University	1998	3 weeks	1
Preventative maintenance & Road safety	World Vision	1998	1 week	4
Supervisory course	Federation	1998	2 weeks	1
Strategic management	MMI	1998	2 weeks	1
Rural development management	MMI	1998	2 weeks	1
H. Resources training	US University	1998	1 month	1
Agric. Training	US University	1998	1 month	1
Environmental evaluation	USAID	1999	1 week	2
Sustainability & phase out plan for MIS	Life Work Ministry Consultancy	1999	2 weeks	14
Environmental impact assessment	KIA	1999	2 weeks	1
Development and management of IGA projects	MMI	1999	1 week	2
Regenerative agriculture	MMI	1999	2 weeks	2
Effective logistics	MMI	1999	2 weeks	1
Bio-intensive agriculture	MHAC	1999- 2000	3 months	2
Participatory leadership		1999	1 weeks	1
Stock control and stores management	MMI	1999	2 weeks	2
Fluid mechanics & closed channels land surveying	Moi University	1999	1 month	1
Organic farming	K.O.F	1999	3 weeks	1
Training needs assessment	K.I.A	1999	1 week	1
Public relations	MMI	1999	1 week	1
Development Activity Proposal	WVUS	2000	3 days	16
Neem awareness workshop	ICIPE	2000	1 week	2
Competency in driving	A.A.	2000	2 weeks	5
Participatory Rural Appraisal	Premese	2000	2 weeks	5
Management of community based organizations	Premese	2000	1 week	5
Driving	A.A	2000	1 month	3
Leadership challenge course	Outward bound	2000	2 weeks	1
Training of facilitators	Premese	2000- 2001	2 weeks	6
Community based social development	Kenya Institute of social work	2000	1 year	1
Computer training	Moi University	2000- 2001	3 weeks	10
Result oriented project management	Premese	2001	2 weeks	6
Counselling	University of Nairobi	2001	4 weeks	1
TOTAL	-	-	+ 321 WEEKS	157 heads

Table C2: Functional committees, their composition ,roles and functions

Name of the functional committee	Date established	# of members	Frequency of meetings	Frequency of election	Main functions	Training received
Women's group	1994	60	2/year 1/month	Every year	Generate income from crop production & kiosk Give credit to members & sometimes non-members Assist needy members with gifts Help each other with farm work	Group formation Record keeping Leadership Management of IGA Nutrition & Food preservation Improved jikos
Health and sanitation committee	1999	38	2/month	Every year	Train mothers basic health care, nutrition, food preservation, sanitation Supervision of VIP latrines Run small community pharmacy (income MOWUA)	Role of CHW in promotion of community based health care Community based health care (health education, safe water and sanitation, local disease control, nutrition and food supply) Financial management (officials)
Environmental committee	1999	10 2/block	Not known	Every year	Train farmers in conservation Manage and run tree nursery Collect and store tree seeds Keep records of trees and survival rates Enforce bylaws related to conservation Promote the use of energy saving stove	Environmental conservation Soil conservation & fertility The use of bio-pesticides Agro-forestry Energy conservation
Water Committee	2000	22 approx. 3/well	When necessary	Not elected	Operate and maintain the hand-pumps Collect monthly water user fee.	Hand-pump operation and management Basic sanitation training
Posho mill committee	1994	4	1/month	Every year	Coordinate the use and maintenance of the Posho mill	Business skills
Animal traction committee	2001	10	1/month	Not elected	Promote animal traction activities Provide a contracting service in animal powered transport and ploughing	Technical training in the use of animal traction
Assets committee	2001	9	1/month	Every year	Manage MWUA assets	None

MSMS: enforcement of by laws (number of fines); non-payment of water maintenance fees; biggest challenges;

RECOMMEDATION OF PHASE I FINAL EVALUATION

The table below compares the main recommendations of the final evaluation of Phase I of the project with the implementation that took place during Phase II. The evaluation team found that WV has fully implemented the main recommendations of this study. Some of the drainage water is still being used by water pirates. This is a problem that will probably always exist as a result of the high demand for land. What is important is that the MWUA has the land (a further 700 acres is available for expansion) and technical know-how that will enable them to expand the existing system if necessary.

Table c3: Degree to which the recommendations of the End of Project Evaluation (Phase I FY1992-FY1994) were implemented

Main Recommendations, Phase I final evaluation: (Ondolo et al. 1994)	Degree of compliance
Completion of outstanding project expansion to 614 acres.gf	Fully
Studies should be undertaken to identify ways of improving intake works and reduce siltation, a cost benefit analysis of shifting the intake upstream should also be undertaken.	Fully
Construction of regulating structures to facilitate the regulation and control of water.	Fully
Rehabilitation of canal banks, providing sufficient walkways to prevent further damage	Fully
Detailed design documents of the present system should be prepared to rationalize future modifications	Fully
Irrigation scheduling should be improved to increase water use efficiency. Implications of inefficient water use should be identified and taught to farmers	Fully
Water user by-laws have to be enforced	Fully
Drainage system is not fully developed and some farmers are using the drainage water to irrigate additional area	Partially
A gully developed at the water drainage outlet and it was recommended that it should be repaired as soon as possible to avoid further expansion.	Fully
The training program was constrained by: inconsistencies in planning and implementation, inadequate monitoring and evaluation mechanisms and weak linkages with affiliated organizations at project level.	Fully

APPENDIX D

SPECIALIST REPORTS

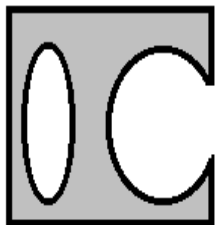
ENVIRONMENTAL ASSESSMENT
IRRIGATION AND IRRIGATION INFRASTRUCTURE
ASSESSMENT

WORLD VISION KENYA

MORULEM IRRIGATION SCHEME

FINAL EVALUATION EXERCISE

FINAL TECHNICAL REPORT



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1.0 INTRODUCTION

1.1 Background Information

This technical report from Log Associates presents final evaluation of the World Vision/Kenya Morulem Irrigation Scheme in Lokori location of Lokori Division, Turkana District.

The district with 77,000 sq. kilometres is the largest in Kenya and has 17 divisions, 58 locations and 158 sub-locations. It is situated in Northern Kenya and borders Lake Turkana to the East, Samburu, Baringo and West Pokot to the South. It shares international borders with Uganda to the West, Ethiopia to the North and Sudan to the North-West. The 1999 census report shows that the district population is about 450,000 people while in Lokori location where the project is situated the population is 7,000 comprising of 3,250 men and 3,750 women. The location is one of the densely populated in the district.

The district has both arid and semi-arid land (ASAL) and consists of low lying plains with isolated mountains and hill ranges. The rainfall patterns and distribution is unreliable and erratic as evidenced from annual figures which range from 19mm to 380mm. The district has several rivers with the major ones being Turkwel and Kerio. However, most of the rivers are seasonal.

1.2 Policy Environment

Poor infrastructure, food insecurity, inadequate supply of water, poor enrollment rate in schools, poor sanitation, insecurity and inaccessibility of health services are the major constraints to development in ASAL areas of Kenya. The Government of Kenya through its various policy documents such as Sessional Paper NO. 4 of 1981 on National Food Policy, Sessional Paper No. 1 of 1986 on Economic Management for Renewed Growth, various development plans and Poverty Reduction Strategy Paper (PRSP) of the year 2001 has put in place strategic development objectives to address these development challenges with the ultimate goal of reducing poverty. The strategic objectives include increase of agricultural food production and other income generating activities, infrastructure development, environmental management, health and sanitation, amongst others. In ASAL districts which include Turkana, the Government through participatory process of planning identified key priorities to be addressed. These include diversification through introduction of agro-pastoralism, development of irrigation schemes, rehabilitation of existing water resources, high dropout rates, training of communities on health and sanitation, and management of existing water facilities. These strategic objectives are complementary with both USAID and World Vision development objectives. Since Morulem Irrigation Scheme was addressing the plight of the community to increase their food security and improve on their welfare USAID agreed to fund the project, as was requested by WVK.

1.3 Justification of Morulem Irrigation Scheme Project

The MIS was started in response to the desire of the community living in the area of Kerio River to increase agricultural production.

The origin of the scheme dates back to the 1970s, when Africa Inland Mission initiated the project and later handed it over to the Africa Inland Church (AIC). In 1984 AIC phased out its assistance to the scheme thereby leaving Joint Water User's Association to implement the project. The MWUA had no capacity for implementation and by 1988 the scheme almost collapsed due to shortcomings in the initial design, ineffective scheme management and lack of technical knowledge. In 1990 the Morulem community requested World Visions's assistance to rehabilitate the project. WVK commissioned a feasibility study which found that the scheme management system was weak and there was need for rehabilitation of the scheme. Between 1992 and 1995 WVK implemented the first phase through USAID financing, with the principle objective of developing an effective, efficient and sustainable irrigation scheme. The Phase I project benefited 1228 farmers and their households directly and the general community of Lokori indirectly.

1.4 Initial Project Objectives

The project document clearly spells out that the project goal is to assist the Morulem community in establishing and sustaining a seasonal small holder irrigation scheme which contributes to food security of the area. This was to be achieved through the establishment of an effective and sustainable irrigation scheme, managed on a full cost recovery basis by farmers. The processes which were considered essential for meeting the overall project goal were that:

- the agricultural output must be increased by enlarging the size of farmer holdings for all member households and by intensifying agricultural extension so that a family of five will produce enough food to sustain itself throughout the year
- the scheme management institutions must be strong, ensuring ongoing maintenance of the scheme and equitable use of resources
- health and sanitation must reach a standard which does not compromise utilization of food, particularly by vulnerable individuals
- other income-earning opportunities must be explored to mitigate adverse climatic conditions and provide adequate cash income to ensure that locally produced food is not sold

In pursuit of the overall objective and based on the above processes the specific objectives of Phase II of the project were as follows:

Objective one

To increase agricultural production to achieve adequate household level grain production during years of normal rainfall to supply 80% of household food grain needs.

Specific interventions aimed at achieving this objective:

1. Increase diffusion and adoption of improved agricultural practices through: farmer training, demonstrations, on-farm visits, farmer field days, visits to other irrigation schemes, distribution of extension packages and messages to farmers and collaboration with research institutions
2. Strengthen scheme management and maintenance institutions in the following skills: accounting record-keeping and enforcement of water by-laws
3. Ensure that all FY97-2001 MIS activities are compliant with USAID environmental procedures. This is done through collaboration with their agencies; establishment of community wood-lots and planting of tree and fruit tree seedlings; conducting of training sessions; facilitating and promoting activities that would enhance the survival of tree/fruit seedlings; Environmental Conservation Committee.

Objective two:

To ensure that all households have sufficient land resources and yields to ensure adequate access to food for household needs.

Specific interventions aimed at achieving this objective:

1. Train and mobilize farmers to start with income generating activities

Objective three:

To maximize effective utilization of food among Morulem households.

Specific interventions aimed at achieving this objective:

1. Training on and demonstration of 4 key nutritional messages
2. Improve access to clean drinking water
3. Promoting improved agricultural storage

Objective four:

To enhance management and maintenance of the scheme assets and activities by the beneficiaries.

Specific interventions aimed at achieving this objective:

1. Farmers are participating actively in project implementation, project review and planning sessions, surveys and meetings.
2. Provision of on-going technical support to staff and farmers groups
3. Promote networking between project, other NGOS' and Government departments.

1.5 Terms of Reference for Technical Assignment

The Terms of Reference outlined the specific areas to be covered in the technical evaluation as follows:

- *Evaluation of Irrigation Infrastructure:* an evaluation of the appropriateness, sustainability and quality of irrigation infrastructure developed during Phase II
- *Cost Benefit Analysis:* an analysis of the costs and benefits of the project in comparison with the feeding schemes/food distribution projects that have been implemented in the surrounding areas
- *Environmental Evaluation:* an evaluation of the environmental components of the project, its appropriateness and sustainability. The soil survey analysis (2000) and other environmental assessments that were done during the life of the project should also be taken into consideration.

1.6 Methodology of the Technical Assignment

The consultant reviewed key documents related to the project that were provided by the Client. Data was collected from the field using the following methods

1. General inspection of the scheme and direct observation of ongoing and completed project activities
2. Structured and unstructured interviews with project staff, farmers and committee members as well as stakeholders

The Terms of Reference required the consultant to undertake comparative analysis of MIS and relief schemes food distribution projects in the surrounding areas. This Cost benefit analysis has not been included in this report, with the direction of the Client, because the required data was not readily available.

2.0 EVALUATION OF IRRIGATION INFRASTRUCTURE

2.1 Background

Morulem irrigation Scheme was started in the 1970's when severe spells of drought drove thousands of the inhabitants of the general area into the famine relief camps. The digging of a canal along the dead river bed of the Kerio river which was left dry when the river changed course about 40 years ago started in 1979 when the African Inland Church (AIC) set out with the objective of assisting the farmers with the diversion of the water from the river by use of gravity into the farms the inhabitants had cleared. By September 1979, 800m of the main canal measuring 3m deep, 3m wide at the bottom and 15m wide at the top, had been dug. The clearing of the irrigation area and the construction of the distribution canals was completed in 1982. Over the years since then, the programme has been assisted by a number of donors with the Provincial Irrigation Unit (PIU) at Nakuru closely associated with design and survey work, while the number of farmers and acreage has been increasing. The intake and water conveyance system was constructed using labour provided by farmers using local materials (Except cement) while supervision was provided by the Project Engineer assisted by Engineers from the Ministry of Agriculture (PIU). In field, structures i.e. division boxes, box culverts e.t.c were constructed using local materials (sand and aggregate), local artisans under the supervision of the Project Engineer whereas other materials and specialized inputs were by World Vision. In 1999, a mid - term evaluation on the project was conducted and it recommended the following, among others:

- That the project accelerates the engineering activities to complete phase II;
- That Measurement of water flows using flumes/gauging stations be instituted.

Therefore, with regard to Infrastructure development, the table below summarizes the activities in the years between 1997 – 2001. There does not seem to have been much activity in 1997.

Table 2.1: Irrigation Infrastructure Development between 1997 and 2001

Activity	WORK ACCOMPLISHED				
	1997	1998	1999	2000	2001
Construction of tertiary canals		21,000m	56,500m	-	15,000m
Construction of primary canals		1,220m	3,420m	-	600m
Construction of Secondary canals		7,000m	12,004m	-	3,000m
Construction of basins				17,192	4,200
Construction of drains			3,440m	-	600m
Main canal extension to phase II area		3,000m		-	
Main canal extension (for the new intake)				-	1,750m
Construction of new intake				1	-
Rehabilitation / Cleaning of old inlet / gate done every year to allow water to flow into the farms)		1	1	1	1

Other Phase II infrastructure developed include:

- One main division box
- 55 division boxes
- 110 gates
- 11 Road crossings
- 59 drop structures
- 13 foot bridges

During the implementation and operation of Phase I, a number of lessons were learnt which formed the basis of the design and implementation of Irrigation Infrastructure development activity in Phase II. These were presented hereunder: -

- That the river carries a high sediment (mainly silt and sand) load which enters the main canal and subsequent parts of the conveyance system hence requiring a lot of desilting work for the farmers during maintenance.
- That ground water available is limited due to low recharge and hence it should primarily be used to meet domestic and livestock watering needs.
- That the Intake works to the scheme was so constructed and located on the bend of the river as to render it unstable and inefficient in carrying out its intended task.

Therefore concerning the high sand and silt intake in the project water conveyance system, it was decided that a suitable site be identified at about 800m upstream of the existing intake point where the river is straight and a stable bank exists to locate the intake water.

2.2 Appropriateness and Quality of Irrigation Infrastructure

2.2.1 Intake and Siltation Reservoir

The Intake with wing walls was constructed and three (3) steel gates were correctly fixed in March 2001 as per the design drawings and specifications, which in our opinion, were adequate and appropriate to the overall scheme design philosophy. The Siltation Reservoir was being shaped to its designed dimensions and levels. A local Artisan with a work force of 25 people is progressing on well with this work. The steel gates to the main and flushing canals have not been fixed. The walls and lined reservoir bed are yet to be done. It is expected that these remaining works shall be completed by the end of July 2001. This structure in the existing intake works seems to have been rendered ineffective thus leading to the big problem of high sediment deposits in the conveyance system.

2.2.2 Main Canal (New)

The excavation work of the 1700m long new main canal was complete. There are small sections, which need to be shaped to the designed invert levels and dimensions. The excavated

materials/soil had not been moved to some distance from the canal to prevent the soil from falling back into the canal. Further, the designs specify that the canal will be lined.

2.2.3 Flushing or Desilting Canal

The excavation work was going on and it was more than 60% complete. There are three artisans with a work force of 21 people each, contracted to do this work. However, the point at which the Flushing canal was to discharge is different from the one in the design. The canal joins the siltation reservoir as per the design but after 100m, it makes a curve or a bend and then it ends in the river at a distance of about 100m downstream of the Intake point. The overall length of this canal is about 200m. The riverbed level at the discharge point of the flushing canal and bedlevel of the flushing canal at its head is almost the same. However, it is expected that once the gates to the main canal are closed and the intake gates opened, there will be enough head to make the Decanted silt be flushed back to the river.

2.2.4 Road Crossings

There are three (3) road crossings along the main canal. The first one is at a distance of 300m from the Intake. The second road crossing is at a distance of 800m from the Intake and the third road crossing is on the road connecting Morulem centre and Lokori centre. The three (3) road crossings are properly constructed as per the design drawings and specifications, which in our opinion, were adequate and appropriate to the overall scheme design philosophy.

2.2.5 In-field Structures

The consultants' understanding of the term "in-field structures" should include primary, secondary and tertiary canals, main canal, extension to phase II area and the division boxes, which also act as drop structures. Table 2.1 has outlined the time and amount of activity related to infield structures development (the division boxes are silently included in the canals). All in all, a total of 25,150m of canal work (including drains) were constructed during the period under review. The consultant has reviewed the design drawings together with the accompanying specifications and found them to be appropriate to the overall scheme design philosophy, and following the visit to the field, is of the opinion that the quality of construction is sound. These structures are important in effecting water control and regulation in the project. What was missing to complement the existing structures, are measuring and additional control structures. The Project Engineer was of the opinion that the division boxes were actually measuring structures of the broad-crested weir type only that they lacked calibration marks to assess actual flow rates (or quantities) at the different parts of the project. Therefore, the gate openings by foremen/water controllers are set on "gut-feelings". Thus, it may not be possible to achieve equitable water distribution to the farmers who have equal plot sizes - an important aspect of sustainable irrigation water delivery. Several incidences of scouring at the secondary and tertiary canals especially just after the division boxes were reported - probably due to unregulated flows. The Project Engineer conceded to this problem and reported that the new intake works will have one measuring structure and further that efforts will be made to convert existing division boxes into measuring structures by calibrating them. He also reported that the water guards seem to know the number of turns on the sluice gates control arrangement necessary to effect enough water abstraction from the river

to meet project water requirements. The Engineer kept records emanating from the staff gauge and tried to train the foremen/ water managers on record keeping as a management tool but this has proved quite hard. Table 2.2 below presents a comparison of scenarios of 1989, 1994 and 2001.

Table 2.2: Comparison between the situation before World Vision became involved, at the end of Phase I and at the end of Phase II.

Observation	1989*	1994*	2001
Desilting of sediment basin	Satisfactory	Satisfactory	Satisfactory
Maintenance of main and primary canals	Satisfactory	Satisfactory	Satisfactory
Maintenance of secondary and tertiary canals	Poor	Poor	Satisfactory
Plots left unattended	Some	None	None
Water logging	Some plots	Some plots	Rare
Unauthorized and unplanned canals from the main and primary canals	Yes	One case	None
Acquisition of abandoned plots	Slow	No abandoned plots	No abandoned plots
Frequency of clearing of main drain	Rarely done	Rarely done	Rarely done
State of embankment of tertiary canals	Some collapsed	Some collapsed	Satisfactory
State of embankment of secondary canals	Not reported	Some collapsed	Satisfactory
Inlet gates left open at night	Yes	Yes	No
Lack of suitable outlet for some plots - waterlogged	Yes	Yes	None

* **Source: Ondolo et al. 1994**

Further to the observations above, there is need to control and regulate water flow rates to deal with the problem of scouring at some points in the project infrastructure. The consultant recommends inclusion of several check dams at the main and primary canals to regulate flow and help control the problem of sediment load in the water and therefore desilting.

2.2.6 Basins

It was observed that each household (farmer) had 14 basins, measuring 3.6m by 25m each, in each 1/4 acre plot they had, giving a total of 42784 basins constructed in the project, 21392 at which were constructed in the period under review (See Table 2.1). While it is clear that the basins offer greater water application control especially when water is not enough during periods of low river flows, no one was able to rationalize why 14 basins were created for each 1/4 acre plot. The number represents more work for the farmer and tends to inhibit efficient mechanization of operations especially soil tillage. The consultant therefore recommends that the basins be made big by combining several of the existing sizes e.g. 5 or 4. Further in the interest of moisture conservation, the furrow system of planting be studied with a view of

replacing the flooding type of irrigation currently practiced. Even though this represents more work to the farmer, the spin-offs in terms of moisture conservation are attractive especially given that South Turkana is an arid area where moisture conservation should be a leading criterion of achievement. The construction of furrows prior to planting can be considered as part of the improved tillage systems that the farmers should adopt alongside the adoption of Animal Traction, which should enable farmers to accomplish deep tillage for effective seedbed preparation and weed control. By using Animal Traction on the farm, they could reduce labour requirements and do the work faster and better. The consultant recommends the adoption of conservation tillage alongside animal traction whereby the animal-drawn mould board plough should be avoided and replaced with animal-drawn tined tools, which are available in the market. Conservation tillage combines both moisture and energy conservation by avoiding soil inversion during tillage.

2.3 Sustainability Issues

Issues touching on the sustainability of the project rest heavily on those activities that would strengthen scheme management and environmental conservation as the World Vision team prepares to formerly handover the project to the Morulem community (i.e. institutionalizing the processes needed for the scheme to be self-sustaining over the long-term). The level of involvement of the Morulem community in the management of the project is a key factor in the long-term sustainability of the project. The consultant is satisfied that the foundation for a self-reliant irrigation community has been laid.

2.3.1 Scheme Management

There is a Scheme Management Committee of the Morulem Water Users Association (MWUA), supported by functional committees with grassroots representations which has the mandate of coordinating cultivation of crops, repair of infrastructure, desilting of the water conveyance system. MWUA is organized into five blocks with each block being run by a committee, which supervises the day-to-day operations and maintenance work, as well as looking into the farmers' welfare. The following have been put in place to ensure sustainability: -

- Functional committees have been trained and are now actively involved in the activities for their respective sectors, and 112 farmers have visited similar irrigation schemes.
- By-laws have been developed to regulate activities of the scheme members and Scheme Management Committee continues to enforce the by-laws with defaulters being fined to discourage non-compliance (e.g. being absent from a desilting exercise attracts a fine of Kshs. 800.00 for the main canal and Kshs. 300.00 for secondary and tertiary canals and failure to pay a fine means the culprits are denied water).
- All farmers in the scheme are now paying a maintenance fee of Kshs. 1,000.00 each either in cash or in kind meant to take care of farm inputs and maintenance of infrastructure.

- Respected and knowledgeable members of the community are elected to scheme leadership positions every year to allow wider participation in scheme leadership.
- The maintenance and desilting of the water conveyance system and structures is the responsibility of the farmers. They all work together on the main canal and as they progress further towards their fields they split into smaller groups to work on the primary canals supplying their fields. When they reach the tertiary canals feeding their basins, they work on their own.
- The Government has been involved in the project through provision of staff and equipment since the beginning and has pledged to continue this effort by undertaking to post key personnel to Lokori District to provide technical backstopping
- 234 scheme leaders have been trained on leadership and management, but training to impart entrepreneurial and mechanical skills should be encouraged to sharpen their business skills and enable them to support new mechanization initiatives like Animal Traction.
- The Morulem Scheme Management Committee be encouraged to acquire a tractor in the long term to assist in the mechanization of farming operations.

2.3.2 Water Conservation

Because the area falls under the Arid and Semi-arid climate with an annual average rainfall of 250–500 mm and mean annual temperature of 30°C, water conservation becomes a very important contribution to sustainability. Conservation tillage and furrow planting (i.e. planting at the furrow bottom) are vital strategies to achieving moisture conservation. It is heartening to note that an awareness campaign has already been launched on Animal traction and several farmers have been exposed to the technology. Animal traction will make farmers achieve the objectives of deep tillage for effective control of weeds and manure incorporation while furrow planting is made easier. It is recommended that tined implements be introduced and farmer training in the area be intensified. This should improve the water economy in the scheme especially during the periods associated with low river flows. The lining of the new main canal should further improve the water economy by improving the water conveyance efficiency. The system of using siphons to apply water from the tertiary canal into the furrowed plots is recommended. Further training on irrigation technologies that promise higher water application and conveyance efficiencies like drip irrigation is encouraged. For this, the Ministry of Agriculture PIU in Nakuru should be approached. Over-irrigation is something that must be avoided at all costs as it would lead to leaching of the nutrients away from the plants root zone. Farmers need to be sensitized on this matter and foremen/ water controllers be made to remain vigilant that it does not happen.

3.0 ENVIRONMENTAL EVALUATION

3.1 Introduction

The Morulem Irrigation Scheme (MIS) is in Lokori Division, Southern part of Turkana District. The project area is mostly flat, consisting mainly of thin layers of recent and subrecent alluvial deposits. However, the River Kerio which flows seasonally from South to North, influences the topography of the area. Flood plain soils are very deep (i.e. more than 2.5m) and River water samples have shown that the water is suitable for most locally grown crops.

The inhabitants of the District, the Turkanas, are predominantly pastoralists although a few are agro-pastoralists. Livestock keeping is frequently checked by periodic drought and over the last 30 years, four major droughts have resulted in widespread famine, diseases and loss of large numbers of livestock rendering thousands of people destitute. Agriculture, through both rainfed and irrigated crops, is the only major alternative source of food security in the region, hence the need to safeguard the environment for prolonged sustainable agricultural production.

Design requirements for environmental conservation should be devoted to the accomplishment of the following three goals in the most economical way:

1. Keeping the natural beauty of the surrounding intact
2. Creating aesthetically satisfying structures and landscapes
3. Causing minimum disturbance to the area ecology

The programs objective was to ensure that the FY 97-2001 activities are compliant with USAID environmental procedures. This was to be achieved through establishment of woodlots, tree planting (including fruit trees), training sessions, and promoting activities that would enhance the survival of these tree seedlings.

The main activities undertaken in this phase were:

- Leveling 104 acres of land
- Leveling and clearing of 203 acres of marginal land with very sparse bush and dry wood remains
- Excavation of 6 km of canal
- Construction of 20 diversion boxes and 9 road crossings
- Fencing of 1.5 km of the main canal
- Flood irrigation of 614 acres (now 764 acres) in both phase 1 and 2
- Construction of improved demonstration grain store
- Drilling 3 wells and installation of hand pumps
- Construction of 12 VIP latrines

3.2 Implementation Strategies

The design of the second phase of the MIS incorporated a number of mitigating measures that would prevent adverse environmental impacts. Community involvement in all the activities has been effectively emphasized.

The clearing of land area was to be done in such a way that tree shrubs along the canals were not cleared for soil erosion control. The community was to be trained on soil conservation measures and crop husbandry.

The river water quality was to be tested every four years as there are no known upstream activities that could adversely affect the quality of water. Excess water from the irrigated fields is drained into the woodlots which are outside the scheme preventing the possibility of contaminating water downstream. Seven and a half percent of the river flow was to be used for irrigation for two and a half months. The canals would be kept weed free and deep enough with the required minimum gradient to facilitate continuous water flow.

The community has received health education that has sensitized them on various health issues including the need to keep the canals weed free to prevent water borne diseases. A storage protection plan was to be prepared and information for pesticide analysis was to be assembled. Use of Actellic was deferred until the plan was in place. Farmers were to be trained in drying farm grains to the required moisture content. Additional specialized training on pesticide handling was also to be effected.

The environmental conservation activities carried out in the MIS could be broadly broken down into Tree planting, Solid Waste management, Energy use, Soil fertility management, Sanitation and Chemical use.

These activities are mainly overseen by the Conservation, Health and Sanitation, and Block committees.

3.2.1 Conservation Committee

The responsibilities of the conservation committee include:

- Training and encouraging the farmers to plant trees
- Keeping records of trees and their survival
- Collecting seeds
- Enforcing by-laws related to conservation
- Managing the tree nursery
- Coordinating tree planting in the farms

3.2.2 Health and Sanitation Committee

The committee comprises a total of 38 members drawn from each block and are involved in the following activities:

- Promoting environmental cleanliness in the homesteads and pit latrines
- Sensitizing the villagers on water hygiene

3.2.3 Block Committees

The scheme comprises 5 blocks in phase I and 3 in phase II. Each block has a committee which is headed by an elected block chairman. The activities they undertake include:

- Monitoring of trees planted within the block
- Enforcing by-laws related to conservation
- Effecting block related concerns raised by the conservation committee

3.3 Quality and Outcome of Environmental Components

3.3.1 Tree Planting

Trees are mainly planted as hedge rows along the canals to serve as wind breaks as well as for bank stabilization. Reforestation is also being undertaken in two woodlots, covering approximately 4 acres which are being established using drainage water from the scheme. There is an adequate supply of seedlings from the tree nursery which has a capacity of 25,000 seedlings. Tree seedlings that are doing well include Azadirachta (Neem), Moringa, Zyziphus, Tamarindus, Leucaena, Sesbania, paw paw and local species such as Cordia Sinesis (Edome) and Acacia (tortilis, Senegal, and Nilotica). The other seedlings that are still on trial include Kei apple, , citrus, mangoes, dates, guava, and bougainvillea,

The average survival of tree seedlings is 82 % while that of fruit seedlings is 80%. A total of 26,394 tree seedlings and 16,829 fruit seedlings have been distributed so far. It has been noted that survival of the seedlings is better when planted along canal banks.

3.3.2 Solid Waste Management

The main solid waste generated directly from the project activities are the plastic bags from the tree nursery and the silt from the irrigation canals.

Seedlings in the tree nursery were originally planted in clear polythene bags which when buried degrade faster than the plastic bags. However, due to a delay in opening the new scheme there was a shortfall in the clear polythene bags and a number of seedlings were transplanted into the plastic bags. This was done with the intention of recycling the used bags for other seedlings. The plastic bags which have deteriorated and cannot be used are either buried in a pit or thrown into a pit latrine. The farmers have been sensitized on this and are aware of the possible harmful effects of these plastic bags.

Most of the silt removed from the canals is used to stabilize the banks of the canals.

3.3.3 Energy Use

The community derives most of the cooking energy from firewood. The law prohibits them from cutting down trees in the forest as well as within the scheme. They are however allowed to collect the deadwood from the forest of which there is an adequate supply. An energy saving 'jiko' has also been introduced amongst them and this has greatly reduced the consumption of firewood.

With the afforestation program in the woodlots it is expected that there would be sufficient firewood even if the number of farmers would increase within the scheme.

3.3.4 Soil Fertility Management

According to the soil survey undertaken by KARI, the soils are generally stratified, deep sandy loam to silty clay with platy structure and having pronounced smeary consistence. The soil reaction ranges from slightly acid (pH 6.3) to moderately alkaline (pH 8.1). The nitrogen levels and organic matter content were also established to be low throughout the project site.

Soil Fertility Management (SFM) remains one of the key factors in deciding the success of irrigation. Optimum agricultural production aims at eliminating the correctable limitations that reduce crop production below the desired levels, and this is often achieved through the application of technologies or management strategies that address the problems related to the adequacy of nutrients and water supply. Based on the detailed soil survey analysis by KARI in December 2000, it is recommended that cycling of the nutrients within the farmers' household be maximized.

Towards this end, farmyard manure is extensively used in the farms. Although it is difficult to state the exact extent to which it is used, it is estimated that about 70% of the farmers use it in their plots. Most farmers collect manure from the homesteads and carry it (on their heads) to the farms using metal basins (karais), plastic basins, gunny bags, etc. A few farmers use animal carts.

Generally, manure transportation from the homesteads has been a big challenge due to its bulky nature. However, a new trend has emerged which, if well utilized, will help minimize this problem. This involves a form of zero grazing where farm refuse is fed to the livestock in designated areas outside (of the fenced scheme area). The animal droppings are later collected by farmer and used for improving soil fertility in the farms. This has picked very well and is now being adopted by majority of the farmers (about 60%).

There have been no serious problems related to crop yields within the scheme. The problems encountered have mainly been solved through training on recommended agronomic practices.

3.3.5 Chemical Use

The use of chemicals such as pesticides or inorganic fertilizer has been discouraged in the project. Pesticides are not used in the grain store. No problems have been noted in the store so far in terms of pests or vermin. The grain is normally well dried to the required moisture

content and is usually stored for a period not exceeding six months. There has been no notable complaint regarding the quality of the grain.

The soil fertility management measures appear adequate and there is no need for inorganic fertilizer at the moment. However, the soils should be monitored closely to ensure that any deterioration in fertility would be addressed promptly and adequately.

Although there have been no cases of infestation by pests such as mites or weevils it is very important to monitor the grain store for pests. An integrated pesticide analysis should also be undertaken. There should be pest monitoring and crop loss assessment on a regular basis.

3.3.6 Sanitation

There are a total of 30 VIP latrines within the scheme. There are 14 latrines in Phase 2 all of which are in good condition and well maintained. In Phase 1 13 latrines are in good condition, and 3 are not well maintained. The farmers have been sensitized on the need to use them and the response has been very good to the extent that some of them have attempted to construct their own. Capacity is still being built among them to impart the new technology which is more cost effective. The farmers have also maintain these latrines well in terms of cleanliness.

World vision Kenya has also installed a total of 6 boreholes under the MIS project. Only 4 of these boreholes are in operation. Water quality tests are undertaken every two years. The water quality tests done in 1999 for two boreholes indicated that the water was unsuitable for human consumption. Water samples from all the boreholes should be tested once more and results should be well kept.

3.4 Appropriateness and Sustainability

The planting of trees along the canals is suitable for bank stabilization and also for wind breaking. The woodlots are appropriate for reforestation and future firewood needs. Implementation of these activities was participatory and the community is fully in control of the exercises. These are sustainable.

The burying or depositing of plastic bags in pit latrines is not sustainable. The use of clear polythene bags should be encouraged. The use of cost effective incinerators for burning these bags could also be explored.

The current use of organic manure is sustainable and the farmers capacity on correct agronomic practices has been built up well. Composting of household waste, crop residues, weeds, leafy litter, prunings and other plant matter is yet another promising idea although leaf litter, crop residue and weeds are currently used for feeding livestock. However, the use of this technique is increasing and is particularly important to farmers with few animals and hence it is recommended that farmers be trained on composting techniques.

Agro-forestry is yet another system that provides the opportunity for nutrient cycling. Normally an alley of trees are grown and periodically cut for fuel wood and foliage for feeding animals. In the project area trees that are presently available and which offer good

opportunities for agro-forestry are Sesbania Sesban, Leucaena Leucocephala as they are leguminous and the decomposed leaves (i.e. Green manure working crop remains into the soil) would not only improve the nutrient status of the soil, but also the soil structure. Farmers have been trained on the benefits of agro-forests i.e. bio-pesticide, nutrition value and soil fertility enhancement and maintenance. Project should consider trials towards introducing Calliandra and Tithonia into the area as agro-forestry trees.

Deep tillage is vital in easing soil strength while preparing the seedbed to allow for adequate root proliferation, while at the same time incorporating farmyard manure. This is where Animal Traction becomes vital in empowering the farmers to accomplish this object. Tined implements associated with conservation tillage should be provided.

The construction of pit latrines is appropriate in the scheme as it has checked the possibility of human waste finding its way into the irrigation canals which would have been a serious health hazard. The exercise is sustainable as the required capacity is being developed within the community.