

Appendix B
Project Design Matrix and Project Proposal
For Model Irrigation Schemes

**THE STUDY
ON
THE NATIONAL IRRIGATION MASTER PLAN
IN
THE UNITED REPUBLIC OF TANZANIA**

Action Plan Report

Appendix B

Project Proposal and Project Design Matrix For Model Irrigation Schemes

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Appendix B

Project Proposal and Project Design Matrix For Model Irrigation Schemes

GENERAL

The action plan for the model irrigation schemes is based on the site inspection and RRA, and is summarised in the Project Design Matrix (PDM) and the Project Proposal.

A. Development Concept

The action plan for the model irrigation schemes is prepared under the following concepts, which lead to technical self-reliance, financial self-reliance, and institutional/organizational strengthening, and consequent to self-reliance of irrigation schemes.

Development Concept to Model irrigation Schemes

Description	Development Concepts
Technical Self-reliance	<ul style="list-style-type: none">- Planning and design of irrigation infrastructures taking into consideration farmers' capacity of O & M and water management.- Raising of technical knowledge of farmers on O & M and water management, providing appropriate training to them.
Financial Self-reliance	<ul style="list-style-type: none">- Formulation of rehabilitation / improvement plan of irrigation infrastructure considering farmers' affordability to O & M.- Preparation of agricultural development plan, which leads to improvement of farmers' profitability, encouraging them to introduce vegetable farming.
Institutional/Organizational Strengthening	<ul style="list-style-type: none">- Institutional strengthening for raising organizational management of IA, such as leadership, decision-making, and conflict resolution.- Institutional strengthening for raising financial management by IA, such as collection of water fee and O & M cost.- Promotion of farmers' participation in project implementation during planning, design, and construction periods.

B Project Design Matrix (PDM)

The PDMs prepared by the Study Team are outlined below:

(1) Overall Goal

Based on the results of the Master Plan Study, the 'overall goal' in all ten model schemes is to improve agricultural productivity and profitability in the irrigation schemes.

(2) Project Purpose

The 'project purpose' is to "ensure to supply stable irrigation water to the farms". The 'objectively verifiable indicator' is to enable all farmers in the scheme to get sufficient water according to schedule by the end of the project and the scheme monitoring reports will be the 'means of verification'.

(3) Outputs

In accordance with the results of the field investigation, the following three main ‘outputs’ were established:

- 1) Capacity of IA management is strengthened.
- 2) Irrigation infrastructures are rehabilitated or improved.
- 3) Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.

The ‘objectively verifiable indicators’ will be: 1) 80% or more farmers participate in the maintenance works, 2) rehabilitation is completed by the specified year, and 3) 100% of committee members are trained for O&M by the end of the project. The scheme monitoring reports will be the ‘means of verification’.

(4) Activities

To achieve the outputs mentioned above, the following activities were worked out, based on the ‘objective trees’ presented in Chapter 5:

- 1) Capacity of IA management is strengthened.
 - Raise farmers’ awareness to the project implementation.
 - Re-organize structure of IA.
 - Enhance leadership of committee members.
 - Strengthen decision making of IA.
 - Prepare by-laws and regulation.
 - Enhance financial management capacity of IA.
 - Promote to register IA.
- 2) Irrigation infrastructures are rehabilitated or improved.
 - Conduct survey and investigation with farmers’ participation.
 - Carry out design works.
 - Make agreement on the project implementation including components of rehabilitation / improvement works and farmers’ contribution to the works.
 - Proceed pre-implementation activities including tendering and its evaluation.
 - Construct irrigation infrastructures with farmers’ participation.
 - Turn-over O&M of completed irrigation facilities to IA.
 - Raise farmers’ awareness to the project implementation.
- 3) Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.
 - Prepare irrigation schedule and maintenance plan.
 - Conduct water distribution.
 - Conduct maintenance works.
 - Enhance skills to mediate and resolve water disputes among members and with outside people.
 - Monitor performance of scheme.

(5) Inputs

The foreign donor will cover costs of training and rehabilitation / improvement costs. Vehicles, operation and maintenance equipment and costs of monitoring and engineering services will be provided.

The Tanzanian Government will provide manpower, including engineers, support staff and project office space as well as administration cost for the project implementation. Farmers will contribute 10 to 20 % of rehabilitation and improvement costs.

C Components of the Project

The development plans are formulated for each irrigation scheme, and are summarised in PDM. In the PDM, “activities” indicate the project components to be implemented in the irrigation schemes. These activities are outlined below, and compiled into the implementation program compiled in Appendix B. These were worked out based on the results of “problem analysis” and “objectives analysis”.

C.1 Strengthening of IA Management Capacity

(1) General

In accordance with the policy of participatory management of the Project, GOZ is now handing over the responsibility of O&M to IA. IA is requested to play more important role for the participatory management of the Project including not only O&M of the irrigation infrastructures but also supporting services for agriculture and community development.

Under such circumstances, securing further development and sustainability of the Project largely depend on the strengthening of the farmers’ organisations. Accordingly, the immediate urgent matter to be implemented in the Project is the strengthening of the IA to have enough capacity to carry out relevant activities including O&M of irrigation infrastructures and supporting services by themselves.

(2) Workshop on Awareness Raising

It should be stressed that the awareness raising programme for the government officer as well as the farmers should be carefully implemented to let them the importance of water management and maintenance by farmers themselves. The programme will be carried out in two steps.

First, the programme for the government officer will be carried out in order to let them understand the participatory planning approach, and method and attitude to communicate with the farmers with a proper manner.

Consequently, the workshops, in which the officers, the external staff, and the farmers participate, are held so that the farmers are aware of the responsibility of the scheme implementation such as participation in planning and design works as well as construction, and water management and maintenance of the irrigation infrastructures, which should be carried out by them. The following issues would

be discussed in the workshop to raise farmers' awareness with regards to the scheme management:

- irrigation schedules and methods,
- attendance to IA meeting,
- attendance to preventive maintenance activities,
- participation in maintenance work of irrigation facilities.
- paying O&M cost, and
- participation in training course undertaken by GOZ.

(3) Re-organization of IA

Activities on re-organizing the IA includes selection of committee members and establishment of sub-committees considering women's participation. The committee is composed of the following members; Chairman, Secretary, Accountant, and several committee members. Main tasks of the committee are (i) to prepare annual management plans and budget, (ii) to instruct and supervise activities implemented by the service section, (iii) to manage complaints and grievance from the farmers, (iv) to co-ordinate with other agencies and associates, and so on. The chairman would make a good communication channel between the government staff and IA, and co-ordinate the water delivery to all the canals. The accountant would collect the O&M cost from the farmers and keep financial records.

(4) Enhancement of Leadership for Committee Members

For proper management of the IA, leadership of the committee members should be enhanced. The government official are expected to support the members to build capacity for internal communication and conflict management within the members as well as coordination with outside people and the government officials.

(5) Strengthening of decision-making process

Decision-making process to be strengthened through the process of IA establishment is how to hold general and committee meetings with democracy and high transparency. The general meeting is held at least annually, and has the following main activities:

- Election of the executive committee members and auditor,
- Approval of result of auditing,
- Approval of the annual management plan and budget,
- Determination of the amount of irrigation service charge,
- Revision of the contribution for the IA management,
- Revision and enactment of articles and by-laws,
- Specific items requested by the members and committees, and so on.

(6) By-law and regulation

The establishment of articles and by-laws is essential for well functioning organisations as a legal body. They should be accepted and approved by the members of IA. It will be necessary to prepare several standard articles and by-laws covering O&M of irrigation facilities with the relevant activities, so that IAs

can enact easily their own articles based on the standard one.

(7) Financial management

The contribution money collected from the IA members covers all necessary costs of the scheme management. The cost in pump irrigation scheme includes fuel and lubricants, allowance of a pump operator, and maintenance of the pump.

The accountant collects the money directly from the members, and the collected amount is deposited immediately in IA's bank account. The accountant manages all these transactions, and external auditors should check their collection according to needs. The IA committee is responsible for management and use of the collected money.

(8) Registration of IA

Registration of IA as a legal entity would be promoted under guidance of district staff so that the organization makes an agreement with the district office on the implementation of the rehabilitation and improvement works of irrigation infrastructures.

C.2 Rehabilitation / Improvement of Irrigation Infrastructures with Strengthening of Farmers' Participation

(1) Survey, investigation and design

The activities during the survey, investigation and design period are listed below.

Feasibility Study

- Mapping
- Field Investigation with farmers
- Formulation of Development Plan
- Environmental Impact Assessment
- Discussion with farmers

Detailed Design

- Field Investigation with farmers
- Formulation of Definite development plan
- Workshop with IA
- Cost estimate and final development plan

Agreement of Cost sharing and O&M Responsibility of IA

Pre-Implementation Activities

- Tender and its evaluation
- Guidance to IA for construction

In order to promote farmers' participation in the planning and design stage, the "Guideline for Participatory Improvement to Farmer Initiated and Managed Smallholder Irrigation Schemes" specifies that "participatory action planning", "participatory diagnostic study", and "participatory design and feasibility study"

should be conducted. The participatory design and feasibility study would include the following sessions:

- Guidance on participatory planning for the farmers before commencement of the field investigation
- Survey and Investigation in co-operation with farmers
- Workshop with farmers to formulate rehabilitation and improvement plans
- After design works, workshops with farmers to discuss final development plan with farmers' cost sharing.
- Agreement on implementation of work with farmers and farmers' contribution to construction work
- Training on construction management for farmers for proper monitoring of the work

(2) Implementation of rehabilitation and improvement works

The construction works for the facilities, such as headworks, pump station and main, secondary, and tertiary irrigation canal system, drainage canals, and farm roads would be carried out by both a private contractor and farmers.

The estimated period for the works ranges from one to three year(s) depending on the command area including mobilisation works. The progress of the construction works will be monitored by the government officials to grasp overall status of the programmes. The data are overall progress of construction of scheme facilities, quality of construction works done by both contractors and farmers, and cost invested to the programmes.

In line with the concept for the participatory approach, parts of the construction works will be contracted out to farmers as much as possible, providing their labour force and construction materials, such as stone, sand, and so on. In such case, it will be required that the government staff would take necessary quality control measures to keep the works implemented by farmers up to a normally acceptable level.

The quality of the farmer's construction works will be monitored with that progress through the monitoring system. Then, based upon the result of monitoring and evaluation, necessary technical guidance will be provided to farmers' organisations during the rehabilitation works.

(3) Turnover O&M of completed facilities to IA

The following steps are to be taken so that irrigation facilities can be handed over to the satisfaction of farmers:

- Joint inspection by the government officials and farmers to identify defects made by the contractor,
- Rectification work, if any,
- Preparation of documents for the hand-over of the completed infrastructures, such as agreement, irrigation diagram, maps, and so on,
- Turnover of operation and maintenance of the completed facilities to IA.

C.3 Enhancement of Farmers' Skills for Operation and Maintenance

The proposed training programme for proper and efficient operation and maintenance of irrigation facilities are indicated below. The officials of districts as well as farmers, who are engaged in the O&M work in IAs, will attend the training courses.

Training courses for O&M

Category of Scheme	Description of Training
1. Awareness programme for O&M	Understanding of the basic concepts of the Project
	Understanding duties and responsibilities of the staff/officers and farmers
	Understanding participatory planning
2. Irrigation schedule and planning	Knowledge about irrigation methods
	Methods of estimating irrigation water requirement
	Methods of preparing irrigation schedules
3. Water distribution	Methods of preparing the irrigation water orders
	Knowledge about the water management facilities
	Methods of operating the water management facilities
4. Maintenance system	Methods of conducting rotational irrigation
	Knowledge about maintenance system
	Methods of conducting an inventory survey to check defects of facilities
	Methods of preparing the annual maintenance programmes
	Methods of preparing maintenance schedule and cost estimate
	Methods of informing damage to facilities in an emergency
	Methods of keeping maintenance records
Methods of conducting preventive maintenance	
5. Communication	Knowledge on how the irrigation problems are communicated to higher level authorities effectively.
	Knowledge on how decisions from higher level authorities are communicated downwards
	Knowledge on how to contact relevant officials
	Knowledge on how to contact and co-operate with other IAs
6. Monitoring & evaluation	Knowledge about monitoring and evaluation procedures on water management
	Knowledge about administrative reporting procedures
	Methods of preparing reports

It should be stressed that the awareness programmes for the farmers should be carefully implemented to let them understand water saving agriculture with cultivation of vegetables, the importance of water management and maintenance of the irrigation infrastructures, which should be carried out by themselves. The following issues would be taken into consideration in terms of above:

- water management under the 'self-management concept',
- selection of crops as per the soil type,
- keeping irrigation schedules and methods without illicit water tapping,
- payment of O&M cost,
- participation in training course undertaken by GOZ
- attendance to the meeting, and
- participation in maintenance work of irrigation facilities.

Further, the O&M activities by farmers will be monitored every cultivation season.

1. Kinyope Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Kinyope Irrigation Scheme
(2) Location	Three villages, namely, Kinyope, Ruhoma and Myangara, Rutamba Ward, Lindi Rural District, Lindi Region (see attached location map)
(3) Objectives of Project	To ensure stable water supply to the fields through Strengthening of capacity of IA management, rehabilitation / improvement of Irrigation infrastructures, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The scheme area occupies most of Rutamba Ward (Lindi Rural District) extending at the eastern part of the Lindi Region. Administratively it includes 3 villages, namely, Kinyope, Ruhoma and Myangara. Access to the scheme area in the Kinyope village is by an unmetaled feeder road from Lindi, of which length is about 36 km. The scheme area could be accessible even by normal vehicle, while being difficult or sometimes impossible during the rainy season.</p> <p>Annual rainfall of the scheme area is relatively abundant, and ranges 600 mm to 920 mm having single peak in April. Milola river, water source for the Kinyope Irrigation Scheme, is perennial in flow discharge.</p> <p>The scheme area is located at the loose valley formed by the river running in a direction of west to east.</p>
(5) Scheme Description	The Kinyope Irrigation Scheme is characterized as a traditional scheme. Farmers are presently irrigating their lands by 13 simple intake weirs constructed using timber and grasses in the Milola river. About 400 ha are irrigated somehow in traditional manners. However, their irrigation practice is not efficient because of lack of irrigation facilities. Farmers desire to improve the existing intake structures to more reliable and solid ones. Total number of farmers related to the scheme is approximated at 1,434, with 186 households. While presently about 400 ha is irrigated, about 480 ha is supposed to be potential irrigable.
(6) Problems identified in the Study	<p><u>Institution</u></p> <ul style="list-style-type: none"> - Top-down intervention of the district cooperative officer in the registration of IA - The farmers' insufficient skill of managing a IA: no bylaw and regulations, poor financial management, no women leaders, high rate of fee non-payment, and etc. <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Fragile existing intake weirs. - Water conflict among farmers on water abstractions. - Ineffective water distribution due to lack of canal system. - Lack of knowledge on water management on "canal

	<p>irrigation”.</p> <ul style="list-style-type: none"> - Water stagnant due to poor drainage system - Poor knowledge on a participatory gabion weir construction due to less dissemination to farmers. - No compilation on data and information on the previously implemented works. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Insufficient water supply due to frequent weir destruction - Destructive birds and animals - Marketing problems such as manual transport of farm products from field to home, lack of storage facilities, unavailability of rice mill, low and unstable farm gate prices of the products - Ineffective utilization of data and information obtained from past surveys and studies management on “canal irrigation”. - Improvement work for drainage is required for almost whole area concerned to the scheme. - NARI (Naliendele Agriculture Research Institute) introduced a useful participatory gabion weir construction to the farmers scheme site. However, it is not transferred to farmers and not yet utilized. - Data and information on the previously implemented schemes related to the scheme area are not accumulated. Important and useful ones are left abandoned.
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers’ awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers’ participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers’ contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers’ participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA. 3. Enhancement of farmers’ skill for operation and maintenance of irrigation infrastructures. <ol style="list-style-type: none"> 3-1 Preparation of irrigation schedule and maintenance plan. 3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people.

	3-5 Monitoring of irrigation performance of the scheme.
(8) Irrigation and Drainage Development Plan	<p><u>Basic Approach</u></p> <p>To enhance the irrigation efficiency by improving water abstraction and distribution by providing proper facilities at low cost.</p> <p><u>Development Plan</u></p> <p>The proposed scheme area is 480 ha in net. The existing weak intake weirs are to be replaced with stable and solid ones at the same locations, to reduce farmers' heavy load caused by frequent re-construction of intake weirs flushed out by floods. This is the highest priority in farmers' request. As for irrigation canal network, it is essential to provide farm-ditches for ensuring water delivery to on-farm level. These farm ditches should be constructed by farmers themselves as farmers' participation, in parallel with the scheme construction works. Drainage canals are also to be constructed in place to eliminate excess water from fields during rainy season. Inspection passes are provided along the existing main and secondary irrigation canals for easy O & M of canals and transportation of agricultural products. The proposed scheme facilities to be constructed are as follows:</p> <p>(a) Intake weirs (13 nos. if necessary integrating several existing intake weirs)</p> <p>(b) Main irrigation canal (unlined, length of 20,000 m)</p> <p>(c) Secondary irrigation canal (unlined, length of 22,000 m)</p> <p>(d) Turnouts (50 nos.)</p> <p>(e) Farm ditches (length of 48,000 m)</p> <p>(f) Drainage canal (length of 10,000 m)</p>
(10) Required Cost	Tsh. 824 Million (US\$ 775,000)
(11) Executing Agency	Lindi Rural District Office
(12) Implementation Schedule	Three years for survey, plan, construction and follow-up of the scheme, including training of IA. (see attached sheet)
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized.
(15) Special Arrangements	None

(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to increase the cropping intensity from 107% to 175% by expanding the area of dry season paddy through the improvement of irrigation system. <p><u>Cropping Outline:</u></p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Present</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td style="text-align: center;">Paddy</td> <td style="text-align: center;">Paddy</td> </tr> <tr> <td>- Paddy Yield</td> <td style="text-align: center;">4.0ton/ha</td> <td style="text-align: center;">5.5ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td style="text-align: center;">512ha</td> <td style="text-align: center;">840ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td style="text-align: center;">107%</td> <td style="text-align: center;">175%</td> </tr> <tr> <td>- Paddy Production</td> <td style="text-align: center;">2,048ton</td> <td style="text-align: center;">4,620ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td style="text-align: center;">165MTsh</td> <td style="text-align: center;">290MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - The farm income is sufficient for the living expenses even in the present condition and the net income of the proposed condition is almost double of the present condition. - The net farm income is just enough to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 3% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy	Paddy	- Paddy Yield	4.0ton/ha	5.5ton/ha	- Cultivated Area	512ha	840ha	- Cropping Intensity	107%	175%	- Paddy Production	2,048ton	4,620ton	- Project Benefit (Financial)	165MTsh	290MTsh
	<u>Present</u>	<u>Proposed</u>																				
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- Project Benefit (Financial)	165MTsh	290MTsh																				
(b) Environmental Consideration	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Water logging in some areas due to lack of drains, - Destructive birds, - Possible increase in water use conflict, - Possible increase in water borne diseases, - Deterioration of natural vegetation by construction works, - Loss of soil fertility, and - Possible soil and water pollution. 																					
(c) Evaluation	EIRR: 16%																					

(2) Project Design Matrix

Project Name: Kinyope Irrigation Scheme Duration: (3 years)
 Project Area: Lindi Rural District, Lindi Region Target Group: IA members Date: August 2003

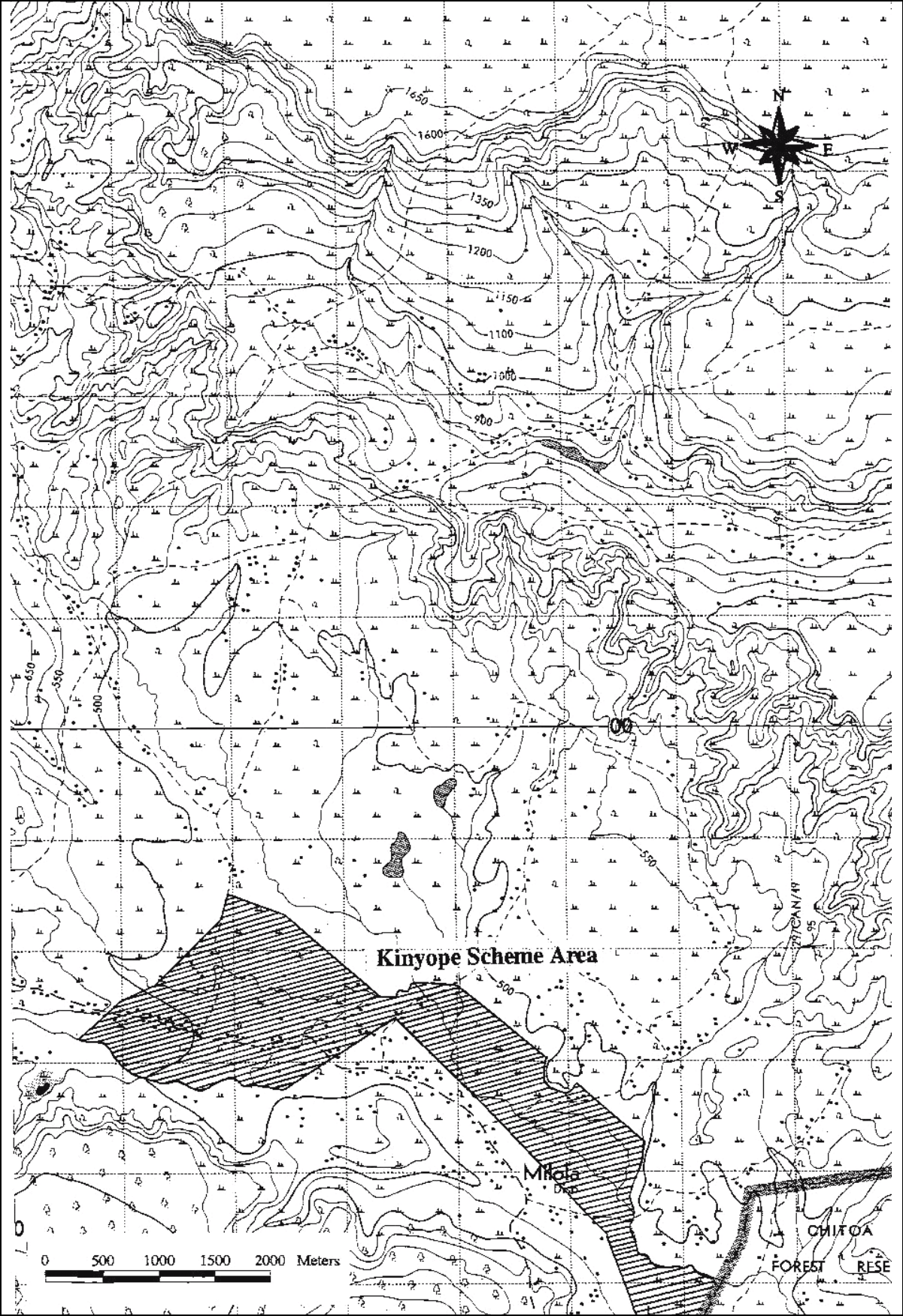
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 20% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Implementation Schedule for Kinyope Irrigation Scheme

Activities	Expected Results	Month and Year																																				Agencies in charge	Input	Remarks
		1st Year												2nd Year												3rd Year														
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
1-1	Raise farmers' awareness to the project implementation.	■																																				District Office	<u>Manpower</u> District staff, Farmers, Consultants, <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	Capacity of District staff for IA establishment and management will be strengthened by training Programme
1-2	Re-organize structure of IA.	■																								Follow-up														
1-3	Enhance leadership of committee members.	■																								■														
1-4	Strengthen decision making of IA.	■												■												■														
1-5	Prepare by-laws and regulation.	■												■												■														
1-6	Enhance financial management capacity of IA.													■												■														
1-7	Promote to register IA.	■																																						
2-1	Conduct survey and investigation with farmers' participation.	■																																				District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants, and Contractor <u>Equipment</u> Vehicles and Survey Equipment	Technical Support will be provided by Zonal Irrigation Office Farmers participate in parts of civil works, such as excavation of irrigation and drainage canals
2-2	Carry out design works.	■																																						
2-3	Make agreement on the project implementation													■																										
2-4	Proceed pre-implementation activities including tendering and its evaluation.													■																										
2-5	Construct irrigation infrastructures with farmers' participation.													■																										
2-6	Turn-over O&M of completed irrigation facilities to IA.																									■														
3-1	Prepare irrigation schedule and maintenance plan.																									■												District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	Technical Support will be provided by Zonal Irrigation Office
3-2	Conduct water distribution.																									■														
3-3	Conduct maintenance works.																									■														
3-4	Enhance skills to mediate and resolve water disputes																									■														
3-5	Monitor performance of scheme.																									■														
<i>Relevant Activities to the Project</i>																																								
A	Conduct EIA.	■																																				District Office	District staff, Zonal staff, Consultants	Kinyope Irrigation Scheme
B	Conduct farmers' training for farming practice																									■												District Office	District staff, Zonal staff, Consultants	

Remarks :

Scheme Map



Photographs



Entrance of village



Traditional intake



River diversion works



Command area



Irrigated paddy



RRA workshop with farmers

2. Magoma Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Magoma Irrigation Scheme
(2) Location	Two villages, namely, Makangara and Mkuajuni, Magoma Ward, Magoma Division, Korogwe District, Tanga Region (see attached location map)
(3) Objectives of Project	To ensure stable water supply to the fields through the improvement of existing traditional irrigation system, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The scheme area extended over Makangara and Mkuajuni villages in Magoma Ward, Magoma Division in Korogwe District. Access to the scheme area is by an unpaved road in about 50 km distant from Korogwe. The scheme area is accessible by any type automobile even in the rainy season.</p> <p>The scheme area is influenced by Indian Ocean in specific climate characteristic. Average temperature is approximately 30 °C to 32 °C during hot months (December to March), while it is approximately 23 °C to 28 °C during cool months (May to October). High atmospheric humidity is a characterised factor in this area, showing 100 % maximum and 65 to 70 % minimum. The amount of rainfall is about 1,100 to 1,400 mm in the area, however, it may exceed 2,000 mm per year in the catchment area of Lwengera river. The annual pattern of mean monthly rainfall is bi-mode with maximum monthly rainfall occurring in April and May.</p> <p>According to the farmers living near the scheme area, the flood attacks the part of scheme area every year, and brought the inundation with half meter deep for about a week. The Lwengera river has a tendency of changing its river course at the foot of Usambara mountains during floods.</p>
(5) Scheme Description	<p>The Magoma Irrigation scheme was identified under the inventory survey in the RBM Project in 1999. In 1980', Kwamazadu irrigation scheme located adjoining downstream of the Lwengera river was implemented under the technical assistance of GTZ. Effect in life standard upraising of the implemented Kwamazadu scheme encourages Magoma farmers to accomplish irrigation development.</p> <p>The potential irrigation area of the scheme is estimated at 300 ha. Total number of farmers households related to the scheme is approximated at 300 lived within the both villages. Presently about 100 ha of lowlands cultivate paddy supplying irrigation water from the Lwengera river during dry season, avoiding periodic flooding in wet season. In reply to the farmers' request for irrigation development, Korogwe District Office conceived an irrigation development plan for the scheme area.</p>
(6) Problems identified in the Study	<p><u>Institution</u></p> <ul style="list-style-type: none"> - Non registered IA. - The farmers' insufficient skill of managing a IA: no bylaw and

	<p>regulations, poor financial management, no women leaders, high rate of fee non-payment, and etc.</p> <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - No irrigation practice in the rainy season due to area inundation. - Farmers' burden to repeat to construct intake weir every cultivation season. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Rainfall variation and consequent fluctuation of water level in the river which causes both flood and water shortage - Laborious land preparation by hand hoe - Laborious weeding - Damages by animal pests such as wild pigs and monkeys - Expensive inputs such as high yield variety paddy seeds - Cheap farm gate prices of farm products.
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers' participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA. 3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures. <ol style="list-style-type: none"> 3-1 Preparation of irrigation schedule and maintenance plan. 3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitoring of irrigation performance of the scheme.
<p>(8) Irrigation and Drainage Development Plan</p>	<p><u>Basic Approach</u></p> <p>To create good irrigation circumstance for selected areas in the dry season, focusing on avoidance of magnificence of flood damage to other areas in the rainy season.</p>

	<p><u>Development Plan</u></p> <p>The proposed scheme area is 250 ha in net. In the rainy season, the scheme area is inundated in large ranges and in long term. Low lands of the scheme extending along the Lwengera river, which is a main water source for the scheme, are unavoidable to be affected by flood in the rainy season unless river training and wide ranging flood protection are totally provided. Flood protection targeting only to the scheme area would lead to worse inundation in downstream areas. The synthetic flood protection work for whole river course is so costly and not feasible. In this scheme, thus irrigation area should be selected from upland area which does not suffer from the floods, and drainage system in addition to irrigation canal system is provided to eliminate excess water. The proposed scheme facilities are as follows:</p> <p>(a) Intake weir (1 site) (b) Main irrigation canal (unlined, length of 10,000 m) (c) Secondary irrigation canal (unlined, length of 11,000 m) (d) Drainage canal (length of 10,000 m) (e) Turnout with intake ponds for treadle pump use (20 nos.) (f) Partial flood dike (length of 2,000 m)</p>
(10) Required Cost	Tsh. 767 Million (US\$ 721,000)
(11) Executing Agency	Korogwe District Office
(12) Implementation Schedule	Three years for survey, plan, construction and follow-up of the scheme, including training of IA. (see attached sheet)
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized.
(15) Special Arrangements	None
(16) Relevant Information	
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to increase the paddy production area from 100ha to 200ha through flood protection and drainage improvement. - Vegetable production is introduced in the area where is not severely affected by the flood.

	<p><u>Cropping Outline:</u></p> <table border="0"> <thead> <tr> <th></th> <th><u>Present</u></th> <th><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td>Paddy</td> <td>Paddy & Vegetables</td> </tr> <tr> <td>- Paddy Yield</td> <td>4.0ton/ha</td> <td>5.5ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td>100ha</td> <td>300ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td>40%</td> <td>120%</td> </tr> <tr> <td>- Paddy Production</td> <td>400ton</td> <td>1,100ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td>44MTsh</td> <td>218MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - Although the farm income hardly sustains the living expenses in the present condition, considerable amount of reserve can be kept under the proposed condition. - The net farm income is quite sufficient to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 2% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy	Paddy & Vegetables	- Paddy Yield	4.0ton/ha	5.5ton/ha	- Cultivated Area	100ha	300ha	- Cropping Intensity	40%	120%	- Paddy Production	400ton	1,100ton	- Project Benefit (Financial)	44MTsh	218MTsh
	<u>Present</u>	<u>Proposed</u>																				
- Crops Applied	Paddy	Paddy & Vegetables																				
- Paddy Yield	4.0ton/ha	5.5ton/ha																				
- Cultivated Area	100ha	300ha																				
- Cropping Intensity	40%	120%																				
- Paddy Production	400ton	1,100ton																				
- Project Benefit (Financial)	44MTsh	218MTsh																				
<p>(b) Environmental Consideration</p>	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Loss of soil fertility, - Destructive birds, - Possible increase in water borne diseases, - Possible soil and water pollution, - Deterioration of natural vegetation by construction works, - Possible change of river course, and - Possible canal erosion. 																					
<p>(c) Evaluation</p>	<p>EIRR: 14%</p>																					

(2) Project Design MatrixProject Name: Magoma Irrigation SchemeDuration: (3 years)Project Area: Korogwe District, Tanga RegionTarget Group: IA membersDate: August 2003

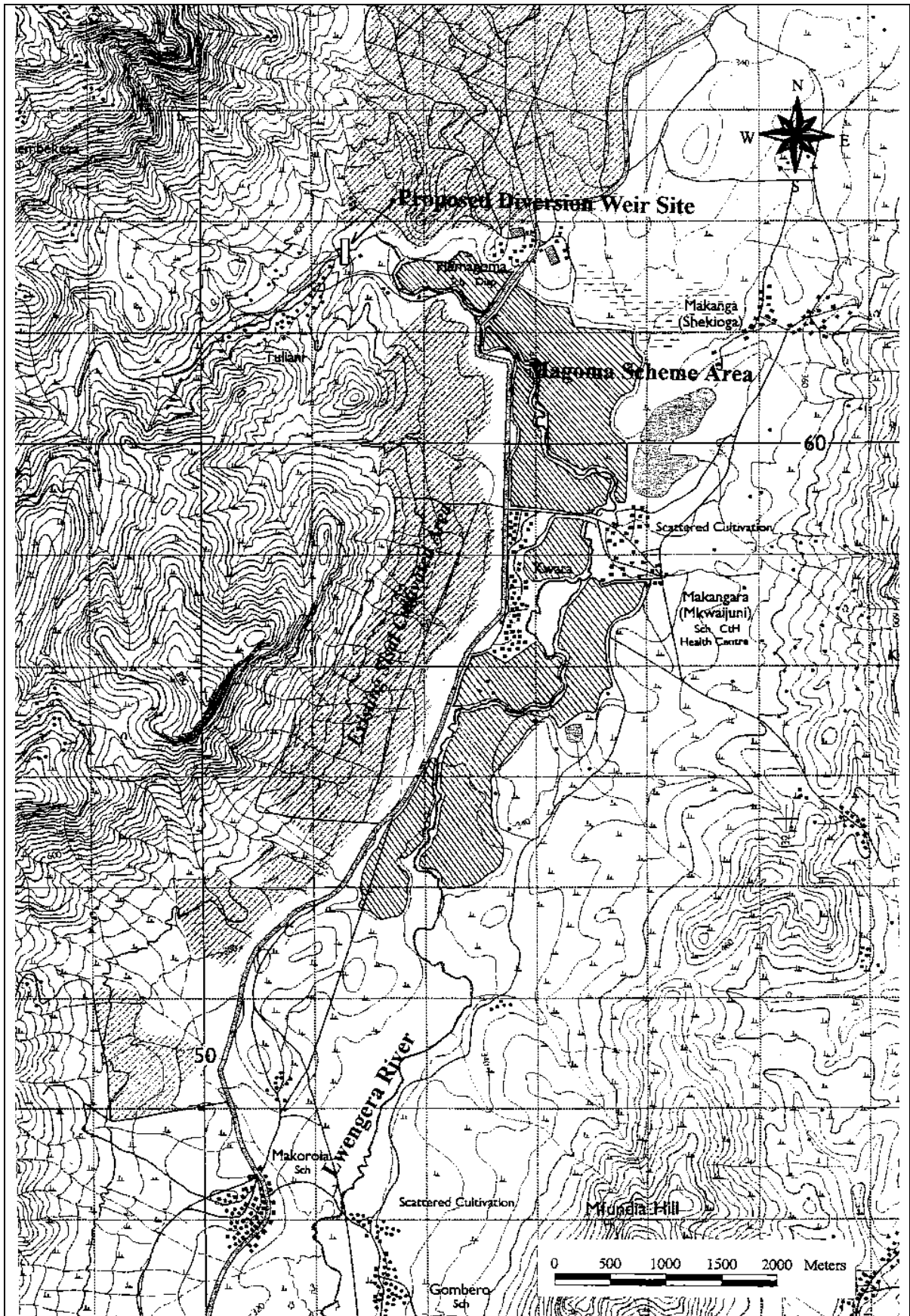
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 20% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Implementation Schedule for Magoma Irrigation Scheme

Activities	Expected Results	Month and Year																																				Agencies in charge	Input	Remarks
		1st Year												2nd Year												3rd Year														
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
1-1	Raise farmers' awareness to the project implementation.																									Follow-up												District Office	<u>Manpower</u> District staff, Farmers, Consultants, <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	Capacity of District staff for IA establishment and management will be strengthened by training Programme
1-2	Re-organize structure of IA.																									Follow-up														
1-3	Enhance leadership of committee members.																									Follow-up														
1-4	Strengthen decision making of IA.																									Follow-up														
1-5	Prepare by-laws and regulation.																									Follow-up														
1-6	Enhance financial management capacity of IA.																									Follow-up														
1-7	Promote to register IA.																									Follow-up														
2-1	Conduct survey and investigation with farmers' participation.	■																																				District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants, and Contractor <u>Equipment</u> Vehicles and Survey Equipment	Technical Support will be provided by Zonal Irrigation Office Farmers participate in parts of civil works, such as excavation of irrigation and drainage canals
2-2	Carry out design works.													■																										
2-3	Make agreement on the project implementation																									■														
2-4	Proceed pre-implementation activities including tendering and its evaluation.													■																										
2-5	Construct irrigation infrastructures with farmers' participation.													■																										
2-6	Turn-over O&M of completed irrigation facilities to IA.																									■														
3-1	Prepare irrigation schedule and maintenance plan.																									■												District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	Technical Support will be provided by Zonal Irrigation Office
3-2	Conduct water distribution.																									■														
3-3	Conduct maintenance works.																									■														
3-4	Enhance skills to mediate and resolve water disputes																									■														
3-5	Monitor performance of scheme.																									■														
<i>Relevant Activities to the Project</i>																																								
A	Conduct EIA.																																					District Office	District staff, Zonal staff, Consultants	
B	Conduct farmers' training for farming practice																																					District Office	District staff, Zonal staff, Consultants	

Remarks :

Scheme Map



Photographs



Magoma Village



Command Area



Lwengara River as Water Source



Proposed Intake Weir Site



Maize Cultivation in Low Land



Discussion with Farmers

3. Pawaga Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Pawaga Irrigation Scheme
(2) Location	Six villages, namely, Itunundu, Kimande, Kisanga, Isele, Ndolea and Kisoloka, Itunundu Ward, Iringa Rural District, Iringa Region (see attached location map)
(3) Objectives of Project	To ensure stable water supply to the fields through further rehabilitation of the existing traditional irrigation scheme once improved, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The scheme area covers most of Itunundu Ward (Iringa District) at the west bank of the little Ruaha river. It administratively includes 6 villages: Itunundu, Kimande, Kisanga, Isele, Ndolea and Kisoloka. Access to the scheme area is mostly unpaved road, but possible even in the rainy season. Its distance from Iringa, is approximately 80 km.</p> <p>Average annual rainfall in the scheme area is 375 mm, so that agriculture is virtually dependent on irrigation. Originally, irrigation in the scheme area had started for some areas by diverting water from the tributaries of the Little Ruaha river. In the alluvial plain of the Little Ruaha river of about 7,000 ha, the irrigated area had come to around 2,000 ha with paddy cultivation through traditional irrigation system in the same manner mentioned above.</p>
(5) Scheme Description	<p>The Pawaga Irrigation Scheme is characterized as an improved traditional irrigation scheme. The Little Ruaha river had taken its course to the west of Kimande, and near Mlenge divided into numerous channels forming the distinctive alluvial plain. In 1962, the river was obliged with change of its course due to the big magnitude flood, and eventually settled into the more easterly course. This river morphologic change has brought less and less water spilt into the old channels, and finally into the irrigation system.</p> <p>The Feasibility Study of the Pawaga Irrigation Scheme was carried out in 1985, aiming to regain irrigation in the scheme area by constructing new facilities to divert water from new easterly river course to the old westerly channels. The Feasibility Study focused upon the existing irrigation schemes serving 6 villages and Prison Farm in the area.</p> <p>The Pawaga Irrigation Scheme was launched in 1993, which was oriented to "small scale irrigation" characterized by low technology, a step-by-step approach and maximization of village and farmers' responsibility and participation. The Project was formulated to phase in three stages. First phase of the Project is to regain the existing irrigation system relating to the old river course of Little Ruaha by means of construction of intake weir (Mlenge Diversion Weir) and diversion canal. Second phase is to remodel the main distribution in order to improve constraint on</p>

	<p>development later in the project life in inefficient water distribution and drainage. Third phase is to complete minor canalization and to improve farm technology. The Project is now under the stage of first phase completed.</p> <p>During about 10 years after completion of the phase I work, only 600 – 800 ha has been irrigated due to poor function of the irrigation system. Rehabilitation works for recovering project benefits are therefore highly required at present.</p> <p>In order to remove identified problems and constraints, the MAFS has proposed a rehabilitation scheme for the Pawaga Irrigation Project.</p>
<p>(6) Problems identified in the Study</p>	<p><u>Institution</u></p> <ul style="list-style-type: none"> - Non registered IA. - No financial report. The farmers don't have sufficient experiences of managing a IA. - Irrigation sub blocks are not identical to the boundaries of the IA subgroups <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Huge sedimentation diverted into canal due to improper facilities designing. - No capability of farmers on repair for gabion weir. - Insufficient water supply due to use on natural channels as irrigation canals. - Difficult water management due to canal network based on administrative boundaries. - Poor drainage due to double function irrigation canal and drain. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Dependency on traditional farming system - Proper Farming Practice - Low and unstable farm gate prices of the products - Proper Market Price Control
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works.

	<p>2-4 Pre-implementation activities including tendering and its evaluation.</p> <p>2-5 Construction of irrigation infrastructures with farmers' participation.</p> <p>2-6 Turn-over process for O&M of completed irrigation facilities to IA.</p> <p>3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.</p> <p>3-1 Preparation of irrigation schedule and maintenance plan.</p> <p>3-2 Water distribution.</p> <p>3-3 Maintenance works.</p> <p>3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people.</p> <p>3-5 Monitoring of irrigation performance of the scheme.</p>
<p>(8) Irrigation and Drainage Development Plan</p>	<p><u>Basic Approach</u></p> <p>To apply proper planning and designing of irrigation facilities, to remove major constraints such as improper condition of the weir, heavy silt intrusion into canal and insufficient water distribution into the fields.</p> <p><u>Development Plan</u></p> <p>The proposed scheme area is 2,000 ha in net. The existing irrigation system had been once improved under the Pawaga Irrigation Project, Phase I, but thereafter it has not functioned well mainly due to poor intake weir, much siltation on canal and insufficient water distribution into fields. To recover the effects of the executed works, further rehabilitation is essential through appropriate plan and design works for the system.</p> <p>The existing damaged gabion weir should be remodeled by applying concrete and gabion combination type. In addition to remodeling of the existing damaged gabion weir, silt extractor should be provided around the beginning point of diversion canal, to reduce siltation on canal. Presently, natural streams are used as distribution canals, which lead to insufficient water distribution to the scheme area. Remodeling of these natural channels are therefore required for achieving suitable irrigation water distribution in harmony with the enhanced water users' activities. The proposed works for the scheme are as follows:</p> <p>(a) Remodeling of gabion weir (1 site)</p> <p>(b) Silt extractor installation in the diversion canal (1 site)</p> <p>(c) Remodeling of irrigation channels (unlined, length of 10,400 m)</p> <p>(d) Construction of division structures (6 nos.)</p> <p>(e) Construction of drainage canals (length of 10,000 m)</p>
<p>(10) Required Cost</p>	<p>Tsh. 3,104 Million (US\$ 2,921,000)</p>
<p>(11) Executing Agency</p>	<p>Iringa Rural District Office</p>
<p>(12) Implementation Schedule</p>	<p>Four and half years for survey, plan, construction and follow-up of the scheme, including training of IA.</p> <p>(see attached sheet)</p>

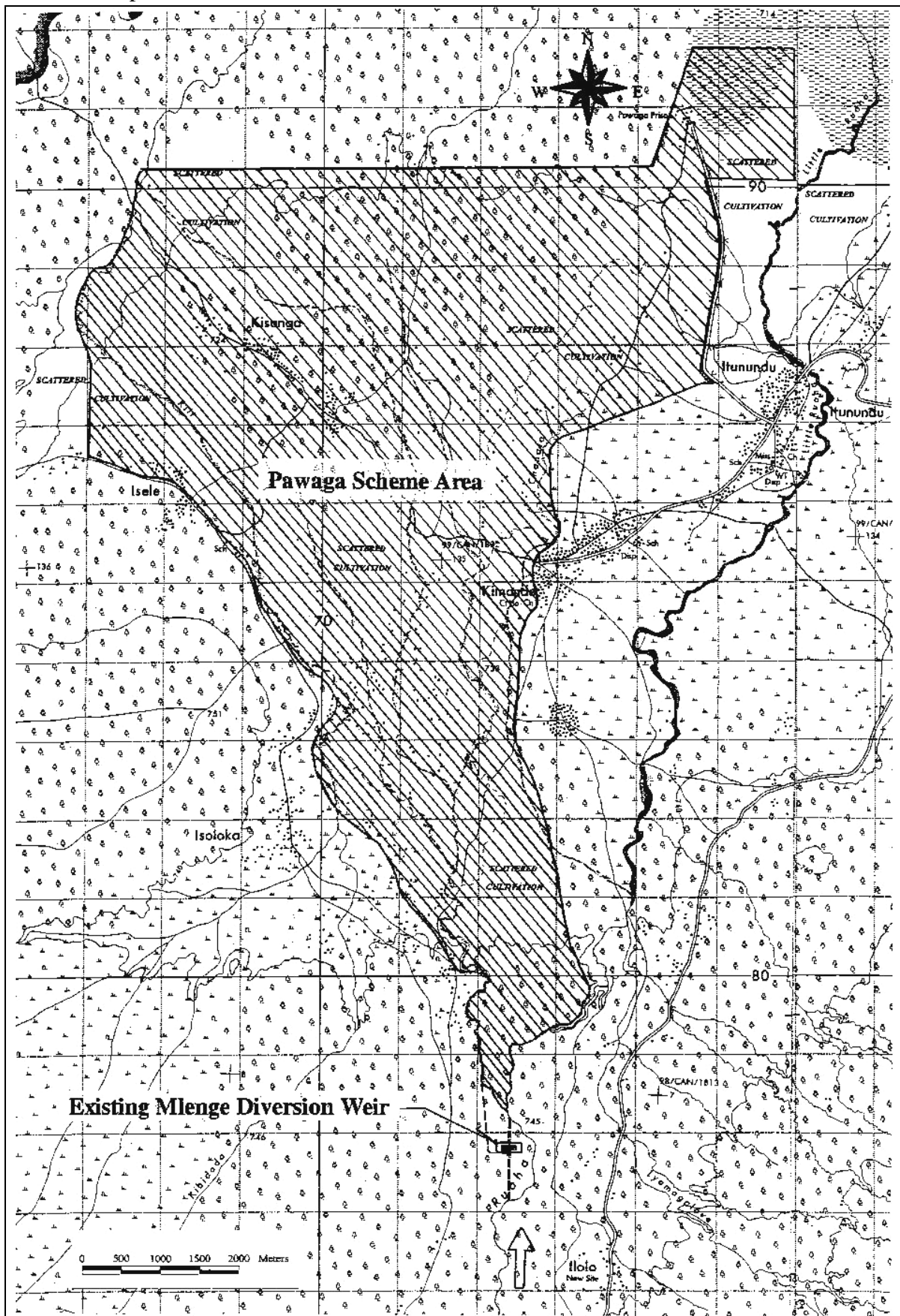
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced 																					
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized. 																					
(15) Special Arrangements	None																					
(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to increase the area of irrigated paddy from 1,465ha to 2,000ha by changing the surrounding rainfed field into irrigated condition. - The target cropping intensity under the proposed condition is 125%. <p><u>Cropping Outline:</u></p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Present</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td style="text-align: center;">Paddy & Maize</td> <td style="text-align: center;">Paddy</td> </tr> <tr> <td>- Paddy Yield</td> <td style="text-align: center;">2.6ton/ha</td> <td style="text-align: center;">4.5ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td style="text-align: center;">1,500ha</td> <td style="text-align: center;">2,500ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td style="text-align: center;">75%</td> <td style="text-align: center;">125%</td> </tr> <tr> <td>- Paddy Production</td> <td style="text-align: center;">3,809ton</td> <td style="text-align: center;">11,250ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td style="text-align: center;">366MTsh</td> <td style="text-align: center;">822MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - Although the farm income is not sufficient for the living expenses in the present condition, it can cover the living expenses in the proposed condition with certain amount of reserve. - The net farm income is enough to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 4% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy & Maize	Paddy	- Paddy Yield	2.6ton/ha	4.5ton/ha	- Cultivated Area	1,500ha	2,500ha	- Cropping Intensity	75%	125%	- Paddy Production	3,809ton	11,250ton	- Project Benefit (Financial)	366MTsh	822MTsh
	<u>Present</u>	<u>Proposed</u>																				
- Crops Applied	Paddy & Maize	Paddy																				
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- Paddy Production	3,809ton	11,250ton																				
- Project Benefit (Financial)	366MTsh	822MTsh																				
(b) Environmental Consideration	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Siltation of main canal, - Water logging due to poor drainage, - River bank erosion, - Water use conflict among farmers, - Deterioration of natural vegetation by construction works, - Land use conflict among farmers, - Possible increase in water borne diseases, - Destructive birds, and - Possible soil and water pollution. 																					
(c) Evaluation	EIRR: 12%																					

(2) Project Design Matrix

Project Name: Pawaga Irrigation Scheme Duration: (4.5 years)
 Project Area: Iringa Rural District, Iringa Region Target Group: IA members Date: August 2003

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 10% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Scheme Map



Photographs



Diversion weir



Gabion protection at diversion weir



Irrigation canal



Paddy field



Discussion with farmers



Farmers and JICA Study Team

4. Musa Mwinjanga Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Musa Mwinjanga Irrigation Scheme
(2) Location	Mijongweni village, Machame South Ward, Hai District, Kilimanjaro Region (see attached location map)
(3) Objectives of Project	To ensure stable water supply to the fields through further rehabilitation of the existing traditional irrigation scheme once improved, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The scheme area is located in Mijongweni village, Machame South Ward (Hai District) in the low land agro-ecological zone of the Kilimanjaro Region. It lies at the border of Moshi Rural-Hai District. Access to the scheme area in the Mijongweni village is by an unmetaled all-weather road from the center of Moshi town, of which distance is about 7 km.</p> <p>Annual rainfall of the scheme area is relatively scarce ranging between 400 mm to 570 mm having two rainy seasons, a major one in April to May and a minor one in September to November. Catching that precipitation, Weruweru river is perennial with certain flow over the year.</p> <p>The scheme area extends alluvial plain located in right bank of Weruweru river. The area is much suitable for cultivation because of fertile and having gentle slope of 0 – 2 %.</p>
(5) Scheme Description	<p>The Musa Mwinjanga Irrigation Scheme is characterized as an improved traditional scheme. Through the historical irrigation improvements, the Scheme reached the irrigation area of about 480 ha. However, the intake weir was flashed out completely by the 2002 heavy rainfall. Though temporary sandbags to maintain water diverting at the weir site were piled, the Scheme faces a serious water shortage in irrigation. Total number of farmers related to the scheme is approximated at 600. Though the preliminary design of the main drain in the scheme area was carried out in 1990 by FAO, no construction of any drainage system has ever being implemented.</p> <p>Musa Mwinjanga Irrigation Scheme was formulated on the basis of the previous implemented scheme under the Rehabilitation of Traditional Irrigation Project (TIP).</p>
(6) Problems identified in the Study	<p><u>Institution</u></p> <ul style="list-style-type: none"> - Organizing a IA is on going under supervision of the district cooperative officer and the zonal office (more or less top down approach). - The farmers' insufficient skill of managing a IA. <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Unstable existing intake weir. - No systematic water management. - In efficient irrigation system due to no consistency in repair

	<p>works.</p> <ul style="list-style-type: none"> - Improper operation of intake gates on the main canals due to poor design. - Water stagnant due to poor drain. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Water scarcity due to weir breakage and high seepage loss - Adequate Water Supply - Un-affordability to farm inputs - Ensuring of Inputs - Lack of negotiation power of farmers with middlemen - Establishing Proper Approach to Marketing
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers' participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA. 3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures. <ol style="list-style-type: none"> 3-1 Preparation of irrigation schedule and maintenance plan. 3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitoring of irrigation performance of the scheme.
<p>(8) Irrigation and Drainage Development Plan</p>	<p><u>Basic Approach</u></p> <p>To provide firm intake weir and to improve improper facilities at low cost.</p> <p><u>Development Plan</u></p> <p>The proposed scheme area is 676 ha in net. Main problem of the</p>

	<p>scheme is a weak intake weir, so that the scheme area could not be irrigated at full scale. The existing weak gabion intake weir is to be restored with concrete-gabion combined intake weir, which is strong and stable against flood. The existing canal system functions almost well. However, there have found improper alignment in some parts of canal network and inadequate function of division structures in the scheme area. These portions should be improved. The southern parts of the scheme face poor drainage. The drainage canal should be provided for these parts. The proposed works for the scheme are as follows:</p> <p>(a) Reconstruction of intake weir (1 site)</p> <p>(b) Partly remodeling of canal alignment (length of 8,000 m)</p> <p>(c) Improvement of division structures (12 nos.)</p> <p>(d) Construction of drainage canal (length of 6,000 m)</p>																					
(10) Required Cost	Tsh. 795 Million (US\$ 748,000)																					
(11) Executing Agency	Hai District Office																					
(12) Implementation Schedule	<p>Three years for survey, plan, construction and follow-up of the scheme, including training of IA.</p> <p>(see attached sheet)</p>																					
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced 																					
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized. 																					
(15) Special Arrangements	None																					
(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to resume the existing irrigation system under the condition of double cropping of paddy. - This irrigation system should cover the extension area at least to irrigate in the rainy season paddy. <p><u>Cropping Outline:</u></p> <table border="0"> <thead> <tr> <th></th> <th style="text-align: center;"><u>Present</u></th> <th style="text-align: center;"><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td style="text-align: center;">Paddy & Others</td> <td style="text-align: center;">Paddy & Others</td> </tr> <tr> <td>- Paddy Yield</td> <td style="text-align: center;">1.3/3.7ton/ha</td> <td style="text-align: center;">4.5ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td style="text-align: center;">816ha</td> <td style="text-align: center;">1,156ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td style="text-align: center;">121%</td> <td style="text-align: center;">171%</td> </tr> <tr> <td>- Paddy Production</td> <td style="text-align: center;">1,513ton</td> <td style="text-align: center;">3,942ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td style="text-align: center;">437MTsh</td> <td style="text-align: center;">676MTsh</td> </tr> </tbody> </table>		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy & Others	Paddy & Others	- Paddy Yield	1.3/3.7ton/ha	4.5ton/ha	- Cultivated Area	816ha	1,156ha	- Cropping Intensity	121%	171%	- Paddy Production	1,513ton	3,942ton	- Project Benefit (Financial)	437MTsh	676MTsh
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	<p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - The farm income is sufficient for the living expenses even in the present condition and the net income of the proposed condition is almost double of the present condition. - The net farm income is enough to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 2% of net farm income from the benefit area.
<p>(b) Environmental Consideration</p>	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - High seepage loss of irrigation water, - Water logging due to inadequate drainage system, - Possible vandalism after rehabilitation, - Loss of soil fertility, - Deterioration of natural vegetation by construction works, - Destructive animals such as monkeys and baboons, - Possible increase in water borne diseases, and - Possible soil and water pollution.
<p>(c) Evaluation</p>	<p>EIRR: 17%</p>

(2) Project Design MatrixProject Name: Musa Mwinjanga Irrigation SchemeDuration: (3 years)Project Area: Hai District, Kilimanjaro RegionTarget Group: IA membersDate: August 2003

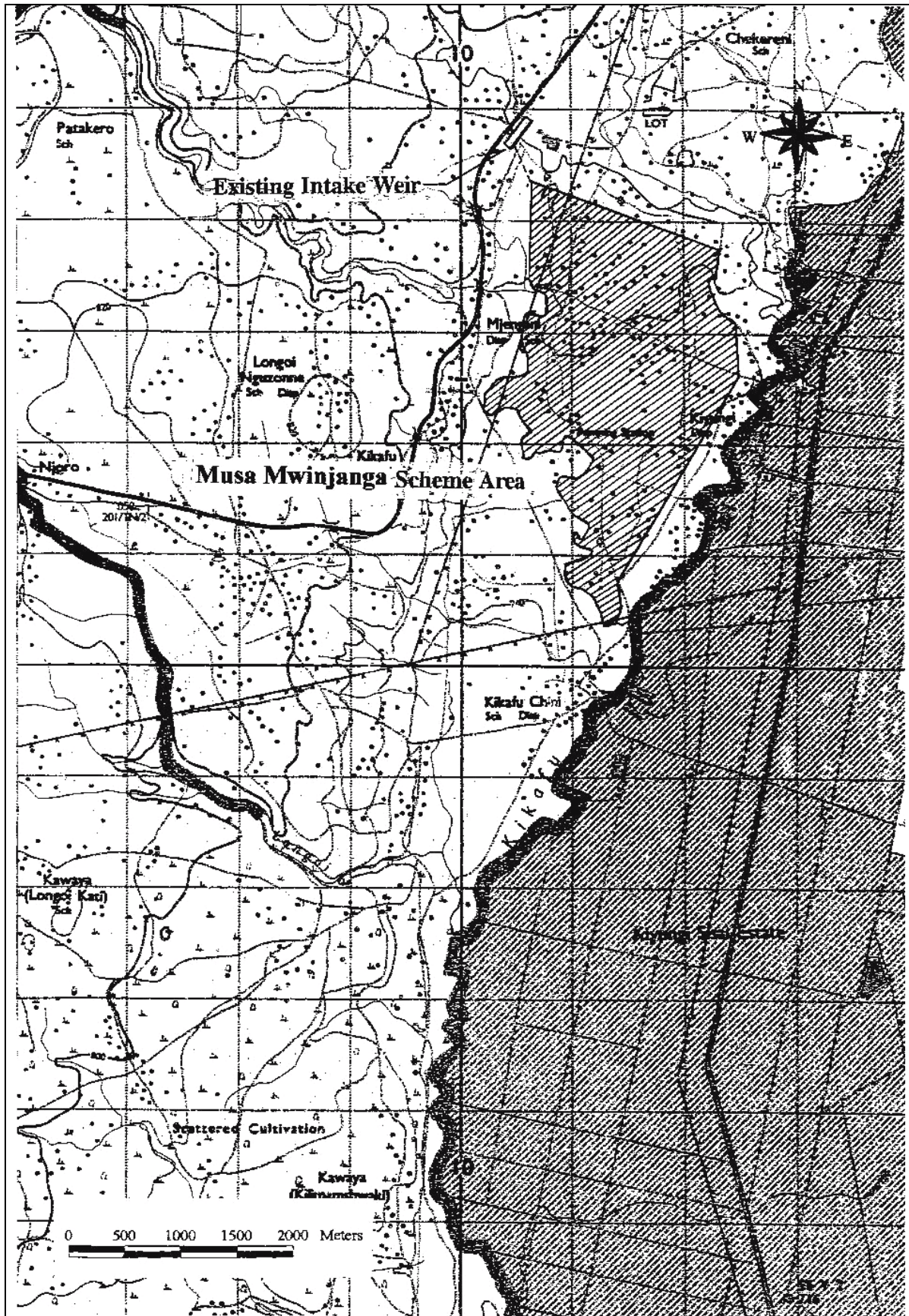
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 10% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Implementation Schedule for Musa Mwinjanga Irrigation Scheme

Activities	Expected Results	Month and Year												Agencies in charge	Input	Remarks												
		1st Year				2nd Year				3rd Year																		
		1	2	3	4	5	6	7	8	9	10	11	12				1	2	3	4	5	6	7	8	9	10	11	12
1-1	Raise farmers' awareness to the project implementation.																									District Office	<u>Manpower</u> District staff, Farmers, Consultants, <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	· Capacity of District staff for IA establishment and management will be strengthened by training Programme
1-2	Re-organize structure of IA.																											
1-3	Enhance leadership of committee members.																											
1-4	Strengthen decision making of IA.																											
1-5	Prepare by-laws and regulation.																											
1-6	Enhance financial management capacity of IA.																											
1-7	Promote to register IA.																											
2-1	Conduct survey and investigation with farmers' participation.																								District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants, and Contractor <u>Equipment</u> Vehicles and Survey Equipment	· Technical Support will be provided by Zonal Irrigation Office · Farmers participate in parts of civil works, such as excavation of irrigation and drainage canals	
2-2	Carry out design works.																											
2-3	Make agreement on the project implementation																											
2-4	Proceed pre-implementation activities including tendering and its evaluation.																											
2-5	Construct irrigation infrastructures with farmers' participation.																											
2-6	Turn-over O&M of completed irrigation facilities to IA.																											
3-1	Prepare irrigation schedule and maintenance plan.																							District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	· Technical Support will be provided by Zonal Irrigation Office		
3-2	Conduct water distribution.																											
3-3	Conduct maintenance works.																											
3-4	Enhance skills to mediate and resolve water disputes																											
3-5	Monitor performance of scheme.																											
<u>Relevant Activities to the Project</u>																								District Office	District staff, Zonal staff, Consultants			
A	Conduct EIA.																											
B	Conduct farmers' training for farming practice																							District Office	District staff, Zonal staff, Consultants			

Remarks :

Scheme Map



Photographs



Collapsed intake weir



Existing canal facilities



Command area



Transplanting of paddy



RRA meeting



Interview with farmers

5. Mgongola Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Mgongola Irrigation Scheme
(2) Location	Three villages, namely, Mkindo, Dihombo and Hembeti, Hembeti Ward, Morogoro Rural District, Morogoro Region. (see attached location map)
(3) Objectives of Project	To ensure stable water supply to the existing pilot model project (Mkindo Pilot Project) and the surrounding areas, through improvement of existing irrigation facilities and provision of irrigation and drainage system, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The scheme area occupies most of Hembeti Ward (Morogoro Rural District) at the eastern part of the Morogoro Region. Administratively, it includes 3 villages, namely, Mkindo, Dihombo and Hembeti. Access to the scheme area in the Mkindo village is by an unmetaled all-weather road from Dakawa, of which the distance is about 10 km. The scheme area could be easily accessible by any kind of vehicle in every season, because the access roads are well maintained though it is unpaved.</p> <p>Average annual rainfall of the scheme area is estimated at about 1,310 mm with double threads at the maximum in April. Mkindo river which is a water source of the scheme has perennial flow. Average discharge of the river at the existing intake point was estimated at more than 8.0 m³/sec, and even the lowest discharge in the dry season, say in September was estimated at above 1.9 m³/sec.</p> <p>Fertile alluvial plain extends downstream of the gouge of the Mkindo river. The scheme area is enclosed by the Mkindo river and its tributary, Mgongola river.</p>
(5) Scheme Description	<p>The Mgongola Irrigation Scheme is characterized as a modern irrigation scheme. In the light of success of the Mkindo Pilot Scheme, and also taking into consideration sufficient available water of the Mkindo river, the Government had a plan of irrigation development for the rainfed area extending toward downstream of the pilot farmlands. At the response to the Government request, JICA conducted a feasibility study on Mgongola Irrigation Scheme which was selected as a priority scheme in the Master Plan Study in Wami River-Basin.</p> <p>Based upon the development plan proposed in the feasibility study, the District formulated an irrigation development for the Mgongola Irrigation Scheme using the latest information. Total number of farmers related to the scheme is approximated at about 1,700, some of whom are belonging in the present water users association of Mkindo Pilot Scheme.</p> <p>Scheme area of 620 ha was demarcated by the limitation of availability of river water in dry season. Presently water right for off-taking water from the Mkindo River in irrigation purpose was</p>

	registered at 3.9 million litter/day for the Mkindo Pilot Scheme only.
(6) Problems identified in the Study	<p><u>Institution</u></p> <ul style="list-style-type: none"> - Non registered IA. In addition, the registered cooperative was established by some members of the IA through top-down intervention of the district cooperative officer. The cooperative doesn't work well, however. - The bylaw and the regulations are not well understood by the members. Only landowners are eligible for the membership. Poor participation of members in the IA activities such as operation and maintenance activities of irrigation facilities, meeting and etc. <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Water conflict with outside irrigation water users. - Water stagnant due to no flood protection facility and poor drain. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Future re-distribution of land due to irrigation development - Appropriate Holding Size - Pests and diseases - Proper Farming Practice - Un-affordability to farm inputs - Ensuring of Inputs - Lack of negotiation power of farmers with middlemen - Establishing Proper Approach to Marketing
(7) Component of Project	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers' participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA. 3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.

	<p>3-1 Preparation of irrigation schedule and maintenance plan. 3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitoring of irrigation performance of the scheme.</p>
(8) Irrigation and Drainage Development Plan	<p><u>Basic Approach</u> To employ the same irrigation development level with the pilot area to the surrounding areas.</p> <p><u>Development Plan</u> The proposed scheme area is 620 ha in net. Farmers adjoining the pilot project have been motivated to introduce the new irrigation method being stimulated by the pilot model effects. Some of them have initiated irrigation practices executed in the pilot project. But those are done disorderly, and frequently troubles occur on water distribution with other farmers. Farmers are looking forward to an implementation of the irrigation scheme which enables them to cover surrounding potential areas with the same irrigation system. The scheme fully requires new construction of irrigation and drainage canal system and flood protection work for the surrounding areas. For the existing intake weir, it is necessary to make enlargement of intake gates so as to divert sufficient irrigation water to both the pilot project and surrounding area. The proposed works for the scheme are as follows:</p> <ul style="list-style-type: none"> (a) Remodeling of intake weir (1 site) (b) Remodeling of diversion canal (unlined, length of 1,200 m) (c) Construction of main irrigation canal (unlined, length of 2,400 m) (d) Construction of secondary irrigation canal (unlined, length of 19,100 m) (e) Construction of drainage canal (length of 13,100 m) (f) Construction of flood dike (length of 9,800 m) (g) Construction of related structures (Lump Sum)
(10) Required Cost	Tsh. 1,913 Million (US\$ 1,799,000)
(11) Executing Agency	Morogoro Rural District Office
(12) Implementation Schedule	<p>Three years for survey, plan, construction and follow-up of the scheme, including training of IA.</p> <p>(see attached sheet)</p>
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established.

	- Process to strengthen IA including capacity building programme for farmers should be standardized.																					
(15) Special Arrangements	None																					
(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to expand irrigated paddy by changing 420 ha of rainfed condition into irrigated condition. - The target cropping intensity under the proposed condition is 150%. <p><u>Cropping Outline:</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;"><u>Present</u></th> <th style="width: 20%; text-align: center;"><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td style="text-align: center;">Paddy</td> <td style="text-align: center;">Paddy</td> </tr> <tr> <td>- Paddy Yield</td> <td style="text-align: center;">1.3/3.6ton/ha</td> <td style="text-align: center;">5.5ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td style="text-align: center;">770ha</td> <td style="text-align: center;">930ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td style="text-align: center;">124%</td> <td style="text-align: center;">150%</td> </tr> <tr> <td>- Paddy Production</td> <td style="text-align: center;">1,806ton</td> <td style="text-align: center;">5,115ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td style="text-align: center;">173MTsh</td> <td style="text-align: center;">476MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - Although the farm income is not sufficient for the living expenses in the present condition, considerable amount of reserve can be kept under the proposed condition. - The net farm income is just enough to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 2% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy	Paddy	- Paddy Yield	1.3/3.6ton/ha	5.5ton/ha	- Cultivated Area	770ha	930ha	- Cropping Intensity	124%	150%	- Paddy Production	1,806ton	5,115ton	- Project Benefit (Financial)	173MTsh	476MTsh
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- Project Benefit (Financial)	173MTsh	476MTsh																				
(b) Environmental Consideration	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Possible increase in pressure on natural resources such as fuel wood, - Possible water pollution, - Land use conflict among farmers, - Possible increase in water borne diseases, - Deterioration of natural vegetation by construction works, - Destructive birds, and - Possible increase in use of fertilizers and agro-chemicals. 																					
(c) Evaluation	EIRR: 12%																					

(2) Project Design Matrix

Project Name: Mgongola Irrigation Scheme _____

Duration: (3 years) _____

Project Area: Morogoro Rural District, Morogoro Region _____

Target Group: IA members _____

Date: August 2003 _____

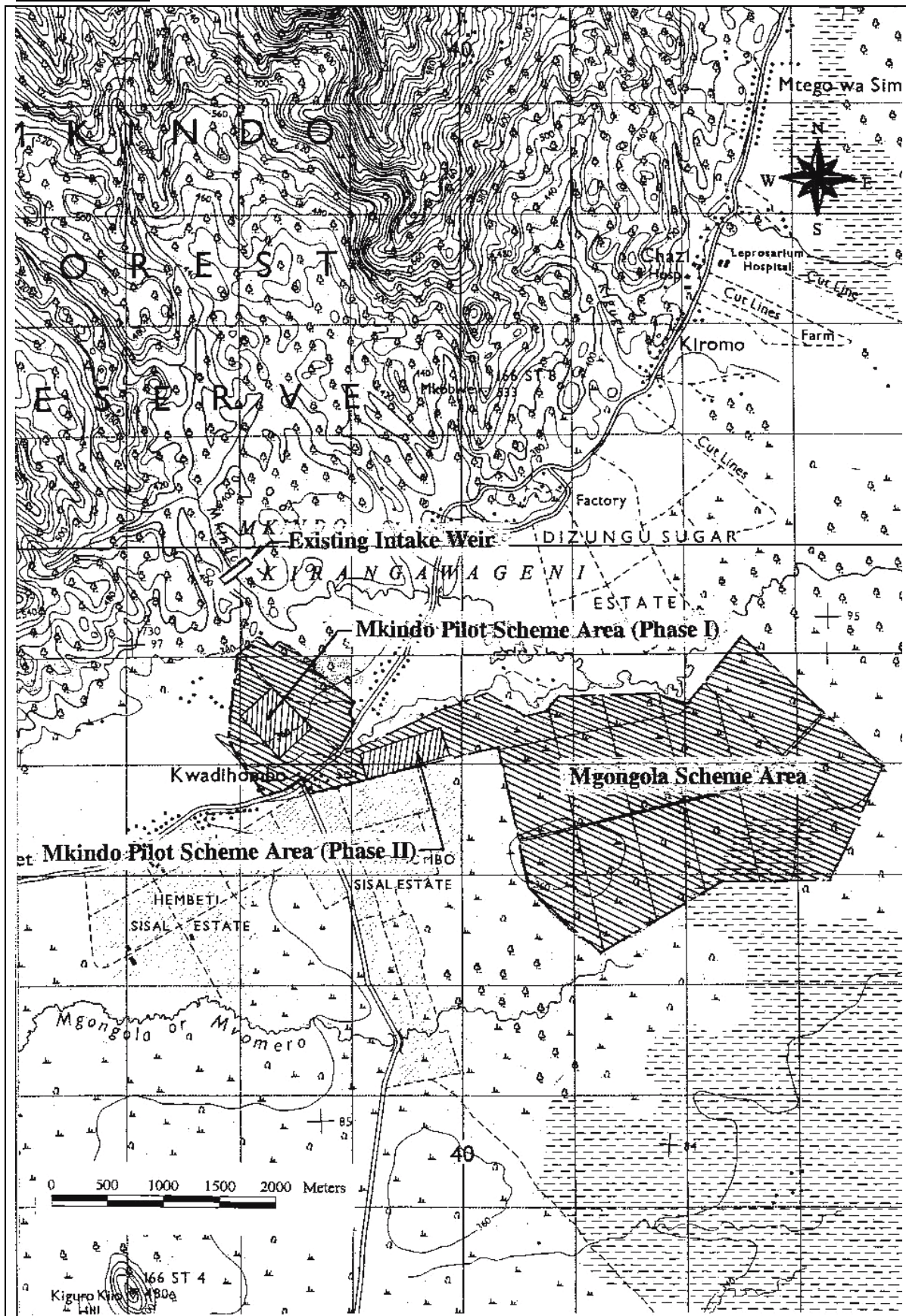
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 20% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Implementation Schedule for Mgongola Irrigation Scheme

Activities	Expected Results	Month and Year												Agencies in charge	Input	Remarks							
		1st Year			2nd Year						3rd Year												
		1	2	3	4	5	6	7	8	9	10	11	12				1	2	3	4	5	6	7
1-1	Raise farmers' awareness to the project implementation.	[Gantt bar: 1st Year, Month 1]												District Office	<u>Manpower</u> District staff, Farmers, Consultants, <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	· Capacity of District staff for IA establishment and management will be strengthened by training Programme							
1-2	Re-organize structure of IA.	[Gantt bar: 1st Year, Month 2]																					
1-3	Enhance leadership of committee members.	[Gantt bar: 1st Year, Month 3-4]																					
1-4	Strengthen decision making of IA.	[Gantt bar: 1st Year, Month 3-4; 2nd Year, Month 4-12]																					
1-5	Prepare by-laws and regulation.	[Gantt bar: 2nd Year, Month 4-12]																					
1-6	Enhance financial management capacity of IA.	[Gantt bar: 2nd Year, Month 9-12]																					
1-7	Promote to register IA.	[Gantt bar: 1st Year, Month 6]																					
2-1	Conduct survey and investigation with farmers' participation.	[Gantt bar: 1st Year, Month 1-6]												District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants, and Contractor <u>Equipment</u> Vehicles and Survey Equipment	· Technical Support will be provided by Zonal Irrigation Office · Farmers participate in parts of civil works, such as excavation of irrigation and drainage canals							
2-2	Carry out design works.	[Gantt bar: 1st Year, Month 7-12]																					
2-3	Make agreement on the project implementation	[Gantt bar: 1st Year, Month 11]																					
2-4	Proceed pre-implementation activities including tendering and its evaluation.	[Gantt bar: 1st Year, Month 11-12]																					
2-5	Construct irrigation infrastructures with farmers' participation.	[Gantt bar: 2nd Year, Month 4-12]																					
2-6	Turn-over O&M of completed irrigation facilities to IA.	[Gantt bar: 2nd Year, Month 12]																					
3-1	Prepare irrigation schedule and maintenance plan.	[Gantt bar: 3rd Year, Month 1-12]												District Office	<u>Manpower</u> District staff, Zonal staff, Farmers, Consultants <u>Equipment</u> Training facilities, Vehicles, and Training Equipment	· Technical Support will be provided by Zonal Irrigation Office							
3-2	Conduct water distribution.	[Gantt bar: 3rd Year, Month 1-12]																					
3-3	Conduct maintenance works.	[Gantt bar: 3rd Year, Month 1-12]																					
3-4	Enhance skills to mediate and resolve water disputes	[Gantt bar: 3rd Year, Month 1-12]																					
3-5	Monitor performance of scheme.	[Gantt bar: 3rd Year, Month 1-12]																					
<u>Relevant Activities to the Project</u>																							
A	Conduct EIA.	[Gantt bar: 1st Year, Month 3-4]												District Office	District staff, Zonal staff, Consultants								
B	Conduct farmers' training for farming practice	[Gantt bar: 3rd Year, Month 1-12]												District Office	District staff, Zonal staff, Consultants								

Remarks :

Scheme Map



Photographs



Mkindo diversion weir



Broken aqueduct



Irrigation canal



Paddy field after harvest



Soil surface covered by Azzola



Presentation in RRA workshop

6. Lower Moshi Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Lower Moshi Irrigation Scheme
(2) Location	Six villages, namely, Mabogini, Rau Ya Kati, Chekereni, Oria, Mandaka Mnono and Kaloleni, Moshi Rural District, Kilimanjaro Region (see attached location map)
(3) Objectives of Project	To realize even water use in upstream area (Expanded Area) and downstream area (Existing Lower Moshi Area) through strengthening water management.
(4) Site Description	<p>The Scheme is located in the Moshi Rural District of the Kilimanjaro Region. The Scheme covers six villages of Mabogini, Rau Ya Kati, Chekereni, Oria, Mandaka Mnono and Kaloleni. The population of these villages in 2002 is estimated at 21,110 using the 1988 population and annual growth rate 3.08 %.</p> <p>The Scheme Area extends on the alluvial low land area being composed of gently sloping land with an average gradient of 0.5 %. The elevation of the Study Area ranges from 700m to 760m.</p> <p>Climate in the Scheme Area is characterized by three seasons: rainy season from March to May, dry season from June to October, and small rainy season from November to February. The mean temperature varies from 20°C to 25°C throughout the year. The monthly average of relative humidity varies from 64 % to 77 %.</p> <p>Water source of the Scheme consists of the Rau river and the Njoro river, a tributary of the Rau river. The Rau river originates from Mt. Kilimanjaro and traverses the Scheme Area until it is joined by the Ruvu river, collecting water from springs in the mountain area. The Mwanagurue spring located in Mandaka Mnono is acting as a stable water source of the river. The Njoro river, collecting water from such springs as the Njoro ya Dobi spring and Goa spring, has a relatively stable flow throughout the year. The estimated mean monthly discharge at Mabogini and Rau Ya Kati ranges from 1.23 m³/sec to 1.59 m³/sec and from 2.24 m³/sec to 4.35 m³/sec, respectively.</p> <p>Eutric Cambisols, Phreatic are dominantly distributed in nearly flat lands in the Scheme Area, and are almost entirely used for crop cultivation. Vertic Camisols, Poorly Drained Phase are found to a limited extent in paddy fields in Kaloleni. The soils have no serious limitation for irrigated rice farming. Typic Eutric Gleysols, Poorly Drained Phase are found mainly low-lying areas extending paddy fields in the northeastern end of the Scheme. The soils have no serious limitation for irrigated rice farming. The access to the Scheme Area is good, and possible even during the rainy season.</p>
(5) Scheme Description	The Lower Moshi Irrigation Scheme is categorized as a modern irrigation scheme. The Scheme Area is estimated at 1,560 ha consisting of 460 ha of the Expanded Area and 1,100 ha of the presently irrigated area in the Existing Lower Moshi Project. The objective of the Scheme is to strengthen the water management for

	<p>the Area for effective use of limited water source.</p> <p>The Existing Lower Moshi Project was developed in 1987, aiming at 1,100 ha of paddy cultivation and 1,200 ha of upland crops, and the paddy production had been successfully increased by 1990. However, the development of new paddy fields and the arbitrary water tapping in the upstream areas of the Existing Project, namely the Expanded Area, brought about constant water shortage in the Existing Lower Moshi Project. The Expanded Area is presently cultivated with 2.5 times of paddy cultivation in a year, while the Existing Lower Moshi Project with one time of paddy cultivation in 14 months although the Scheme has already obtained the granted water right of 804 l/sec at the Mabogini Intake Weir and 1,135 l/sec at the Rau Ya Kati Intake Weir.</p> <p>The Expanded Area consists of Kaloleni area and Mandaka Mnono area. The Kaloleni area further consists of the Northern Kaloleni area, Western Kaloleni area and Southern Kaloleni area, for which the water sources for irrigation are mostly springs. On the other hand, the water source for the Mandaka Mnono is the Mwananguruwe spring of which the low discharge is observed at approximately 300 l/sec. According to the farmers in the Mandaka Mnono, the Mandaka Mnono Irrigators Cooperative Society obtained the provisional grant of water right (200 l/sec) on October 5, 2001.</p>
<p>(6) Problems identified in the Study</p>	<p><u>Institution</u></p> <ul style="list-style-type: none"> - Non registered IAs. No concrete future plans for registration. Neither cooperative nor association is necessarily an optimum organizational form for the IA. The differences between the cooperative and the association including their application procedures are not clearly understood by the farmers. - Water right issue needs coordination of the responsible stakeholders including relevant governmental organizations <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Critical water conflict with other outside irrigation water users. - No protection of water right obtained. - Improper rotational irrigation. - No even water use in the same river basin. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Uneven distribution of water resources within and between schemes - Proper Water management related to the scheme area are not accumulated. Important and useful ones are left abandoned.
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation.

	<p>1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration.</p> <p>2. Rehabilitation / improvement of Irrigation infrastructures 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers' participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA.</p> <p>3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures. 3-1 Preparation of irrigation schedule and maintenance plan. 3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitoring of irrigation performance of the scheme.</p>
<p>(8) Irrigation and Drainage Development Plan</p>	<p><u>Basic Approach</u></p> <p>To provide necessary irrigation and drainage facilities for proper water management for upstream area and to make minimum rehabilitation work for downstream area, to enhance irrigation efficiency.</p> <p><u>Development Plan</u></p> <p>The proposed scheme area is 1,560 ha in net. The Existing Lower Moshi Project is provided with modernized irrigation and drainage system although rehabilitation works for damaged canal lining and gates are required for further effective water management.</p> <p>The Expanded Area is presently covered with the farmers-built irrigation canal systems. These canal systems are not enough to realize the proper water management due to no control facility, poor canal condition, and lack of farm road. Besides, no drainage system including flood protection dyke is provided. Improvement of these unsuitable conditions is therefore indispensable to avoid unnecessary water tapping from the limited water sources, and also smoothly to eliminate excess water to the river. The required works mentioned above are summarized below:</p> <p>(a) Existing Lower Moshi Project (1,100 ha paddy field only)</p> <ul style="list-style-type: none"> - Rehabilitation of two intake weirs (intake/scouring sluice gates): 4nos - Repairing of canal lining : Lump Sum - Repairing of drains: Lump Sum - Repairing of related structures: Lump Sum <p>(b) Expanded Area (460 ha in total)</p> <ul style="list-style-type: none"> - Construction of intake facilities: 8nos - Improvement of existing canals: 26 km - Construction of drains: 21 km - Rehabilitation/construction of farm roads: 30 km

	<ul style="list-style-type: none"> - Construction of related structures: 244 nos. - Construction of flood dike: 16 km 																					
(10) Required Cost	Tsh. 2,999 Million (US\$ 2,821,000)																					
(11) Executing Agency	Moshi Rural District Office																					
(12) Implementation Schedule	Three and half years for survey, plan, construction and follow-up of the scheme, including training of IA. (see attached sheet)																					
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced 																					
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized. 																					
(15) Special Arrangements	None																					
(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to evenly distribute the limited water resources within and between schemes. - Yield per unit area will be increased in expanded area through improvement of irrigation system. <p><u>Cropping Outline:</u></p> <table border="1"> <thead> <tr> <th></th> <th><u>Present</u></th> <th><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td>Paddy</td> <td>Paddy</td> </tr> <tr> <td>- Paddy Yield</td> <td>4.5/6.6ton/ha</td> <td>7.0ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td>1,530ha</td> <td>1,560ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td>98%</td> <td>100%</td> </tr> <tr> <td>- Paddy Production</td> <td>4,761ton</td> <td>10,920ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td>1,014MTsh</td> <td>1,252MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - Although the farm income is not sufficient for the living expenses in the present condition, it can just cover the living expenses in the proposed condition with certain amount of reserve. - The net farm income is enough to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 2% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy	Paddy	- Paddy Yield	4.5/6.6ton/ha	7.0ton/ha	- Cultivated Area	1,530ha	1,560ha	- Cropping Intensity	98%	100%	- Paddy Production	4,761ton	10,920ton	- Project Benefit (Financial)	1,014MTsh	1,252MTsh
	<u>Present</u>	<u>Proposed</u>																				
- Crops Applied	Paddy	Paddy																				
- Paddy Yield	4.5/6.6ton/ha	7.0ton/ha																				
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- Cropping Intensity	98%	100%																				
- Paddy Production	4,761ton	10,920ton																				
- Project Benefit (Financial)	1,014MTsh	1,252MTsh																				
(b) Environmental Consideration	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Possible increase in pressure on water resources, 																					

	<ul style="list-style-type: none"> - Conflict of interest between KADP and CHAWAMPU on the ownership, - Siltation at intake points, - Possible vandalism after rehabilitation, - Deterioration of natural vegetation by construction works, - Reduced water flow in irrigation canals due to weed, - Possible increase in water borne diseases, - Possible soil and water pollution, - Possible conflict between crop producers and livestock keepers, and - Destructive birds.
(c) Evaluation	EIRR: 6%

(2) Project Design Matrix

Project Name: Lower Moshi Irrigation Scheme _____

Duration: (3.5 years) _____

Project Area: Moshi Rural District, Kilimanjaro Region Target Group: IA members _____ Date: August 2003 _____

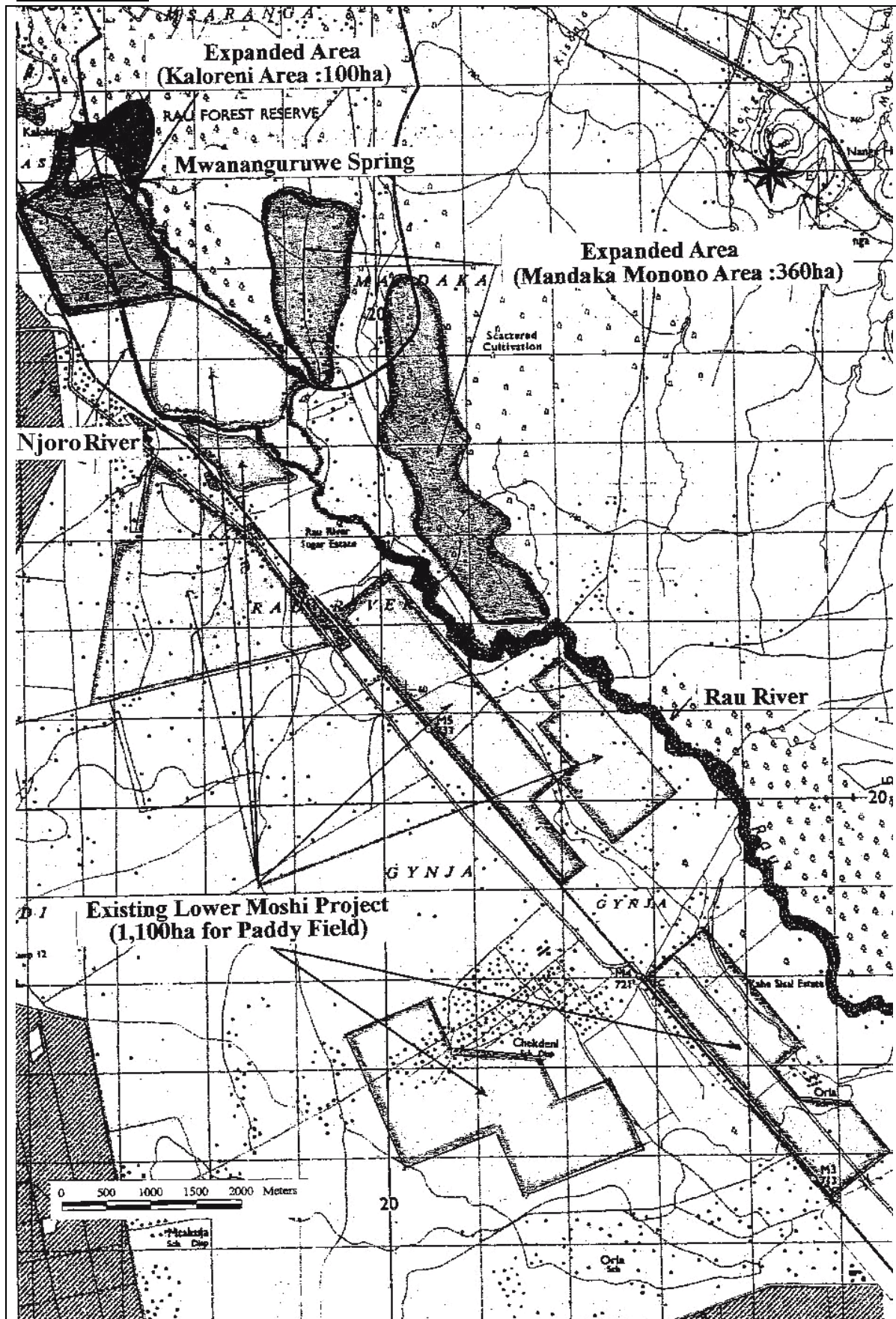
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 20% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Implementation Schedule for Lower Moshi Irrigation Scheme

Activities	Expected Results	Month and Year																																																Agencies in charge	Input	Remarks
		1st Year												2nd Year												3rd Year												4th Year														
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6									
1-1	Raise farmers' awareness to the project implementation.																																											District Office	Manpower District staff, Farmers, Consultants, Equipment Training facilities, Vehicles, and Training Equipment	Capacity of District staff for IA establishment and management will be strengthened by training Programme						
1-2	Re-organize structure of IA.																																														Follow-up	Follow-up				
1-3	Enhance leadership of committee members.																																																			
1-4	Strengthen decision making of IA.																																																			
1-5	Prepare by-laws and regulation.																																																			
1-6	Enhance financial management capacity of IA.																																														Training					
1-7	Promote to register IA.																																																			
2-1	Conduct survey and investigation with farmers' participation.																																											District Office	Manpower District staff, Zonal staff, Farmers, Consultants, and Contractor Equipment Vehicles and Survey Equipment	Technical Support will be provided by Zonal Irrigation Office Farmers participate in parts of civil works, such as excavation of irrigation and drainage canals						
2-2	Carry out design works.																																																			
2-3	Make agreement on the project implementation																																																			
2-4	Proceed pre-implementation activities including tendering and its evaluation.																																																			
2-5	Construct irrigation infrastructures with farmers' participation.																																														Follow-up					
2-6	Turn-over O&M of completed irrigation facilities to IA.																																																			
3-1	Prepare irrigation schedule and maintenance plan.																																											District Office	Manpower District staff, Zonal staff, Farmers, Consultants Equipment Training facilities, Vehicles, and Training Equipment	Technical Support will be provided by Zonal Irrigation Office						
3-2	Conduct water distribution.																																																			
3-3	Conduct maintenance works.																																														Training					
3-4	Enhance skills to mediate and resolve water disputes																																																			
3-5	Monitor performance of scheme.																																																			
<i>Relevant Activities to the Project</i>																																																				
A	Conduct EIA.																																											District Office	District staff, Zonal staff, Consultants							
B	Conduct farmers' training for farming practice																																											District Office	District staff, Zonal staff, Consultants							

Remarks :

Scheme Map



Photographs



Diversion point at Mwananguruwe spring



Irrigated area at Mandaka Mnono



Mabogini Intake



Paddy in Mabogini system



Canal system at existing Lower Moshi



Interview with farmers

7. Kisese Irrigation Scheme

(1) Project Proposal

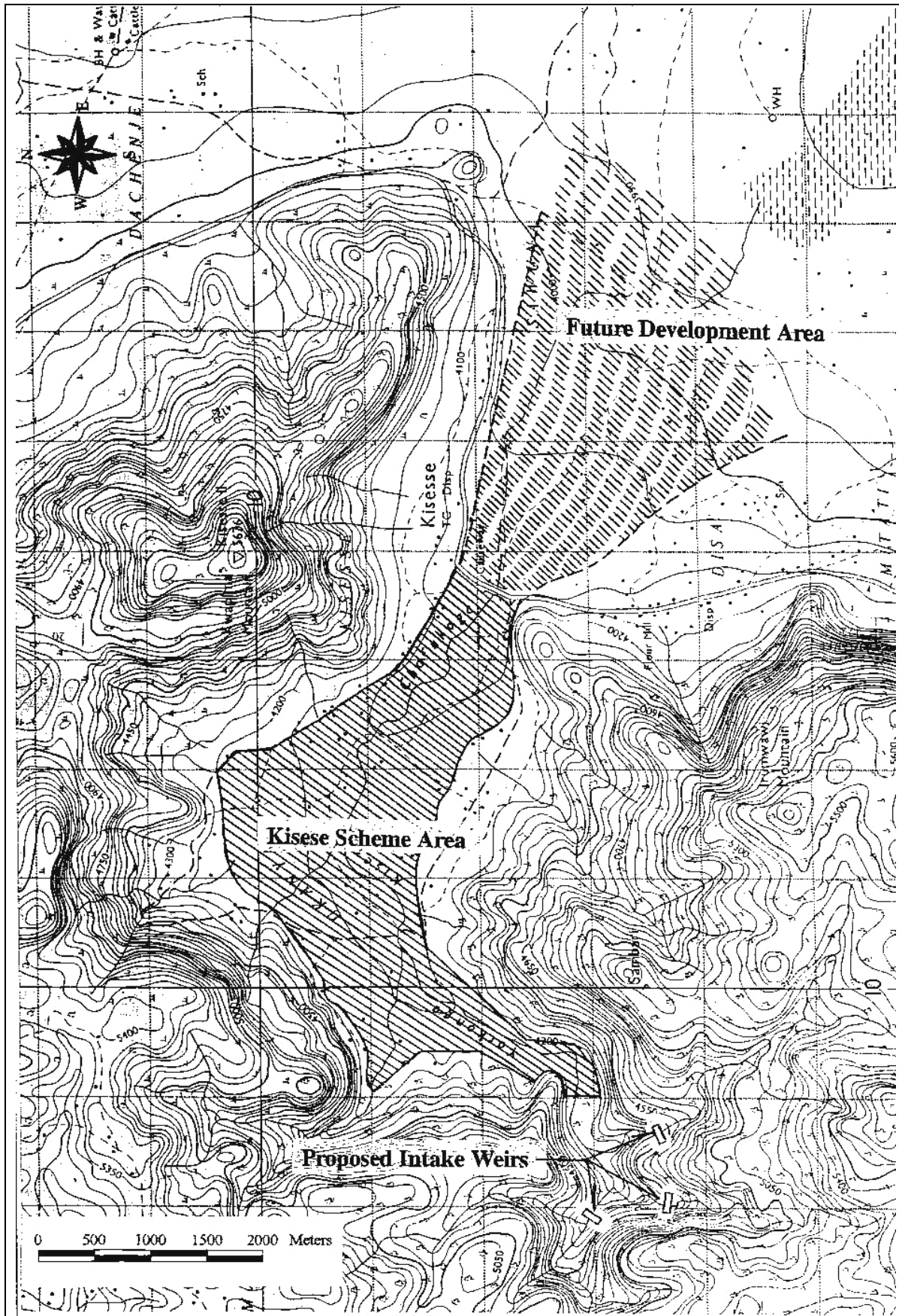
(1) Title of Programme	Kisese Irrigation Scheme
(2) Location	Four villages, namely, Kisese-Sauna, Kisese-Disa, Mapinduzi and Madisa, Kisese Ward, Kondoa District, Dodoma Region. (see attached location map)
(3) Objectives of Project	To ensure irrigation water by river-basin-wide water harvesting development, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The scheme area covers most of Kisese Ward (Kondoa District) at the northern part of the Dodoma Region. It administratively includes 4 villages, namely, Kisese-Sauna, Kisese-Disa, Mapinduzi and Madisa. Access to the center of the scheme area in the Kisese-Sauna is by an unmetaled seasonal-weather road from Kondoa, about 71 km long. The scheme area could be accessible only by 4WD vehicle even in the dry season because the access roads approaching from west are likely mountain pass with small width and steep slopes, otherwise other access roads approaching from south are erodible at the closings with tributaries. It is sometimes difficult to reach the area during rainy season even by any type automobile.</p> <p>Annual rainfall of the scheme area ranges from 500 mm to 800 mm having single peak in April. Kisese river is a major water source of the scheme having about 100 km² of catchment area at the site. The river is intermittent or ephemeral in and below its middle reaches. Small streamlet has however been seen in the upstream of the river gushing out from several springs during the dry season. Watershed of the river is well-vegetated and exposing rocks in layers which seem to be relatively suitable for feeding springs.</p> <p>As the downstream of scheme area and outside area extending downstream are cultivated in rainfed during the rainy season, water harvesting measures diverting flood flush are solitary possible for irrigation to these dry area. On the other hand, specified areas in upstream are presently irrigated by abstracting water in a traditional manner.</p>
(5) Scheme Description	As the first step of irrigation improvement for these areas, District office has proposed the Kisese Irrigation Schemes which is targeted specified upstream area to improve it irrigated agriculture by utilizing possible perennial spring sources. In the upstream of the River, about 20 ha has been irrigated taking water from the River by traditional dikes within the river-course.
(6) Problems identified in the Study	<p><u>Institution</u></p> <ul style="list-style-type: none"> - No IA, but a small group of vegetable cultivation at present. - The management of IA is still insufficient. There is no general meeting. The bylaw and the regulations are not well

	<p>understood by the members.</p> <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Less water source. - Poor existing intake facility. - Insufficient knowledge on irrigation. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Soil erosion caused by floods - Proper Water management - Unavailability of farm inputs - Ensuring of Inputs - Destructive insects and animals - Proper Farming Practice - Uncontrolled market prices of farm products - Proper Market Price Control
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers' participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA. 3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures. <ol style="list-style-type: none"> 3-1 Preparation of irrigation schedule and maintenance plan. 3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitoring of irrigation performance of the scheme.
<p>(8) Irrigation and Drainage Development Plan</p>	<p><u>Basic Approach</u></p> <p>To apply suitable water harvesting methods for every specified river segment considering river morphologic form.</p> <p><u>Development Plan</u></p>

	<p>The proposed scheme area is 50 ha in net. The riparian area of Kisese river is classified into the following three segments from river morphologic form:</p> <p>(1) First river segment</p> <p>The well vegetation-covered catchment area of the Kisese river, bears relatively stable base-flow only its upstream reaches. This is categorized into the first river segment of the Kisese river. The river water is abstracted partially for irrigation purpose by earthen and fragile intake dikes at five points. Farmers are very eager to replace them with the solid and stable ones because these are flushed out by flood.</p> <p>(2) Second river segment</p> <p>Middle reach of the river, which is categorized into the second segment of the river, is not perennial but intermittent or ephemeral although there is considerable subsurface flow under the riverbed even during the dry season. Farmers abstract subsurface flow water from the river by digging riverbed during dry season. River section in this second segment forms deeply carved side banks, and its riverbed has been deepening year by year. Due to such characteristic of the river shape, water harvesting like flood flow diverting has not been practiced. The farm-lands concerning the type of second river segment could extract water from sub-surface flow of the river by pump, otherwise, harvest water by collecting flood water at upper side of adjoining mountain slopes like a method known as the external water harvesting.</p> <p>(3) Third river segment</p> <p>Down reach of the river, which is categorized into the third segment of the river, is ephemeral. Farmers have not irrigated their lands in this river segment. However, there is a possibility to initiate irrigation applying conventional water harvesting method where farmers divert flood flow into their lands during flood time.</p> <p>The whole reaches should be developed stage-wise considering the area size of respective reaches. As Phase 1, the first river segment is recommendable since about 38 ha is presently irrigated using river water. The irrigation development for the first river segment which targets 50 ha irrigation development, is regarded as pilot irrigation area the upper reach of the river. The required construction works for the scheme are summarized below:</p> <p>(a) Intake weirs (3 sites) (b) Irrigation canal (unlined, length of 17,900 m) (c) Storage reservoir (1 site with capacity of 2, 60 m³) (d) Drainage canal (length of 8,000 m)</p>
(10) Required Cost	Tsh. 325 Million (US\$ 306,000)
(11) Executing Agency	Kondoa District Office
(12) Implementation Schedule	<p>Three years for survey, plan, construction and follow-up of the scheme, including training of IA.</p> <p>(see attached sheet)</p>
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved.

	<ul style="list-style-type: none"> - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced 																					
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized. 																					
(15) Special Arrangements	None																					
(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to increase the vegetable production area from 38ha to 50ha by changing the surrounding rainfed field into irrigated condition. - Emphasis was given to the vegetable production in the dry season due to high demand and farmers' requirement. <p><u>Cropping Outline:</u></p> <table border="1"> <thead> <tr> <th></th> <th><u>Present</u></th> <th><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td>Maize/Vegetables</td> <td>Vegetables</td> </tr> <tr> <td>- Paddy Yield</td> <td>-</td> <td>-</td> </tr> <tr> <td>- Cultivated Area</td> <td>88ha</td> <td>100ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td>176%</td> <td>200%</td> </tr> <tr> <td>- Paddy Production</td> <td>-</td> <td>-</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td>195MTsh</td> <td>295MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - The farm income is sufficient for the living expenses even in the present condition and the reserve can be increased in 16% under the proposed condition. - The net farm income is quite sufficient to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 0.7% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Maize/Vegetables	Vegetables	- Paddy Yield	-	-	- Cultivated Area	88ha	100ha	- Cropping Intensity	176%	200%	- Paddy Production	-	-	- Project Benefit (Financial)	195MTsh	295MTsh
	<u>Present</u>	<u>Proposed</u>																				
- Crops Applied	Maize/Vegetables	Vegetables																				
- Paddy Yield	-	-																				
- Cultivated Area	88ha	100ha																				
- Cropping Intensity	176%	200%																				
- Paddy Production	-	-																				
- Project Benefit (Financial)	195MTsh	295MTsh																				
(b) Environmental Consideration	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Siltation in Kisese River, - Soil erosion in the valley, - High water loss due to seepage, - Possible conflict between crop producers and livestock keepers, - Deterioration of natural vegetation by construction works, - Possible increase in water borne diseases, - Possible soil and water pollution, and - Destructive animals such as wild pigs, monkeys and baboons. 																					
(c) Evaluation	EIRR: 18%																					

Scheme Map



Photographs



Kisese village



River for water source



Temporary intake



General landscape of command area



Contour band in the field of advanced farmer



RRA workshop with farmers

8. Pamila Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Pamila Irrigation Scheme
(2) Location	Pamila Village, Kigoma Rural District, Kigoma Region (see attached location map)
(3) Objectives of Project	To ensure necessary irrigation water by applying new water harvesting method using flood water, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The Pamila Irrigation Scheme is located in the Pamila Valley extending south of Pamila Village situated about 53 km east of Kigoma Town, capital of Kigoma Region. Beneficiaries of the Scheme are mostly living in Pamila Village having a total population of 3,469 in 2002. The households' number is 671.</p> <p>The inhabitants of Pamila Village are mostly peasants. Their livelihood mainly depends on agricultural production of food and cash crops. As food crops, they cultivate rice, maize, cassava, sweet potatoes and pulses. Oilpalms and sometimes rice are cultivated as cash crops. Fruits such as mangoes, oranges and bananas are grown on a small scale.</p> <p>The scheme area is covered with comparatively flat topography sloping toward east. Its elevation ranges from 990 m to 1,000 m. The Scheme Area extends on the alluvial deposits being fairly fertile, well drained with fine to moderate textured clay loams and sandy clay loams. The soils have no serious limitation for irrigated rice farming.</p> <p>The scheme area has bimodal type of rainfall. The first rainy season starts in mid. October through mid. January, and the second rainy season starts in late February and lasts in May. The average annual rainfall is about 1,200 mm. The average minimum temperature is 18°C and the maximum temperature is 30°C.</p> <p>The access to the scheme area is fair and possible even during the rainy season. However, it is difficult to approach to plural intake sites due to high moisture soil during the rainy season.</p>
(5) Scheme Description	<p>The Pamila Irrigation Scheme was characterized as a water harvesting scheme. The water source is the Nyankara stream flowing in the Scheme Area. The discharge of Nyankara stream much depends on rainfall, and generally can supply irrigation water to fields in rainy season although being far from appropriate quantity in irrigation. Some of farmers of the scheme area have progressively tried water harvesting for paddy cultivation with coming up with their own various ideas to suit condition of their lands. Spring water sourcing from upper portion of surrounded hills is seasonally available while those dry up before coming driest month. Paddy cultivated area by water harvesting is not definite but it could be presumed at about 10 ha.</p> <p>Recognized the farmers' efforts in advancing irrigated agriculture</p>

	<p>in the scheme area, Kigoma District draws up an irrigation development plan for Pamila valley making this Pamila Irrigation Scheme a core of irrigation development through enhancing water harvesting.</p>
<p>(6) Problems identified in the Study</p>	<p><u>Institution</u></p> <ul style="list-style-type: none"> - No IA, but informal irrigators' sub groups. However, the farmers don't have sufficient experiences of managing a IA. - Insufficient technical training opportunities for the farmers <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Very fragile existing weirs. - Superficial farmers' experience in irrigation. - Ineffective irrigation canal system . - Water stagnant due to poor drainage system. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Shortage of land due to land fragmentation under the customary land ownership - Appropriate Holding Size - Unsatisfactory yield even under irrigated condition Proper Farming Practice - Insufficient supply of inputs such as farm machinery and fertilizer - Ensuring of Inputs - Low and unstable farm gate prices of the products - Proper Market Price Control
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers' participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA. 3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures. <ol style="list-style-type: none"> 3-1 Preparation of irrigation schedule and maintenance plan.

	<p>3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitoring of irrigation performance of the scheme.</p>
<p>(8) Irrigation and Drainage Development Plan</p>	<p><u>Basic Approach</u> To establish and apply the water harvesting at field plot level at low cost.</p> <p><u>Development Plan</u> The proposed scheme area is 30 ha in net. This is a pilot scheme to examine a new water harvesting method. The scheme is to verify the farmers' practice for water harvesting whether it is worthy for expanding other areas and improving the technology. Water harvesting is generally practiced in hilly sloping dry farm-lands, catching flood water from upper reach and reserving it into temporal artificial small pool or banded fields. In a different manner from it, some farmers utilize inundated water at field plots level during the rainy season. The scheme area extends to the low land basin unlike the typical water harvesting areas. During the rainy season, inundated water over the low basin is rising steadily to the scheme area. The permeated water into the scheme area stagnates, and then drains gradually at flood retardation time. Some farmers are presently using this natural phenomenon for irrigation. They confine the stagnant water at the paddy field plot by small bund during the rainy season, temporally named "Confining Water Harvesting", and succeed rice cultivation. However, such water harvesting is still required to refine its manners and to develop adequate skills for reliable operation. This scheme gives a proper site for examining the new water harvesting technology. The required works for the scheme are summarized below:</p> <p>(a) Construction of farm-bunds (totally 30 ha) (b) Construction of drainage canal (length of 1,300 m) (c) Construction of farm-passes (length of 2,500 m) (d) Procuring of equipment for verifying the new water harvesting method (L.S.)</p>
<p>(10) Required Cost</p>	<p>Tsh. 40 Million (US\$ 38,000)</p>
<p>(11) Executing Agency</p>	<p>Kigoma Rural District Office</p>
<p>(12) Implementation Schedule</p>	<p>Three years for survey, plan, construction and follow-up of the scheme, including training of IA. (see attached sheet)</p>
<p>(13) Expected Benefit</p>	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced
<p>(14) Assessment of Possible Problems and Bottlenecks in Implementation</p>	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers'

	<p>participation under decentralization should be established.</p> <ul style="list-style-type: none"> - Process to strengthen IA including capacity building programme for farmers should be standardized. 																					
(15) Special Arrangements	None																					
(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to increase the paddy production area from 10ha to 30ha to perform the cropping intensity of 100%. - The traditional water harvesting method will also be improved. <p><u>Cropping Outline:</u></p> <table border="0"> <thead> <tr> <th></th> <th style="text-align: center;"><u>Present</u></th> <th style="text-align: center;"><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td style="text-align: center;">Paddy</td> <td style="text-align: center;">Paddy</td> </tr> <tr> <td>- Paddy Yield</td> <td style="text-align: center;">2.7ton/ha</td> <td style="text-align: center;">4.0ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td style="text-align: center;">10ha</td> <td style="text-align: center;">30ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td style="text-align: center;">33%</td> <td style="text-align: center;">100%</td> </tr> <tr> <td>- Paddy Production</td> <td style="text-align: center;">27ton</td> <td style="text-align: center;">120ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td style="text-align: center;">2.2MTsh</td> <td style="text-align: center;">6.9MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - The farm income does not sustain the living expenses both in the present and the proposed conditions so that the off-farm income is essential for farmers. - The net farm income does not cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 1% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy	Paddy	- Paddy Yield	2.7ton/ha	4.0ton/ha	- Cultivated Area	10ha	30ha	- Cropping Intensity	33%	100%	- Paddy Production	27ton	120ton	- Project Benefit (Financial)	2.2MTsh	6.9MTsh
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- Cropping Intensity	33%	100%																				
- Paddy Production	27ton	120ton																				
- Project Benefit (Financial)	2.2MTsh	6.9MTsh																				
(b) Environmental Consideration	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Water logging due to lack of drainage system, - Water shortage during the dry spell (January/February), - Destructive animals such as vermins, tortoise and birds, - Possible increase in water borne diseases, - Deterioration of natural vegetation by construction works, and - Possible soil and water pollution. 																					
(c) Evaluation	EIRR: 7%																					

(2) Project Design Matrix

Project Name: Pamila Irrigation Scheme Duration: (3 years)

Project Area: Kigoma Rural District, Kigoma Region Target Group: IA members Date: August 2003

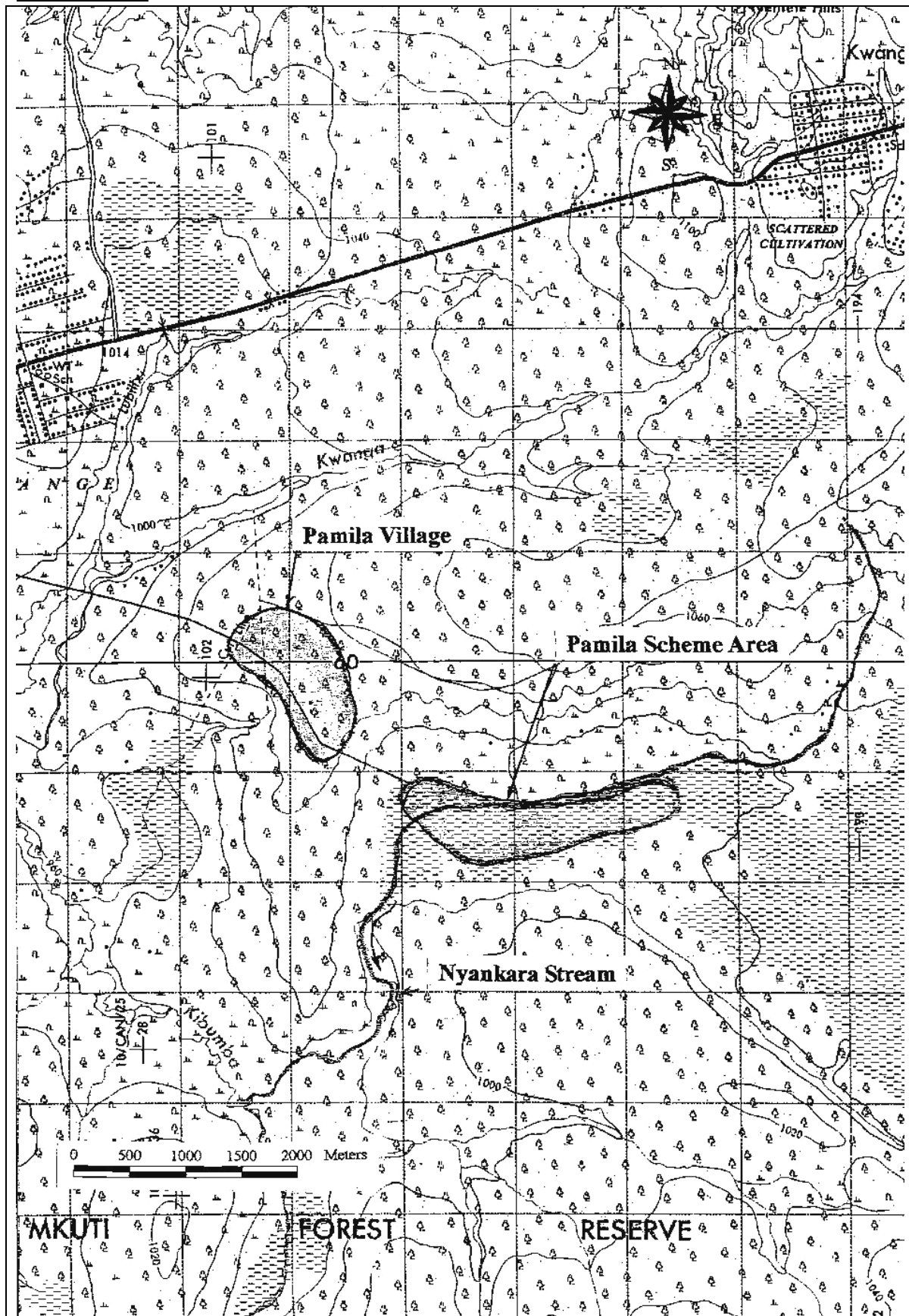
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 20% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Implementation Schedule for Pamila Irrigation Scheme

Activities	Expected Results	Month and Year																																				Agencies in charge	Input	Remarks
		1st Year												2nd Year												3rd Year														
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
1-1	Raise farmers' awareness to the project implementation.																									Follow-up												District Office	Manpower District staff, Farmers, Consultants, Equipment Training facilities, Vehicles, and Training Equipment	Capacity of District staff for IA establishment and management will be strengthened by training Programme
1-2	Re-organize structure of IA.																									Follow-up														
1-3	Enhance leadership of committee members.																									Follow-up														
1-4	Strengthen decision making of IA.																									Follow-up														
1-5	Prepare by-laws and regulation.																									Follow-up														
1-6	Enhance financial management capacity of IA.																									Follow-up														
1-7	Promote to register IA.																									Follow-up														
2-1	Conduct survey and investigation with farmers' participation.	■																																				District Office	Manpower District staff, Zonal staff, Farmers, Consultants, and Contractor Equipment Vehicles and Survey Equipment	Technical Support will be provided by Zonal Irrigation Office Farmers participate in parts of civil works, such as excavation of irrigation and drainage canals
2-2	Carry out design works.													■																										
2-3	Make agreement on the project implementation																									■														
2-4	Proceed pre-implementation activities including tendering and its evaluation.													■																										
2-5	Construct irrigation infrastructures with farmers' participation.													■																										
2-6	Turn-over O&M of completed irrigation facilities to IA.																									■														
3-1	Prepare irrigation schedule and maintenance plan.																									■												District Office	Manpower District staff, Zonal staff, Farmers, Consultants Equipment Training facilities, Vehicles, and Training Equipment	Technical Support will be provided by Zonal Irrigation Office
3-2	Conduct water distribution.																									■														
3-3	Conduct maintenance works.																									■														
3-4	Enhance skills to mediate and resolve water disputes																									■														
3-5	Monitor performance of scheme.																									■														
<i>Relevant Activities to the Project</i>																																								
A	Conduct EIA.	■																																				District Office	District staff, Zonal staff, Consultants	
B	Conduct farmers' training for farming practice																									■												District Office	District staff, Zonal staff, Consultants	

Remarks :

Scheme map



Photographs



Command Area



Command Area



Harvesting of paddy



Preparation of drainage canal



Vegetable production by residual moisture



Interview with Farmers

9. Nkenge Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Nkenge Irrigation Scheme
(2) Location	Mbale Village, Kitobo Ward, Kiziba Division, Bukoba District, Kagera Region. (see attached location map)
(3) Objectives of Project	To ensure irrigation water through rehabilitation of the existing failed pump irrigation scheme, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The Nkenge Irrigation Scheme is located in Mbale Village, Kitobo Ward, Kiziba Division, Bukoba District, Kagera Region. The scheme area lies about 32 km northwest of Bukoba, capital of Kagera Region. The access to the Scheme Area is good and possible even in rainy season.</p> <p>The scheme area extends in the Ngono river basin which is the most suitable and potential area for irrigated farming. The topography of the scheme area is gently sloped toward northwest. Its elevation ranges from 1,147 m to 1,155 m above mean sea level.</p> <p>The climate of the scheme area is classified as "Moist-Sub Humid". The mean annual rainfall is about 1,300 mm. The rainy season is in March to May, and the dry season in June and July. The temperature is characterized by average daily minimum ranging from 13°C to 16°C and daily maximum from 24°C to 25°C.</p> <p>The scheme area is underlain by alluvial deposits of the Ngono flood plain. These deposits are fine textured to a depth of at least 3 m and have high silt and clay contents which have no serious limitation for irrigated rice farming.</p> <p>It is easy to approach to the pumping site and major structure sites because of exist of farm roads.</p>
(5) Scheme Description	<p>The Nkenge Irrigation Scheme is categorized as a pump irrigation scheme. The Scheme is one of the schemes identified through the feasibility study on Ngono Riverbasin Development in 1973. In 1979, the Scheme was launched into implementation under technical and financial support by CEBEMO (Dutch Catholic Organization). The constructed infrastructures were (i) four residential houses for key staff, (ii) a research and training centre, (iii) a workshop for servicing machinery and other equipment, (iv) an office building, and (v) a main crop and input store.</p> <p>In addition, clearing work was conducted for 32 ha of pilot area, and then an elaborate gravity irrigation system was established. It consisted of a supporting diesel operated water pump, a main canal, several branch canals, distribution and field canals, main drains, field drains and related structures.</p> <p>The Scheme played a role of research and training to tackle and find solutions to problems that would impair development of</p>

	<p>larger area because the Ngoni riverbasin has a potential area of 4,100ha.</p> <p>In 1990, the Government/CEBEMO withdrew the financial support from the Nkenge Irrigation Scheme. Thereafter, the Scheme was given up by farmers because of lack of their knowledge on its management.</p> <p>In 2002, the active 30 farmers have re-started the cultivation of maize, beans and vegetables at about 6 ha in the Area under rainfed condition. They organized a group for hiring a tractor. Pushing from farmers' request, the District Office has drawn up a rehabilitation/expansion plan on the Scheme. The farmers concerning to the scheme are very eager to restore the irrigation scheme as soon as possible. Some sources of failure of previous scheme seem to exist in technical aspect besides of mishandling of farmer-managed irrigation.</p>
<p>(6) Problems identified in the Study</p>	<p><u>Institution</u></p> <ul style="list-style-type: none"> - No IA. The farmers don't have any experiences of managing a IA. <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Deterioration of existing pump equipment - High pump operation cost for farmers. - Lack of ownership on operation and maintenance of irrigation facilities. - Insufficient support to farmers by LGAs. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Inappropriate distribution size of holding under irrigation condition - Appropriate Holding Size - Insufficient supply of inputs such as certified seeds, machinery and fertilizer - Ensuring of Inputs - Low and unstable farm gate prices of the products - Proper Market Price Control
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers' awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers' participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works.

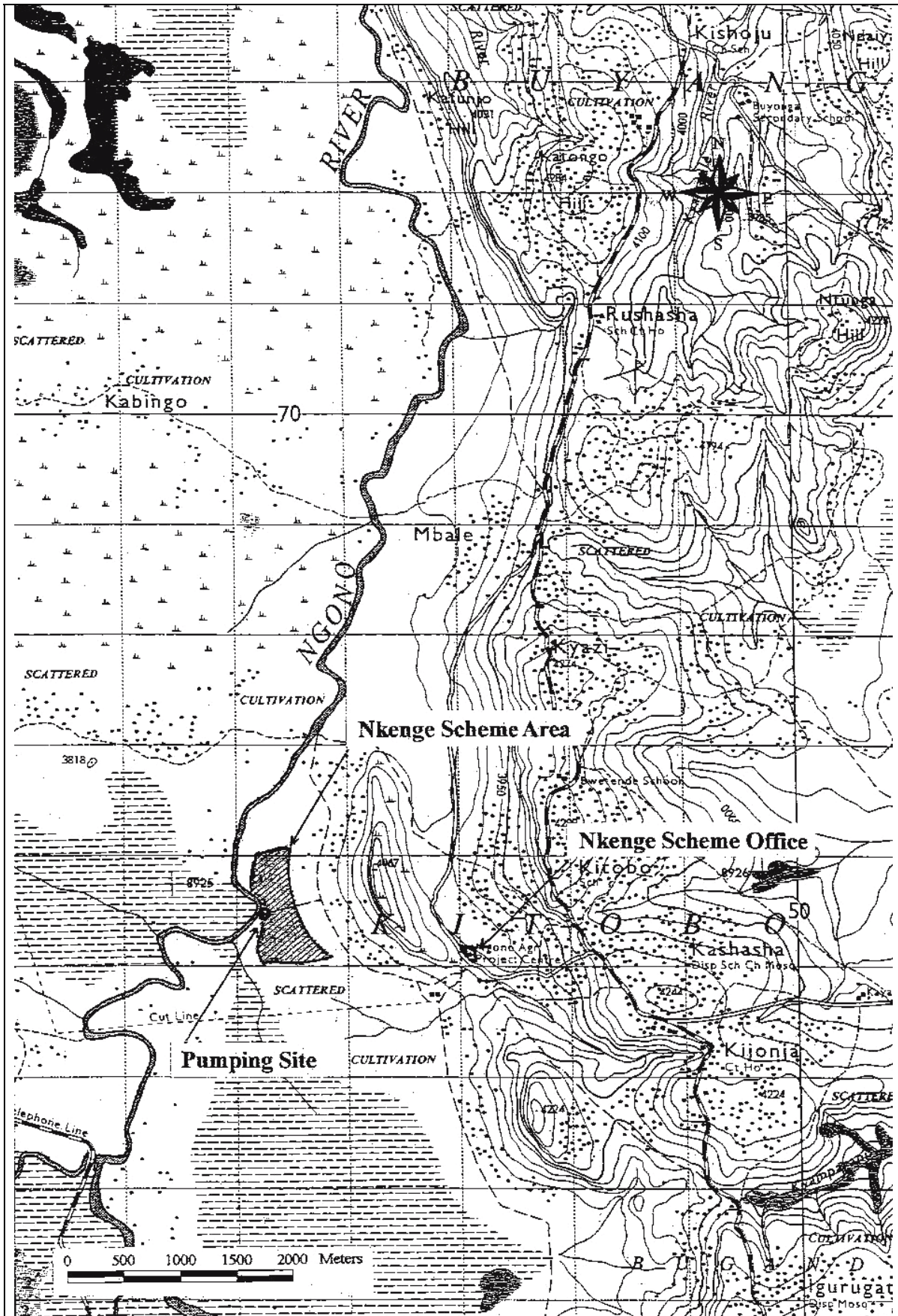
	<p>2-4 Pre-implementation activities including tendering and its evaluation.</p> <p>2-5 Construction of irrigation infrastructures with farmers' participation.</p> <p>2-6 Turn-over process for O&M of completed irrigation facilities to IA.</p> <p>3. Enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.</p> <p>3-1 Preparation of irrigation schedule and maintenance plan.</p> <p>3-2 Water distribution.</p> <p>3-3 Maintenance works.</p> <p>3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people.</p> <p>3-5 Monitoring of irrigation performance of the scheme.</p>
(8) Irrigation and Drainage Development Plan	<p><u>Basic Approach</u></p> <p>To introduce the conjunctive use of pump and surface irrigation system to save O & M cost.</p> <p><u>Development Plan</u></p> <p>The proposed scheme area is 32 ha in net. The exiting pump irrigation scheme was failed due to mismanagement, strong intervention by the Government and poor involvement of farmers. The rehabilitation of failed irrigation system should be therefore planned, designed and implemented based on lessons learned from the past. The Ngono river is the reliable water source for irrigation development of the scheme. The scheme is proposed to install low-head pump to lift water from the Ngono river, and to supply irrigation water to the farmlands using the previous irrigation network with reconstruction. In order to lighten financial burden of farmers on pump operation, and to realize the scheme sustainability, it is proposed to construct a small dam on perennial small stream flowing near the scheme area as a supplemental water source. The required works for the scheme are summarized below:</p> <p>(a) Remodeling pump house and related intake facilities (1 site)</p> <p>(b) Installation of pump and its accessory (1 set)</p> <p>(c) Reconstruction of irrigation canal (unlined, length of 2,100 m)</p> <p>(d) Reconstruction of drainage canal (length of 1,600 m)</p> <p>(e) Construction of small dam (1 site)</p> <p>(f) Diversion canal related to the small dam reservoir (length of 1,500 m)</p>
(10) Required Cost	Tsh. 133 Million (US\$125,000)
(11) Executing Agency	Bukoba District Office
(12) Implementation Schedule	<p>Three years survey, plan, construction and follow-up of the scheme, including training of IA.</p> <p>(see attached sheet)</p>
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced

(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized. 																					
(15) Special Arrangements	None																					
(16) Relevant Information																						
(a) Agricultural Development Plan	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to resume pump irrigation scheme in 32ha for paddy production. - Vegetables will be introduced in 6ha during dry season for 30 farmers who already have experience in rainfed vegetable production. <p><u>Cropping Outline:</u></p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Present</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td style="text-align: center;">-</td> <td style="text-align: center;">Paddy & Vegetables</td> </tr> <tr> <td>- Paddy Yield</td> <td style="text-align: center;">-</td> <td style="text-align: center;">4.5ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td style="text-align: center;">-</td> <td style="text-align: center;">64ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td style="text-align: center;">-</td> <td style="text-align: center;">200%</td> </tr> <tr> <td>- Paddy Production</td> <td style="text-align: center;">-</td> <td style="text-align: center;">261ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td style="text-align: center;">-</td> <td style="text-align: center;">26MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - Although the farm income is not sufficient for the living expenses in the present condition, it can just cover the living expenses in the proposed condition with certain amount of reserve. - The net farm income is just enough to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 13% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	-	Paddy & Vegetables	- Paddy Yield	-	4.5ton/ha	- Cultivated Area	-	64ha	- Cropping Intensity	-	200%	- Paddy Production	-	261ton	- Project Benefit (Financial)	-	26MTsh
	<u>Present</u>	<u>Proposed</u>																				
- Crops Applied	-	Paddy & Vegetables																				
- Paddy Yield	-	4.5ton/ha																				
- Cultivated Area	-	64ha																				
- Cropping Intensity	-	200%																				
- Paddy Production	-	261ton																				
- Project Benefit (Financial)	-	26MTsh																				
(b) Environmental Consideration	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Destructive animals such as wild pigs and birds, - Possible increase in water borne diseases, - Deterioration of natural vegetation by construction works, and - Possible soil and water pollution. 																					
(c) Evaluation	EIRR: 11%																					

(2) Project Design MatrixProject Name: Nkenge Irrigation Scheme Duration: (3 years)Project Area: Bukoba District, Kagera Region Target Group: IA members Date: August 2003

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 20% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Scheme Map



Photographs



Ngono River



Water source



Spring



Pumping well



Main canal



Interview with farmers

10. Luchili-Nyakasungwa Irrigation Scheme

(1) Project Proposal

(1) Title of Programme	Luchili - Nyakasungwa Irrigation Scheme
(2) Location	Two villages, namely, Luchili and Nyakasungwa, Sengerema Ward, Sengerema District, Mwanza Region (see attached location map)
(3) Objectives of Project	To ensure irrigation water through rehabilitation of the existing pump irrigation scheme, strengthening of capacity of IA management, and enhancement of farmers' skill for operation and maintenance of irrigation infrastructures.
(4) Site Description	<p>The scheme area covers most of Sengerema Ward (Sengerema District) at the shore of the Luchili Bay in the Lake Victoria. It administratively includes 2 villages, namely, Luchili and Nyakasungwa. Access to the scheme area is by an unmetaled road from Sengerema, of which distance is about 35 km.</p> <p>Annual rainfall in the scheme area is about 930 mm distributing mainly during two periods of the short rains in October-December and the long rains from March to May. Agriculture especially during the dry season is virtually dependent on irrigation.</p>
(5) Scheme Description	<p>The Luchili-Nyakasungwa Irrigation Scheme is characterized as a pump irrigation scheme. In 1974, an Indian engineer dispatched by the Indian Government visited Luchili area, and paid attention to the high potential of irrigation development of the area by lifting lake water. After the Indian engineer leaving, J.O.C.V. volunteer had joined cooperation for irrigation development in the area since 1979. District Government implemented pump irrigation system commanding about 20 ha in the Luchili area under the cooperation of the volunteer. The Scheme became unoperational in the year 1992 due to shortfalls in irrigation facilities and organizational problems.</p> <p>Considering the present non-functional situation of the Scheme, Mwanza Zonal Irrigation Office and District are going to prepare a scheme document for the rehabilitation of improved traditional irrigation scheme in Luchili. The scheme aims at rehabilitation of the previous implemented pump scheme emphasizing on remodeling irrigation system and strengthening of IA in order to overcome previous shortfalls.</p> <p>Total number of farmers related to the scheme is approximated at 62 households. Presently the area is not irrigated because of damages in the irrigation facilities. Therefore, the IA is suspended in its operation practically. Water right taking water from Lake Victoria was already obtained in 1990 at the discharge of 3.24 million l/day.</p>
(6) Problems identified in the Study	<p><u>Institution</u></p> <ul style="list-style-type: none"> - Non registered IA and its poor management. Its activities are stagnant because of no irrigation at present.

	<ul style="list-style-type: none"> - Weak ownership and financial base of farmers <p><u>Irrigation and Drainage</u></p> <ul style="list-style-type: none"> - Deterioration of installed pump equipment and irrigation facilities. - Improper design on pump station and its related facilities. - High pump operation cost for farmers. <p><u>Agriculture</u></p> <ul style="list-style-type: none"> - Insufficient site investigation prior to the development for effective water use - Proper Water management - Inappropriate distribution size of holding under irrigation condition - Appropriate Holding Size - Unclear aim of irrigation development - Proper Planning - Outbreak of diseases and destructive animals - Proper Farming Practice - Low affordability to farm inputs such as machinery and other materials - Ensuring of Inputs
<p>(7) Component of Project</p>	<p>The proposed contents of the Scheme are as follows:</p> <ol style="list-style-type: none"> 1. Strengthening of Capacity of IA management <ol style="list-style-type: none"> 1-1 Farmers’ awareness to the scheme implementation. 1-2 Re-organization of IA structure 1-3 Enhancement of leadership of committee members. 1-4 Strengthening of decision making of IA. 1-5 Prevarication by-laws and regulation. 1-6 Enhancement of financial management capacity of IA. 1-7 Promotion of IA registration. 2. Rehabilitation / improvement of Irrigation infrastructures <ol style="list-style-type: none"> 2-1 Survey and investigation with farmers’ participation. 2-2 Design works. 2-3 Agreement on the scheme implementation including components of rehabilitation / improvement works and farmers’ contribution to the works. 2-4 Pre-implementation activities including tendering and its evaluation. 2-5 Construction of irrigation infrastructures with farmers’ participation. 2-6 Turn-over process for O&M of completed irrigation facilities to IA. 3. Enhancement of farmers’ skill for operation and maintenance of irrigation infrastructures. <ol style="list-style-type: none"> 3-1 Preparation of irrigation schedule and maintenance plan. 3-2 Water distribution. 3-3 Maintenance works. 3-4 Enhancements of skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitoring of irrigation performance of the scheme.

(8) Irrigation and Drainage Development Plan	<p><u>Basic Approach</u></p> <p>To make proper design of pump capacity and subsequent pipeline to save operation cost and to introduce high profitable crops.</p> <p><u>Development Plan</u></p> <p>The proposed scheme area is 20.5 ha in net. Deterioration of the pump irrigation scheme is mainly caused by undesirable performance of the pump irrigation system and unaffordable pump operation cost for farmers. Insufficient performance of the pump irrigation system is due to unsuitable design of the system. In the previous pump system, intake structure is designed with less consideration of lake water level fluctuation. Remodeling of the pump system should be done considering such problem. As for the operation cost, the cost reduction should be considered as much as possible. Replacing delivery pipeline from existing conduit to new ones with bigger diameter is an effective remedy for saving operation cost due to reducing friction losses. Existing gravity canal system with minor repairs, should be used to minimize construction cost. On the other hand, profitable crops should be introduced to the scheme in cooperation with other sub-sectors, to make farmers pay whole or part of O & M cost. The required works for the scheme are summarized below:</p> <ul style="list-style-type: none"> (a) Remodeling of pump system (1 site) (b) Re-installation of pump facilities (1 set) (c) Replacement of delivery pipe (length of 1,890 m) (d) Repair of existing canal system (L.S.)
(10) Required Cost	Tsh. 210 Million (US\$ 198,000)
(11) Executing Agency	Sengerama District Office
(12) Implementation Schedule	<p>Three years survey, plan, construction and follow-up of the scheme, including training of IA.</p> <p>(see attached sheet)</p>
(13) Expected Benefit	<ul style="list-style-type: none"> - Capacity of IA management is strengthened - Irrigation infrastructures are rehabilitated / improved. - Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced
(14) Assessment of Possible Problems and Bottlenecks in Implementation	<ul style="list-style-type: none"> - Capacity of district staff for survey, investigation, planning, and design for irrigation development schemes should be strengthened. - Scheme implementation procedure promoting farmers' participation under decentralization should be established. - Process to strengthen IA including capacity building programme for farmers should be standardized.
(15) Special Arrangements	None
(16) Relevant Information	

<p>(a) Agricultural Development Plan</p>	<p><u>Main Objective:</u></p> <ul style="list-style-type: none"> - The main objective is to resume pump irrigation scheme of 20.5ha for paddy production. - Vegetables will be introduced during dry season in 12ha in which the soil is rather sandy characteristics. <p><u>Cropping Outline:</u></p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>Present</u></th> <th style="text-align: center;"><u>Proposed</u></th> </tr> </thead> <tbody> <tr> <td>- Crops Applied</td> <td style="text-align: center;">Paddy</td> <td style="text-align: center;">Paddy & Vegetables</td> </tr> <tr> <td>- Paddy Yield</td> <td style="text-align: center;">2.0ton/ha</td> <td style="text-align: center;">4.5ton/ha</td> </tr> <tr> <td>- Cultivated Area</td> <td style="text-align: center;">20.5 ha</td> <td style="text-align: center;">41.0ha</td> </tr> <tr> <td>- Cropping Intensity</td> <td style="text-align: center;">100%</td> <td style="text-align: center;">200%</td> </tr> <tr> <td>- Paddy Production</td> <td style="text-align: center;">41ton</td> <td style="text-align: center;">130ton</td> </tr> <tr> <td>- Project Benefit (Financial)</td> <td style="text-align: center;">3.0MTsh</td> <td style="text-align: center;">44.1MTsh</td> </tr> </tbody> </table> <p><u>Farm Economy:</u></p> <ul style="list-style-type: none"> - Although the farm income is not sufficient for the living expenses in the present condition, considerable amount of reserve can be kept under the proposed condition. - The net farm income is sufficient to cover the production cost for the next cropping season and the O/M cost. - The annual O/M cost per farm household would account for 8% of net farm income from the benefit area. 		<u>Present</u>	<u>Proposed</u>	- Crops Applied	Paddy	Paddy & Vegetables	- Paddy Yield	2.0ton/ha	4.5ton/ha	- Cultivated Area	20.5 ha	41.0ha	- Cropping Intensity	100%	200%	- Paddy Production	41ton	130ton	- Project Benefit (Financial)	3.0MTsh	44.1MTsh
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- Paddy Production	41ton	130ton																				
- Project Benefit (Financial)	3.0MTsh	44.1MTsh																				
<p>(b) Environmental Consideration</p>	<p>The potential environmental impacts identified are;</p> <ul style="list-style-type: none"> - Water hyacinth problem at the suction line, - Vandalism of the pressure pipeline, - Land use conflicts between farmers in Luchili and Nyakasungwa, - Deterioration of natural vegetation by construction works, and - Possible conflict between crop producers and livestock keepers. 																					
<p>(c) Evaluation</p>	<p>EIRR: 11%</p>																					

(2) Project Design Matrix

Project Name: Luchili-Nyakasungwa Irrigation Scheme

Duration: (3 years)

Project Area: Sengerema District, Mwanza Region

Target Group: IA members

Date: August 2003

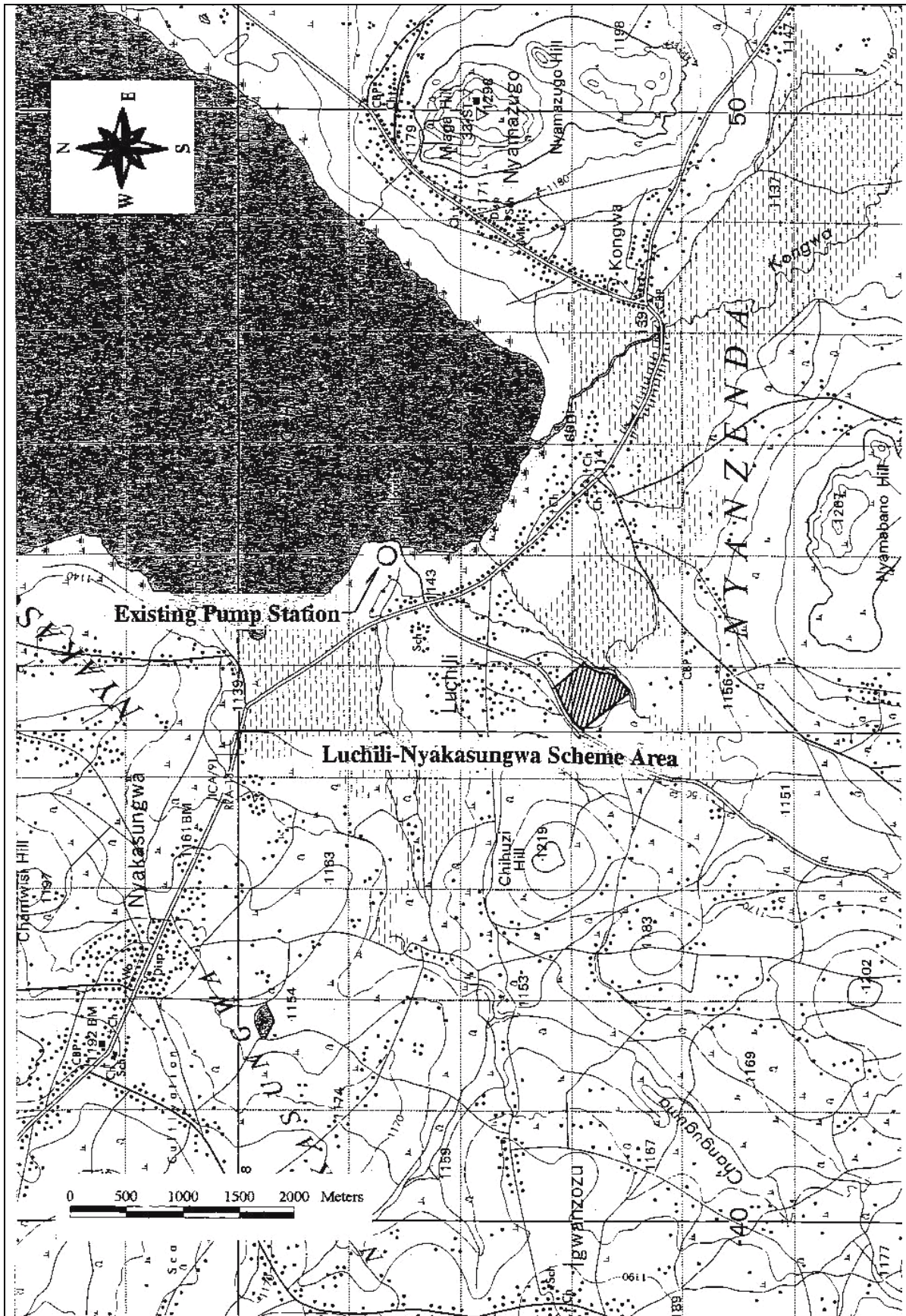
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Productivity and profitability is improved in the irrigation schemes.			
Project Purpose Ensure to supply stable irrigation water to farms	All farmers are enabled to get sufficient water according to schedule	- Scheme monitoring report	- Other agricultural sub-sectors continue to coordinate with irrigation sub-sector. - There is no drastic change of price of agricultural products.
Outputs 1. Capacity of IA management is strengthened 2. Irrigation infrastructures are rehabilitated / improved 3. Skill of farmers for operation and maintenance of irrigation infrastructures is enhanced.	1. 80% or more farmers participate in the maintenance works 2. Rehabilitation is completed by the end of 2nd year 3. 100% of committee members are trained for O&M	- Scheme monitoring report	- There is no extreme natural disaster. - Government enforces existing rules and regulations to support IA.
Activities 1-1 Raise farmers' awareness to the scheme implementation. 1-2 Re-organize structure of IA. 1-3 Enhance leadership of committee members. 1-4 Strengthen decision making of IA. 1-5 Prepare by-laws and regulation. 1-6 Enhance financial management capacity of IA. 1-7 Promote to register IA. 2-1 Conduct survey and investigation with farmers' participation. 2-2 Carry out design works. 2-3 Make agreement on the scheme implementation including components of rehabilitation / improvement works and farmers' contribution to the works. 2-4 Proceed pre-implementation activities including tendering and its evaluation. 2-5 Construct irrigation infrastructures with farmers' participation. 2-6 Turn-over O&M of completed irrigation facilities to IA. 3-1 Prepare irrigation schedule and maintenance plan. 3-2 Conduct water distribution. 3-3 Conduct maintenance works. 3-4 Enhance skills to mediate and resolve water disputes among members and with outside people. 3-5 Monitor performance of scheme.	Inputs Donor - Training cost - Rehabilitation and improvement cost - Vehicles and Equipment - Cost for engineering services	Tanzanian Side (1) MAFS <u>Manpower</u> - Staff in Zonal Irrigation Engineer's Office (2) District Government <u>Manpower</u> - District officer - Ward officer - Village government <u>Others</u> Project office space Recurrent cost for scheme implementation (3) Farmers - 20% of rehabilitation and improvement cost	- Local government staff continuously supports IA. Pre-conditions - GOT raises all project funds including foreign currency portion, local currency portion, and recurrent expenditures. - Necessary officer and facilities are provided by donors and GOT.

Implementation Schedule for Luchili-Nyakasungwa Irrigation Scheme

Activities	Expected Results	Month and Year																																				Agencies in charge	Input	Remarks
		1st Year												2nd Year												3rd Year														
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
1-1	Raise farmers' awareness to the project implementation.	█																																				District Office	Manpower District staff, Farmers, Consultants, Equipment Training facilities, Vehicles, and Training Equipment	Capacity of District staff for IA establishment and management will be strengthened by training Programme
1-2	Re-organize structure of IA.	█																								█ Follow-up █ Follow-up														
1-3	Enhance leadership of committee members.	█																								█														
1-4	Strengthen decision making of IA.	█												█												█														
1-5	Prepare by-laws and regulation.	█												█												█														
1-6	Enhance financial management capacity of IA.																									█ Training █														
1-7	Promote to register IA.	█																																						
2-1	Conduct survey and investigation with farmers' participation.	█																																				District Office	Manpower District staff, Zonal staff, Farmers, Consultants, and Contractor Equipment Vehicles and Survey Equipment	Technical Support will be provided by Zonal Irrigation Office Farmers participate in parts of civil works, such as excavation of irrigation and drainage canals
2-2	Carry out design works.	█												█																										
2-3	Make agreement on the project implementation													█																										
2-4	Proceed pre-implementation activities including tendering and its evaluation.													█																										
2-5	Construct irrigation infrastructures with farmers' participation.													█												█														
2-6	Turn-over O&M of completed irrigation facilities to IA.																									█ Follow-up █														
3-1	Prepare irrigation schedule and maintenance plan.																									█												District Office	Manpower District staff, Zonal staff, Farmers, Consultants Equipment Training facilities, Vehicles, and Training Equipment	Technical Support will be provided by Zonal Irrigation Office
3-2	Conduct water distribution.																									█ Training █														
3-3	Conduct maintenance works.																									█														
3-4	Enhance skills to mediate and resolve water disputes																									█														
3-5	Monitor performance of scheme.																									█														
<i>Relevant Activities to the Project</i>																																								
A	Conduct EIA.	█																																				District Office	District staff, Zonal staff, Consultants	
B	Conduct farmers' training for farming practice																									█												District Office	District staff, Zonal staff, Consultants	

Remarks :

Scheme Map



Photographs



Pump house



Pump



Abandoned irrigation canal



Cotton field around command area



RRA workshop



Group works in RRA workshop

Appendix C
Analysis of Model Irrigation Schemes

**THE STUDY
ON
THE NATIONAL IRRIGATION MASTER PLAN
IN
THE UNITED REPUBLIC OF TANZANIA**

Action Plan Report

APPENDIX C

ANALYSIS OF MODEL IRRIGATION SCHEMES

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APPENDIX C ANALYSIS OF MODEL IRRIGATION SCHEMES

CHAPTER 1 GENERAL

1.1 Site Inspection

To collect the data and information, the selected 10 irrigation schemes were inspected by the JICA Study Team, counterpart personnel, and District office staff. Concurrently, interviews were also made for about 10 to 20 farmers using the detailed check sheet which was prepared for respective irrigation categories. Major data and information to be collected through interview are as follows:

- (a) Socio-economy
 - Land tenure
 - Household
- (b) Agriculture
 - Cultivation area
 - Crop yield and production
 - Farming calendar
 - Farmers supporting system (post harvest, input supply and extension services)
- (c) Farmers' organization
 - General information (name of farmers' organization and scheme)
 - Institution (date of formation, registration under Cooperative Act or Association Act, number of members, exist of by-laws)
 - Activities (frequency of meetings, collection of water fee, exist of book-keeping, regulation of O & M, mechanism of internal disputes)
 - Farmers' contribution to construction/rehabilitation and maintenance of facilities
 - Experience of Farmers' participation in planning and implementation
- (d) O & M for Irrigation and drainage facilities
 - Regulation of O & M
 - Situation of O & M for facilities
- (e) Support by GOT
 - Support by GOT to farmers' organization (contents of support, frequency of support)

In addition, the presently available development plan for the scheme, which was mostly prepared by the Local Government Agencies (LGA), was examined for assessment and also for preparation of Action Plan.

The results of these site inspection and interview with farmers are discussed hereinafter.

1.2 Rapid Rural Appraisal (RRA)

RRA were conducted for the selected 5 irrigation schemes, namely Kinyope in Lindi Region, Luchili-Nyakasungwa in Mwanza Region, Kisese in Dodoma Region, Mgongola in Morogoro Region, and Musa Mwinjanga in Kilimanjaro Region.

The purpose of the rapid rural appraisal (RRA) in the Study is,

- To clarify operation and maintenance on the selected irrigation schemes including water management, maintenance, cost for maintenance,
- To grasp present activities of farmers' organizations including water users' association with linkage between the groups and Government authorities, and
- To collect data and information agriculture, such as land use, agricultural production, farm inputs, production cost, and so on.

The total number of RRA in the irrigation schemes was 5 schemes. Two days were allocated for each RRA. In principal, the procedure in conducting RRA is as follows:

1st Day

- Opening and ice breaking
- Group works for 5 groups, such as mapping, custom related to irrigation, farming calendar by gender, gender issue, and farming calendar
- Presentation of the group discussion results by representatives of the farmers
- Group discussion for institution, operation and maintenance, and agriculture and land use

2nd Day

- Continuation of the group discussion
- Presentation of the group discussion results
- Venn diagram to identify present situation and constraint of linkage between the farmers and the Government officials
- Closing

All of the RRA sessions were proceeded by two facilitators according to the above-mentioned programme. The number of farmers participants were some 30 including committee members of the farmers' groups. Irrigation technicians as

well as officers in the Districts and the counterparts in the MAFS were present as observers of RRA. **All results of RRA are presented in Appendix E.**

1.3 Problem and Objective Analysis

Based on the results of the site inspection and RRA in the 10 schemes, problem analysis and objective analysis were carried out by the JICA study team, creating common core problems and objectives as shown below:

Core Problems : Unstable irrigation water supply to field

Core Objectives : Realization of stable irrigation water supply to field

The problem trees and objective trees in the model schemes are presented in the proceeding sections. The following points are commonly highlighted from the analysis carried out in all schemes:

- Deterioration of irrigation infrastructures
- Insufficient maintenance works by farmers
- Lack of farmers' skills for water distribution
- Insufficient management skill of IA, such as financial management, leadership, and decision making.

1.4 Development Approaches

Based on the results of the objective analyses, three approaches are identified as follows:

- Strengthening of IA management capacity,
- Construction, rehabilitation and improvement of irrigation infrastructures
- Enhancement of farmers' skills for operation and maintenance of irrigation infrastructures.

The above approaches would be the main components of the projects.

CHAPTER 2 KINYOPE IRRIGATION SCHEME

2.1 Institution

There are 13 weirs and each of them has a group of farmers for its operation and maintenance. The members of groups vary in number. The largest is the group of Makolo weir (290) and the smallest is that of Ulimbo (12). The total number of members is presently 893. Most of them are the residents of the three villages, Kinyope, Ruhgoma and Makangara. Some of them come from the surrounding villages and even from Lindi town. Among them 215 are the land owners in the irrigated area. All of the farmers cultivating in the irrigated area belong to one of the groups and share activities for operation and maintenance.

In 2001 the 13 groups were integrated into a main organization which hasn't been registered yet. The District Cooperative Officer came to the village in December, 2002 and strongly recommended the farmers to register the group as cooperative. Under his strong guidance, 118 members (male 87 and female 31) have already agreed to his proposal so far, as some members were interested in marketing activities and credit services by the cooperative. However, the difference between cooperative and association is seemingly not clearly understood by the farmers. None of them could explain it. It is apparent that the members have been strongly influenced by the intervention of the cooperative officer. The intervention may not be based on the farmers' needs. If so, such unilateral intervention must be harmful to encouraging the bottom up approach.

The executive committee of the main organization consists of 39 members (male 26 and female 13) including a chairperson, a secretary, an assistant secretary, and a treasurer selected by secret ballot. Each of 13 subgroups also has a committee consisting of a chairperson, a secretary and a treasurer. These 3 committee members become the members of the executive committee of the main organization. Before 2001 each weir group was headed by the founder of the weir. The founders of weirs have still strong influence on operation and maintenance of the weirs. A democratic management is seemingly still difficult under such circumstances.

The general meeting is not regularly held, but according to needs, although the executive committee is held monthly. The discussion at the executive committee is documented only according to needs. The results of the other meetings are not documented at present. The issues discussed cover water shortage, broken structures, poor participation in operation and maintenance, and etc.

The main group doesn't have the bylaw and regulations yet, although each subgroup has some regulations of penalty. The farmers who cultivate the irrigated land in the area are eligible for the membership of the group. The registration fee and any membership fees are not collected at present. However, the members share the materials for repairing the weirs and other facilities according to needs. Therefore, the organization doesn't need to have a bank account at present.

As for training, the farmers have had opportunities to attend the programs at KATC (3 farmers) and a field training in Dodoma (9 farmers) since 1996. However, some farmers complained of no feed back from the attendants to the other farmers. The needs for the following training programs are high among the farmers: paddy production, marketing of products and operation and maintenance of irrigation facilities.

2.2 Irrigation and Drainage System

Milola river, which is a main water source of irrigation for the scheme area, has a stable river course having perennial flow. Sufficient flow of about 1.5 m³/sec was observed in the river during the field survey. Catchment area for the river is estimated to be around 250 km² at the central point of the scheme area.

The scheme area lies on an alluvial valley along the river course, extending both sides with around 2,000 – 4,000 m wide. Cultivable lands extending the both sides run down to the river with gentle slope. The low lands of the valley along the river, are topographically suitable for irrigation in the dry season, but are sometimes suffered from inundation during flood time. Thus, certain countermeasures against flood like flood protection dike would be required.

The present irrigation system, say abstracting water from the Milola river by simple intake weir, was started at the downstream of the river in early 1960' by farmers initiatives. Since the beginning of irrigation, an intake weir had been constructed toward upstream one after another. Latest intake structure was constructed at the most upstream of the tributary of the river in 1990.

Irrigation method being presently applied by farmers is a plot to plot irrigation without any canal, which could not be efficient proper water distribution and farming. Irrigation system of the scheme area is sub-divided into each irrigation unit by 13 existing intake weirs. Each irrigation unit generally consists of intake weir and diversion canal which conveys water to the beginning farm plot of irrigation. Few irrigation canals and drains exist except natural watercourses.

On the basis of site inspection and beneficiaries' opinion, the following problems and constraints were recognized in irrigation and drainage system:

(a) Need of improvement of existing intake weirs

Water is abstracted through the local made intake, so-called “PATAs”. Frequent floods wash these intakes every season, which bear frequent repair and/or construction and crop damages. Repair is done 4 to 10 times per season and requires about 2 weeks in total. These cumbersome works create a heavy load to farmers.

(b) Need of extending irrigation area during the rainy season

Potential irrigable area are estimated at more than 700 ha, but presently about 400 ha are under irrigation because of low efficient intake and inadequate water delivery system. If irrigation canal system is improved including installation of irrigation ditches, more than 480 ha could be commanded for irrigation during the rainy season although consideration should be given to flood protection.

(c) Need of extending irrigation area during the dry season

Presently only 32 ha are irrigated in the dry season. Such small area is caused by low efficient intake and inadequate water delivery system. If irrigation system is properly improved, about 350 ha could be irrigated even in the dry season.

(d) Provision of watercourses

Farmers deliver water plot to plot of the farmland without watercourse. This irrigation method frequently brings about individual conflicts between adjoining farmland owners. It is thus proposed to construct watercourses.

2.3 Water Management, Operation and Maintenance

2.3.1 Water management

Thirteen sub-committees are organized according to irrigation blocks on the basis of the intake sites. Chairman and secretary of each sub-committee are responsible for irrigation scheduling, water distribution, and maintenance of the intake. The farmers stated that there is no serious water conflict among irrigation blocks upstream and downstream because they coordinate abstraction schedule together in the periods of low river flow. In fact, the coordination is made successfully with irrigation and domestic water supply schemes upstream located in Milola. Further, they are confident, based on previous experience that they can carry out proper water management with mutual discussion and coordination among the irrigation blocks even if a new farmer group hope to start abstraction within the village. However, none is yet aware that replacement of the intakes

with a permanent one may change river flow, resulting in new water conflict.

At present, farmers' concern for water distribution is rather within an irrigation block than among irrigation blocks. Since the plot to plot irrigation is dominantly applied in the irrigated area, uniform of cultivation calendar within the block consequently reach difficulty to get water properly in farm lands downstream. The farmers, under the guidance of the irrigation technicians and extension officers in the District, try to coordinate the cropping calendar with mutual discussion of the farmers within the block. Further, the irrigation technicians give the farmers technical guidance for construction of field canals so as to ensure proper water distribution within the block. It is expected that the District officers continue to let the farmers make aware of how water management be improved.

2.3.2 Operation and Maintenance

Since the intake weirs are made of local materials, such as earth, sand, and stone, the farmers are obliged to maintain the weir whenever they are flushed away due to floods during the rainy season. The farmers stressed that it is much burden to participate in the weir maintenance at an average of ten times a season, spending a few days per each works. Most of the farmers participated in the works, and those who did not attend the works are imposed to pay a penalty of Tsh. 1000.

To eliminate the farmers' burden, the District has commenced to replace the simple weir with a permanent one made of gabion. The costs for gabion weir, nail, and transportation to collect rock were borne by the district while the farmers participated in their labour force.

2.4 Other Special Issues

2.4.1 Farmers' expectation to Government for scheme development

The farmers expect the Government,

- Improvement of the intake weirs,
- Construction of irrigation canals,
- Technical instruction for water management,

As for the replacement of the existing intake weirs with the gabion weirs, farmers are anxious to technical assistance for the construction and transportation of construction materials.

2.4.2 Farmers' contribution to development

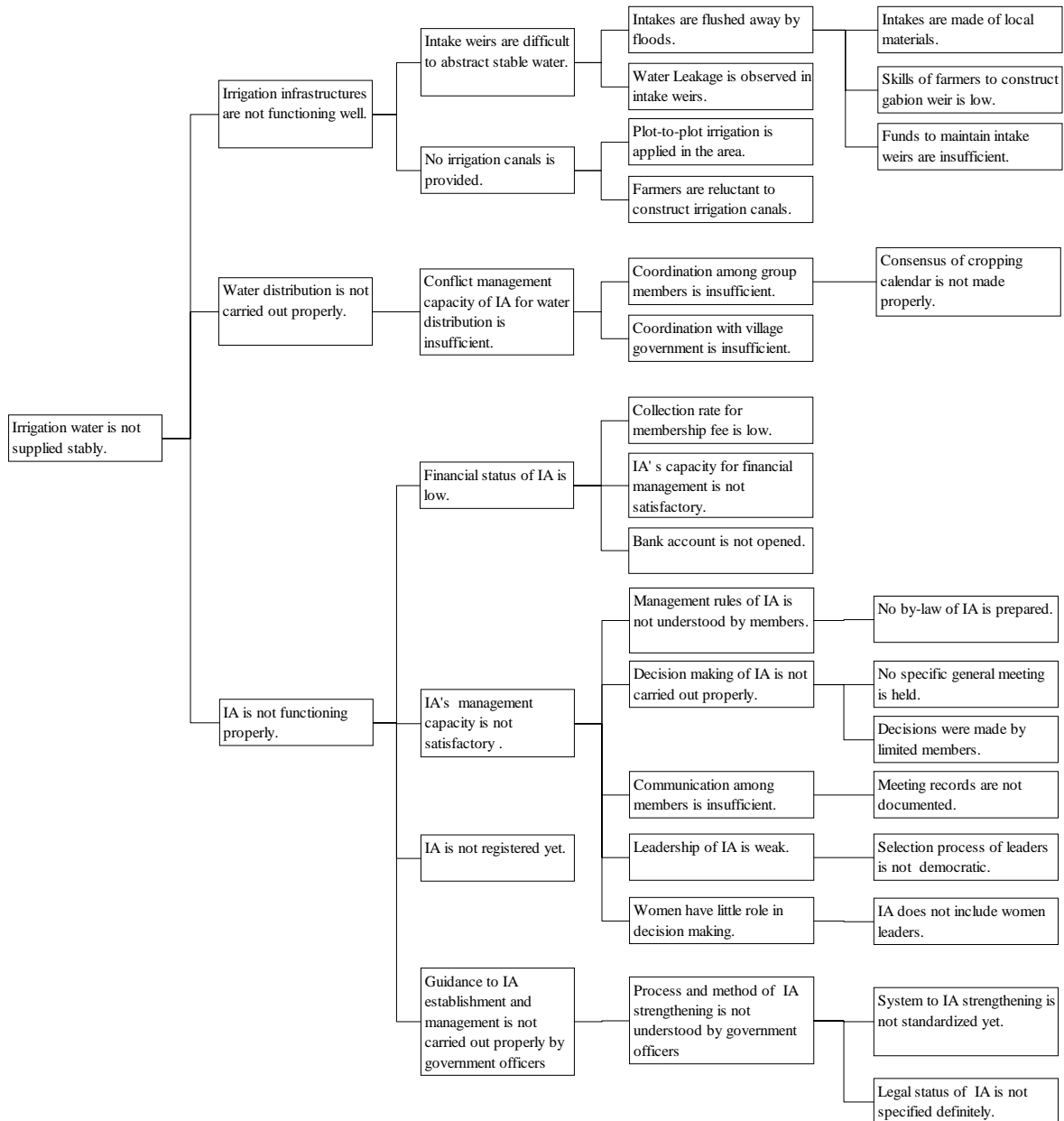
The farmers are ready for contributing labour force to collect the construction materials, such as rock and stone.

2.4.3 Previous farmers' participation in planning and implementation

The farmers have experience to participate in recent improvement works of the intake weirs while no Government intervention has been made in the intake weirs.

2.5 Problem Analysis

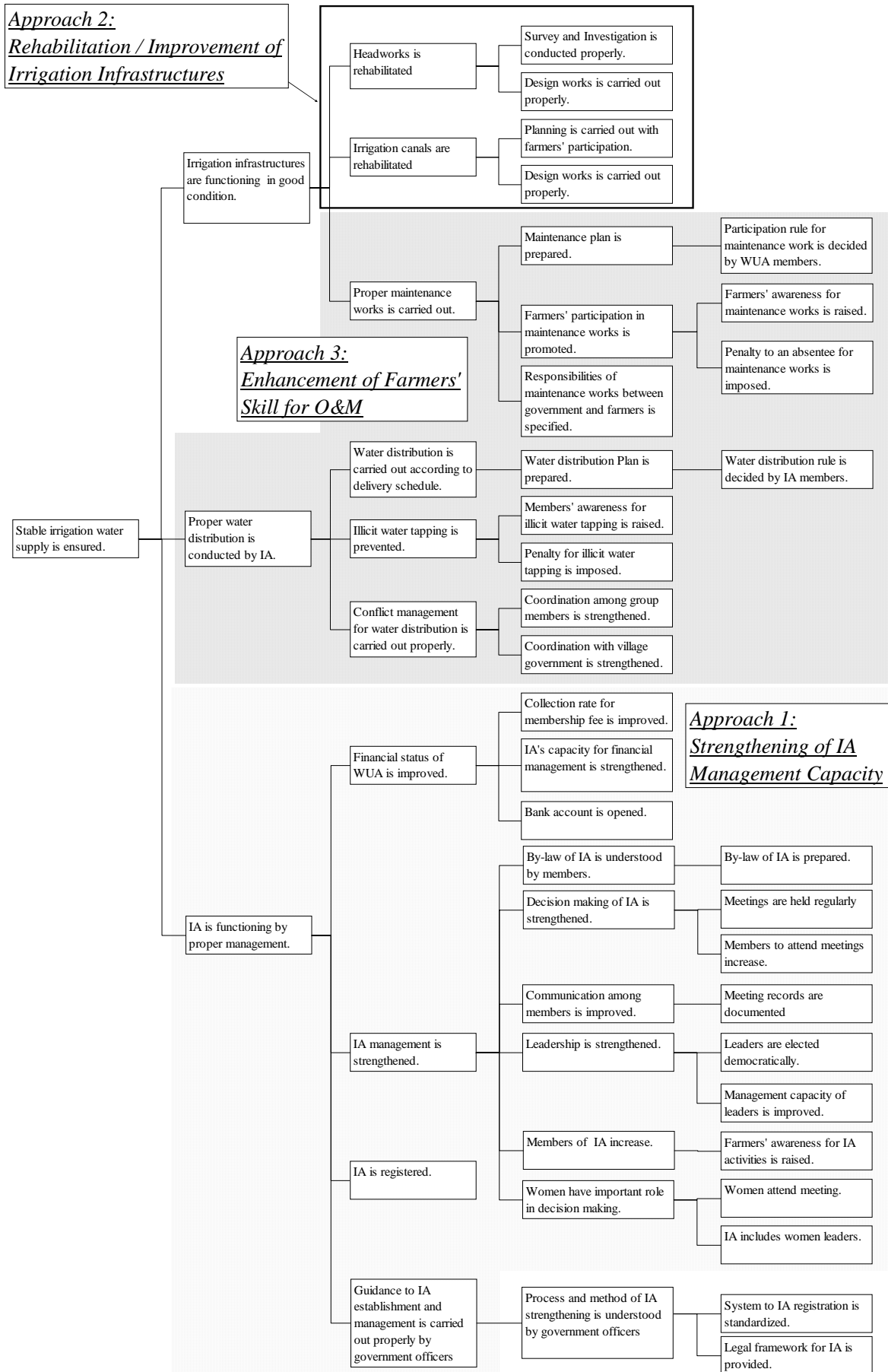
Problem analysis of Kinyope Irrigation Scheme is shown below.



Kinyope Irrigation Scheme - Problem Tree

2.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Kinyope Irrigation Scheme - Objective Tree

CHAPTER 3 MAGOMA IRRIGATION SCHEME

3.1 Institution

There is presently an unregistered irrigator's group established in 1998. The leader has been trying to register the group as association since 1999. However, the ordinary farmers don't understand the differences between the cooperative and the association. Besides, as only a cooperative officer is stationed at the district level, the leader couldn't have got necessary advice and guidance about the application procedure from the local government. The reason why an association is preferable to a cooperative is, according to them, a cooperative needs to employ some staffs to run it, but an association doesn't.

The present members who paid the registration fee, Tsh. 1,000 are 26. In addition, interested provisional members are over 100 farmers who haven't yet paid the registration fee. The executive committee consisting of 18 people has a chairperson, a secretary and a treasurer selected by secret ballot. There is no subcommittee at present. However, there are 10 field canal groups. The groups meet around 3 to 4 times annually according to needs. They generally discuss water management, in particular drainage, broken structure and so forth.

Presently the bylaw and regulations haven't yet been established. Cultivators including tenant farmers in the irrigable area are eligible for the membership. Although it has collected the registration fee from only the 26 members, the group already has a bank account at the National Micro Finance Bank Korogwe Branch.

As for technical training except the agricultural extension services, three people were invited to KATC in 1995 and participated in the training program of paddy production, water management and nurseries. Besides, they received the two-week on-farm training of paddy production, financial management and group management from KATC in 1998. They want to receive the technical training of sustainable agriculture, that is to say, the irrigation agriculture.

3.2 Irrigation and Drainage System

Lwengera river, reliable sourceful stream of the scheme area, is perennial and having considerable sufficient quantity of base flow even during dry season. The river had observed river discharge during 1967 to 1989 at Magoma site having catchment area of 276.75 sq.km. According to the data observed in such duration, annual mean discharge at the site was estimated at 3.57 m³/s, flow duration data for Q₉₀ and Q₁₀ are 11.06 m³/s and 0.60 m³/s, respectively. The data show that the concerned river supply sufficient flow in dry season while flood

occurs frequently in every wet season. Lowlands along the Lwengera river are usually inundated during flood occurred, and the river course varies year by year with meandrous change over the lowlands.

Irrigation using diverted river water has been practiced in scattered paddy fields of about 100 ha in the scheme area during dry season from August to February. Whereas irrigated agriculture is improper for the scheme area during wet season from March to July due to inundation over the fields. Diverting means of river water during dry season is to construct some numbers of temporary intake weirs at suitable sections of the river. Farmers declared that totally six (6) or at best ten(10) weirs are used to be constructed at the beginning of August and removed in February so as to escape flood.

Irrigable areas of the scheme are divided into three portions of lands by existing bridges. Upstream portion of the scheme area is composed of undulated hills formed by the Lwengera river having steeper river bed gradient. Upland fields are prominent in the cultivable lands in the upstream portion, and slight paddy fields exist within the portion. Middle-stream portion of the scheme area extends from second bridge to the next bridge. The area is composed of flat lowlands formed by the Lwengera river having gentle river bed gradient. Downstream portion of the scheme area extends from third bridge to northern edge of Makangara village. The area is composed of same flat lowlands, while having narrow widths because both mountainsides along the Lwengera river are closing to the river courses gradually.

During wet season, no irrigation is practiced in the scheme area because the area is flooded and flood water remain until end of the season. After releasing inundation, farmers try to irrigate to the scattered irrigable paddy plots by gravity diversion of river water by means of construction of temporary weirs. In such manner of irrigation, present irrigation in the scheme area is mainly subject to drainage conditions.

3.3 Water Management, Operation and Maintenance

Prominent farmers' need in the scheme area is to control flood water as being flat and smooth. Presented desires of farmers is not only to expand irrigated area of paddy during dry season, but also make the paddy fields cultivable during wet season through flood mitigation.

Some farmers irrigate their paddy fields by temporarily fabricated irrigation system during dry season. They usually construct temporary diversion weirs in August. After servicing the temporary weirs throughout the irrigation term, the weirs are removed by farmers so as to make free from flood flowing during rainy

season. For those maintenance and operation, irrigating farmers bear the cost at about Tsh.500 per household in addition to required labour providing for the maintenance works. Such maintenance and operation duties have been carried out by not certain farmers entity but interested voluntary farmers.

3.4 Other Special Issues

3.4.1 Farmers' expectation to Government for scheme development

The farmers expect the Government to construct intake weirs to ensure stable water abstraction and to provide the flood protection work.

3.4.2 Farmers' contribution to development

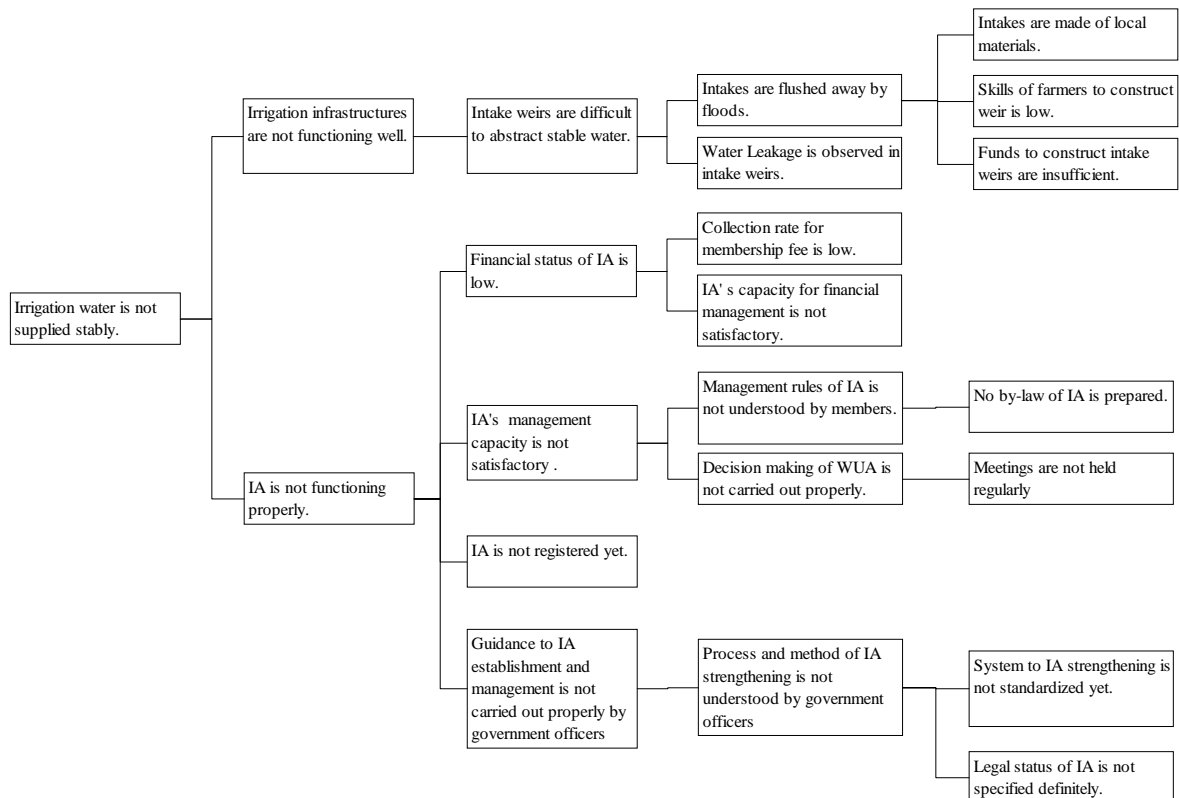
The farmers are ready for contributing labour force for canal excavation as well as collection and transportation of the construction materials, such as sand and stone.

3.4.3 Previous farmers' participation in planning and implementation

Since no Governmental intervention has been made in the area so far, the farmers have no experience to participate in planning and implementation of the irrigation development.

3.5 Problem Analysis

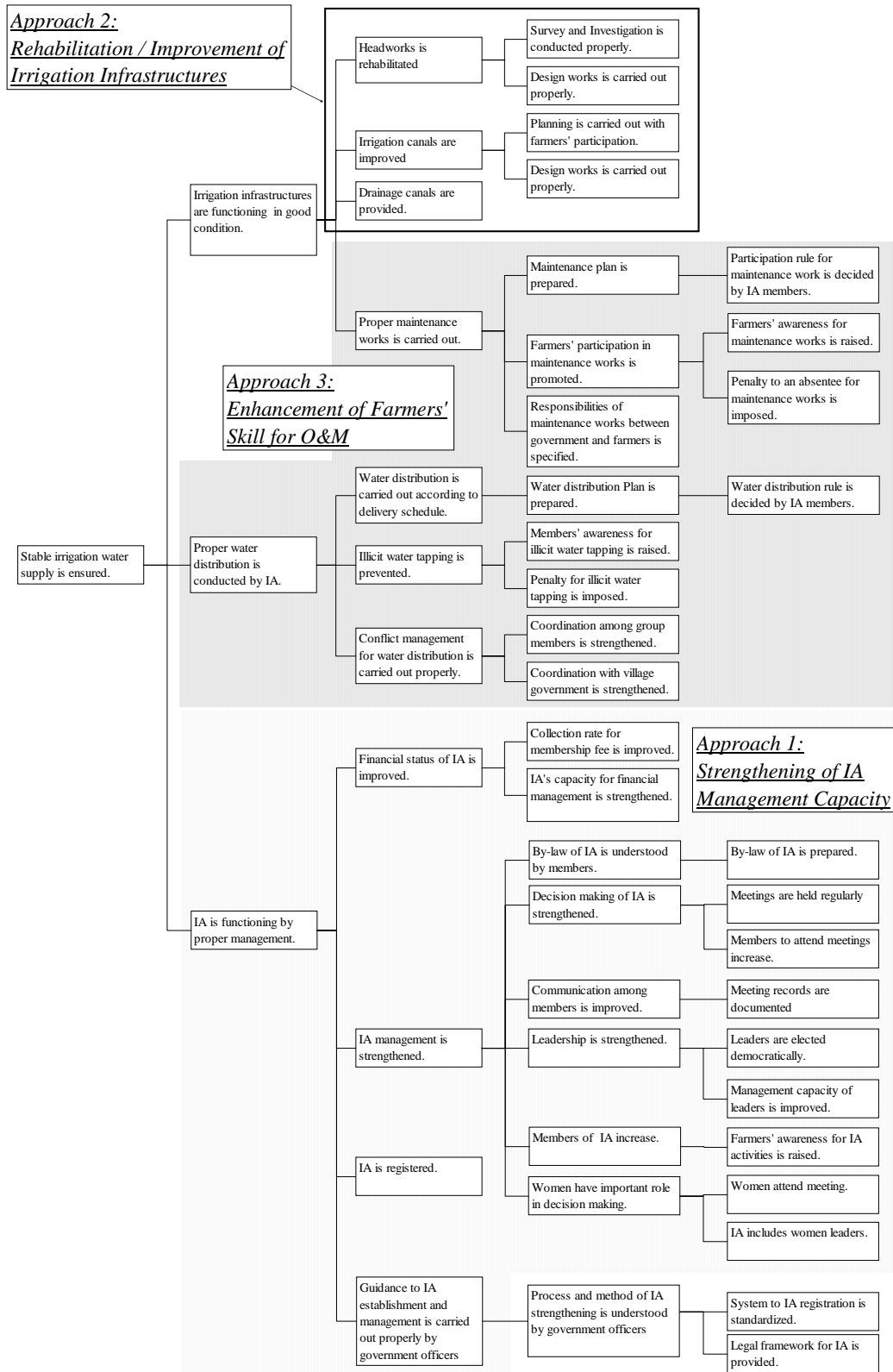
Problem analysis of Magoma Irrigation Scheme is shown below.



Magoma Irrigation Scheme - Problem Tree

3.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Magoma Irrigation Scheme - Objective Tree

CHAPTER 4 PAWAGA IRRIGATION SCHEME

4.1 Institution

An unregistered IA exists presently. However, the members already made an application for the registration of association. The reason why they selected an association rather than a cooperative is that requirements of audit for the cooperative are more rigid and complicated than those of the association. Besides, the application procedure of the cooperative is, according to them, sometimes more bureaucratic than the association.

The total number of the members is 344 among 1,475 farmers in the area. The present enrollment ratio is 23%. However, the number is growing step by step, as the farmers have gradually understood the importance of the IA. The executive committee consists of 18 members including a chairperson, a secretary and a treasurer. 3 members per village are selected as the executive committee member from 6 villages in the area. Besides, there are the following three subcommittees: (i) rehabilitation and maintenance, (ii) finance, and (iii) conflict.

The executive committee is held every three months, but there is no general meeting. Therefore, the results of the meeting are reported to other members in each village by the executive committee members. The bylaw and the regulations haven't been adopted yet and the village law is applied to the IA management now. However, the members are now preparing the bylaw and the regulations. Although only landowners in the area are presently eligible for the membership, tenant farmers also will be eligible for it in the near future. The members are now investigating how many tenant farmers are in the irrigated area. In case of a female landowner, she is eligible for it, if she is a head of household.

The registration fee is Tsh. 1,000 and the annual membership fee, Tsh. 2,000 per acre is collected, whose breakdown roughly consists of Tsh. 1,050 for water charge and Tsh. 950 for operation and maintenance. Some farmers are still reluctant to pay water charge, as they still believe it must be free as a gift from the God. The IA has a bank account at the Iringa Branch of National Microfinance Bank. The account was audited by the district cooperative officer last year, as this was a requirement for opening the account. Any written financial reports such as a budget plan and a statement of accounts haven't been prepared so far. As for future training needs, the priority fields are management of the IA, water management and crop production.

In addition, under the executive committee, each village has a subgroup of the

irrigators. However, the boundary of each irrigation block is not identical to the area of each village. Therefore, problems such as water disputes within each block can't be settled within each subgroup. In future, subgroup should be reorganized based on the irrigation sub-block for efficient water management.

4.2 Irrigation and Drainage System

The Mlengi Diversion Weir is still in function, but some troubles are observed. Gabion wall in left abutment of the weir remains un-repaired for its collapse. Weir gabions are entirely damaged due to cutting and losing wires. Much silts flow into the diversion canal although these are periodically removed by farmers. It gives farmers heavy burden.

Presently, old natural channels in the scheme area are used as irrigation canals of the water distribution system. These irrigation channels are improper due to much meandering with deeper beds and small flow capacity. Most of the irrigation channels also act in part as drains. During the dry season, water flowing in these channels cannot be distributed to some part of scheme area due to low water level in the channels. On the other hand, during the rainy season, waterlogging appears in some areas.

The Mlengi Diversion Weir requires proper rehabilitation work, otherwise it needs to be remodelled so as to make the life of weir long applying concrete instead of present gabion. As to the sedimentation trouble in the diversion canal, intake gate structure of the Mlengi Diversion Weir should be replaced to reduce invasion of river bed load sedimentation. A silt excluder might be effective to flush deposited sedimentation. Irrigation canals which are utilized old natural channels, should be remodelled to have appropriate flow capacity to meet the required discharge, and certain water distribution facilities are to be provided for proper water management. New drainage canals as well as the existing canals should be separately constructed so as to segregate drainage water flow from irrigation canals.

As for the present IA, some improvement is so required as to meet the actual situation. For instance, sub-grouping of IA is presently organized on the basis of administrative boundary, not water abstracting unit. IA should be rather organized based on the irrigation system, considering effective water management.

In the original plan, gabion was applied for the Mlengi Diversion Weir from a basic development concept of the scheme of "low cost technology" and "maximization of farmers' responsibility and responsibility". This concept means that repair of damages of gabions should be made on time by farmers themselves. However, it is a fact that damaged gabion weir has never been

repaired by them as planned. No provision of appropriate technology training to them is one of the reasons.

4.3 Water Management, Operation and Maintenance

4.3.1 Water management

Decision making on irrigation schedule and the operation of the diversion weir in the Pawaga Irrigation Scheme is carried out by members of the rehabilitation and management subcommittee. The subcommittee is also responsible for conflict resolution for water distribution as a mediator. Each farm land is fed by irrigation water through abstraction points on the river channels and the irrigation canal, in which no gate is provided. Generally no rotational irrigation method is applied in the scheme. The farmers pointed out that water distribution is constrained by lack of regulating structures at abstraction points and irrigations canal in the particular areas, hoping technical guidance and financial assistance by the Government.

4.3.2 Operation and Maintenance

Maintenance works of the Mlengi Diversion Weir is carried out by farmers' participation. In addition that, according to needs, funds collected from the members is spent for hiring equipment for the maintenance. While all members participate in the maintenance of the diversion weir, maintenance of the irrigation canal is carried out on the basis of irrigation blocks.

4.4 Other Special Issues

4.4.1 Farmers' expectation to Government for scheme development

The farmers expect the Government technical guidance, supply of construction material, and provision of equipment for rehabilitation of the diversion weir and construction of the regulating structures and the irrigation canals.

4.4.2 Farmers' contribution to development

The farmers are ready for contributing labour force for canal excavation as well as collection of the construction materials, such as rock and stone.

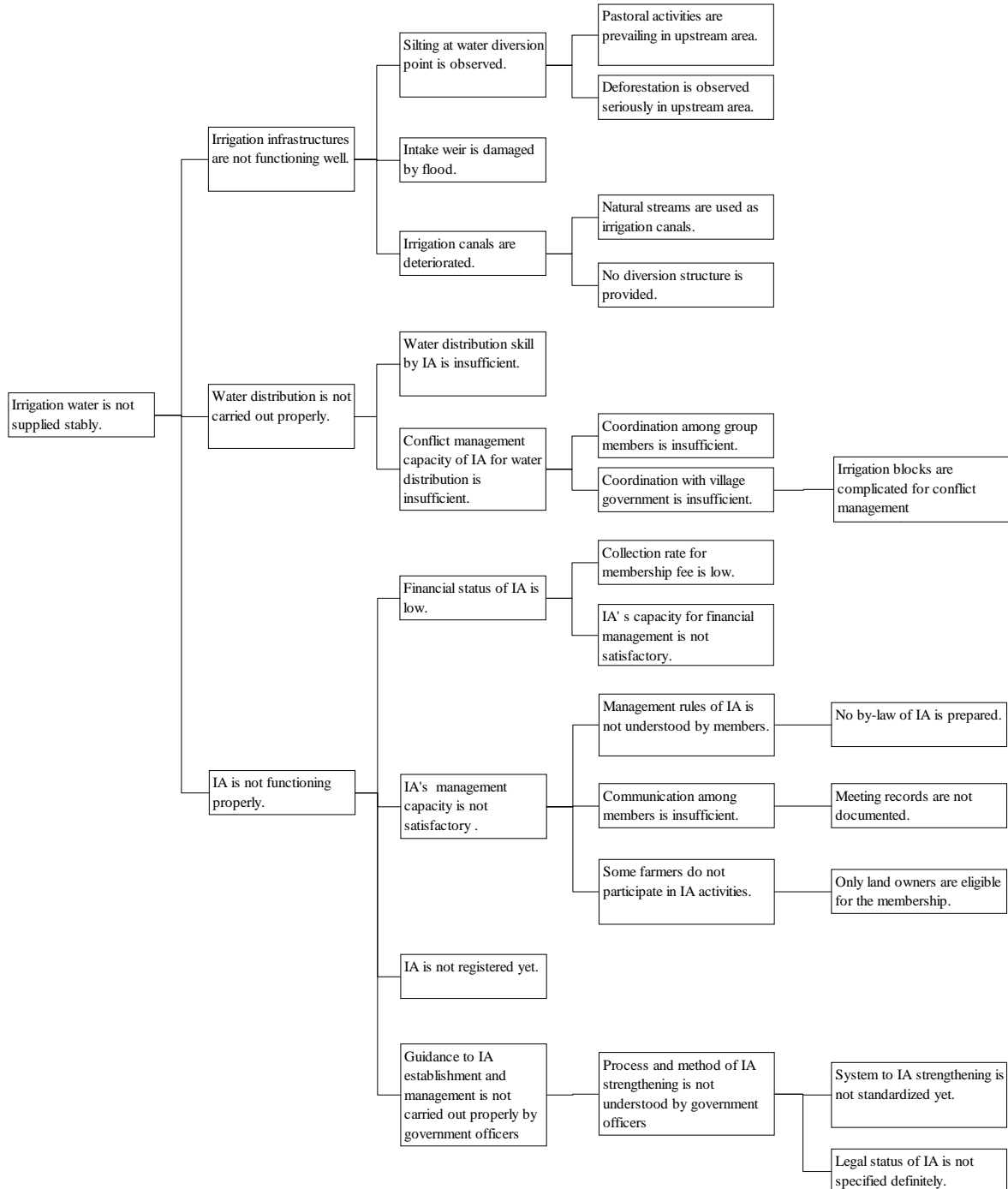
4.4.3 Previous farmers' participation in planning and implementation

The farmers have experience to participate in recent improvement works of the Mlengi Diversion Weir. In the planning stage, it was agreed that they would contribute their labour force to the rehabilitation works. During the implementation of the rehabilitation works, the Government provided them provision of equipment and technical guidance while the farmers were engaged in such works as such as collection of materials, assembly of gabion. No particular

training for the farmers on operation and maintenance of the facilities was conducted after completion of the rehabilitation works.

4.5 Problem Analysis

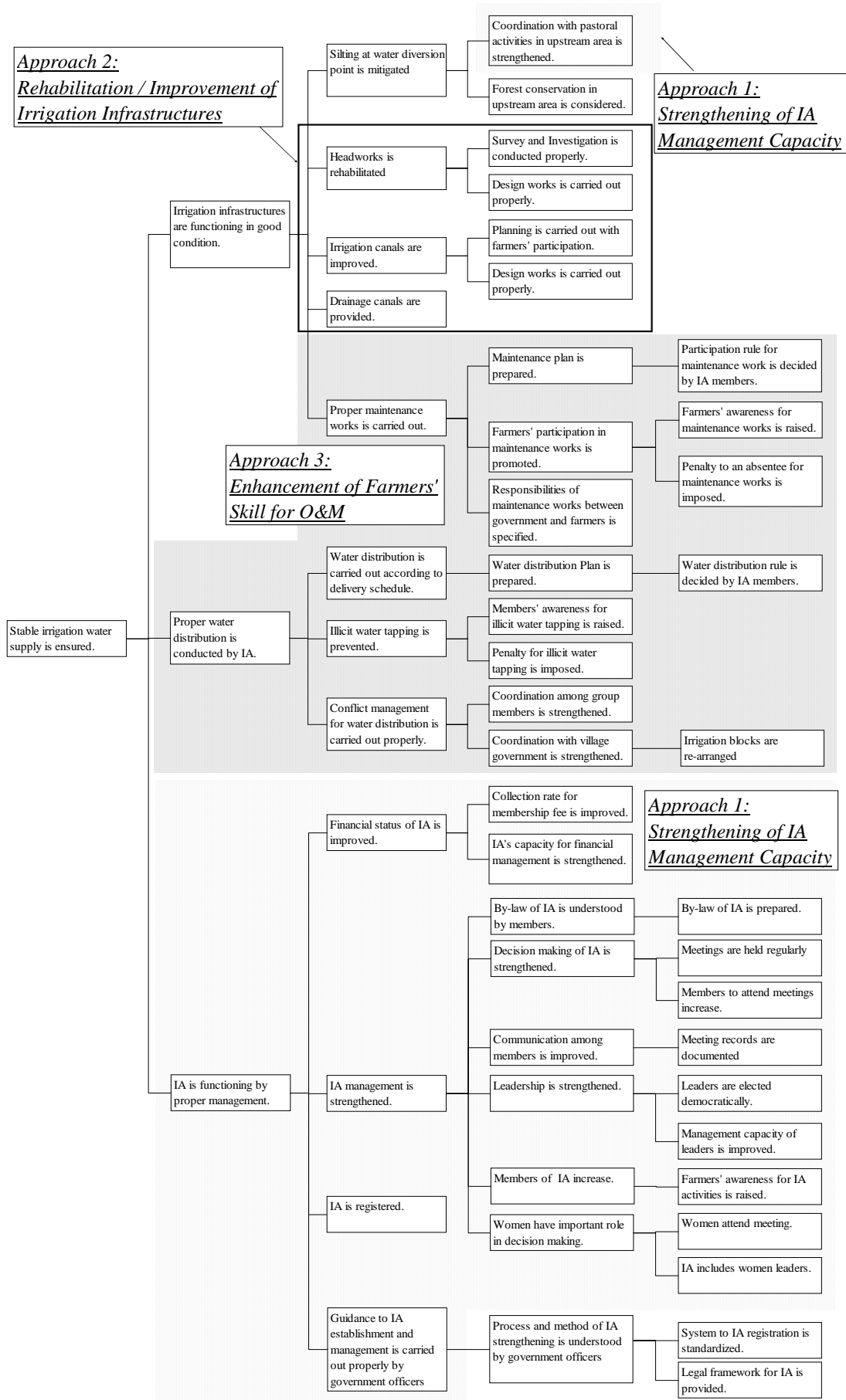
Problem analysis of Pawaga Irrigation Scheme is shown below.



Pawaga Irrigation Scheme - Problem Tree

4.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Pawaga Irrigation Scheme - Objective Tree

CHAPTER 5 MUSA MWIJANGA IRRIGATION SCHEME

5.1 Institution

Organizing a IA (Mijongweni Irrigators Cooperative Society) is presently in progress under the guidance of the District cooperative officer and the agronomists from the Kilimanjaro Zonal Irrigation Office. In May, 2002 the Mijongweni Irrigators Committee was established, as the first step. It consists of 10 members (male 6 and female 4) including a chairperson, a vice chairperson, a secretary, and a treasurer selected by consensus. At first the members intended to register the IA as an association, as they had a negative images of previous cooperative activities. However, the District cooperative officer urged them to register as a cooperative. Then, the committee agreed to register as a cooperative. Therefore, the committee decided to discuss the issue of registration at the first general meeting in February, 2003. However, the members couldn't explain exactly the differences between the cooperative and the association, their merits and demerits for them and etc.

The bylaw and the regulations were under preparation with assistance of the District cooperative officer and the agronomists. They were also planned to be discussed at the general meeting in February. According to the proposed bylaw and the regulations, all residents in the area who are over 18 years old are eligible for the membership. The planned registration fee and annual membership fee are Tsh. 2,000 and Tsh. 1,000 respectively. Previously 9 water distributors designated by the village council collected water charges (Kimada): Tsh. 6,000 per season from the farmer in the village who didn't participate in labour service and Tsh. 6,000 per year from the farmer outside the village. As for training, the extension service from the DALDO and the Kilimanjaro Zonal Irrigation Office are available. The service covers operation and maintenance of the irrigation facilities, paddy production, upland crop production, management of cooperative and association, and etc. The farmers generally satisfy the programs. Their future priority fields are the leadership training, financial management, operation and maintenance, paddy production, and marketing of the products.

Communication with the relevant Government staff is rather satisfactory to farmers. The issues discussed cover pest control, plant diseases, farmer's contribution to repairing the irrigation facilities, water shortage, illicit water tapping and etc. However, some farmers complained of slow responses of the staff to the farmers' requests. They also requested a transparency of budget for construction work by the Government and/or donors, as they were not informed of

any data so far.

5.2 Irrigation and Drainage System

The scheme area has been irrigated through traditional irrigation canals since 1940'. Hai District Council through its District Irrigation Office built an intake weir to effective off-take of river water in 1980'. It was later rehabilitated in 1991 with UNDP/FAO assistance through the "Rehabilitation of Traditional irrigation scheme (TIP)", having following improvement components:

- Improvement of the diversion weir and gate intake
- Realignment of main canals
- Construction of flow control structures on main canal and secondary/tertiary canal head regulators/off-takes and
- Construction of road culverts

After conducting the rehabilitation, the irrigation system of the Scheme had functioned properly until the intake weir was flashed out. Though the intake weir was destroyed completely in 2002, the required discharge has been taken by means of piling sandbags in an orderly line. However, as it is a temporary measure, drastic implementation to rehabilitation of the destroyed weir should be taken as early as possible in order to sustain the Scheme. Main canal and several secondary canals seem to be under well-functioned situation. Kilimanjaro Zonal Irrigation Office has supported to rehabilitate some irrigation facilities partly on the basis of urgency and availability of funding resources. Recently road crossing structure was repaired. Such improvement works have been conducted occasionally in some places. It is questionable whether these rehabilitation works are in line with certain priorities for the scheme improvement.

Paddy fields are sparsely scattered over the whole area depending upon mainly soil suitability. As growing stages of the cultivated crops are irregular in area, it is unlikely that farmers consider adjustment in cultivation. Farmers explained that a rotational irrigation is applied in the irrigation groups of upstream and downstream covered by a tertiary canal so as to save water during the dry season. Nevertheless, farmers still complain shortage of water in the dry season.

Furthermore, it was observed that turnout gates on the main canal face difficulties in smooth operation due to accumulated garbage in front of the gate and vandalized steal gates at the some gate structures. Drainage problem is also a highlighted issue in the area. Some waterlogged portion was observed even during the site inspection.

5.3 Water Management, Operation and Maintenance

5.3.1 Water Management

Although the farmers' group is being organized, aiming at carrying out water management, operation and maintenance works under their initiatives, as a transition period from the old to the new systems, the works is still led by water distributors appointed by the village Government

Nine water distributors are assigned to the same number of irrigation blocks to ensure proper water distribution within the area. They have also responsibility to decide irrigation schedule and to make coordination of water distribution when water conflict among irrigation blocks may arise. The rotation irrigation is adopted with 12 hours interval (day and night). Operation of the intake and the turnouts at main canal are under the water distributors, and field canals are by the farmers.

The farmers pointed out that water distribution is constrained by the following defects of irrigation infrastructures:

- Difficulty to ensure required water level for abstraction due to water leakage at temporary intake weir made of sandbags,
- Deterioration of the turnouts, accounting to about 80% of the total number,
- Some higher elevated farm lands than designed water level at field canal,
- Stagnation of flow locked by big rock in the upper reach of the main canal, and
- Improper canal profile.

Water conflicts take place between the upstream and downstream especially in the dry season, because upstream farmers dispossess irrigation water against the water rotation. If water conflicts are not settled among the farmers, village Government put penalty of Tsh. 10,000 to the offender. As a countermeasure for that, they discussed and decided among themselves to reduce the cultivation areas during the dry season (from December to early March).

5.3.2 Operation and Maintenance

The nine water distributors patrol at the intake and along the main canal whether the facilities function well. Some defects of the facilities are immediately reported to the village Government in order to take an action for remedial works.

Against the collapsed intake weir, the farmers communally put traditional gabions of bamboo with stones and/or sandbags as the intake. However, since this temporary weir has too heavy water leakage to control water level for the water abstraction, and it is subject to be washed away, the farmers are obliged to check

and reinforce the weir frequently at least once a week.

Field canals are monitored by the farmers, and the found problem is informed to the water distributors, who call the farmers to allocate the maintenance work. The water distributors also check the condition of the facilities within their assigned area. Maintenance works tasked for farmers are clearing of intakes, desilting of canals, clearing of canals, bank forming of canals, and repair works of canal structures, etc.

The major maintenance works of the main canal is desilting in the head reach, and weeding in the downstream portion. Each farmer takes responsibility to clear the canal in 10 to 20 steps along the main canal, which is assigned by the water distributors. The clearing by handhoe is main task for the field canal maintenance. The penalty of Tsh. 2,000 is imposed on persons, who fail to attend the maintenance works on the main canal, while those who ignored maintenance of the field canals are punished with stopping water supply for their farm lands.

5.3.3 O&M cost

There is no collection of O&M cost because they have not established their association/cooperative. The village Government takes care of all O&M cost.

5.4 Other Special Issues

5.4.1 Farmers' expectation to Government for scheme development

The farmers expect the Government the following aspects:

- Reconstruction of the diversion weir, which was washed away by the flood,
- Rehabilitation and improvement of the main canal system, such as provision of canal lining and turnout structures,
- Drainage improvement for water-logging area, and
- Improvement of roads in the scheme.

The farmers stated that they submitted the request of rehabilitation of the diversion weir, and stressed that the Government urged them to be get organized themselves before implementation of the works so that they could manage the facilities in proper manner.

5.4.2 Farmers' contribution to development

The farmers are ready for contributing labour force to such construction works, as excavation of channels, and collection of sand and stone.

5.4.3 Previous farmers' participation in planning and implementation

In the project planning stage of previous rehabilitation project, which was

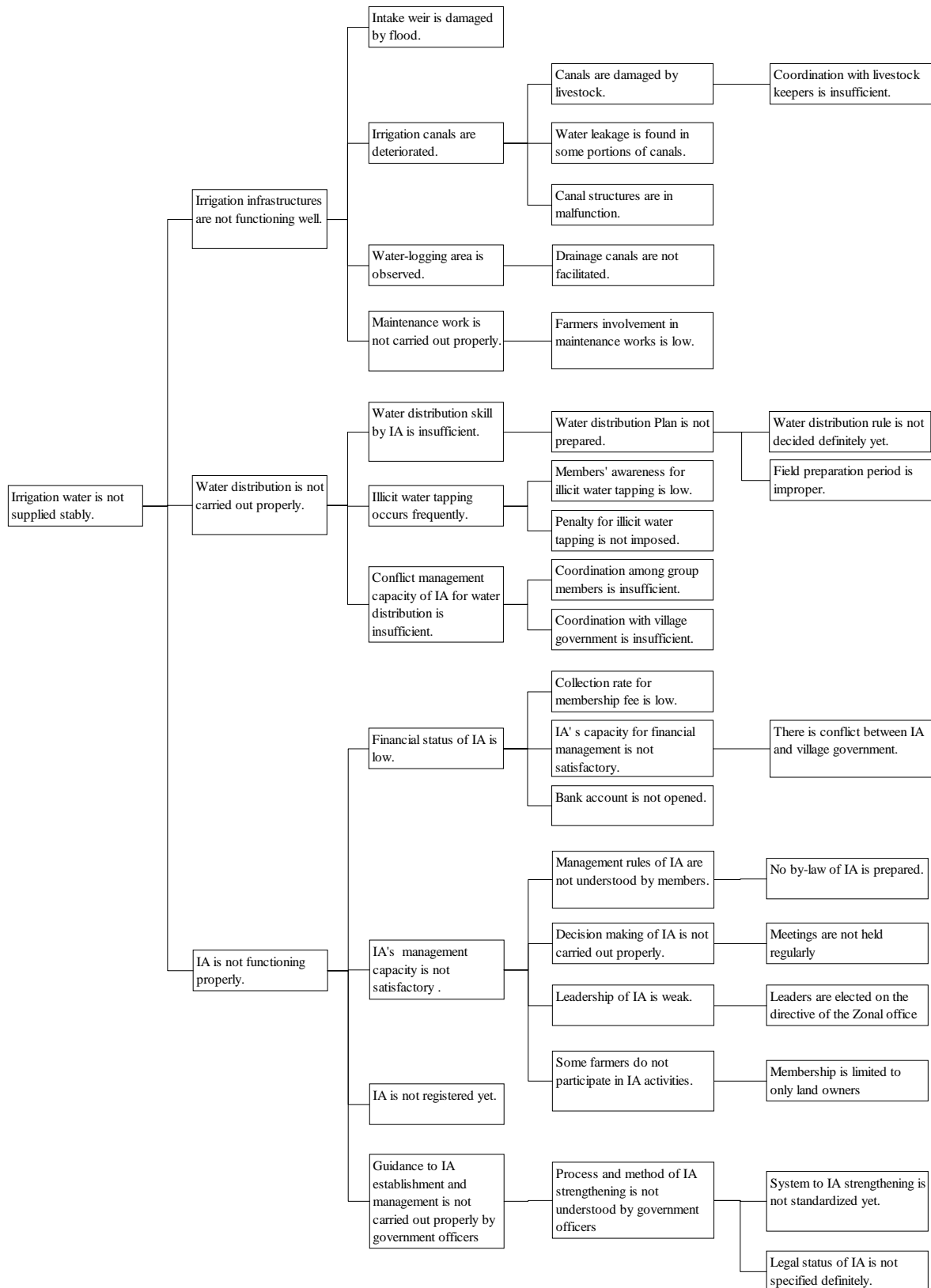
financed by UNDP/FAO in the year 1991, the farmers pointed out that explanation and/or consultation to them were not conducted satisfactorily, adding that only farmers' representatives participated the meeting to outline the project.

The farmers were not concerned with an agreement on farmers' participation in the construction works, which seemed to be made between the Government and the Village Government. The farmers were solely requested by the Village Government to attend the communal works two days a week, they never opposed to the instruction because this kind of works has been regarded as duties assigned to the community members.

No particular training for the farmers on operation and maintenance of the facilities was conducted after completion of the rehabilitation works.

5.5 Problem Analysis

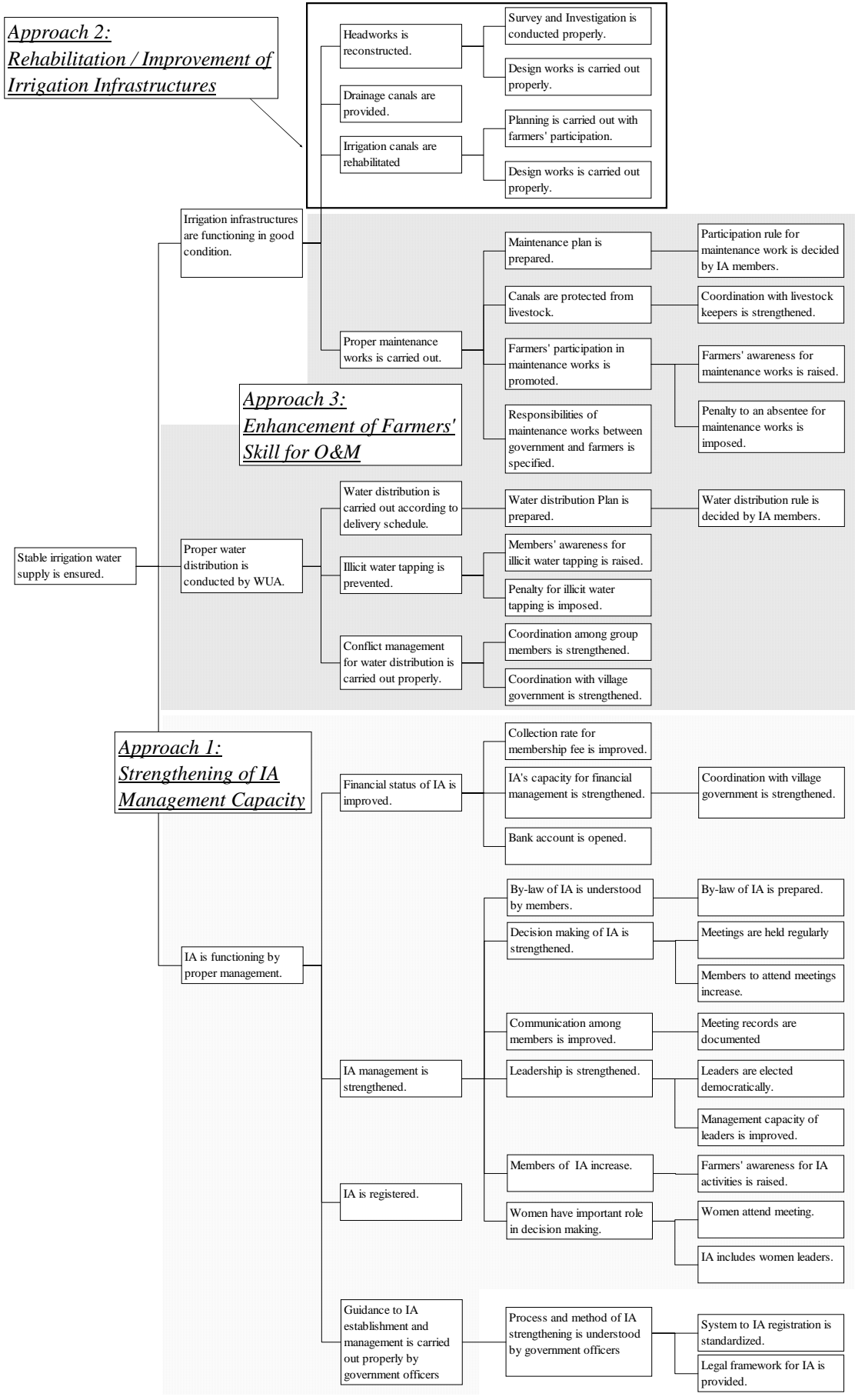
Problem analysis of Musa Mwinjanga Irrigation Scheme is shown below.



Musa Mwinjanga Irrigation Scheme - Problem Tree

5.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Musa Mwinjanga Irrigation Scheme - Objective Tree

CHAPTER 6 MGONGOLA IRRIGATION SCHEME

6.1 Institution

So far having received development assistances from various donors, such as JICA, South Korea, DANIDA, FAO, and etc., the farmers' attitude of this area toward development seemingly more or less tends to be dependent on the Government and/or donors. In other words, their active initiative seems rather weak. The construction of weir began in 1982 by the assistance of the Netherlands and the irrigation facilities completed in 1985. And then an IA consisting of 42 members was established in 1987 and the number of the members presently reaches 98 (male 58 and female 40). The number, 98, is identical to the presently irrigated area, 98 acres, as each member owns one acre of the irrigated land respectively.

The IA hasn't been registered yet. The executive committee consists of 10 members including a chairperson, a vice chairperson, a secretary, and a treasurer selected by secret ballot. Besides, there are two following subcommittees: the planning and finance and the agriculture. They have a general meeting twice a year and the executive committee and the subcommittees meet according to needs. The issues discussed cover problems occurred in the previous season, cleaning of canal, operation and maintenance of the facilities, collection of fees and other charges, and etc. Poor participation of farmers in the general meeting is pointed out by the farmers. Some landowners (15% of the members) who live in Morogoro town and about 35% of members in the villages tend not to attend it.

The IA has the bylaw and regulations which were established based on the guidelines provided from the DALDO. About a half of the members don't understand them well, however. Only landowners in the scheme area are eligible for the membership.

There are no registration and membership fees but water charge, Tsh. 5,000 per season and acre began to be collected since August, 2002 according to the order of the District Government. Besides, the irrigators outside the scheme area to whom water is distributed also have to pay Tsh. 6,000 per season and acre. Previously the charges were born by the District Government. So far around 70% of the members have paid it. The members who don't pay will be reported to the village council and to the District court for mediation, if necessary. In addition, expenses of canal rehabilitation are also collected from the members. The amounts differ according to needs, for instance, last year Tsh. 1,000. The IA has a bank account at the Saving and Credit Cooperative Society at Hembeti and prepares the financial

report twice a year. Its account is audited by the ward revenue collector.

As for training, the farmers have had lot of opportunities to attend training programs of paddy production, vegetable cultivation and fish cultivation at KATC, Mkindo Farmers Training Centre and Indonesia. Their future priority fields are leadership training, documentation technique and financial management.

The communication with the relevant Governmental organizations such as the extension officer, the village Government, the DALDO, and the Zonal Irrigation Office are generally well maintained. Issues discussed with them cover equipments for canal rehabilitation, lack of the IA leadership, water dispute at the dry season, members' poor attendance to the meetings, and etc.

In addition, in 1997 the District cooperative officer supervised the irrigators to organize a registered cooperative. Some of the IA members (35 at that time and 45 at present) organized Mkindo Farmers Irrigation Agriculture Marketing Primary Cooperative Society. However, its purpose and roles of the cooperative were not well defined by the farmers themselves. Moreover, the differences from the existing IA were not clear to the farmers at all and its establishment was overwhelmingly initiated by the local Government. Therefore, the cooperative practically hasn't had any activities. Such one-way top down approach still remains as a harmful problem against the farmer's oriented irrigation development.

6.2 Irrigation and Drainage System

The Mkind Pilot Scheme was implemented by two phases. In 1985, the Mkind Pilot Scheme (Phase I) was implemented with an aid from the Government of Netherlands. The Phase I works aim to irrigate consolidated pilot farmlands of 16.8 hectare (42 acre) by abstracting river water at the point of the present intake weir site and conveying it through a main canal with 1.5 km long to the field. The Phase II works was continually completed in 1988, extending its service to irrigate additional pilot farmland of 22.4 hectare (56 acre). The Mkind Pilot Scheme has been fairly operated additionally committing technology transfer on irrigated agricultural techniques by the Government of Indonesia through the basis of South-South Cooperation. Furthermore, sometimes it was conducted necessary improvement for the irrigation system, lately minor repairs were done by FAO's support in 1999 for the system of Phase I and in 2002 for the additional system of Phase II.

Sufficient flow is observed in Mkindo river during the site inspection. Excessive availability of water source was confirmed as analyzed in the feasibility study conducted by JICA.

Intake structure at the off-take site of the Mkindo river is fairly operated while it is far below capacity to cover additionally new areas of the Mgongola Irrigation Scheme. Present main canal to divert river water to the farmlands has also rather small capacity because even present it sometimes overflows from the canal due to discord between the intake capacity and the distribution capacity. At the intake structure, a pipe line having 5" diameter has been temporarily installed for the purpose of domestic water supply to the downstream villages. In the case of remodelling of the intake structure, proper adjustment with the domestic water use should be taken into consideration.

In the farmlands of the pilot scheme, modern paddy cultivation like twice harvestings in a year has been practiced. The modern irrigated agriculture has been expanded spontaneously to the outside areas of the pilot farmlands. The same irrigation practice performed in the pilot farmlands has been seen in some areas surrounding the farmlands of Phase II. It is estimated at about 200 ha.

The scheme area is roughly demarcated by the watercourses of Mkindo river and Mgongola river. It is a flat plain having an overall slope of 1/300 to 1/400 to the downstream of bounded rivers. Due to such topographical condition, the scheme area is habitually inundated with flooding water from both Mkindo and Mgongola rivers.

Water resource availability for irrigation development for the scheme area is remarkably outstanding by perennial river stream. As far as water resource is concerned, the scheme area has substantial potential for irrigation development. Conversely, drainage is serious hazard in the area especially during the rainy season. For the scheme area, drainage issues should be solved properly preceding or keeping pace with irrigation development.

The scheme comprehends the advanced area of Mkindo Pilot Scheme. Present irrigation facilities of the pilot scheme should be remodelled so as to fairly cover the new area without discord between present pilot scheme area and new developed area.

6.3 Water Management, Operation and Maintenance

6.3.1 Water management

Irrigation schedule in the Mkindo scheme is decided by members of the agricultural sub-committee in cooperation with the village extension officer. Other than the members of the association, farmers out of the Scheme, varying in number from 50 to 60, are allowed to irrigate their farm lands two days a week, paying Tsh. 6000 per acre and season to the association. The increase of the

farmers may cause pressure of water shortage.

The committee members are responsible for operation of the intake and the main canal while water distribution on field level is carried out by farmers themselves.

It is revealed that present water shortage should be caused by the following reasons:

- Silting in the main canal,
- Demolition of the aqueduct, resulting in serious water shortage in the Phase II area, and
- Water abstraction by the farmers out of the scheme.

The aqueduct on the main canal, crossing the Dizingwi river, was provided to convey irrigation water to the Phase II area. Against the serious water shortage, the farmers are obliged to take a remedial measurement to abstract water from the Dizingwi river. However, a proposed irrigation scheme, depending on a water resources on the river upstream, could impact on the river flow and consequent present water abstraction in the Phase II area.

6.3.2 Operation and Maintenance

The committee members patrol regularly to preventive maintenance for the intake weir and the main canal. Regular maintenance is carried out by farmers themselves before every cultivation season. The maintenance works include removal of stone and rock and greasing at the intake weir, and clearing, desilting and bund forming on the canal. Most of the farmers participated in the works, and those who did not attend the works are imposed to pay a penalty of Tsh. 3000. The needs of the works beyond farmers' capacity are reported to the District.

6.4 Other Special Issues

6.4.1 Farmers' expectation to Government for scheme development

The farmers expect the Government the following aspects:

- Rehabilitation of existing main canal, such as reshaping of the canal section, and construction of culverts, and
- Construction of irrigation canals for the extension area.

They pointed out that minor repair would be required for the intake weir, adding that its maintenance has been carried out properly.

6.4.2 Farmers' contribution to development

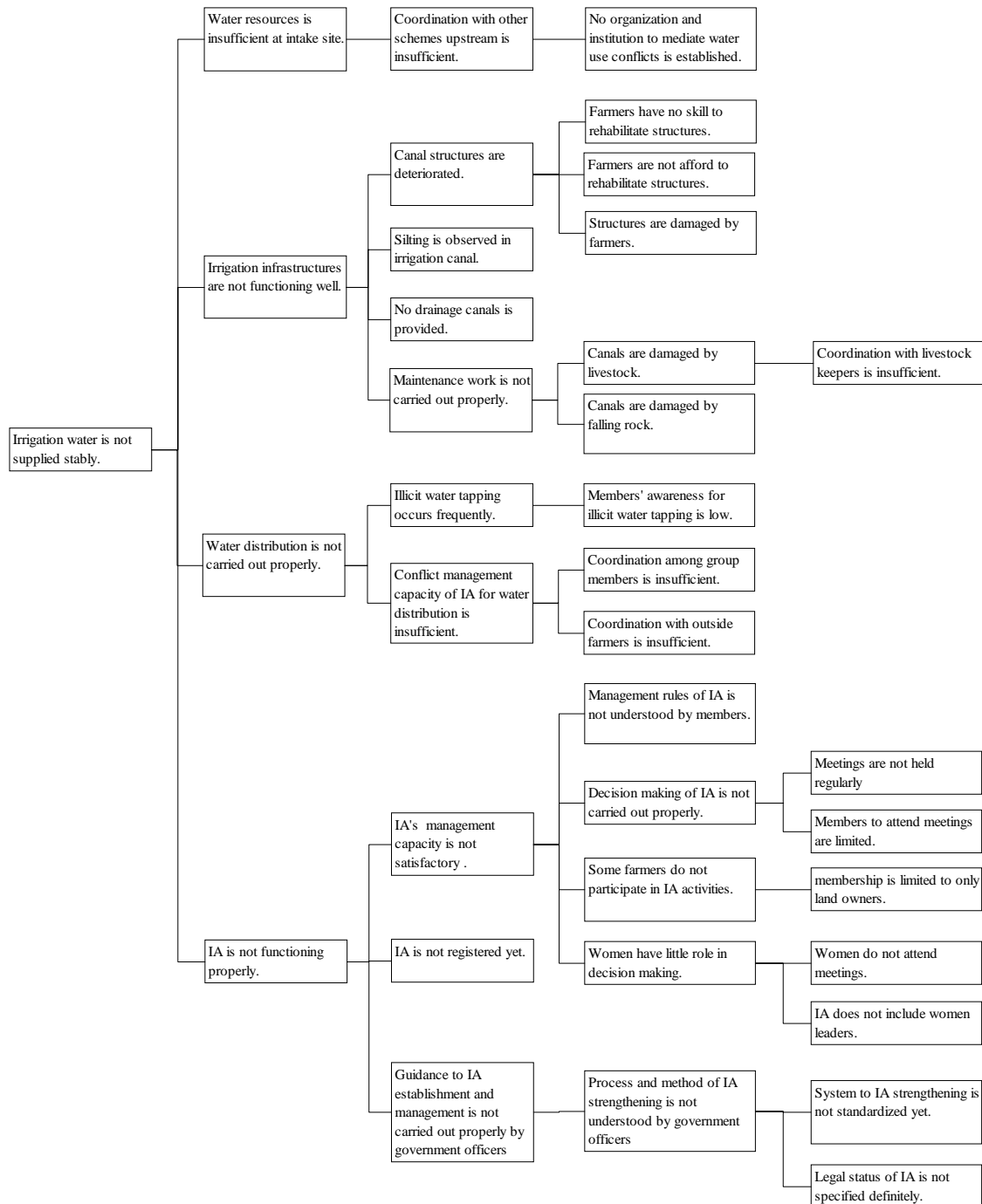
For the construction works, farmers are ready for contributing labour force to such construction works, as excavation of channels, and collection of sand and stone.

6.4.3 Previous farmers' participation in planning and implementation

Farmers participated in planning and implementation of the recent rehabilitation works under FAO-financed SPFS in 1999 and 2001. The District extension officer acted as a facilitator for the participatory planning. Further, the farmers participated in the rehabilitation works as common labour and masons.

6.5 Problem Analysis

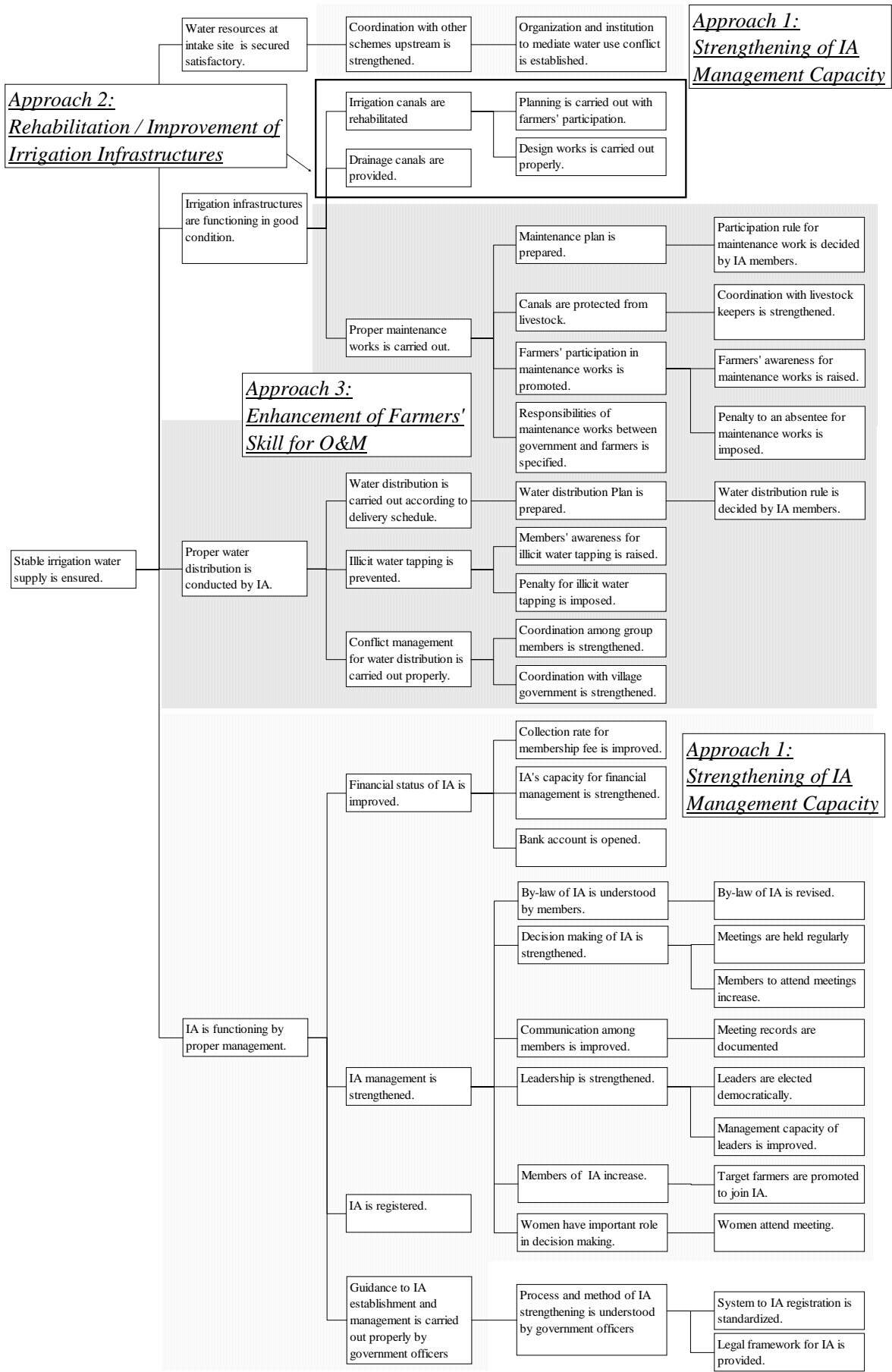
Problem analysis of Mgongola Irrigation Scheme is shown below.



Mgongola Irrigation Scheme - Problem Tree

6.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Mgonbola Irrigation Scheme - Objective Tree

Chapter 7 Lower Moshi Irrigation Scheme

7.1 Institution

Mandaka Mnono and Kaloleni are two villages in the upper stream area next to the Existing Lower Moshi Project area. Mandaka Mnono has an unregistered IA consisting of 6 sub-groups, and Kaloleni has three unregistered IAs. As for future registration, they don't have any concrete plans at present. Each executive committee consists of a chairperson, a vice chairperson, a secretary, an assistant secretary, and a treasurer selected by open election (Kaloleni doesn't have a treasurer, however). The executive committee of Mandaka Mnono has a sub-committee of water management.

The general meetings are held yearly and the discussions are always documented. Issues discussed cover water distribution, drainage problems, crop calendar, flood problems, and etc. Some farmers in Kaloleni complained of the time of general meeting which tended to be too long for them. It sometimes took 4 hours. Besides, a poor participation of farmers, lack of communication among members and tenant farmers' unstable status of cultivation right in the area were pointed out.

The IAs adopted the bylaw and regulations which were generally understood by the members. The land owners and tenant farmers (male and female) are eligible for the membership. However, only land owners are eligible for the executive committee leaders. The IAs collect the registration fee (Tsh. 500 – 1,000) and the membership fee for operation and maintenance (Tsh. 500 – 1,500). As for expenses of special activities, the expenses for water right application were shared by 46 farmers in Mandaka Mnono. In Kaloleni the farmers contribute labour service, for instance for bridge repairing, but not money. The IAs don't have bank accounts yet.

Mandaka Mnono and Kaloleni are at present using water without the water right in the upstream of Existing Lower Moshi Project area. Because of that, the Lower Moshi area can't utilize the water right to the full extent. The coordination of the stakeholders including relevant Governmental organizations is urgently necessary.

7.2 Irrigation and Drainage System

As mentioned above, the limited water sources are not used fairly between the Expanded Area (upstream area) and the Existing Lower Moshi Area (downstream area), even within the Existing Lower Moshi Area. The Existing Lower Moshi Project was planned to aim at twice paddy cultivation per year in about 1,100 ha with 173 % of cropping intensity. However, actual cropping intensity for rice

cultivation was recorded at 86 % in whole scheme area basis during last three years from 2000 to 2002, in which the cropping intensity of Mabogini system is at 113 %, and that of Rau system is largely down to 65 %. While the Expanded Area reaches the average annual cropping intensity of more than 160 % in paddy cultivation, but more than 200 % in some areas. Thus, it is necessary to establish an appropriate approach to fair water allocation within the river basin. Strengthening of water management is one of effective way toward fulfilment of fair water allocation.

In order to realize the appropriate water management, proper irrigation and drainage system is indispensable as a minimum requirement. At present, The Existing Lower Moshi Area and the Expanded Area have a different level on irrigation development. The Existing Lower Moshi Area is covered with the modernized irrigation and drainage canal system. However, this system was constructed in 1987, and minor repairs are presently required for strict water management. These are repair/replacement of intake and turnout gates, repair of concrete block lining, filling of joints between concrete blocks, and reforming of drains.

The Expanded Area consisting of Kaloleni Area and Mandaka Mnono Area, is covered with traditional irrigation system. This system could not offer the proper water management because of poor canal construction and lack of structures, which lead to much seepage water and wasteful water. Besides, the Expanded Area is not provided with drainage system. Consequently, there find water stagnant in the Area. It is expected that proper drainage system would bear the return flow for downstream area. These situations were appealed by farmers in the Expanded Area at the interview with them held in this reporting period. From these findings, it is recognized that proper irrigation and drainage system including farm roads, should be constructed for the Expanded Area. In addition, flood protection work should be provided to protect the farmland and the irrigation and drainage facilities from floods.

7.3 Water Management, Operation and Maintenance

The operation and maintenance of the Existing Lower Moshi Project has been carried out by KADP and CHAWAMPU on a cooperative basis. KADP was in charge of operation of main facilities to turnouts to tertiary irrigation canals, and CHAWAMPU was responsible for operation of tertiary irrigation canals, watercourses and respective irrigation blocks under instruction and guidance of KADP.

Workshop was held in October 2002 to discuss and prepare an action plan to

ensure sustainable management on the project, consisting of clarification of the responsibilities between KADP and CHAWAMPU, and capacity building plan of CHAWAMPU, taking into consideration full hand over of O&M responsibility to CHAWAMPU.

An irrigation schedule is prepared by KADP, and discussed and approved by a joint meeting of KADP, Ward councillors, CHAWAMPU, and representatives of each village. The approved irrigation schedule is announced to the farmers. However, as described in preceding section, imbalance of water distribution between upstream and downstream areas is observed, resulting in serious conflicts among the farmers. Even within the Existing Lower Moshi Project Area, there is a water conflict between the Mabogini area and Rau Ya Kati /Chekereni areas. KADP is thus requested to settle this water conflict urgently.

In both Mandaka Mnono and Kaloleni areas operation and maintenance works for irrigation systems are executed by farmers themselves. Through discussion with the farmers present condition and constraints for water management and maintenance in the areas were identified as outlined below.

Results of Discussion with Farmers in Mandaka Mnono and Kaloleni

	Mandaka Mnono Area	Kaloleni Area
<u>Water Management</u>		
Responsibility for water distribution	Water distribution is carried out completely by the Irrigators' group at intake, main canal, and field canals.	Water distribution is carried out completely by the irrigators' group at intake, main canals, and field canals
Farmers' satisfaction with water distribution	All farmers are not satisfied because some farm lands are elevated.	The farmers are satisfied with water distribution
Countermeasure by farmers to remove constraints for water distribution	The farmers discussed the water problem, rehabilitated the canals. The system got improved.	The farmers discussed the water problem, rehabilitated the canals. The system got improved.
Access to the Government agencies to solve the problem	The farmers had no idea where to access to solve the problem.	The farmers request the Agricultural office to solve the problem, but no response is received yet.
Farmers' proposal to improve the water distribution	Canal lining is proposed to ensure better water distribution	Canal lining is proposed to ensure better water distribution
<u>Operation and Maintenance</u>		
Present problems for maintenance	Damage of the intake and water loss from the canals	The whole system does not work, but CARE group takes care of the intake
Countermeasure by farmers to remove constraints for maintenance	The farmers have discussed the issue, but could not do much.	Ten years ago, University people promised to repair the system, but nothing to date.
Access to the Government agencies to solve the problem	None	None
Budget for maintenance	The irrigators' group has no budget for the maintenance	The irrigators' group has no budget for the maintenance

7.4 Other Special Issues

7.4.1 Farmers' expectation to Government for scheme development

The farmers expect the following of the Government:

Kaloleni Area

- Good irrigation system (canal construction)
- Arrangement of farm input and marketing
- Formation of farmers' organization

Mandaka Mnono Area

- Proper water distribution by provision of irrigation infrastructure
- Proper drainage system to prevent water stagnant
- Arrangement of farm roads

7.4.2 Farmers' contribution to development

The farmers in both Areas, propose the labour contribution for development. In

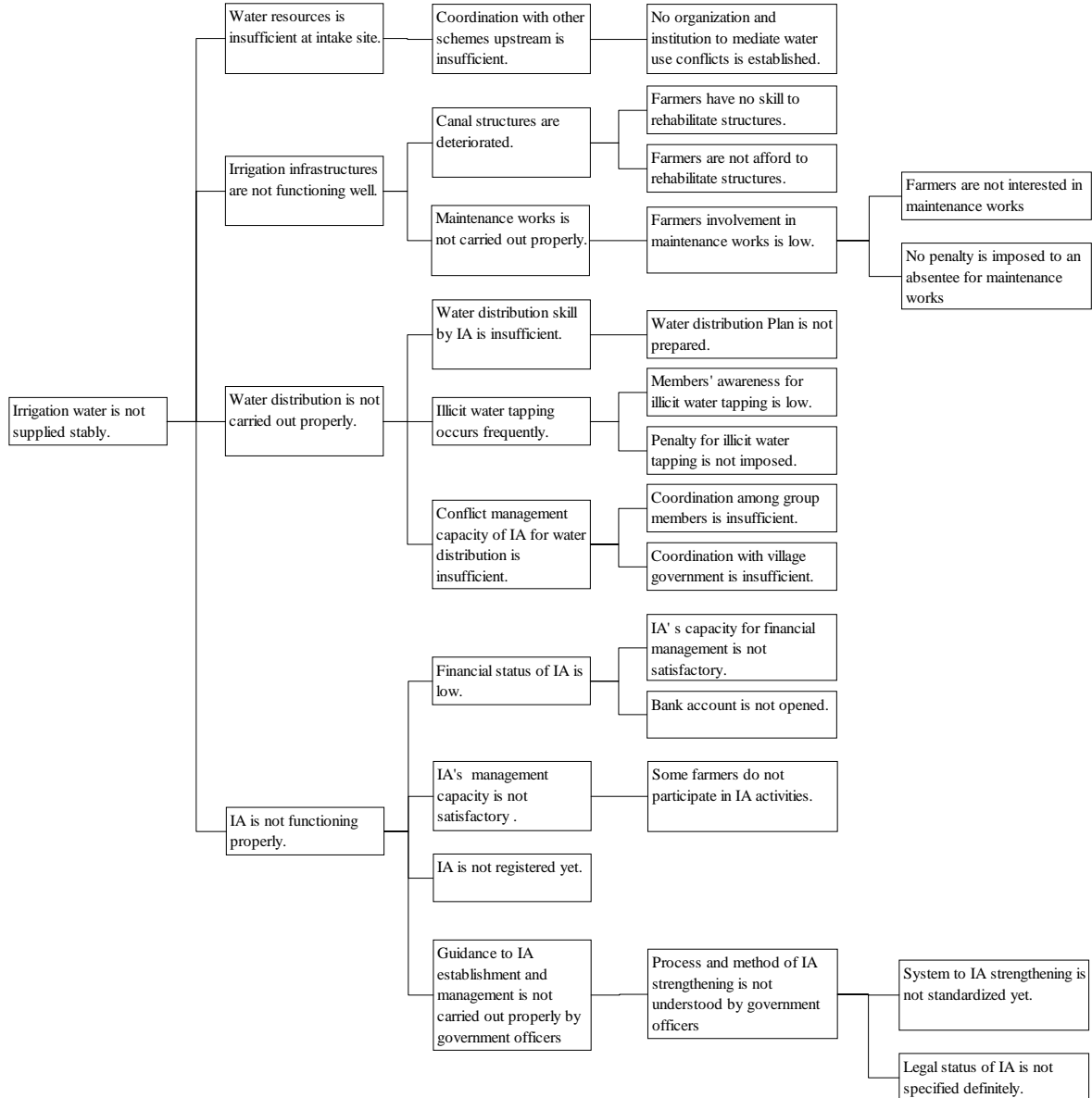
particular, the farmers in Mandaka Mnono say that larger contribution would be possible if attractive market is realized.

7.4.3 Previous farmers’ participation in planning and implementation

No participation because of no implementation.

7.5 Problem Analysis

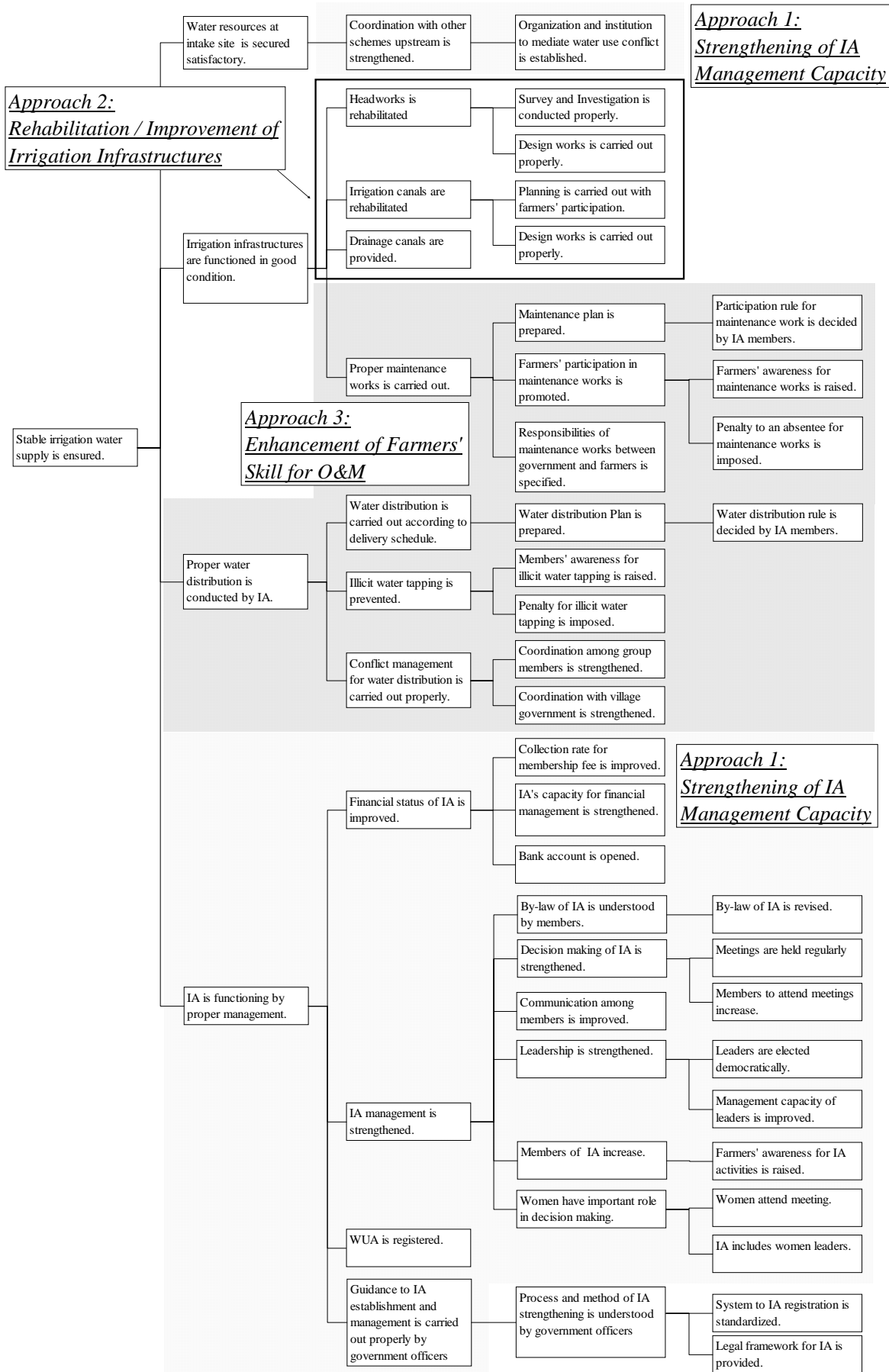
Problem analysis of Lower Moshi Irrigation Scheme is shown below.



Lower Moshi Irrigation Scheme - Problem Tree

7.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Lower Moshi Irrigation Scheme - Objective Tree

CHAPTER 8 KISESE IRRIGATION SCHEME

8.1 Institution

As Kiseke is presently a water harvesting area, there is no IA at present. However, the two farmers who attended the training program of vegetable seed multiplication assisted by the ASPS, DANIDA in 1999 initiated organizing the local farmers who cultivate vegetables. The number of the present members reaches 15 members (male 9 and female 6). The farmers in the group are cultivating not only vegetables, but also paddy and maize. If water conditions permit, they intend to diversify their products through expanding paddy production. Presently the group operates and maintains simple weirs and canals in the rainy season.

In December 2002, the group reformed the executive committee consisting of three leaders: a chairperson, a secretary and a treasurer. At the same time they approved a new plan to collect the registration fee (Tsh. 2,000) and the annual membership fee (Tsh. 1,000). The group has been trying to enrol other local farmers in the group. Their efforts should be evaluated to some extent. Frankly speaking, however, the present number of the members is too small for the area. Considering the various water conditions in the area (upstream and downstream), it is not easy for them to enrol further members in the group under the current circumstances. It can become a possible base for the future IA in the area, however. Besides, as for training their priority fields are operation and maintenance of irrigation facilities, financial management of the group, pest management, and leadership training.

8.2 Irrigation and Drainage System

Because of well vegetation covered in the catchment area, relatively stable base flow exists only upstream reaches of the Kiseke river even though it is a small discharge. River flow has been taken off partially for irrigation purpose by traditional intake dikes within the river course at 5 points. Since the intake dikes are earthen and fragile, farmers have to rebuild them every after floods. Farmers are very eager to make its intake dike solid and stable.

At middle reaches of the river, there is no perennial flow, and intermittent or ephemeral flow. However considerable subsurface flow exists under the riverbed even in the dry season. Farmers take subsurface flow water from the river by digging riverbed in the dry season. River section of the middle reaches forms deeply carved with vertical side banks, and its riverbed has been deepening year

by year. Due to such characteristic of river shape, water harvesting like flood flow diverting has not been practical.

“Water harvesting” includes various irrigation forms. As far as intending irrigation utilizing intermittent or ephemeral water source, it may be called as water harvesting in a broad sense. Therefore, this Scheme may be categorized into the water harvesting. The feature of water harvesting varies in upstream, middle stream and down stream depends upon its physical condition.

8.3 Water Management, Operation and Maintenance

There are five small-scale irrigators groups in the area, consisting of 15 members with an extent of 42 acres. The organized groups have individual intakes, which were originally constructed as private users, and make a rotation for water abstraction under the technical guidance by the irrigation technician in the District. The farmers pointed out that there was considerable water loss from river and irrigation canals because of soil characteristics (sandy soil) in the area.

The farmers are obliged to reconstruct the weir whenever they are flushed away due to floods during the rainy season.

8.4 Other Special Issues

8.4.1 Farmers’ expectation to Government for scheme development

For the construction of the reservoir and irrigation canals, farmers expect the Government technical assistance, financial assistance for purchasing such material as cement, and provision of equipment and lorry to transport the construction material. They added that they were anxious for maximum development within the limited water resources, knowing that the whole area cannot be benefited by the resources

8.4.2 Farmers’ contribution to development

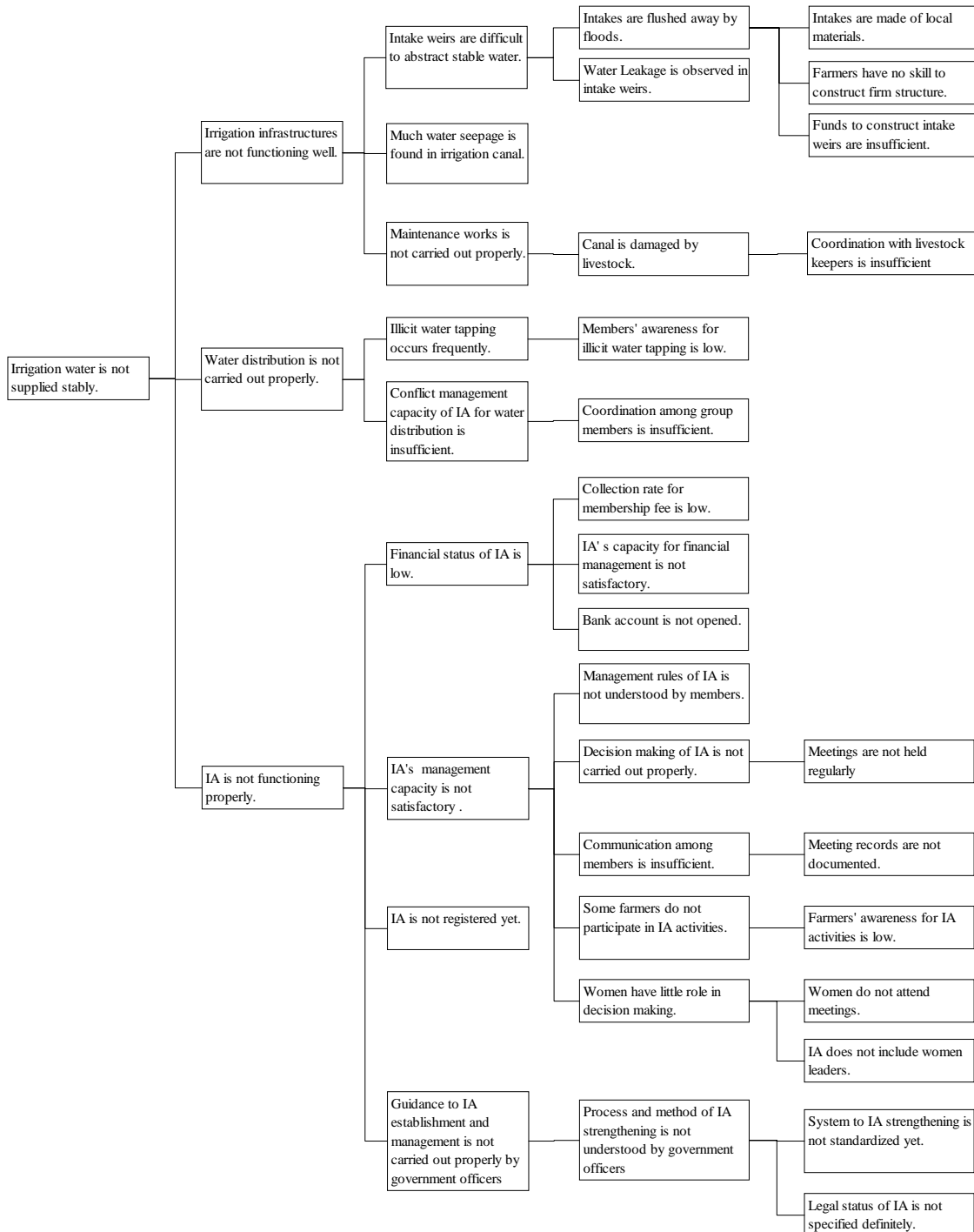
Farmers are ready for contributing labour force to such construction works, as excavation of canals, crashing aggregates, masons and carpenters, adding that they have experienced the contribution to construction of the hospital and school in the village.

8.4.3 Previous farmers’ participation in planning and implementation

Farmers stressed that they were satisfied with the proposed development plan because the plan originated from them, being scrutinized and formulated by the District officials.

8.5 Problem Analysis

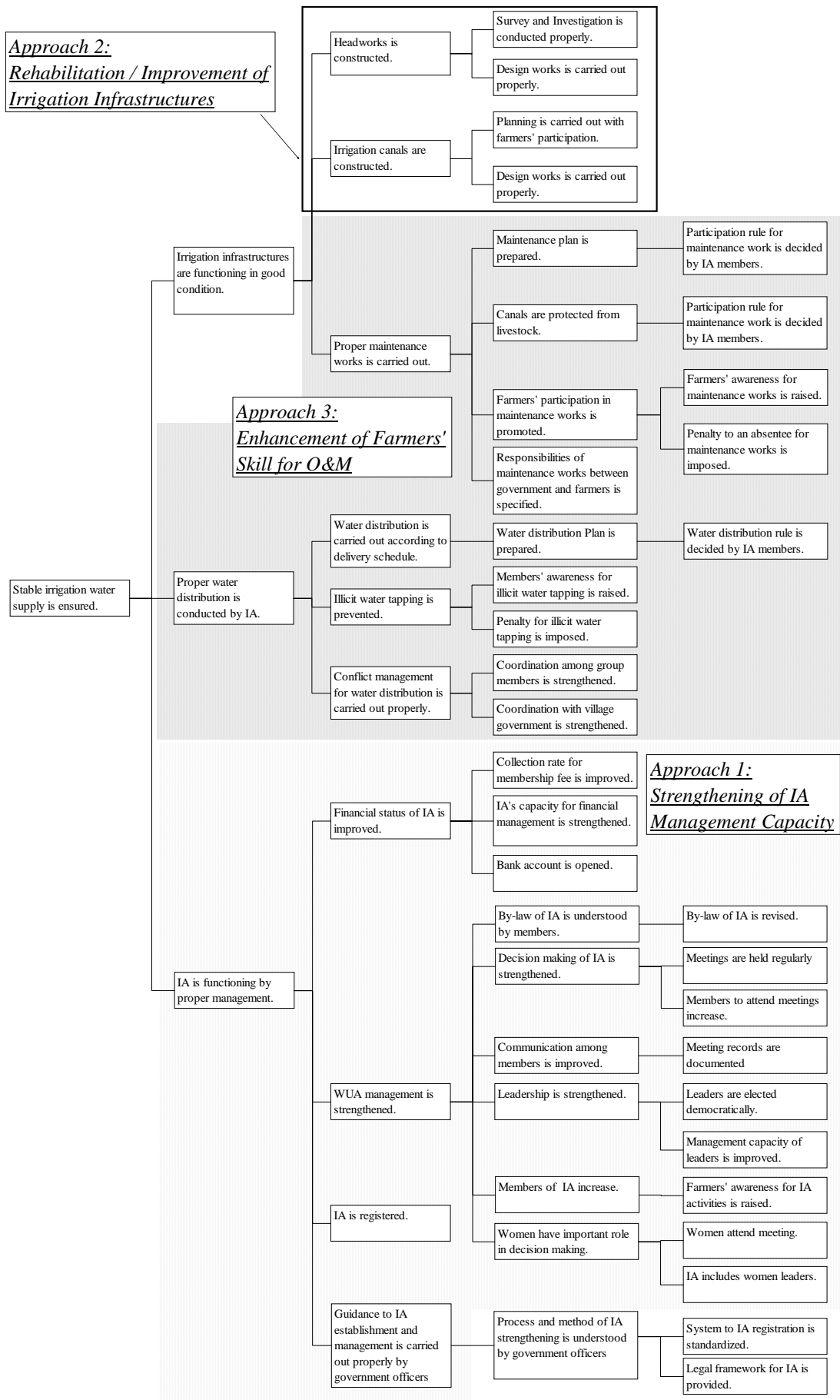
Problem analysis of Kisese Irrigation Scheme is shown below.



Kisese Irrigation Scheme - Problem Tree

8.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Kisesa Irrigation Scheme - Objective Tree

CHAPTER 9 PAMILA IRRIGATION SCHEME

9.1 Institution

There is no IA presently. However, there are 15 simple weirs and each of them has an informal group of farmers. Its primary role is to maintain the weir and cleaning the canal. The first weir was constructed in 1985 and then the number of the weirs has been increased gradually. The 15th weir was constructed in 2002. As the river flow has been decreasing, construction of additional weirs may become difficult from now on. Farmers including tenant farmers cultivating in the irrigated area are eligible for the membership.

Each group has a leader who is not selected by election, but in some way by consensus. There are no secretary and treasurer. Besides, no fees have been collected so far. The members provide their labors to maintain the facilities, if necessary. The meetings are not held regularly, but according to needs. The groups don't have bylaws and regulations. Those who don't contribute to maintenance and cleaning activities are not eligible for using water. Water disputes sometimes occur between the upstream and the downstream groups. In those cases the groups sit together, discuss and solve them by themselves.

The farmers intend to organize a IA and to register it as association in future. The reason why they prefer association is the application procedure is simpler than that of cooperative. The farmers haven't had any opportunities to receive technical training except the extension services from the district government. They intend to receive the technical training of paddy production, horticulture, upland rice production and so forth.

In addition, the establishment of SACCO, Savings and Credit Cooperatives Organization for the farmer's groups of horticulture, paddy and peanuts is now in preparation by the assistance of the district government.

9.2 Irrigation and Drainage System

The scheme area extends in the Pamila valley which locates upstream of Mukuti River. Within the valley, the Mukuti River runs westerly joining two tributaries of Rubirizu and Nyankara. Though the Mukuti River has small current even during long spell of dry months, it is characterized by intermittent flow regime with flushing runoff during the rainy season. River bed gradient is relatively flat ranging from 1/1,000 to 1/2,000.

In the Pamila valley, some number of water abstractions like a kind of water harvesting have been initiated by temporary measures since 1998. About 10 ha

is presumed under irrigation for rice production during the rainy season. However, farmers have not yet skilled in irrigation practice repeating trial and error. Further experience in irrigation is required for farmers in order to advance their irrigation technology.

Furthermore, a new drainage system is an important issue to improve the water-logging areas in the scheme area. Drainage to eliminate excess water properly are crucial. Otherwise establishment of new water harvesting technology coexisting with such inferior natural drainage condition is to be sought.

9.3 Water Management, Operation and Maintenance

In the area, as a water management unit, 15 groups have been organized and started their actions of water harvesting in some manners. The method of their water harvesting is to confine the inundated water into the paddy fields up to after entering dry season, by means of building bunds as enclosing their farm plots. It could be peculiar irrigation categorized into a water harvesting method.

Water conflicts rarely happen to in the scheme area. In case of happening the disagreement in water use among the groups and within the group are solved through mutual discussion among persons or parties concerned.

9.4 Other Special Issues

9.4.1 Farmers' expectation to Government for scheme development

The following are the expectation to the Government by the farmers:

- Ensure the stable water resource
- Construction of firm intake facility
- Construction of drainage system
- Construction of farm roads

9.4.2 Farmers' contribution to development

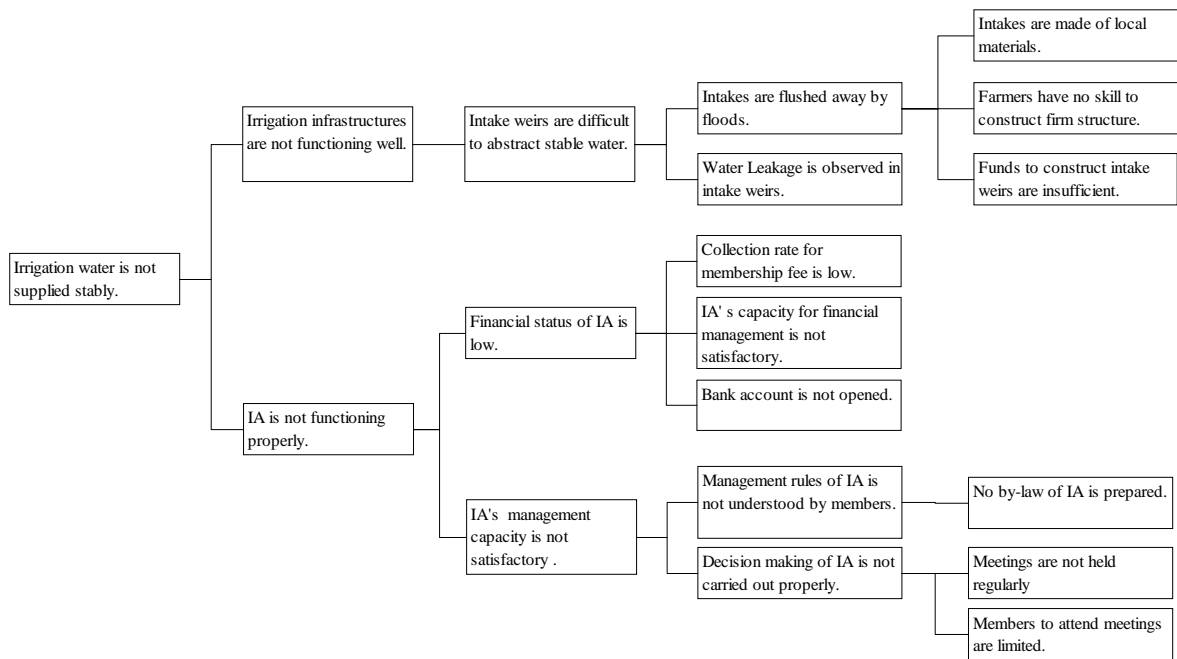
The farmers said in the interviews with them, that possible contribution was offer of labour force for construction and material collection and carrying.

9.4.3 Previous farmers' participation in planning and implementation

The existing irrigation system was constructed by farmers themselves.

9.5 Problem Analysis

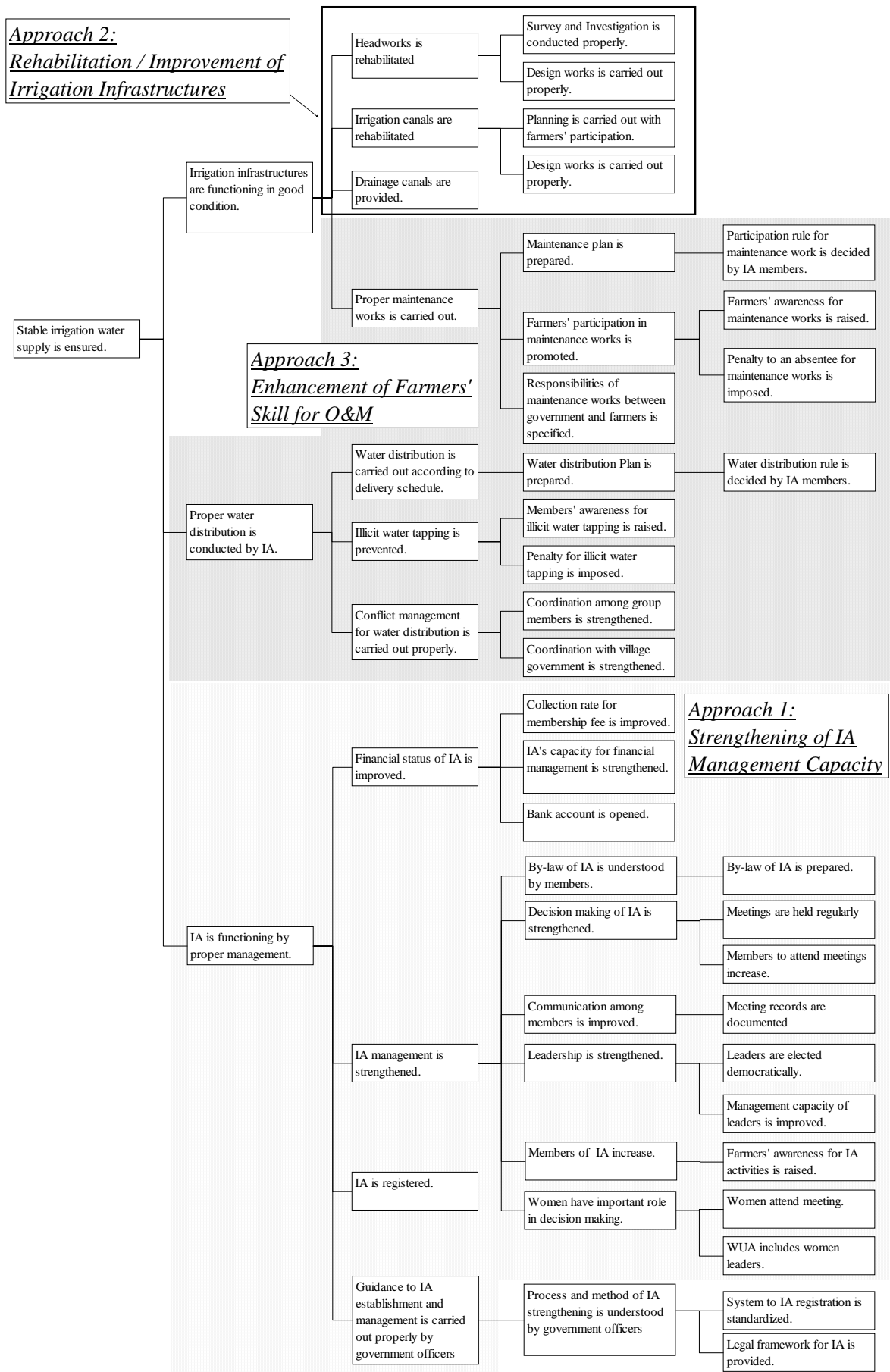
Problem analysis of Pamila Irrigation Scheme is shown below.



Pamila Irrigation Scheme - Problem Tree

9.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Pamila Irrigation Scheme - Objective Tree

CHAPTER 10 NKENGE IRRIGATION SCHEME

10.1 Institution

As for farmer's organization, there are two cooperatives of coffee farmers established in the 1950s, but no IA presently, as the irrigation activities have been suspended since 1990. However, those farmers who intend to resume irrigation for the former 32 ha scheme site, organized a managing group this February with the assistance of the village government. Presently 50 farmers participate in the group and 20 members including 10 females constitute an executive committee. The committee has a chairperson, a secretary and a treasurer. The farmers plan to cultivate paddy, maize and vegetables after the resumption of irrigation. The group has already the regulations and holds a regular meeting twice a month. In addition, the registration fee, Tsh. 1,500 and an annual membership fee, Tsh. 500 are collected. 100% of the members have already paid the registration fee and about 80% have paid the annual fee.

As for the registration in the future, the group prefers association to cooperative, as the application procedure of cooperative is, according to the farmers, rather bureaucratic and cumbersome.

So far the farmers haven't had any opportunities to receive technical training except the extension services from the district government. They intend to receive the technical training of paddy production, banana cultivation and so forth. Their confronting major problems relating to agriculture include pest control, poor agricultural equipments and poor conditions of the access roads in the rainy season.

10.2 Irrigation and Drainage System

The existing irrigation and drainage facilities in the Nkenge Pilot Scheme could be used with rehabilitation, while pump should be procured and installed. Taking present conditions for the existing facilities into account, the pilot farm could be recovered easily if farmers' participation is encouraged properly. Drainage is less important issues for the pilot farm because excess water can easily drain into the Ngono River which runs near the scheme area.

The scheme area locates in the wide fertile plain. In addition to the rehabilitation of the pilot farm, there is a potential to develop irrigated agriculture on a larger scale. Success of the scheme must set off irrigation development in these large areas. For the case of the irrigation development of the area on a larger scale, drainage improvement should be taken into consideration depending upon its local

drainage condition.

10.3 Water Management, Operation and Maintenance

The operation and maintenance of the Nkenge Irrigation Scheme has been carried out by staff employed by the Government until the year 1990, when the Government and the donor withdrew their financial assistance. The farmers have not been involved in the scheme management and they were embarrassed by the sudden withdrawal of the assistance. It was also mentioned that they could not afford operation cost for the first cultivation season without support by the external resources, adding that size of present farm plot allocated to each farmer was too small to raise a fund for irrigated farming. At the moment, farmers recognize importance of farmers participation and initiative in order to success irrigation scheme from the lesson given by the previous scheme failure.

10.4 Other Special Issues

10.4.1 Farmers' expectation to Government for scheme development

In the interview with the farmers, they said the following were expected of the Government:

- Installation of pump
- Rehabilitation of irrigation and drainage system and farm roads
- Advice in proper crops considering soil and marketing conditions

10.4.2 Farmers' contribution to development

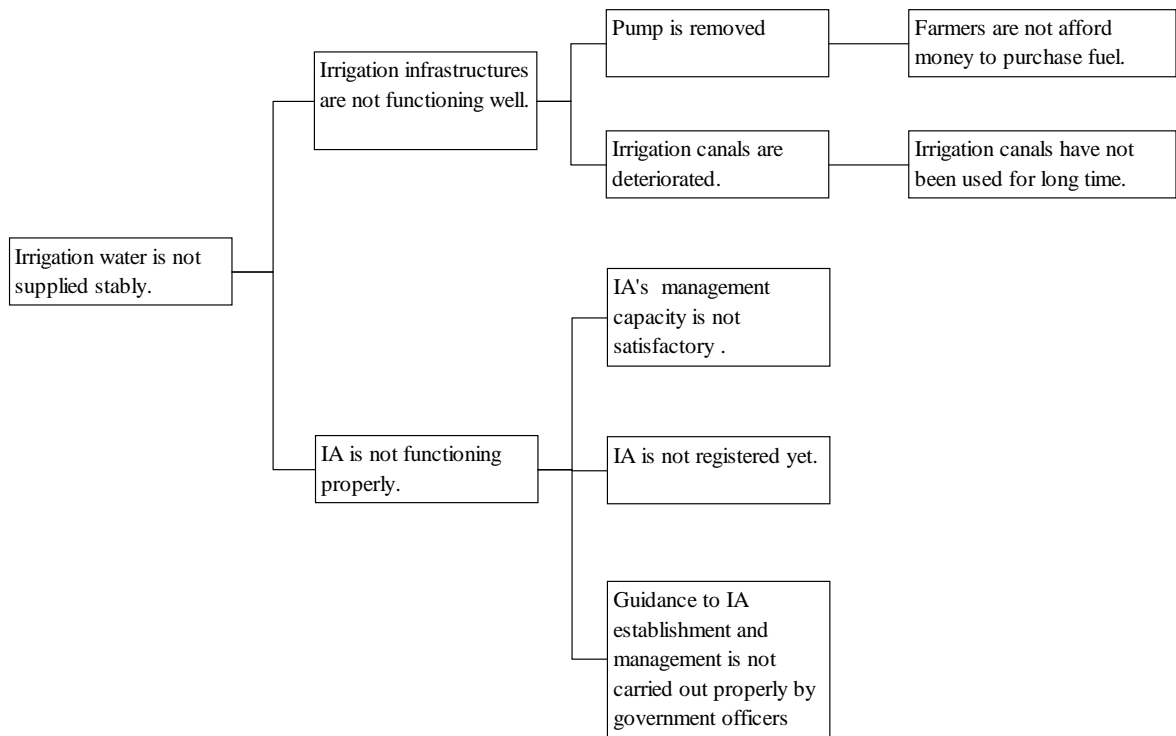
The farmers explained that labour contribution to construction work including materials collection were possible.

10.4.3 Previous farmers' participation in planning and implementation

The Nkenge Irrigation Scheme (32 ha) was constructed by the Government/ CEBEMO (Dutch Catholic Organization) without any involvement of farmers. Even in operation and maintenance and also water management, farmers said no involvement was at all. Such Government-oriented approach leads to passive attitude in scheme management of farmers.

10.5 Problem Analysis

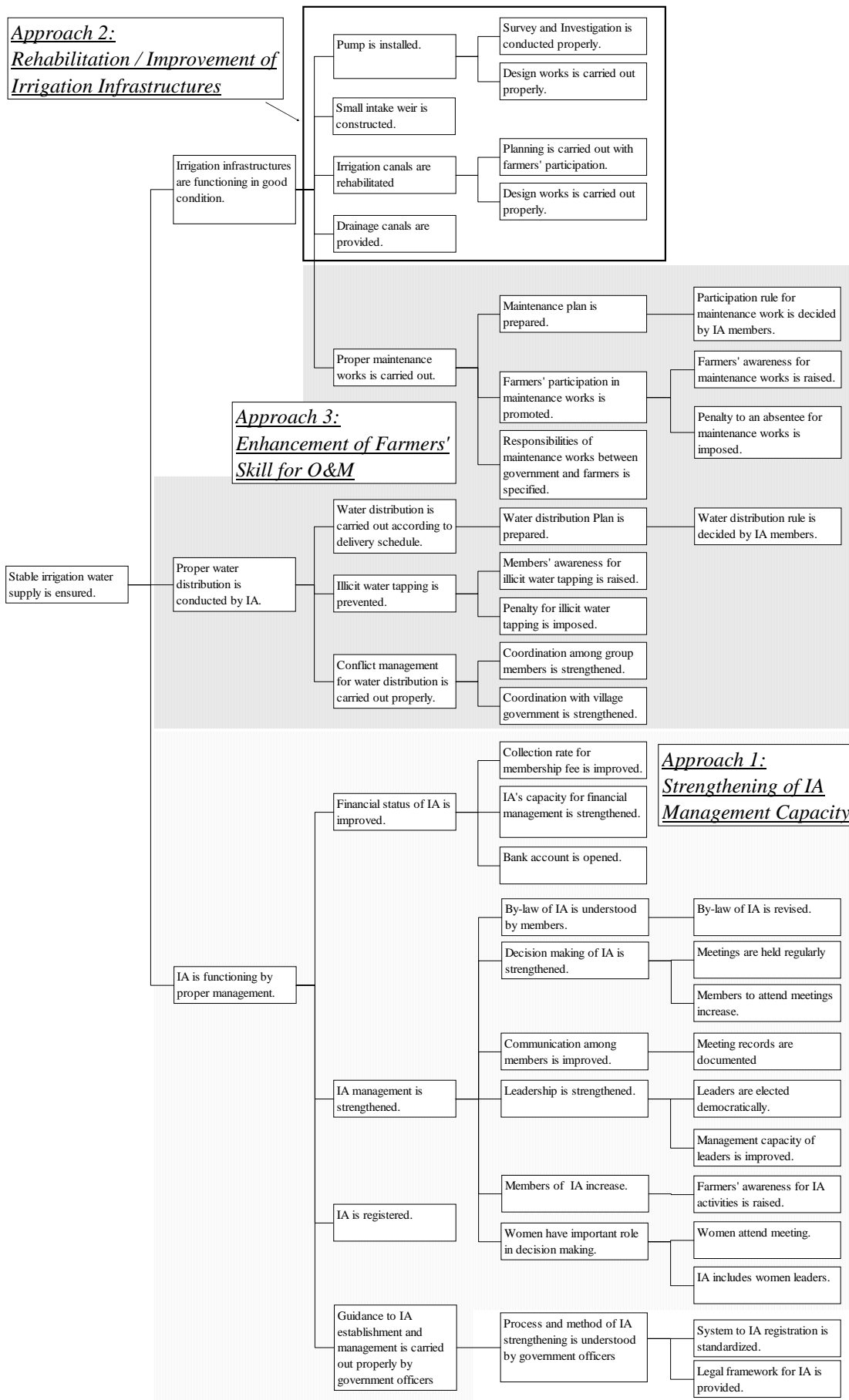
Problem analysis of Nkenge Irrigation Scheme is shown below.



Nkenge Irrigation Scheme - Problem Tree

10.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Nkenge Irrigation Scheme - Objective Tree

CHAPTER 11 LUCHILI-NYAKASUNGWA IRRIGATION SCHEME

11.1 Institution

When the pump irrigation started in 1976, an unregistered IA consisting of 18 members was organized and then the present number of members reaches 62 (male 42 and female 20). However, the irrigation has stopped since 1993 when the District Government terminated bearing the cost of pump operation and maintenance. Since then, the activities of the IA became stagnant. The members of the IA only clean the canals regularly to prepare for resuming the irrigation. In 2001 the IA modernized and reformed the organization under the guidance of the DALDO in order to register it as association in the near future. The reformed executive committee consists of 4 members: a chairperson, a secretary, an assistant secretary, and a treasurer. Previously there were only two leaders, a chairperson and a secretary selected by consensus of the members, in the committee. There are no subcommittees.

The general meeting is held only according to needs and the other meetings are not held at present. The issues discussed cover canal cleaning, security of pumps, pipes and other stored materials against theft and etc. Presently a watchman of the pump house is hired by the District Government.

The bylaw and regulations were established from the beginning in 1976. However, the members don't understand them well. The landowners (62 people) in the scheme area are only eligible to the membership. They collect the registration fee, Tsh. 2,000 but no membership fee. Only 30 from 62 members have paid the registration fee. Besides, they collect expenses of special activities according to needs, such as entertainment expenses for guests. They don't have a bank account. As for training, one farmer attended the training program of paddy production held at Sokoine University in Morogoro in 2002. However, they have had generally only few opportunities for technical training so far. Their priority fields of training are management skill of the IA, paddy production and pest management.

The attitude of the farmers toward resuming the irrigation seems rather passive without their own initiative. They don't have a concrete future plan but tend to be dependent on the Government's decision and/or other's technical and financial assistance. More active and firm intention of farmers themselves is necessary and crucial to the successful farmers-oriented irrigation development. Strengthening of farmers' motivation and initiative should be considered further.

11.2 Irrigation and Drainage System

Pump equipment is still operational by continuous care by a pump attendant. However, the pumping system is not in working condition due to damages in several related facilities. Some part of sanction line is missing and sanction point of the line has been hindered by covering of water-grasses. According to the pump attendant, it was difficult to take water due to much lowering of water level of the Lake Victoria during the dry season. Also some part of pressured diversion conduit has been vandalized. Farmers announced lack of fund for purchasing necessary fuel for power of pumps. As about 1,100 m length of the main canal has been damaged, repair work for masonry repairs are required.

Inadequate planning and designing are recognized for the existing irrigation system. Sanction facility should be fixed with concrete structure so as to enable to lift water from Lake Victoria stably. Proper sanction level of the structure should be designed based on accurate data on seasonal water level fluctuation of the Lake Victoria.

For the present pumping system, major energy of lifting source is consumed not for actual lifting water, but for friction losses in delivering water by conduit. If required energy for the pump could be reduced by decreasing the friction losses, it significantly lightens farmers' burden for operation and maintenance.

In order to remove identified problems and constraints, it is essential to prepare reliable agricultural development plan which make the pump operation feasible and to rehabilitate existing irrigation facilities through proper plan and design.

11.3 Water Management, Operation and Maintenance

Because no irrigation has been practiced since 1993, a group discussion with the farmers in RRA was mainly focused on constraints to resume the pump scheme. First, it is important to remark that the farmers can not afford fuel to operate the pump under present rainfed farming. During the previous operation period, the cost required for the operation and maintenance including personnel cost of the pump operator have been borne by the District and farmers have not fully involved in operation and maintenance of the pump except clearing the pump. Even now, in the idling period, the pump operator is still assigned under financial assistance of the District. Special care shall be taken how the farmers can arrange the operation cost, especially in the first cultivation season after rehabilitation works.

Second, farmers pointed out that corruption of the scheme is attributed to poor management of scheme, such as lack of leadership and fuel management capacity,

depending on the District for the scheme management. But asked if the farmers hope to manage the scheme fully independent from the District, they are reluctant to bear the personnel cost even if the operation and maintenance of the scheme is handed over to them. Under this circumstance, especially in pump irrigation schemes, it is essential to review duty and responsibility of operation and maintenance in both the Government and farmers.

The farmers further mentioned some technical constraints of the schemes, consisting of elevation of the suction pipe with less attention to water level of the lake during the dry season, damage of the suction pipe, and damage of lined irrigation canals.

11.4 Other Special Issues

11.4.1 Farmers' expectation to Government for scheme development

The farmers expect the Government the following aspects:

- Rehabilitation of pump and irrigation canals,
- Provision of equipment for expansion of the irrigable area,
- Technical instruction for operation and maintenance of the pump,
- Supply of implements and loan for purchasing them,

11.4.2 Farmers' contribution to development

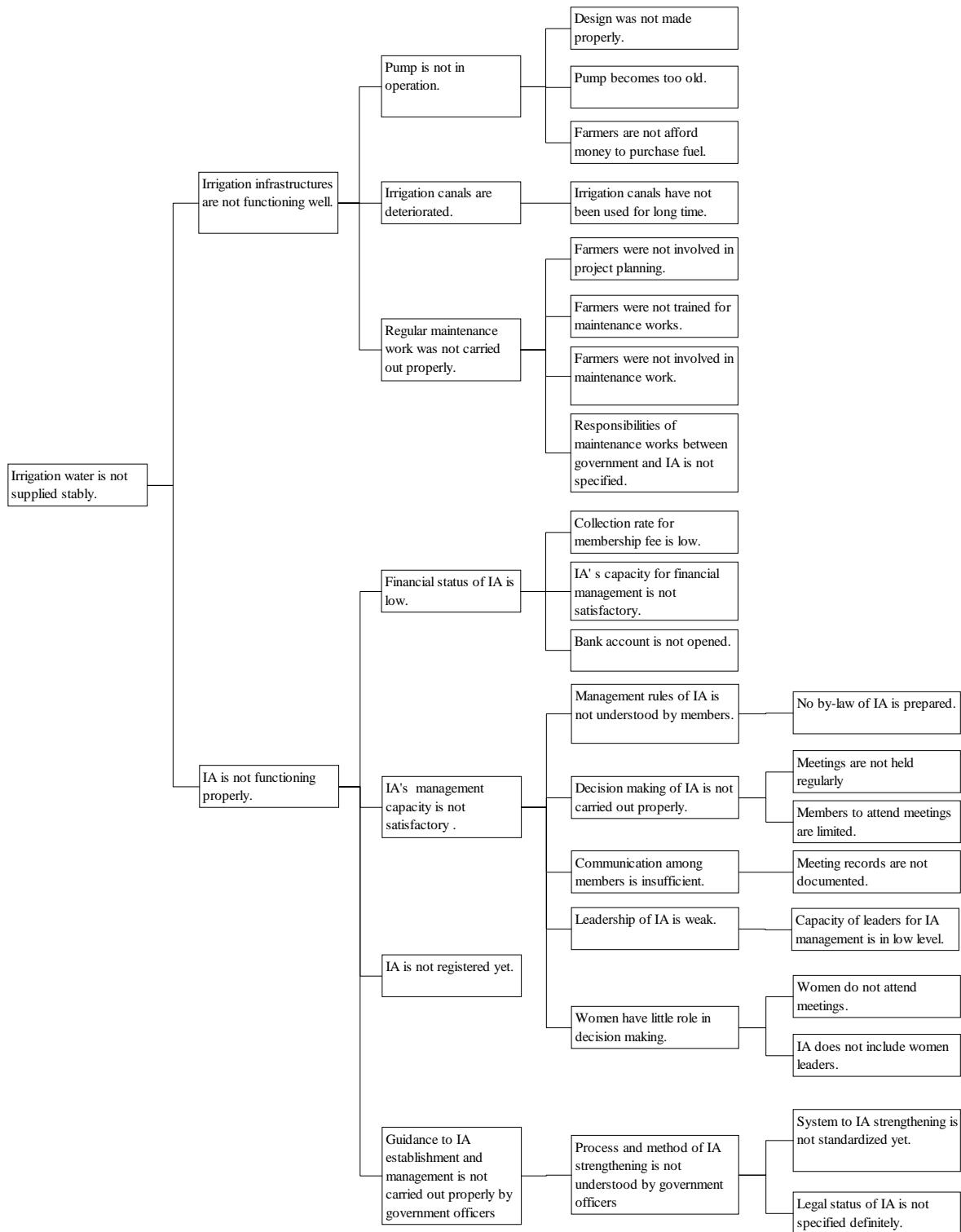
Farmers are ready for contributing labour force to such construction works, as excavation of channels, and collection of sand and stone, adding that they have experienced the contribution to construction of the hospital and school in the village. It is likely that the farmers decided to contribute Tsh. 2000 per member for requesting a technical expert to come to the site and to repair the pump.

11.4.3 Previous farmers' participation in planning and implementation

Farmers stressed that neither farmers' participation and contribution nor consultation by the Government was conducted in the previous project planning and implementation.

11.5 Problem Analysis

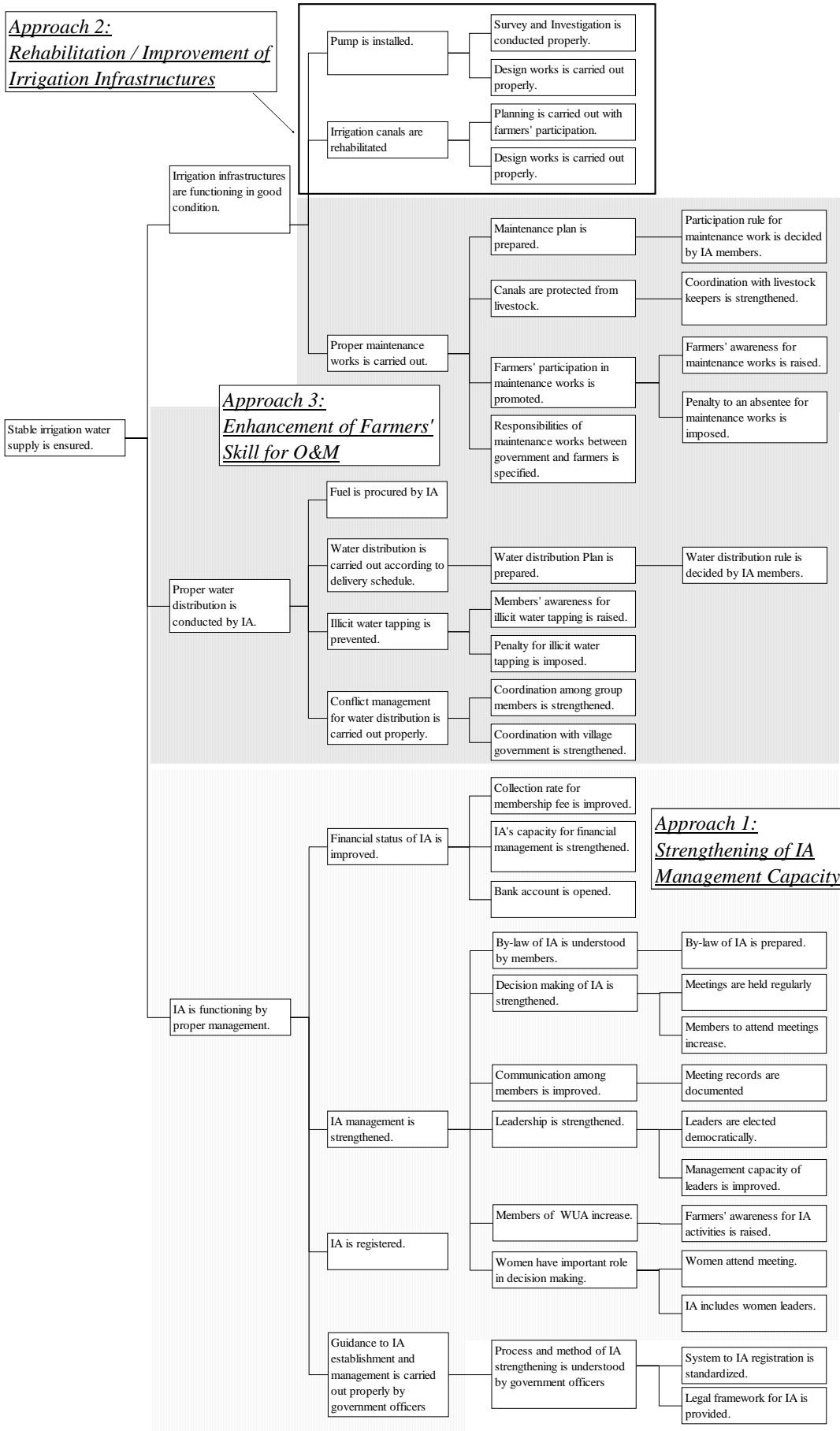
Problem analysis of Luchili - Nyakasungwa Irrigation Scheme is shown below.



Luchili-Nyakasungwa Irrigation Scheme - Problem Tree

11.6 Objective Analysis and Development Approach

Results of objective analysis with three development approaches are indicated below.



Luchili-Nvakasungwa Irrigation Scheme - Objective Tree