

### **3. NKUNJUMO WATER PROJECT**

## CONTENTS

	Page
<b>3.1 Present Conditions</b> -----	2- 46
3.1.1 Administration and Population -----	2- 46
3.1.2 Location, Topography and Meteorological Conditions -----	2- 46
3.1.3 Agriculture -----	2- 46
3.1.4 Social and Farm Economic Conditions -----	2- 47
3.1.5 Irrigation Water Sources and Water Permit -----	2- 48
3.1.6 Irrigation and Drainage -----	2- 48
3.1.7 Farmers' Organizations and Their Activities -----	2- 49
3.1.8 Agricultural Extension Services -----	2- 49
3.1.9 Agriculture and Rural Infrastructure Conditions -----	2- 49
3.1.10 Gender Issues -----	2- 50
3.1.11 Marketing -----	2- 50
3.1.12 Rural Environment and Public Health -----	2- 51
<b>3.2 Present Problems, Constraints and Development Potentials</b> -----	2- 51
<b>3.3 Development Plan</b> -----	2- 53
3.3.1 Objectives and Components of the Project -----	2- 53
3.3.2 Community Capability-Building and Institutional Development Plan -----	2- 54
3.3.3 Agriculture Plan -----	2- 56
3.3.4 Water Sources Development Plan -----	2- 56
3.3.5 Irrigation and Drainage Plan -----	2- 57
3.3.6 Institutional Development Plan for Farmers' Organizations -----	2- 57
3.3.7 Institutional Support System Development Plan -----	2- 58
3.3.8 Marketing Plan -----	2- 58
3.3.9 Physical Plan and Cost Estimate -----	2- 59
3.3.10 Project Implementation and Operation and Maintenance Plan -----	2- 60
3.3.11 Environmental Management Plan -----	2- 61
<b>3.4. Project Evaluation and Cost Recovery</b> -----	2- 62
3.4.1 Economic Evaluation -----	2- 62
3.4.2 Financial Analysis -----	2- 62
3.4.3 Cost Recovery -----	2- 62
<b>3.5. Recommendations</b> -----	2- 62

## LIST OF TABLES AND FIGURES

Table 3.5-1 Required Training Items for Nkunjumo Water Project -----	2- 67
Figure 3.2-1 Relationship between Hard and Soft Aspects to attain Overall Goals -----	2- 52



### 3.1 Present Conditions

#### 3.1.1 Administration and Population

##### 1) Administration and Rural Organization

The administration and social organization of the Project Area can be specified using the standard Kenyan administrative units as shown below;

Province	District	Division	Location	Sub-Location
Eastern	Meru	Abothuguchi Central	Gatimbi	Ngerwe

Nkunjumo Project Area is located in Meru district and covers the villages of Nkunjumo, Nyweri, Kirimene and Mariene.

Government ministries and departments are represented at various administrative levels down to the location and sometimes to sub-location level.

##### 2) Population

Due to the absence of statistical data, population of the Project Area was estimated based on the result of the farm economic survey conducted by the Study Team during the phase-III study. Population in the Area is estimated at 2,200 for total population, 300 for total households and 140 for member households of the Project. Family size in the Project Area is 7.4 persons per household which is larger than the national average of 5.2 persons.

#### 3.1.2 Location, Topography and Meteorological Conditions

The Project Area with a total cultivable area of 160 ha is located at an upper elevation of around 1,600 m with an annual rainfall of more than 1,600 mm. The rainy seasons are comparatively reliable, and the dry season is comparatively short, with an average of 76 mm rain falling between June and September. Rain falls on over 100 days of the year. The 60 percent reliability of rainfall is quite high, with about 600-700 mm in the first rains (March-June) and 700-800 mm in the second rains (October-February). The average maximum temperatures are always below 25°C, and the minimums between 11 and 14 °C. The Area is one of the wetter of the four Project Areas and is moderately cool and humid.

#### 3.1.3 Agriculture

The soils are clays with an acidic humic topsoil, deep and heavy, a mixture of ando-humic Nitisols and humic Andosols. Drainage is usually not a problem. The site has good access to the Nkubu and Meru markets via the tarmac Embu-Meru road.

The main cash crop at the moment is coffee. The main food crops grown are maize and beans, with some bananas and potato. Smaller areas of cabbage, kale, French beans and tomato are also grown for sale. The recommendation for Nkunjumo is to grow a mixture of irrigated coffee, and expand the

production of food crops for both home use and for sale, such as cabbage, French beans, maize and potato. The proposed irrigated area under food crops is 78 percent, under cash crops 71 percent.

According to the farm economic survey the average farm size in the Nkunjumo water project is 1.1 ha. The gross area of the Project Area is 160 ha. The area to be irrigated is 56 ha. The average irrigated area per beneficiary is 0.4 ha.

### **3.1.4 Social and Farm Economic Conditions**

#### **1) Ethnic Groups**

Ethnic groups living in the Project Area are the Meru.

#### **2) Condition of Social Capability**

Community members have a history of pooling resources to assist each other on the basis of neighborhood, family or clan groups for building a house or any other labor-intensive activity. More recently, they have engaged in non-traditional forms of collective action e.g. the cooperative society for collective processing and marketing of coffee as well as in undertaking the present water project.

#### **3) Educational Status of Household Head and Adult Literacy**

Based on the farm economic survey, the ratio of adult literacy in the Area is estimated at 80 percent, which is higher than that of the national average. Most of the household heads, however, graduated only from primary school, followed by secondary school.

#### **4) Agricultural Characteristics**

##### **Farm Labor Availability**

The number of farm labors per family was estimated based on the result of the farm economic survey conducted. The result shows that 4.9 persons per family are engaged in the work for agricultural production. Women perform almost 50.8 percent of farm labor, so their involvement is essential for the success of a small-scale irrigation scheme.

##### **Farm Size and Title Deed**

The average farm size in the Project Area is 1.10 ha which is below the national average of 2.80 ha. This small farm size has affected farm household income and self-sufficiency in food. Farm land is the most important property of farmers. However, ratio of farm households which hold authorized land title deeds is low. According to the farm economic survey, farmers are seeking for early execution of survey of their farmlands by Local Land Control Board, Ministry of Lands & Settlement for the issuance of title deed.

### Self-Sufficiency in Maize

Maize is the main staple food crop for the Kenyan people. It is estimated that consumption of maize is 125.6 kg per capita per year. Self-sufficiency of maize in the Project Area is particularly low at 25 percent. The main reasons of this low self-sufficiency rate of maize are small farm size and frequent water shortage/drought, according to the farm economic survey. Aside from these reasons, current land use is also to be considered. For example, expansion of coffee cultivation will result in shortage of maize production.

### Farm Household's Income and Its Composition

Annual household income is generally affected by land use, climatic conditions and socio-economic conditions such as distance to towns, employment opportunities etc.

- Crop income	: 30,400 (Ksh/family/year)
- Animal income	: 3,200
- Off-farm income	: 12,600
Total	: 46,200

#### **3.1.5 Irrigation Water Sources and Water Permit**

The irrigation water source is the Mariara river. The catchment area above the intake site is only 32 sq.km, but because it is located in the Mount Kenya Forest with high rainfall, water is available throughout the year. There exists one regular gauging station in the immediate downstream of the intake site, and the catchment area is 42 sq.km. The annual mean and low flow are 1.7 and 1.1 cu.m/sec, respectively. The available water at the intake site is estimated by applying observed discharge data at the regular gauging station.

The scheme has the authorized water permit for domestic and irrigation water uses. However, the allocated water for the present scheme is only 2.75 lit/sec. There are 42 projects holding water permits in the upper basin of the scheme with a total amount of authorized water of 0.639 cu.m/sec. There are also 21 water permits in the downstream as far as the junction of the Kathita river with the total amount of 0.05 cu.m/sec.

#### **3.1.6 Irrigation and Drainage**

Total net area of farmland is 160 ha. The irrigated crops are maize, beans and coffee, etc. and the sprinkler irrigation method is adopted at the on-farm level.

The canal system has about five kilometer of PVC pipeline with a diameter of one to six inches and the piped water is distributed to the individual farm household through outlet tab-stands with a diameter of 1/2 inches. As the existing pipeline has a limited capacity and no control valves in the system, the currently irrigated area is only 11 ha along the upper and middle reaches of the existing pipeline. Scheduled irrigation for equal water distribution is not planned, and there is no consensus on water allocation within the members. Consequently, some irrigators whose irrigation area are located at the downstream of the system and higher land are frequently suffered from water shortages.

Hereafter, training of a members on water management as well as the improvement works of canal systems shall be provided for the Project.

Since the Project Area is located on a sloping area, there are no severe drainage problems in the Area.

### 3.1.7 Farmers' Organizations and Their Activities

Farmers organizations and their activities may be summarized as shown below;

Farmers' Organization	Main Activities
1) Cooperative Society	- Processing and marketing of coffee - Procuring and stocking farm in-puts - Giving cash advances to members
2) Water User's Association	- Operating irrigation system - Maintaining the irrigation system
3) Marketing Groups	- Presently absent in the Project Area
4) Women's & Groups	- Assisting each other in buying household utensils improving houses
5) Other Community level organizations (loose associations based on family or clan affinities)	- Providing mutual assistance during financial emergencies .
6) Non-Government Organizations (NGOs): Methodist Church of Kenya (MCK) Diocese of Meru (Catholic Church)	- Providing spiritual service and general advice on family life

Nkunjumo Water Association has been organized in the Project Area to maintain irrigation facilities and to manage group members and bylaws agreed in the group meetings. Organization of committees of WUA are usually composed of chairman, vice-chairman, treasurer, secretary, assistant treasurer, assistant secretary, and in addition to these one water guards are employed to operate water distribution and maintain canals on a daily basis.

### 3.1.8 Agricultural Extension Services

Agricultural extension services are available in the Project Area from the district down to the location level. Others, but limited government extension services, consist of field days given by an out-station of the Coffee Research Foundation, Ruiru.

### 3.1.9 Agriculture and Rural Infrastructure Conditions

Present water supply system is a gravity pipeline system tapping water from Mariara river for irrigation and domestic purposes. Existing system with 4.5 km PVC pipeline is functioning and fairly operated. Domestic water is supplied with house connection and sprinkler irrigation is practiced. The intake weir at Mariara river is a simple concrete structure built on a rock foundation. Major problems in the water supply system are; 1) shortage of water for the expansion of irrigation due to insufficient pipeline capacity, 2) water pressure is not sufficient for sprinkler irrigation at upper reaches, 3) domestic water is not treated, and 4) water storage tanks are required for schools.

Access road is in very good condition, with the B6 National Trunk Road being maintained by MPWH. On the other hand, village/farm roads are in poor condition in many steep sections. Village/farm roads belong to Meru County Council, but road maintenance has been carried out by communities as and whenever needed due to lack of funds for repair work in the local government.

As to other social infrastructure, electric power has not been supplied, nearest public medical facility is Gatimbi health centre, three kilometers from the Project Area, and Nkubu mission hospital is 3.5 km away. There is no primary school in the Project Area, but two primary schools are located on the border of the Project Area. Abothuguchi secondary school and Mukiria Youth Polytechnic are situated in the Project Area.

### **3.1.10 Gender Issues**

While traditionally, women occupied a sub-ordinate status in the community, recent advances in education and employment opportunities (formal and informal) have appreciably improved their status. However differentiation of gender roles is still largely determined by customs and traditions, although somewhat modified as the community increasingly gets involved in the monetary economy. There are, for example, certain tasks (cooking, fetching water and firewood, weeding, harvesting, taking of children and the sick) that tend to be done exclusively by women.

Tradition does not provide for ownership of land by women although they have user rights through connection to husbands or fathers. However, women's empowerment through education and employment in the formal sector has led to some women purchasing land and acquiring an independent right to own land. Women have control and marketing authority for subsistence crops (maize and beans), bananas, sweet potatoes and kales.

### **3.1.11 Marketing**

Based on the field survey and results of workshop seminars of PCM with the participation of beneficial farmers, the present marketing situation in and around the Project Area is presented below;

- Poor marketing arrangement for crops
- Lack of market for produce
- Low prices for produce
- Inadequate market information
- Low quality of agricultural produce
- Lack of alternative buyers for agricultural produce
- Exploitation by middlemen
- Lack of marketing organization
- High transport costs to the market
- Heavy dependence upon coffee cherry production for income-generating
- Frequent buying of pulses and vegetables from outside
- High losses from bad weather conditions
- Lack of knowledge on consumers' or buyers' demand



### 3.1.12 Rural Environment and Public Health

The Project Area has a very steep slope surrounded by valleys of Mariara river and Kangu Stream. Most farmland is divided in long and slender plots, perpendicularly to the river. The source of the Mariara river is Mt. Kenya Forest, though the catchment area covers nearly all the agro-ecological zones.

As for drinking water, 69 percent of households use tap water that is taken from Mariara river without treatment and 31 percent use the river directly in the dry season. In the rainy season, 59 percent use tap water and 32 percent use roof catchment water. The water quality of Mariara river is above standards for BOD, HCO<sub>3</sub> and coliform.

Coffee is grown on terraces on steep farmland and crops for home consumption are grown around houses and near the river. Many farmers are growing trees and Napier grass along the river.

77 percent of farmers use agrochemical, mainly insecticide and fungicide for coffee. It is assumed that some herbicides are used including Atrazine and Paraquat which are not permitted for agricultural use in the EU. As for the agrochemical use, 19 percent of agrochemical are diluted higher than the recommended levels and 15 percent are used at shorter intervals than recommended.

### 3.2 Present Problems, Constraints and Development Potentials

Present problems and constraints encountered in the Area were analyzed in the following aspects, which have been obtained through fieldwork and relevant workshop seminars with the participation of related government officers, Study Team, NGOs, financial agencies, beneficial farmers, etc;

- Agriculture
  - Insufficient irrigation water
  - High cost of inputs
  - No accessibility to agricultural credit
  - Low crop yields
  - Small farm size
- Marketing
  - Poor bargaining power of farmers
  - Low price of crops
  - Lack of storing/packing facilities
  - Lack of technical skill and knowledge on marketing
  - Poor marketing roads
- Rural Society
  - Poverty/low income
  - Poor rural roads
  - Lack of health clinic facilities
  - Inadequate domestic water supply
- Supporting Services
  - Lack of agricultural extension services
  - Weak farmer's group management services
  - Lack of water management and facility management services

Necessary countermeasures and interventions to attain overall goals in terms of hard and soft aspects are given in Figure 3.2-1, which was obtained after due consideration of present problems and the constraints mentioned above.



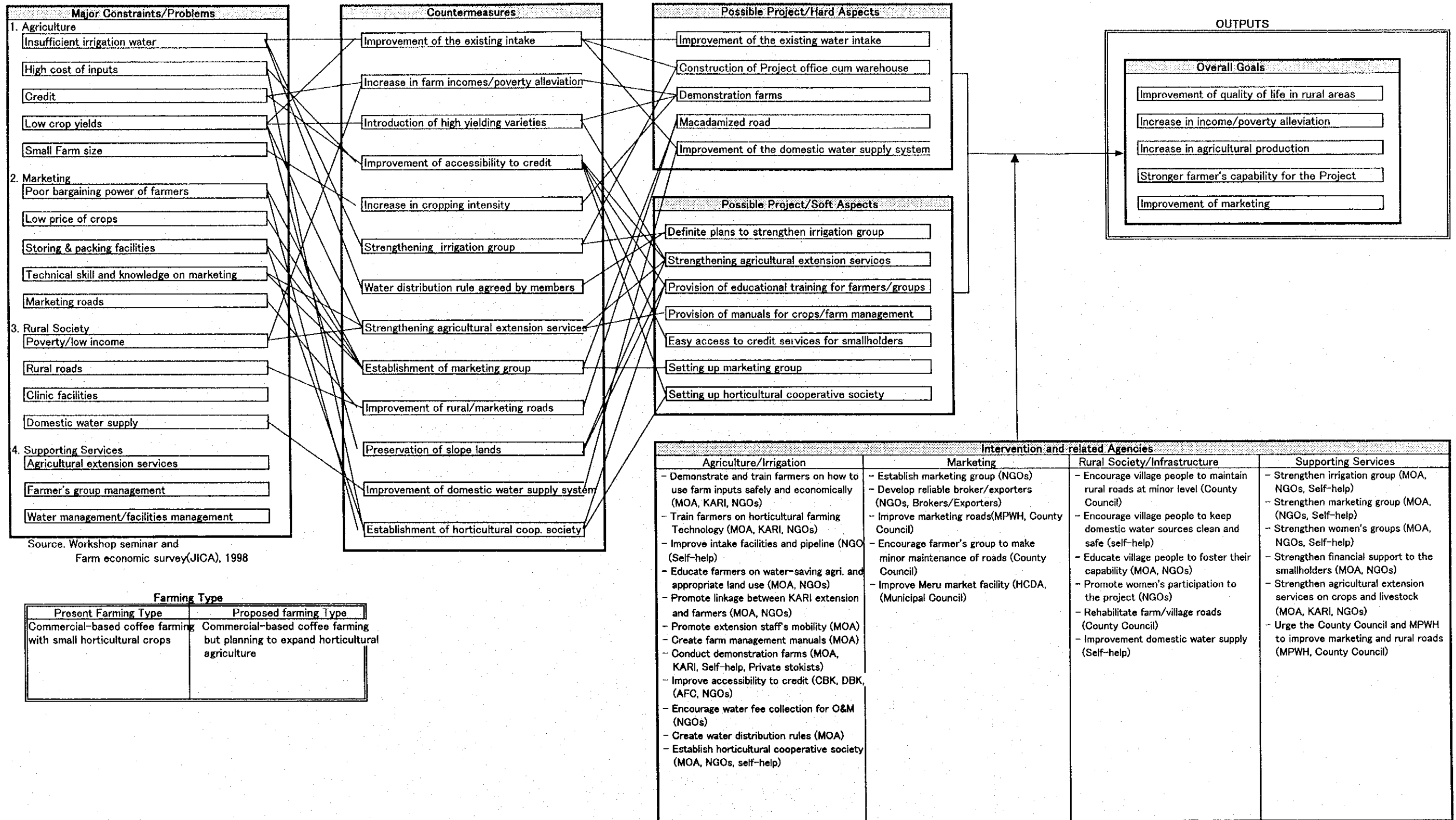


Figure.3.2-1 Relation between Hard and Soft Aspects to attain Overall Goals (Nkunjumo Water Project)



### 3.3 Development Plan

#### 3.3.1 Objectives and Components of the Project

##### 1) Objectives of the Project

Current dominant farming type of the Nkunjumo Water Project, which was classified as Type-D in Model Area selection, is production-oriented commercial-based coffee farming with small-scale horticultural crops. Beneficial farmers are requesting that present farming type will be shifted to commercial-based coffee farming with planning the expansion of horticultural agriculture. This project is the proposed scheme, and categorized into moderate to severe area with relatively hard accessibility to Area from main roads, relatively high construction costs per hectare, a little bit low percentage of horticultural cropping.

Under the situation of the Project Area, development objectives of the Project are presented below in terms of short and medium/long-term objectives;

##### Short-Term Objectives

- To stabilize and raise the rural life of beneficial farmers with introduction of small-scale irrigation system for the proposed irrigation area of 56 ha with provision of new irrigation facilities, improved management of sustainable horticultural farming for a mixture of domestic and export vegetables for both home use and for sale, like cabbage, French beans, maize and potato, and industrial crops farming such as coffee and tea, organization of small-scale farmers of 140 households, and sustainable assistance and support by related government agencies, NGOs, private sectors, etc.,
- To raise self-sufficiency of food farm household in the area by increasing in food production,
- To establish and strengthen farmer's organization, that is, irrigation groups, marketing groups, women's groups, cooperative societies by providing educational training by related government agencies, NGOs, private sectors, etc.,
- To preserve the natural environmental conditions of the Area by determining proper land-use and preventing soil erosion,
- To develop productive lands by improving/providing agricultural infrastructure facilities of small-scale irrigation facilities such as intake facilities, conveyance pipeline with related facilities, and rural infrastructural facilities of 2.5 km of village/farm roads,
- To strengthen productive activities by developing agricultural and institutional support services, such as the provision of necessary post-harvest facilities mainly focusing on coffee production, implementation of training to farmers, strengthening of extension services to farmers' group, cooperative organization, introduction of farmers' capability building program, etc., and
- To improve the rural environmental and health conditions of the Area by providing rural water supply,

### Medium/Long-Term Objectives

- To alleviate poverty and improve welfare conditions of smallholder beneficiaries by raising living standard and giving them opportunities to increase their income through the irrigated agriculture focusing mainly on coffee and horticultural crops as well as improving and/or providing the necessary agricultural infrastructures and services,
- To raise farmer's capability to manage rural society by providing continuous educational training, and
- To provide Gakoromone wholesale market facilities in Meru town to promote trading activities of horticultural crops, grains and pulses of Meru produce, to improve current exploiting transaction modes between small-scale farmers and middlemen, and to create collection/dissemination system of timely market information in trading volume by crop and trading prices.

### 2) Component of the Project

The project components for the smallholder irrigation schemes in the Project are planned as follows;

- Formulation of irrigated horticultural development plan such as land-use, crop selection, and development of animal husbandry, considering the conditions of steep sloping area in topography, well-drained clay loam in soil type, and relative high rainfall,
- Establishment/strengthening of farmers' organization and promotion of agricultural support services,
- Environmental considerations,
- Development of agricultural and rural infrastructures,
- Development of post-harvest and agro-industry facilities,
- Social capability building and institutional strengthening program.
- Improvement of market facilities, and,
- Monitoring and Evaluation of the project.

### **3.3.2 Community Capability-Building and Institutional Development Plan**

#### 1) Community Capability Building Plan

##### General Social Preparation Plan

At the beginning of the project cycle, a PRA workshop for the local community will be conducted with the aim of establishing a sense of community identity and increased awareness about its strength and potential.

## Capability-Building Plan for Farmers' Organization

Type of Farmer's Organization	Proposed Development Plan
Water Users' Association (WUA)	<ul style="list-style-type: none"> <li>- Educate WUA members on requirements and implications of irrigation</li> <li>- Facilitate the community in reviewing and updating the PDM</li> <li>- Train committee members on organization, general and financial management</li> </ul>
Cooperative Society	<ul style="list-style-type: none"> <li>- Indirect strengthening of cooperative society through training of WUA since the two organizations have common membership</li> <li>- Joint meeting of Cooperative and WUA committees to agree on implications of increased irrigated horticultural production</li> <li>- Promote linkage with WUA and Production/Marketing groups</li> </ul>
Women's Groups	<ul style="list-style-type: none"> <li>- Train on proposed irrigation development including review of PDM</li> <li>- Train in organization, general and financial management</li> <li>- Invite and involve women groups in reviewing technical irrigation design (engineering and agronomic) particularly from viewpoints of labor and irrigation benefits as well as their perceived role and preferences</li> </ul>
Production/Marketing Groups	<ul style="list-style-type: none"> <li>- Promote neighborhood production/ marketing groups</li> <li>- Train in organization, general management, agricultural marketing, accounting, and financial management</li> <li>- Train in sourcing and collation of market information</li> </ul>

### 2) Development and Capability-Building of Local NGOs

To enhance the capability of the two church NGOs in providing support services to the project community their staff will be trained in the following areas;

- Community organization techniques
- PRA approaches
- Leadership and management
- Credit administration
- Financial management and accounting procedures

### 3) Tapping Services of Other Agencies in Undertaking Social Preparation

It is planned to encourage a coordinated approach between the MOA and the Ministry of Culture and Social Services during the initial social preparation workshop as well as in establishing and strengthening existing farmers' organizations.

### 4) Establishment of Institutional Mechanism for Social Preparation

IDB will deploy and train a staff member in PRA and PDM techniques both on the job and through attendance of a short PRA course at Egerton University. He will then facilitate social preparation session in IDB supported irrigation schemes including Nkuunjumo scheme.

### 5) Strengthening of IDB Field Offices

It is proposed that staff of IDB field offices (at district and divisional level) will be strengthened by training them in community organization and participatory extension approaches.

## 6) Institutional Strengthening of District Agricultural Offices

With a view to institutionalizing contribution of these specialists, it is planned that relevant specialists at the DAO's office incorporate follow-up support services to the project in their respective operational work plans.

## 7) Equipment and Facility Support

To facilitate the work of IDB field staff at the district level, it is proposed that they will be provided with equipment support.

## 8) Partnership with the Business Community

It is anticipated that partnership links will be developed between the various institutions operating at the project level and the business community as summarized below;

Project Institution	MOA	WUA	Co-op	Marketing Group
Likely Business Partner	- Horticultural Exporters - Farm input Distributors - Local input stockists	- Banks - Credit institutions - Contractors	- Banks - Input-distributors	- Horticultural exporters - Banks - Local input stockists

## 9) Implementation of Capability-Building Training Workshops

As part of capability-building efforts, training workshops will be implemented within three years from the commencement of Project implementation.

### 3.3.3 Agriculture Plan

#### 1) Policy for Proposed Agricultural Farming

The recommendation for agricultural farming for Nkunjomo Area is to grow a mixture of domestic and export vegetables for both home consumption and for sale, like cabbage, French beans, maize and potato.

#### 2) Training and Demonstration for Crop Farming and Farming Techniques

The main interventions proposed are training, trials and demonstrations focused on increasing the production from the coffee crop, and testing drip irrigation techniques, plus the development of a small area of food crops for sale on the domestic market.

### 3.3.4 Water Sources Development Plan

The available water sources for the Area are run-off water of the Mariara river. The minimum



amount of available water at the intake site is estimated at 0.179 cu.m/sec based on the available discharge data and authorized water permits in the immediate downstream of the intake site.

The maximum irrigation requirement for the requested irrigation area of 56 ha by the WUA is roughly estimated at 0.073 cu.m/sec without considering the cropping pattern to be introduced for the Project. As the available river water at the intake site exceeds the maximum irrigation requirement, an area of 56 ha is irrigable. Thus, it is planned that the required water for the Project will be diverted through the existing intake facilities.

### 3.3.5 Irrigation and Drainage Plan

The projected water use consist of irrigation, domestic and institutional water. The irrigation water demand is estimated for the proposed irrigation area of 56 ha mentioned above, and the domestic and institutional water for secondary school and polytechnics are estimated based on the demand of year of 2018.

The introduced crops for the Project, maize, beans, coffee, bananas, cabbage, French beans, onion etc. are selected considering the various factors which are dominant in and around the Project Area. Since the present water application of on-farm level is executed by sprinkler system, sprinkler irrigation is proposed for the Project, and as a working time for irrigation, 12 hours operation per day and six working days per week are proposed.

The estimated maximum water requirements based on the proposed cropping pattern are 67.5 lit/sec. The irrigation interval is estimated at seven days considering the crops to be introduced, soil texture and TRAM values, etc.

The demand for domestic water and institutional water is estimated at 5.6 lit/sec.

Regarding the water management method, water distribution system by a single rotation block will be unrealistic, because all beneficiaries take domestic water through their own outlet taps every day. Therefore, a water distribution system with plural rotation blocks is proposed.

### 3.3.6 Institutional Development Plan for Farmers' Organizations

Type of Farmers' Organization	Development Plan
Water Users' Association	<ul style="list-style-type: none"> <li>- Educating WUA members on irrigation implications using PRA approaches</li> <li>- Training management committee on financial and general management: water charges, financial accounting, planning for operation and maintenance, budget preparation, management and organization principles.</li> <li>- Promoting linkages with other institutions such as MOA, Department of Water Development, Cooperative Society, local NGO as well as the private sector with a view to obtaining relevant support services.</li> </ul>
Cooperative Society	<ul style="list-style-type: none"> <li>- Joint workshop between the cooperative society and WUA committees aimed at exploring areas of co-operation</li> <li>- Training management committee in operational cost management, improved budget control procedures and elementary principles of management .</li> <li>- Strengthening of linkages with MOA, Ministry of Cooperative Development, farm-in-put suppliers and banks</li> </ul>

Type of Farmers' Organization	Development Plan
Marketing Group	<ul style="list-style-type: none"> <li>- Promoting marketing groups and training of prospective members on registration requirements and procedures</li> <li>- Training group members in financial and general management matters including produce documentation, accounting procedures, banking and management principles.</li> <li>- Forming linkages with WUA, MOA, HCDA, local NGOs, banks, producer buyers as well as local input suppliers.</li> </ul>
Women's Group	<ul style="list-style-type: none"> <li>- Convening workshop for existing women groups where members will identify women concerns, needs and priorities</li> <li>- Facilitating review of the proposed irrigation project from women perspective and identify opportunities for women-specific benefits</li> <li>- Training women groups in financial record keeping, planning, banking, as well as well as general management principles.</li> <li>- Encouraging linkages with MOA, HCDA, local NGOs, produce buyers, input suppliers as well as banks.</li> </ul>
Other Groups	<ul style="list-style-type: none"> <li>- Encouraging them to upgrade into production/marketing groups</li> </ul>

### 3.3.7 Institutional Supporting System Development Plan

Staff of various agencies will be trained with the aim of enhancing their ability to strengthen farmers' organizations. Such training will include; community organization, participatory approaches, management and organization principles.

### 3.3.8 Marketing Plan

In order to improve the marketing situation in the Area, the following interventions and activities are proposed through careful analysis of present problems in marketing aspects.

#### Proposed Interventions and Activities for Marketing Plan

Problems/Constraints	Interventions/Activities	Agency/Operation Body Concerned	Outputs
[1] Poor marketing arrangement for crops [2] Lack of market for produce [3] Low prices for produce		Included in the ways below	
[3-1] Inadequate market information	<ul style="list-style-type: none"> <li>- Provision of market price information at Gakoromone wholesale market for local consumed produce</li> <li>- Provision of market price information of auction at Gakoromone wholesale market for local consumed produce</li> <li>- Seminar on trends in foreign markets</li> </ul>	<ul style="list-style-type: none"> <li>- Farm inputs/ marketing officer of DAO-Meru</li> <li>- Marketing expert from HCDA-Meru</li> <li>- Representative of exporters or FPEAK staff</li> </ul>	<ul style="list-style-type: none"> <li>- Better crop planning</li> <li>- Attaining prevailing information</li> <li>- Reducing post-harvest losses</li> <li>- Increasing bargaining power</li> </ul>
[3-2] Low quality of agricultural produce	<ul style="list-style-type: none"> <li>- Seminar on varieties and certified seeds at JKUAT and other institutions managed by the government</li> <li>- Provision of certified seed procurement information</li> </ul>	<ul style="list-style-type: none"> <li>- KARI</li> <li>- Farm inputs/ marketing officer in DAO-Meru</li> <li>- Marketing expert of HCDA-Nkubu</li> </ul>	<ul style="list-style-type: none"> <li>- Better yields and plant protection</li> <li>- Assurance of germination rate</li> </ul>

Problems/Constraints	Interventions/Activities	Agency/Operation Body Concerned	Outputs
	- Seminar on maximum residue levels (MRLs), crop assurance and grading using Export Crop Bulletin at JKUAT and other institutions managed by the government	- Marketing expert of HCDA	- Attaining information of for export green beans, crop assurance and grading - Increasing materials for decision-making in selection of crop
[3-3] Lack of alternative buyers of the agricultural produce	- Seminar on auction consignment at JKUAT and other institutions managed by the government	- Marketing expert of HCDA	- Introduction of auction consignment with HCDA
[3-4] Exploitation by middlemen	- Auctioning services at Nairobi Horticultural Centre for export produce - Auction services at Gakoromone wholesale market for local consumed produce - Following up the marketing groups with provision of information	- HCDA Nkubu Satellite Depot	- Organizing small scale marketing groups
[3-5] Lack of marketing organization	- Seminar on marketing organization through PCM workshop at JKUAT and other institutions managed by the government	- MOA staff on farmers' organization	- Organizing small scale marketing groups
[3-6] High transport costs to the market	- Auction consigning to Nairobi Horticultural Centre for export produce - Auction consigning to Gakoromone wholesale market for local consumed produce - Group loading and transport arrangement for local consumed produce	- Marketing expert of HCDA-Meru & Nkubu  - Marketing groups	- Better trading prices than middlemen. - Cheaper costs than <i>Matatu</i>  - Creating options of market alternatives to consign or sell directly at Gakoromone wholesale market
Heavy dependence upon coffee cherry production for income generation Frequent buying of pulses and vegetables from outside	- Shifting to horticultural production - Lecturing and practice on horticultural production at JKUAT and other institutions managed by the government	- Farmers themselves - MOA staff on horticulture with lectures/technicians	- More stable income than current situation - Saving on food expenses
High losses due to bad weather conditions	- Weather forecasting	- Kenya broadcasting (KBC) - DAO-Meru - Member farmers	- Crop planning to select fluctuating produce such as green maize, beans, cabbage, kale, fresh peas when expecting drought, and red bulb dry onion, carrot and red Irish potato when heavy rain
Lack of knowledge on consumers' or buyers' demands	- Field trip pursuing marketing route; Nairobi markets, exporters' grading & packing facilities, Nairobi Horticultural Centre, Nairobi coffee auction	- MOA staff	- Better understanding of consumers' or buyers' demands and how produce are handled

### 3.3.9 Physical Plan and Cost Estimate

For the water supply system improvement, an additional new pipeline is basically required to supplement the existing one or to be independent for irrigation only. Under such conditions, an alternative study was made in consideration of intake location and pipeline functions between existing and new pipelines. As a result of the study, it is recommended that intake site shall be relocated to upstream of Mariara river and additional pipeline be planned to supplement existing pipeline. The improved water supply system also includes a new intake weir upstream, storage tanks for schools and valve boxes at division point.

As to rural roads, rehabilitation of 2.5 km of village/farm roads is planned with the spot improvement method.

Project costs consist of two categories, i.e. construction cost, and community development and support services cost. Total project costs are estimated at 379.9 million Ksh, of which 6.5 million Ksh will be the repayment cost by farmers. In the total project costs of 379.9 million Ksh, 286.7 million Ksh of rehabilitation/expansion of Gakoromone market facilities in Meru town is included. Annual operation and maintenance (O&M) costs for facilities are 3.0 million Ksh.

### **3.3.10 Project Implementation and Operation and Maintenance Plan**

#### **1) Overall Project Implementation Plan**

An Executive Steering Committee (ESC) under the chairmanship of the Permanent Secretary of MOA and a Technical Working Committee (TWC) shall be established for smooth implementation of the project. Moreover, under TWC, District Project Management Office (DPMO) shall also be organized at the district level.

Project implementation is classified into two categories, i.e. facility construction, and community development and support services. Implementation of community development and support services including social preparation and institutional strengthening shall be rendered by suitable agencies such as consultants and NGOs. Facility construction shall be implemented through labor intensive methods on a contract basis with local contractors under the supervision of DPMO. Self-help projects such as water supply system improvement whose costs are borne by WUA under the cost recovery concept are supervised by NGOs. On the other hand, public projects such as roads improvement to be financed by the government are carried out by Consultants under the direction of District Road Engineer (DRE). The community initiative to carry out the implementation shall always be considered particularly for the self-help projects.

The total implementation period is assumed to be seven years, considering that social preparation and fund procurement for self-help projects are critical factors on implementation.

Executing agencies/bodies for the operation and maintenance of facilities are MPWH for access roads, Meru Municipal Council for marketing facilities, Nkunjumo Water Association for water supply facilities and village communities for village/farm roads.

#### **2) Capability-Building Implementation Plan**

Capability-build-up services during project implementation will be conducted by various agencies as shown below;

Project Stage	Agency	Type of Capability-Build-up Service
1. Project Planning	a) MOA/IDB	- Social preparation of project community - Facilitation of WUA planning sessions (activities, subactivities)
	b) MOA/DAO	- Acting as resource persons during social preparation sessions
	c) Local NGOs	- Acting as resource persons during social preparation sessions
2. Project Design	a) MOA/IDB	- Facilitating WUA design review sessions (availing design model, explaining design criteria and expected mode of operation of design elements) - Actively seeking women's input into the design
	b) MWR	- Awarding and securing water rights for WUA
	c) Local NGOs	- Acting as resource persons
3. Project Funding	a) MOA/IDB	- Advising on project costing and alternative sources of project funding - Explaining funding conditions and procedures for various funding agencies
	b) Local NGOs	- Training WUA members on group formation for security fund contributions, banking operations, loan funds & loan servicing procedures
	c) MOCSS	- Assisting farmers on harambee organization
	d) Provincial Administration	- Facilitating harambee organization by issuing licenses
4. Project Construction	a) MOA/IDB	- Advising WUA on criteria for tender assessment and contractor selection, required supervision and quality control aspects of construction activities
	b) Local NGOs	- Training WUA committee on contractor payment procedures
5. Project (O&M)	a) MOA/IDB	- Facilitating and acting as resource persons during O&M sessions
	b) MOA/DAO	- Acting as resource persons during O&M sessions

Related agencies for providing support services after Project implementation are as follows:

Agency	Type of Support Services
KARI	- On-farm horticultural research aimed at solving problems relating to low crop yields, crop pests and diseases and lack of appropriate crop introductions.
MOA	- Planning, executing and monitoring extension services and paying special attention to production/market groups as well as women's groups - Facilitating a one-day annual review of irrigation project performance by farmers and other stake holders. - Strengthening artisan and entrepreneurial skills that will be needed during the operation and maintenance phase - Fostering farmers capability by awarding prizes every year to the best three irrigated horticultural farmers within the project
Local NGOs	- Giving support in planning courses of action on other problems facing the community.

### 3.3.11 Environmental Management Plan

Extension service and farmers' training by MOA shall include the encouragement of soil and water conservation activities, the risk and appropriate use of agrochemicals.

The water source of Mariara river is in Mt. Kenya Forest Reserve. Therefore, the management of Mt. Kenya Forest shall be strengthened by the Forestry Department to prevent illegal logging.

### 3.4 Project Evaluation and Cost Recovery

#### 3.4.1 Economic Evaluation

The Project was evaluated from the national economic point of view by using EIRR as an index. EIRR of Nkunjumo Project is estimated at 5.9 percent which is below the national standardized EIRR of eight percent for agricultural project. Although mapping costs are not included in the project costs because JICA Study Team made it, if included it, EIRR is 5.8 percent.

#### 3.4.2 Financial Analysis

Financial analysis for the typical farms was made to compare their farm economy in the case of with-project and without-project. Farm income including animal income and off-farm income will increase, when compared to the without-project cases. Farm income in this Area is estimated as follows;

- Without Project : 56,672 (Ksh/farm/year)
- With Project : 67,932

#### 3.4.3 Cost Recovery

Amortizing conditions for the small-scale irrigation projects in the Area should be decided based on the results of the financial analysis, rather than based on the present loan conditions. Therefore, cost recovery was studied to justify farmer's ability to repay by adjusting credit conditions such as interest, repayment period and monthly repayment in each case was calculated and then compared with the estimated disposable incomes which were calculated in the financial analysis. Amount of monthly repayment based on the current and recommended loan conditions is shown below;

	<u>Excluding Mapping Costs</u>	<u>Including Mapping Costs</u>
- Monthly repayment under current loan conditions	: 1,325(Ksh/farm/month)	1,480(Ksh/farm/month)
- Monthly repayment under proposed loan condition	: 710	792

### 3.5 Recommendations

#### Agriculture

- a) The current dominant farming type of the Nkunjumo Water Project, which was classified as Type-D in Model Area selection, is the production-oriented commercial-based coffee farming with small-scale horticultural crops. Beneficial farmers have such strong willingness that the present farming type should be shifted to a commercial-based coffee farming with planning of expansion of horticultural agriculture. Therefore, plan of agricultural farming in the Area should be formulated in the direction mentioned above.
- b) The trials and demonstrations will be conducted by the GOK staff in Agricultural Extension and Irrigation Development Department. The recipients will be the smallholders. The trials and

demonstrations will be conducted on farmer's fields. The actual timing will be determined by the nature of the trial, and preparations will have to be made in advance of the planting season. The frequency will be as shown below. The method will be in collaboration between individual farmers and the project.

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Demonstrations	2	2	1	1	1	7
Trials	2	2	2	1	1	8

- c) The training programs on crop cultivation will be conducted by GOK staff and hired professionals from NGOs. They will be given to interested farmers, and will be held in the field, near to the irrigation scheme, in churches, meeting halls etc. for periods of approximately every six months for the first two to two and a half years. These training programs will be linked to the trials and demonstration farms.

The programs will include topics such as selection of new varieties (e.g. maize hybrids) and how their production differs from traditional varieties, water management and irrigation techniques, animal nutrition including the use of urea supplement blocks, etc.

d) Others

- Testing of drip irrigation technology on coffee and other crops,
- Ensuring of access to improved breeds of local chicken,
- Introduction of suitable improved maize varieties,
- Implementation of trials of urea supplement blocks,

Institutional Supporting Services

- a) The District Irrigation Unit at Meru liaises with IDB, Nairobi in devising a training program specific to Nkunjumo Water Project for social preparation of the community and capability-building of relevant agencies such as Department of Social Services and private sectors.
- b) DPMO should draw a training timetable for social preparation and capability-building of relevant agencies.

Irrigation and Drainage

- a) The pipeline systems provided for the Project area will be facilitated for the purpose of domestic water supply, institutional water supply as well as irrigation water supply. As all beneficiaries take domestic water through their own outlet taps every day, it is recommended that irrigation water shall be irrigated through plural rotation blocks. The WUA shall decide the area and location of proposed farmland to determine the design capacity of the irrigation canal before the commencement of detailed design study.
- b) In order to realize effective water management, a water management manual shall be prepared by the employed consultants. As to the content of the manual, the following items as well as general techniques of water management shall be included, and the training of members of the WUA shall be

provided before the commencement of actual irrigation.

- Adaptive organization for water management (general water management method for total system, organization of irrigation group)
- Water operation rule (method of distribution of domestic and irrigation water, observance of standard cropping pattern, operating rules of control valves, formulation of penalty)
- Water distribution method within the irrigation group (irrigation turn, irrigable area)
- Irrigation method (performance of commonly used sprinklers, unit irrigation area and water application time)
- Irrigation schedule

c) It is recommended to renew existing water permit.

### Marketing

- a) Discussion and formulation of farmers' marketing groups,
- b) Diversification of Planting crops from coffee monoculture,
- c) Auction participation at Gakoromone wholesale market for local consumed produce and auction participation in connection with Nkubu satellite depot for export produce as one of marketing alternatives,
- d) Practical utilization on social and natural resources for marketing advantages of; i) closer distance to Gakoromone wholesale market and Nkubu market, ii) geographical advantage of Gakoromone wholesale market, iii) Motivation of horticultural farming for income generation of farmers, iv) close proximity to Nkubu satellite depot,
- e) Participation to related seminars for smallholders held at Jomo Kenyatta University of Agriculture and Technology (JKUAT) and other institutions managed by the government,

### Agricultural and Social Infrastructure

- a) Basic plan for the water-supply system improvement shall be finalized based on feasibility study results through workshop meetings to be held with association members before commencement of the detailed design.

### Project Implementation

- a) Main implementation agency of the Project is MOA, however, close cooperation and adjustment of work demarcation should be made among related government agencies such as MPWH, MWR, MEC, etc., since the Project involves many project components which are related to each other.
- b) For the construction work of the self-help projects, detailed work allocation and responsibilities as shown below among Contractors, WUA and NGOs, which are directly related to the construction costs, shall be clearly presented to WUA in the detailed design stage;
  - Contents of work to be contributed by WUA in the form of labor,
  - Responsibility of procurement and management of materials, equipment and skilled labors, and



- Responsibility of work quality and schedule.

- c) In the course of project implementation, farmers/farmers representatives should make reference to the on-going activities of classified Type-A smallholder irrigation schemes such as Ciambarage Irrigation Scheme in Tharaka Nithi and Muguna Water Project in Meru district for their horticultural development.
- d) For the planning of irrigated horticultural development for each Model Area, the Study Team prepared a topographical map with a scale of 1:5,000 utilizing aerial photographs and ground survey methods at costs of about 669 thousand Ksh per site (average size is 276 ha). These topographical maps are deemed to be essential and useful not only for carrying out physical planning of irrigation and drainage facilities in the Area, but also encouragement of farmers' participation in the project with their awareness of common ownership for community resources.

In the project evaluation, the required costs for preparation of the topographical maps mentioned above were not counted because the Study Team shoulders the burden of the costs. However, when other projects are planned, such topographical maps with scale of 1:5,000 should be prepared and these required costs should be assumed by beneficiary groups themselves.

#### Environment

- a) It is necessary to avoid the use of herbicides as far as possible, as their use will have a negative influence on soil and rivers, and will destroy a valuable resource for manure. MOA should prohibit the sale of herbicides that are prohibited for use in the EU and collect them from agencies and coffee societies.
- b) Promotion of horticulture crops should be limited to the gentle slopes part of farmland. On the other hand, improvement of coffee growing techniques and the management of coffee societies, and the possibility of fruit-tree growing, etc. should be examined in the steep slopes of the Area.
- c) From viewpoint of rural environment, MOA should support horticulture as well as livestock raising, production of feed and manure synthetically. Extension officers of the MOA should improve the know-how of agriculture and livestock raising. Further, it is important to approach the plan in combination with other projects executed or being executed by other donors.

#### Project Economy and Farm Budget

- a) Preparation is recommended for detailed project plans of the proposed small-scale irrigation schemes that MOA should undertake as well as a careful appraisal of project plans to be proposed by the community's concerned, placing emphasis on the appropriateness of the technology designed for irrigation systems and the accuracy of the cost estimate to be based on least-cost approaches.

In almost all the small-scale irrigation projects, many farmers are being confronted with difficulty in loan repayment. This holds true even for the farmers of Ciambaraga Irrigation Schemes in Tharaka Nithi district, one of the well-managed projects among the 463 reviewed. Accurate cost estimates are

important, since the cost is a crucial element in determining the financial and economic viability of the project and also for planning its funding.

- b) It is recommended that prior to the implementation of the project, a farm budget analysis of the representative farms should be conducted, through detailed farm surveys, with the primary objective of providing a basis for an assessment of the investment plans and debt repayment capacities of the farmers.

The farm budget analysis also provides a basis for setting repayment terms and conditions for credit that will be enough to encourage the farmers to participate in the project and make sure that they would have sufficient cash to repay the loans. The ability of the farmers to pay is an instrument for promoting sustainability.

- c) It is recommended that intensive support should be given to the farmers participating in the project until they have attained the full production target, since it may take several years to reach. To this end, the district governments should establish the District Project Management Office (DPMO), responsible for providing supporting services to the farmers, as proposed in this study.

The proposed DPMO shall formulate support services programs in close coordination with HCDA, FPEAK, DAO and NGOs as agricultural development could be realized only with the full cooperation of the agricultural services agencies, as well as the cooperation of the private entities concerned.

#### Monitoring of the Project

- a) Monitoring work for the progress of project implementation should be carried out by external agencies under the supervision of Executive Steering Committee (ECS), to cope with the following purposes;
- To obtain and judge how many goals and targets initially formulated under the Project are attained,
  - To judge whether or not follow-up support is required from the viewpoint of project sustainability under self-help management, and
  - To learn lessons, both positive and negative, from the Project in order to apply them to other project areas for improvement,
- b) Monitoring work shall be conducted on the following items;
- Irrigation system operation
  - Access and village/farm roads maintenance
  - Agricultural aspect
  - Institutional aspect
  - Marketing aspect
  - Farm economy aspect
  - Control of soil erosion and watershed management

Table 3.5-1 indicates the required training items for the implementation of smallholder irrigation schemes in Nkunjumo Water Project.

Table 3.5-1 Required Training Items for Nkunjumo Water Project

	Training Items	Farmers/ Farmers' Group	Implementing Staff
1. Agriculture/Irrigation	- Land use in combination with coffee plantation	•	•
	- Irrigated and rainfed crop farming for both horticulture and food crops	•	•
	- Establishment of cooperative society to purchasing agricultural inputs	•	•
	- Application of farm input	•	•
	- Water saving farming	•	•
	- Water management in pipe-line system	•	•
	- O&M works for pipe-line irrigation facilities	•	•
	- Management of trial and demonstration farms	•	•
	- Monitoring of the project	•	•
	- Development of farm and water management manuals	•	•
	- Maximum residue levels (MRLs) and crop assurance for export crops	•	•
	- Soil erosion control at sloping farms	•	•
	2. Marketing	- Establishment/strengthening of marketing group	•
- Marketing techniques for both horticulture and food crops to brokers/exporters		•	•
- Promotion of contract farming		•	•
- Collection/compilation of market information		•	•
3. Rural Society/Infrastructure	- Capability-building for farmers/farmers' group and implementing staff	•	•
	- Promotion of women's participation to the project	•	•
	- O&M for water source facilities for rural water supply	•	•
	- Construction and O&M of village and farm roads	•	•
4. Support Services	- WUAs' roles and performance	•	•
	- Financial management for cooperative societies	•	•
	- Processing techniques for coffee produce	•	•
	- Access to agricultural credit	•	•
	- Linkages with other institution	•	•
5. Environment	- Soil erosion control at sloping farms	•	•
	- Watershed Management and water conservation	•	•
	- Promotion of improved cooking stove	•	•

#### **4. RUUNGU/KAROCHO IRRIGATION PROJECT**

## CONTENTS

	Page
<b>4.1. Present Conditions</b> .....	2- 68
4.1.1 Administration and Population .....	2- 68
4.1.2 Location, Topography and Meteorological Conditions .....	2- 68
4.1.3 Agriculture .....	2- 68
4.1.4 Social and Farm Economic Conditions .....	2- 69
4.1.5 Irrigation Water Sources and Water Permit .....	2- 70
4.1.6 Irrigation and Drainage .....	2- 70
4.1.7 Farmers' Organizations and Their Activities .....	2- 71
4.1.8 Agricultural Extension Services .....	2- 71
4.1.9 Agriculture and Rural Infrastructure Conditions .....	2- 71
4.1.10 Gender Issues .....	2- 72
4.1.11 Marketing .....	2- 72
4.1.12 Rural Environment and Public Health .....	2- 72
<b>4.2 Present Problems, Constraints and Development Potentials</b> .....	2- 73
<b>4.3 Development Plan</b> .....	2- 73
4.3.1 Objectives and Components of the Project .....	2- 73
4.3.2 Community Capability-Building and Institutional Development Plan .....	2- 76
4.3.3 Agriculture Plan .....	2- 78
4.3.4 Water Sources Development Plan .....	2- 78
4.3.5 Irrigation and Drainage Plan .....	2- 78
4.3.6 Institutional Development Plan for Farmers' Organizations .....	2- 79
4.3.7 Institutional Support System Development Plan .....	2- 79
4.3.8 Marketing Plan .....	2- 79
4.3.9 Physical Plan and Cost Estimate .....	2- 80
4.3.10 Project Implementation and Operation and Maintenance Plan .....	2- 81
4.3.11 Environmental Management Plan .....	2- 82
<b>4.4 Project Evaluation and Cost Recovery</b> .....	2- 83
4.4.1 Economic Evaluation .....	2- 83
4.4.2 Financial Analysis .....	2- 83
4.4.3 Cost Recovery .....	2- 83
<b>4.5 Recommendations</b> .....	2- 83

## LIST OF TABLES AND FIGURES

Table 4.5-1 Required Training Items for Ruungu/Karocho Irrigation Project .....	2- 89
Figure 4.2-1 Relationship between Hard and Soft Aspects to attain Overall Goals .....	2- 74



## 4.1 Present Conditions

### 4.1.1 Administration and Population

#### 1) Administration and Rural Organization

The administration context of the Project Area can be specified using the standard Kenyan administrative units as shown below;

Province	District	Division	Location	Sub-Location
Eastern	Tharaka	Central Tharaka	Turima	Karocho

Ruungu/Karocho Project Area is located in Tharaka Nithi district and covers the two villages of Ruungu and Karocho.

Government ministries and departments are represented at various administrative levels down to the location and sometimes to sub-location level.

#### 2) Population

Due to the absence of statistical data, population of the project Area was estimated based on the result of the farm economic survey conducted by the Study Team during the phase-III study. Population in the Area is estimated at 2,300 for total population, 300 for total number of households with 164 member households of the Project. Family size in the Project Area is 7.9 persons per household which is larger than the national average of 5.2 persons.

### 4.1.2 Location, Topography and Meteorological Conditions

The Project Area with a total cultivable area of 400 ha is located at a lower elevation of around 600 m above mean sea level with an annual rainfall of less than 900 mm. The rainy seasons are comparatively short, and the dry season is comparatively intense, with an average of 26 mm of rain falling between June and September. Rain falls on about 60 days of the year. The 60 percent reliability of rainfall is quite low, with about 200-250 mm in the first rains (March-May) and 200-250 mm in the second rains (October-December). The average maximum temperatures are always between 30 and 34 °C, and the minimums between 18 to 21 °C. The Area is the hottest and driest of the four Project Areas.

### 4.1.3 Agriculture

The soils have moderate to low fertility, and are clays and sandy clays, with topsoils of loamy clays to sandy clays. Drainage is usually not a problem. The site has poor access to the markets of Marimanti and Mitunguu, via an unpaved road.

Currently, the land in Ruungu is producing dryland crops such as pigeon pea, green gram, cowpea, sorghum and millet, together with erratic and usually low yields of maize. The proposed

emphasis in Ruungu irrigation development is on irrigating food crops, such as maize, green gram, cowpea, and sweet potato, together with the development of a small area of crops for sale, including green gram, tomatoes, onions, tobacco. The proposed area under food crops is 135 percent, and under cash crops 48 percent.

According to the farm economic survey conducted by the Study Team, the average farm size in the Ruungu/Karocho irrigation project is 2.8 ha. The total cultivable area of the Project Area is 400 ha. The area to be irrigated is 68 ha. The average irrigated area per beneficiary is 0.4 ha.

#### **4.1.4 Social and Farm Economic Conditions**

##### **1) Ethnic Groups**

Ethnic groups living in the Project Area are the Tharaka.

##### **2) Condition of Social Capability**

Traditional group action within the community is well entrenched and social groups exist to assist each other on the basis of neighborhood, family or clan groups for building houses or any other labor-intensive activity. More recently, they have engaged in non-traditional forms of collective action in undertaking the present irrigation project.

##### **3) Educational Status of House Head and Adult Literacy**

The results of the farm economic survey show the highest adult literacy of 100percent. Most heads of households, however, only graduated from primary school, followed by secondary school.

##### **4) Agricultural Characteristics**

###### **Farm Labor Availability**

Number of farm laborers per family was estimated based on the result of the farm economic survey conducted. As a result, 4.9 persons per household are engaged in agricultural production work. Women perform 50.5 percent of farm labor, so their involvement is essential for the success of a small-scale irrigation scheme.

###### **Farm Size and Title Deed**

The average farm size in the Project Area is 2.80 ha which is the same as the national average. This small farm size has affected farm household income and self-sufficiency of foods. Farm land is the most important property of farmers, however, ratio of farm households which hold authorized land title deeds is nil in the Project Area. According to the farm economic survey, farmers are seeking early execution of surveys of their farmland by the Local Land Control Board, Ministry of Lands & Settlement for the issuance of title deeds.



### Self-Sufficiency in Maize

Maize is the main staple food crop for the Kenyan people. It is estimated that consumption of maize is 125.6 kg per capita per year. Self-sufficiency in maize in the Project Area is particularly low at 20 percent of the national average. Main reasons for this low self-sufficiency rate of maize are small farm size and frequent water shortages/drought.

### Farm Households' Income and Its Composition

Annual household income is generally affected by land use, climatic conditions and socio-economic conditions such as distance to towns, employment opportunities etc.

- Crop income	: 6,700 (Ksh/family/year)
- Animal income	: 1,500
- Off-farm income	: 11,000
Total	: 19,200

#### **4.1.5 Irrigation Water Sources and Water Permit**

The irrigation water source is the Thingithu river. The catchment area above the intake site is about 220 sq.km, and irrigation water is available throughout year. There exists one regular gauging station downstream from the intake site, and the catchment area is 303 sq.km. The annual mean and low flow are 4.5 and 2.0 cu.m/sec, respectively. The available water at the intake site is estimated by applying observed discharge data at the regular gauging station.

The authorization of water permits belongs to MWR. The Scheme applied the water permit for irrigation to District Water Office of Tharaka Nithi in March of 1996 and the authorization is under processing. However, the recommended water for this Scheme with the proposed irrigation area of 68 ha is only 17.2 lit/sec. There exist 30 projects holding water permit in the upper basin of the Scheme, and the total amount of authorized water is 0.186 cu.m/sec. One water permit exists in the downstream for an amount of 0.002 cu.m/sec.

#### **4.1.6 Irrigation and Drainage**

Total net area of farmland is 400 ha. The major crops planted at present are maize, pigeon pea, sorghum and millet. Currently no significant irrigation is occurring in the area.

The irrigation plan has been established by SISDO in 1995, and it seems to be fairly designed, especially at the point of water management method applying group feeder canal. Outline of the established irrigation plan is shown below;

- Open canal system, obtaining water from the Thingithu river is adopted. The maximum canal length from intake to tail end (C26) is 7.3 km.
- The scheme has 164 members and each member has an irrigation area of 0.4 ha.
- The scheme is divided into 12 rotation blocks, and a group feeder canal to each block is facilitated.
- The proposed irrigation crops are karela, okra, tomatoes, onion, French beans, etc. and

furrow irrigation is adopted with 12 hours daily operation time and seven days irrigation interval.

The farmers in the scheme have no experience of irrigated agriculture. Therefore, training of the members of the WUA on water management shall be provided by the government, NGOs, etc.

Since the Project Area is located on a sloping area, there are no severe drainage problems.

#### 4.1.7 Farmers' Organizations and Their Activities

Farmer organizations and their activities may be summarized as shown below;

Farmers' Organization	Main Activities
1) Cooperative Society	- Does not exist at the moment
2) Water User's Association	- Planning implementation of irrigation system
3) Marketing Groups	- Presently absent in the Project Area
4) Women's Groups	- Assisting each other in buying household utensils
5) Other Community level organizations (loose associations based on family or clan affinities)	- Providing mutual assistance during financial emergencies
6) Non-Government Organizations (NGOs): SISDO	- Providing support service in planning, financing and implementing of irrigation project

Ruungu/Karocho Irrigation Association has been organized in the Project Area to maintain irrigation facilities and to manage group members and bylaws agreed in the group meetings. Organization of committees of WUA is usually composed of chairman, vice-chairman, treasurer, secretary, assistant treasurer, assistant secretary, and in addition to these, one water guards are employed to operate water distribution and maintain canals on a daily basis.

#### 4.1.8 Agricultural Extension Services

Agricultural extension services are available in the Project Area from the district down to the location level.

#### 4.1.9 Agriculture and Rural Infrastructure Conditions

Open canal irrigation system tapping water from Thingithu river with a total length of around 7.4 km is presently under construction. Construction work is totally managed by SISDO (NGO) on a self-help basis with a loan from Cooperative Bank of Kenya. During the construction, however, half of the concrete intake weir at Thingithu river was washed away by floods in late 1997. Since then the construction work has been suspended, but it will start again after all issues have been settled.

Domestic water supply in this semi-arid lowland area is from boreholes which were built under SIDA assistance. There are eight boreholes with handpumps in Ruungu and Karocho areas. Access roads with a total length of 49.7 km from Meru town through C92 Primary Road, E788 Minor Road and unclassified rural road to Ruungu village belong to MPWH and Tharaka Nithi County Council. These access roads are generally in poor condition and they become impassable during

rainy seasons. Village/farm roads are also in the same condition as access roads. Village/farm roads belong to Tharaka Nithi County Council but road maintenance has been carried out by the community at minimum level due to lack of funds in the local government.

As to other social infrastructure, electric power has not been supplied, the nearest public medical facility is Marimante health center, 15 km from the Project Area, and Meru district hospital is 49.7 km away. There are two primary schools in the Project Area, i.e. Ruungu and Karocho primary schools. For secondary school, children have to go to Kiriria (14 km) or Tharaka (17 km) secondary schools.

#### **4.1.10 Gender Issues**

In Ruungu-Karocho Area, where the community holds strongly to traditional attitudes and values, women occupy a rather sub-ordinate position. The most important resource is land, which traditionally is owned and inherited by men with women enjoying only user rights. However, current advances in women's education are expected to improve their status. For the time being, differentiation of gender roles is still largely determined by custom and tradition where certain tasks (cooking, fetching water and firewood, weeding, harvesting, taking care of children and the sick) are expected to be done exclusively by women.

#### **4.1.11 Marketing**

Based on the field survey and results of workshop seminars of PCM with the participation of beneficial farmers, the present marketing problems in and around the Project Area can be summarized as follows;

- Low price for produce
- Low demand for produce grown here from outside markets
- Lack of marketing organization
- Few buyers from outside
- Limited demand in Ruungu
- Lack of countermeasures for drought
- Lack of knowledge on consumers' or buyers' demand

#### **4.1.12 Rural Environment and Public Health**

The area is a dry zone and the droughts caused terrible famines on four occasions between 1960 and now. The catchment area of Thingithu river that is the water source of the Project Area covers nearly all the agro-ecological zones. There are no any forests around the Project Area and farmers collect firewood on their farmland.

As for the drinking water, 96 percent of households use the deep wells and four percent use Thingithu river throughout the year. The water quality of Thingithu river and deep wells are above the standard on BOD, HCO<sub>3</sub> and coliform, and especially one of deep well contains NO<sub>3</sub>, which is above standard.

The dispensary construction projects were carried out in Ruungu and Karocho. However,

Ruungu dispensary was constructed and closed because of lack of funds and Karocho dispensary is at a standstill due to inadequate funds.

The characteristics of farmland in this area is that certain plots are kept fallow for grazing. However, these fallow plots have been changed to crop fields from year to year and the farmers input neither chemical fertilizer nor manure in the farm, so that soil fertility is decreasing.

77 percent of farmers use agro-chemicals, mainly insecticide for cotton. Some farmers use insecticide for cowpeas and green grams.

## **4.2 Present Problems, Constraints and Development Potentials**

Present problems and constraints encountered in the Area were analyzed from the following aspects, which have been obtained through fieldwork and relevant workshop seminars with the participation of related government officers, Study Team, NGOs, financial agencies, beneficial farmers, etc;

- Agriculture
  - Insufficient irrigation water
  - Low crop yield
  - High cost of inputs
  - Low self-sufficiency in maize
  - Small farm size
- Rural Society
  - Poverty/low income
  - Lack of rural roads
  - Lack of health clinic facilities
- Marketing
  - Poor marketing roads
  - Low price for crops
  - Lack of transportation means
  - Long distance to markets
- Support Services
  - Lack of agricultural extension services
  - Lack of farmer's group management services
  - Lack of water management and facility management services

Necessary countermeasures and interventions to attain overall goals in terms of hard and soft aspects are given in Figure 4.2-1, which was obtained after due consideration of the present problems and constraints mentioned above.

## **4.3 Development Plan**

### **4.3.1 Objectives and Components of the Project**

#### **1) Objectives of the Project**

Current dominant farming type of the Ruungu/Karocho Irrigation Project, which was classified as Type-E in Model Area selection, is consumption-oriented farming mainly planting food crops. The beneficial farmers are requesting that present farming type will be shifted to food crop planting for stable food supply accompanied with livestock grazing in the Area. The Area has no irrigated land, although irrigation facilities are under construction. These situations cause poverty with famine occurring in some frequency.



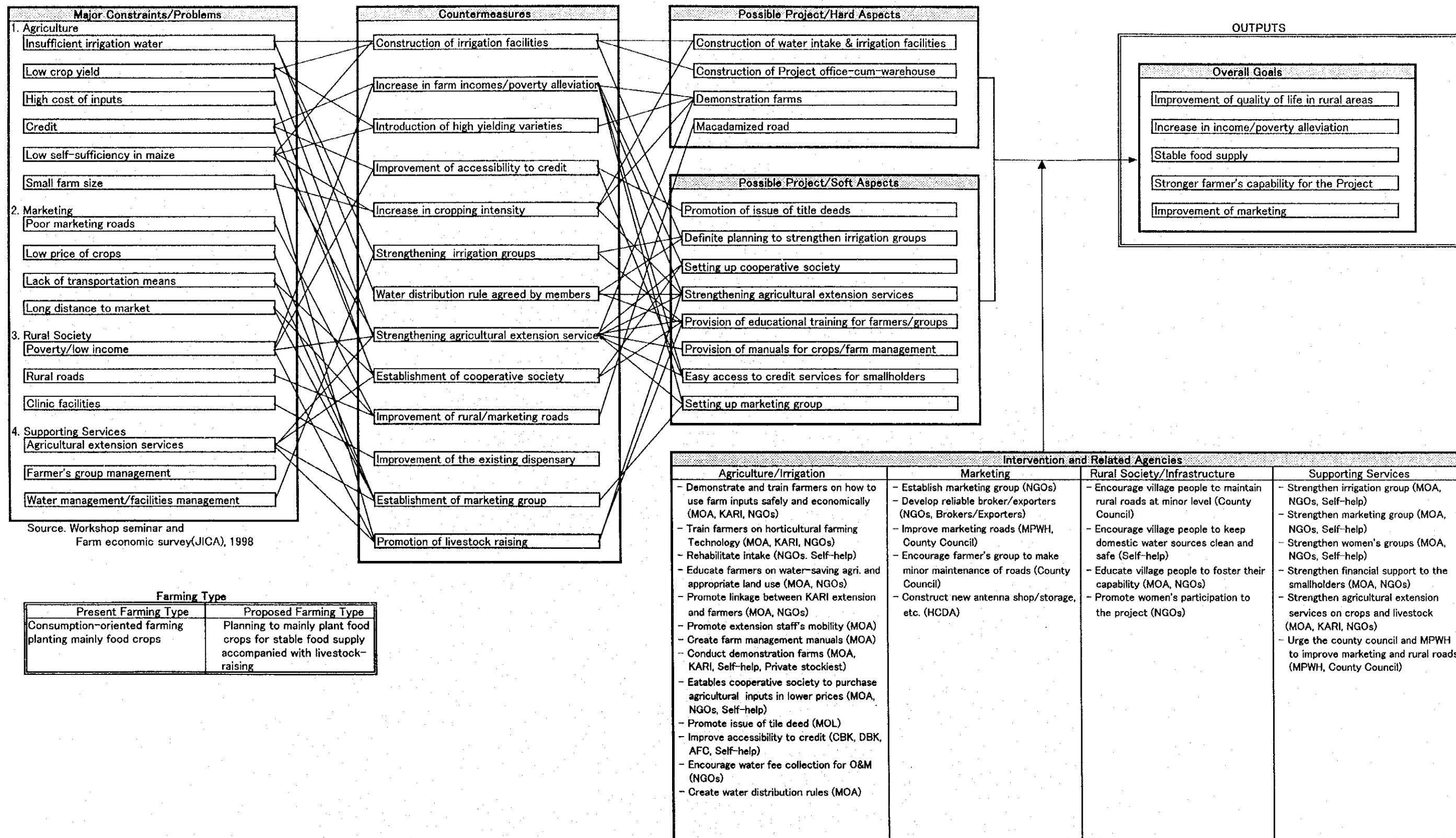


Figure 4.2-1

Relation between Hard and Soft Aspects to attain Overall Goals (Ruungu/Karocho Irrigation Project)



Under such situation of the Project Area, development objectives of the Project are presented below in terms of short and medium/long-term objectives;

#### Short-Term Objectives

- To stabilize and raise the rural life of beneficial farmers with introduction of small-scale irrigation system for the proposed irrigation area for 68 ha, improved farm management of sustainable food and horticultural crops, that is, along with the development programme to improve the cattle production, development of any locally tested dry-land crop varieties such as sorghums, bulrush millets, short season maize, pigeon peas, green gram and cow pea for food crops, and tobacco, Asian vegetable and sweet potato for horticultural crops, organization of small-scale farmers of 164 households, and sustainable assistance and support by related government agencies, NGOs, private sectors, etc.,
- To raise-sufficiency of food for from household by increasing in food production,
- To establish and strengthen farmer's organization, that is, irrigation groups, marketing groups, women's groups, cooperative societies by providing educational training by related government agencies, NGOs, private sectors, etc.,
- To develop productive lands by providing small-scale irrigation and drainage facilities such as intake facilities and irrigation and drainage canals with related structures, and rural infrastructural facilities of 3.0 km of village/farm roads,
- To strengthen productive activities by developing agricultural and institutional support services, such as the provision of necessary post-harvest facilities mainly focussing on food crops, implementation of training to farmers, strengthening of extension services to farmers' group, cooperative organization, introduction of farmers' capability building programme, development of livestock raising, etc., and
- To improve the rural environmental by providing access roads (route C92 and E788) and rural road improvements, etc.

#### Medium/Long-Term Objectives

- To alleviate poverty and improve welfare conditions of smallholder beneficiaries by raising living standard and giving them opportunities to increase their incomes by means of increase in food production and stabilization of food supply to the local peoples through the improvement of rainfed agriculture and introduction of irrigated horticulture as well as improvement and/or provision of the necessary agricultural infrastructures and services, and
- To raise farmer's capability to manage rural society by providing continuous educational training.

#### 2) Project Components

The project components for the Ruungu/Karocho Irrigation Project are generally planned as follows;



- Formulation of irrigated food and horticultural development plan such as land-use, crop selection, and development of animal husbandry, considering the conditions of flat topography with altitude of about 700 m above mean sea level, and semi-arid climate conditions with average annual rainfall of about 850 mm,
- Establishment/strengthening of farmers' organization and promotion of agricultural support services,
- Environmental considerations,
- Construction and improvement of access roads
- Development of agricultural and rural infrastructures,
- Development of post-harvest and agro-industry facilities,
- Social capability building and institution-strengthening programme.
- Construction of new marketing facilities, and
- Monitoring and Evaluation of the project,

#### 4.3.2 Community Capability-Building and Institutional Development Plan

##### 1) Community Capability-Building Plan

###### General Social Preparation Plan

At the beginning of the project cycle, a PRA workshop for the local community will be conducted with the aim of establishing a sense of community identity and increased awareness about its strength and potential.

###### Capability-Building Plan for Farmers' Organization

Type of Farmers' Organization	Proposed Development Plan
Water Users' Association (WUA)	<ul style="list-style-type: none"> <li>- Educate WUA members on requirements and implications of the intended Irrigation system</li> <li>- Facilitate the community in reviewing and updating the PDM</li> <li>- Train management members on organization, leadership, general and financial management</li> </ul>
Cooperative Society	<ul style="list-style-type: none"> <li>- Strengthen cooperative society through training of WUA since the two organizations have common membership</li> <li>- Joint meeting of Cooperative and WUA committees to agree on implications of increased irrigated horticultural production</li> <li>- Promote linkage with WUA and Production /Marketing groups</li> </ul>
Women Groups	<ul style="list-style-type: none"> <li>- Train on proposed irrigation development including review of PDM</li> <li>- Train in organization, general and financial management</li> <li>- Invite and involve women's groups in reviewing technical irrigation design (engineering and agronomic) particularly from view points of labor and irrigation benefits as well as their perceived role and preferences</li> </ul>
Production /Marketing Groups	<ul style="list-style-type: none"> <li>- Promote neighborhood production/ marketing groups</li> <li>- Train in organization, general management, agricultural marketing, accounting, and financial management</li> <li>- Train in sourcing and collation of market information</li> </ul>

##### 2) Development and Capability-Building of Local NGOs

To enhance the capability of the NGOs in providing support services to the project community, their staff will be trained in the following areas:

- Community organization techniques
- PRA approaches
- Leadership and management
- Credit administration
- Financial management and accounting procedures

3) Tapping Services of Other Agencies in Undertaking Social Preparation

It is planned to encourage a coordinated approach between MOA and the Ministry of Culture and Social Services during the initial social preparation workshop as well as in establishing and strengthening existing farmers' organizations.

4) Establishment of Institutional Mechanism for Social Preparation

An IDB staff member will be appointed and trained on the job in PRA and PDM facilitation followed by a short PRA course at Egerton University. He will then facilitate social preparation sessions in IDB supported irrigation schemes including the Ruungu/Karocho scheme.

5) Strengthening of IDB Field Offices

It is proposed that staff members of IDB field offices (at district and divisional level) will be strengthened by training them in community organization and participatory extension approaches.

6) Institutional Strengthening of District Agricultural Offices

With a view to institutionalizing contribution of these specialists, it is planned that relevant specialists at the DAO's office incorporate follow-up support services to the project in their respective operational work plans.

7) Equipment and Facility Support

To facilitate the work of IDB field staff at the district level, it is proposed that they will be provided with equipment support.

8) Partnership with the Business Community

It is anticipated that partnership links will be developed between the various institutions operating at the project level and the business community as summarized below;

Project Institution	MOA	WUA	Co-op	Marketing Group
Likely Business Partner	- Horticultural Exporters - Farm input Distributors - Local input stockists	- Banks - Credit institutions - Contractors	-Banks - Input -distributors	- Horticultural exporters - Banks - Local input stockists

## 9) Implementation of Capability-Building Training Workshops

As a part of capability-building efforts, training workshops will be implemented within three years from the commencement of Project implementation.

### 4.3.3 Agriculture Plan

#### 1) Policy for Proposed Agricultural Farming

The recommendations for agricultural farming in Ruungu/Karocho Area are to consider developing a program to improve the cattle production in the area, along with the wider distribution of seeds of any locally tested dryland crop varieties such as sorghums, bulrush millets, short season maize, pigeon peas, green gram, and cow pea that may be available from KARI and elsewhere. These crops are familiar to local farmers. A few new crops such as tobacco, Asian vegetables (such as ravaya) and sweet potato are also proposed.

#### 2) Training and Demonstration for Crop Farming and Farming Techniques

The main interventions proposed for Ruungu Area are working with the farmers to expand the use of adapted dryland crop varieties, developing an animal improvement program, and producing an increased area of food crops using irrigation. Some limited testing of onions, chillies and Asian vegetables is also proposed.

### 4.3.4 Water Sources Development Plan

The available water sources for the Area is run-off water of the Thungithu river. The minimum amount of available water at the intake site is estimated at 0.222 cu.m/sec based on the available discharge data and authorized water permit amount in the immediate downstream of the intake site.

The maximum irrigation requirement for the requested irrigation area (68 ha) by the WUA is roughly estimated at 0.170 cu.m/sec without considering the cropping pattern to be introduced by the Project. As the available river water at the intake site exceeds the maximum irrigation requirement, the area of 68 ha could be irrigated. Thus, it is proposed that the required water for the Project will be diverted by the intake weir under rehabilitation.

### 4.3.5 Irrigation and Drainage Plan

The estimated maximum water requirements are 150.3 lit/sec, while the maximum capacity of main canal designed by SISDO is 214.3 lit/sec. The difference between the above two estimated values arises from the difference in estimated ETo, adopted Kc values and conveyance losses. Although more discussion about water requirement might be necessary, the irrigation water required for the proposed cropping pattern could be conveyed through the irrigation system designed by SISDO.

Regarding water management methods, the water distribution system with 12 rotation blocks is proposed by following the existing plan designed by SISDO.

#### 4.3.6 Institutional Development Plan for Farmers' Organizations

Type of Farmers' Organization	Development Plan
Water Users' Association	<ul style="list-style-type: none"> <li>- Using PRA approaches, educating WUA members on irrigation implications</li> <li>- Training management committee on financial and general management: water charges, financial accounting, planning for operation and maintenance, budget preparation, management and organization principles.</li> <li>- Promoting linkages with other institutions such as MOA, Department of Water Development, Cooperative Society, local NGOs as well as the private sector with a view to obtaining relevant support services.</li> </ul>
Cooperative Society	<ul style="list-style-type: none"> <li>- Joint workshop between the cooperative society and WUA committees aimed at exploring areas of co-operation</li> <li>- Training management committee in operational cost management, improved budget control procedures and elementary principles of management.</li> <li>- Strengthening linkages with MOA, Ministry of Cooperative Development, farm-in-pup suppliers and banks</li> </ul>
Marketing Group	<ul style="list-style-type: none"> <li>- Promoting marketing groups and training of prospective members on registration requirements and procedures</li> <li>- Training group members in financial and general management matters including produce documentation, accounting procedures, banking and management principles.</li> <li>- Forming linkages with WUA, MOA, HCDA, local NGOs, banks, producer buyers as well as local input suppliers.</li> </ul>
Women's Group	<ul style="list-style-type: none"> <li>- Organizing a workshop for existing women's groups where members will identify women's concerns, needs and priorities</li> <li>- Facilitating review of the proposed irrigation project from women's perspective and identify opportunities for women-specific benefits</li> <li>- Training women's groups in financial record keeping, planning, banking, as well as well as general management principles.</li> <li>- Encouraging linkages with MOA, HCDA, local NGOs, produce buyers, input suppliers as well as banks.</li> </ul>
Other Groups	<ul style="list-style-type: none"> <li>- Encouraging them to upgrade into production/marketing groups</li> </ul>

#### 4.3.7 Institutional Supporting System Development Plan

Staff of various agencies will be exposed to training sessions with the aim of enhancing their ability to strengthen farmer organizations. Such training will include; community organization, participatory approaches, management and organization principles.

#### 4.3.8 Marketing Plan

In order to improve marketing situation in the Area, following interventions and activities are proposed through the careful analysis of present problems in marketing aspects.

### Proposed Interventions and Activities for Marketing Plan

Problems/Constraints	Interventions/Activities	Agency/Operation Body Concerned	Outputs
[1] Low prices for produce [1-1] Low demand for grown here (by outside market)	- Operation of antenna shop with warehouse at Mitunguu	- Farmers group	- Creation of marketing alternatives
	- Provision of market price information at Gakoromone wholesale market for locally consumed produce	- Farm inputs/ marketing officer of DAO-Meru	- Better crop planning - Attaining prevailing information - Reducing post-harvest losses - Increasing bargaining power
	- Provision of market price information of auction at Gakoromone wholesale market for local consumed produce	- Marketing expert of HCDA-Meru	
	- Seminar on varieties and certified seeds procurement at JKUAT and other institutions managed by the government - Provision of certified seed information	- KARI- Farm inputs/ marketing officer in DAO-Meru- Marketing expert of HCDA-Meru	- Better yields and plant protection- Assurance of germination rate
	- Lecturing and practice on horticultural production	- MOA staff on horticulture with lectures/technicians	- More stable income than current situation - Saving on food expenses
[1-2] Lack of marketing organization	- Seminar on marketing organization through PCM workshop at JKUAT and other institutions managed by the government	- MOA staff on farmers' organization	- Organizing and associating marketing groups
[1-3] Few buyers from outside	- Auction consigning to Gakoromone wholesale market for local consumed produce	- Marketing expert of HCDA-Meru	- Better trading prices than middlemen. - Cheaper costs than Matatu - Increasing transaction opportunities
[1-4] Limited demands in Ruungu	- Transport arrangement to Mitunguu antenna shop with warehouse for local consumed produce	- Marketing groups	- Creating options of market alternatives to consign or sell directly at Gakoromone wholesale market, retailers at Mitunguu market or other traders
Lack of countermeasures for drought	- Weather forecasting	- Kenya broadcasting (KBC)- DAO-Meru- Member farmers	- Crop planning to select drought durable produce such as millets, pigeon pea, dolichos bean, green gram and sorghum
Lack of knowledge on consumers' or buyers' demands (After well arranging to Mitunguu, it is possible to plan export produce such as Asian vegetables.)	- Field trip pursuing marketing route; Nairobi markets, exporters' grading & packing facilities, Nairobi Horticultural Center	- MOA staff	- Better understanding of consumers' or buyers' demands and how to handle produce

#### 4.3.9 Physical Plan and Cost Estimate

For irrigation facilities, since the construction is on-going under the management of SISDO after obtaining a loan from CBK, the present facility design is studied particularly for the diversion weir which was damaged by floods and needs to be repaired or replaced. Major observations on the design are; 1) stability analysis of intake weir shall be made under the flood flow condition, 2)

condition of riverbed foundation is unclear, 3) relocation of diversion weir site to upstream may be considered in case of replacement.

As to rural roads, rehabilitation and improvement of three kilometers for village/farm roads and 37.5 km for access roads are planned. Spillway type bridges are planned at stream crossing points on the unclassified rural road.

Project costs consist of two categories, i.e. construction cost, and community development and support services cost. Total project costs are estimated at 62.6 million Ksh, of which 6,425 thousand Ksh will be repayment costs by farmers. Annual operation and maintenance (O&M) costs for facilities are 1.2 million Ksh.

#### **4.3.10 Project Implementation and Operation and Maintenance Plan**

##### **1) Overall Project Implementation Plan**

An Executive Steering Committee (ESC) under the chairmanship of Permanent Secretary of MOA and a Technical Working Committee (TWC) shall be established for smooth project implementation. Moreover, under TWC, District Project Management Office (DPMO) shall also be organized at the district level.

Project implementation is classified into two categories, i.e. facility construction, and community development and support services. Implementation of community development and support services including social preparation and institutional strengthening shall be rendered by suitable agencies such as consultants and NGOs. Facility construction shall be implemented through the labor-intensive method on a contract basis with local contractors under the supervision of DPMO. Self-help projects such as irrigation improvement which costs are borne by WUA under the cost recovery concept are supervised by NGOs. On the other hand, public projects such as roads improvement to be financed by the government are carried out by Consultants under the direction of District Road Engineer (DRE). The community initiative in carrying out the implementation shall be considered, particularly for the self-help projects.

A total implementation period is assumed to be seven years in consideration of social preparation and fund procurement for self-help projects as critical factors on implementation.

Executing agencies/bodies for the operation and maintenance of facilities are MPWH for classified access roads, Tharaka Nithi County Council for unclassified access roads, Ruungu Karocho Irrigation Association for irrigation facilities, village communities for village/farm roads and farmers' groups for marketing facilities.

##### **2) Capability-Building Implementation Plan**

Capability-build during project implementation will be given by various agencies as below;

Project Stage	Agency	Type of Capability-Build-up Service
1. Project Planning	a) MOA/IDB	- Social preparation of project community - Facilitation of WUA planning sessions (activities, subactivities)
	b) MOA/DAO	- Acting as resource persons during social preparation sessions
	c) Local NGOs	- Acting as resource persons during social preparation sessions
2. Project Design	a) MOA/IDB	- Facilitating WUA design review sessions (availing design model, explaining design criteria and expected mode of operation of design elements) - Actively seeking women input into the design
	b) MWR	- Awarding and securing water rights for WUA
	c) Local NGOs	- Acting as resource persons
3. Project Funding	a) MOA/IDB	- Advising on project costing and alternative sources of project funding - Explaining funding conditions and procedures for various funding agencies
	b) Local NGOs	- Training WUA members on group formation for security fund contributions, banking operations, loan funds & loan servicing procedures
	c) MOCSS	- Assisting farmers on harambee organization
	d) Provincial Administration	- Facilitating harambee organization by issuing license
4. Project Construction	a) MOA/IDB	- Advising WUA on criteria for tender assessment and contractor selection, required supervision and quality control aspects of construction activities
	b) Local NGOs	- Training WUA committee on contractor payment procedures
5. Project (O&M)	a) MOA/IDB	- Facilitating and acting as resource persons during O&M sessions
	b) MOA/DAO	- Acting as resource persons during O&M sessions

Related agencies for providing support services after Project implementation are as follows:

Agency	Type of Support Services
KARI	- On-farm horticultural research aimed at solving problems relating to low crop yields, crop pests and diseases and lack of appropriate crop introductions.
MOA	- Planning, executing and monitoring extension services and paying special attention to production/market groups as well as women groups - Facilitating a one-day annual review of irrigation project performance by farmers and other stake-holders. - Strengthening artisan and entrepreneurial skills that will be needed during the operation and maintenance phase. - Fostering farmers capability by awarding prizes every year to the best three irrigated horticultural farm within the project.
Local NGOs	- Giving support in planning courses of action on other problems facing the community.

#### 4.3.11 Environmental Management Plan

The extension service and farmers' training by MOA shall include the encouragement of the risk and appropriate use of agro-chemical, promotion of improved cooking stoves for women's groups and promotion of tree growing.

Sanitary education for children at primary school is required to protect against intestinal worms and diarrhea. Water quality analysis of the sources of drinking water is required periodically and the result shall be informed to the inhabitants, so that they can learn which water source is safest.

#### 4.4 Project Evaluation and Cost Recovery

##### 4.4.1 Economic Evaluation

The Project was evaluated from the national economic point of view by using EIRR as an index. EIRR of Ruungu/Karocho Project is estimated at 3.6 percent, which is far below the national standardized EIRR of eight percent for agricultural project. If including mapping costs, which is not included in the project cost, because JICA Study Team made it, EIRR is 3.5 percent.

##### 4.4.2 Financial Analysis

Financial analysis for the typical farms was made to compare their farm economy in cases of with-project and without-project. Farm income including animal income and off-farm income will increase as compared with without-project cases. Farm income in the Area is estimated as follows;

- Without Project	:	20,360	(Ksh/farm/year)
- With Project	:	57,306	

##### 4.4.3 Cost Recovery

Amortizing conditions for the small-scale irrigation projects in this area should be decided based on the results of the financial analysis, rather than based on the present loan conditions. Therefore, cost recovery was studied to justify farmer's ability for repayment by changing credit conditions such as interest, repayment period and monthly repayment in each case was calculated and then compared with the estimated disposable incomes which were calculated in the financial analysis. Amount of monthly repayment based on the current and recommended loan conditions is shown below;

	<u>Excluding Mapping Costs</u>	<u>Including Mapping Costs</u>
- Monthly repayment under current loan conditions	:1,071(Ksh/farm/month)	1,154(Ksh/farm/month)
- Monthly repayment under proposed loan condition	: 574	618

#### 4.5 Recommendations

##### Agriculture

- a) The current dominant farming type of the Ruungu/Karocho Irrigation Project, which was classified as Type-E in Model Area selection, is the consumption-oriented farming mainly planting food crops. And, beneficial farmers have such strong willingness that present farming type should be shifted to food crop planting for stable food supply accompanied with livestock grazing in the Area. Therefore, plan of agricultural farming should be formulated in the direction mentioned above.
- b) The trials and demonstrations will be conducted by the GOK staff in Agricultural Extension and Irrigation Development Department. The recipients will be the smallholders. The trials and



demonstrations will be conducted on farmer's fields. The actual timing will be determined by the nature of the trial, and preparations will have to be made in advance of the planting season. The frequency will be as shown below. The method will be collaboration between individual farmers and the project.

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Demonstrations	3	3	2	2	1	11
Trials	2	2	2	1	1	8

- c) The training programs on crop cultivation will be conducted by GOK staff and hired professionals from private sectors. They will be given to interested farmers, and will be held in the field near to the irrigation scheme, in churches, meeting halls etc. for periods of approximately every six months for the first two to two-and-a-half years. These training programs will be linked to the trials and demonstrations farms.

The programs will include topics such as selection of new varieties (e.g. maize hybrids) and how their production differs from traditional varieties, water management and irrigation techniques, animal nutrition including the use of urea supplement blocks, etc.

- d) Others

- Introduction of adapted improved dry land crops
- Working with farmers to get tobacco contracts
- Testing of onion, chilies and some Asian vegetables
- Development of livestock improvement program

#### Institutional Supporting Services

- a) The District Irrigation Unit at Marimanti liaises with IDB, Nairobi in drawing up a training programme specific to Ruungu/Karocho Irrigation Project for social preparation of the community and capability building of relevant agencies such as Department of Social Services and private sectors.
- b) MOA/IDB should draw up a training timetable for social preparation and the capability-building in relevant agencies.

#### Irrigation and Drainage

- a) The proposed cropping pattern of irrigated crops is established by putting focus on food consumption in the Area, marketability and storage life of crops. These cropping patterns are slightly different from the proposed ones by SISDO. Therefore, it is necessary to review the proposed cropping pattern in order to determine irrigation water requirement.
- b) The members of WUA have only land occupation rights to their land and do not have land ownership. It is recommended to execute a cadastral survey for the Project area to secure land ownership.

- c) The water management method as proposed by SISDO having 12 rotation blocks with group feeder canals will be adequate for the Project. The WUA shall decide the area and location of proposed farmland to determine dimensions of group feeder canals before the commencement of detailed design study.
- d) In order to realize effective water management, a water management manual shall be prepared by the employed consultants. As to the content of the manual, the following items as well as general techniques of water management shall be included, and training for members of the WUA shall be provided before the commencement of actual irrigation.
  - Adaptive organization for water management (general water management method for total system, organization of irrigation group)
  - Water operation rule (method of distribution of domestic and irrigation water, observance of standard cropping pattern, formulation of penalty)
  - Water distribution method within the irrigation group (irrigation turn, irrigable area)
  - Irrigation method (performance of commonly used sprinklers, unit irrigation area and water application time)
  - Irrigation schedule
- e) It is recommended to review current water permits applied for.

#### Marketing

- a) Discussion and formulation of farmers' marketing groups,
- b) Construction of an antenna shop with a warehouse in Mitungu and transporting arrangements to Mitungu by the marketing groups,
- c) Auction participation at Gakoromone wholesale market for local consumed produces as one of marketing alternatives,
- d) Practical utilization of social and natural resources for marketing advantages of ; i) short-cut to Mitunguu town, ii) possibility of outflows of produce to Mitunguu market or Gakoromone wholesale market, iii) transactions of several exporters in Mitunguu area, iv) road improvement plan between Meru and Mitunguu, v) Haranbee among community,
- e) Participation to related seminars for smallholders held at Jomo Kenyatta University of Agriculture and Technology (JKUAT) and other institutions managed by the government,

#### Agricultural and Social Infrastructure

- a) Repair of damaged diversion weir shall be carefully carried out considering the following points;
  - Re-design of weir may be considered,
  - Condition of riverbed rock needs to be investigated,
  - Relocation of weir site to upstream depending on availability of funds, and
  - Capable contractor for river works is required to undertake the works.

## Project Implementation

- a) Main implementation agency of the Project is MOA, however, close cooperation and adjustment of work demarcation should be made among related government agencies such as MPWH, MOWR, MEC, etc., since the Project involves many project components which are related to each other.
- b) For the construction works of the self-help projects, detailed work allocation and responsibilities as indicated below among Contractors, WUA and NGOs, which are directly related to the construction costs, shall be clearly presented to WUA during the detailed design stage;
  - Contents of works to be contributed by WUA in the form of labor,
  - Responsibility of procurement and management of materials, equipment and skilled labor, and
  - Responsibility of work quality and schedule.
- c) In the course of project implementation, farmers/farmers representatives should make reference to the on-going activities of classified Type-A smallholder irrigation schemes such as Ciambarage Irrigation Scheme in Tharaka Nithi and Muguna Water Project in Meru district for their horticultural development.
- d) For the planning of irrigated horticultural development for each Model Area, Study Team prepared the topographical maps with scale of 1:5,000 applying aerial photography and ground survey methods at costs of about 669,000 Ksh per site (average size is 276 ha). These topographical maps are deemed essential and useful not only for carrying out physical planning of irrigation and drainage facilities in the Area, but also for the encouragement of farmers' participation to the project with their awareness of common ownership for community resources.

In the project evaluation, the required costs for preparation of the topographical maps mentioned above were not counted because the Study Team will shoulder the costs. However, when other projects are planned, such topographical maps with scales of 1:5,000 should be prepared and the necessary costs should be shouldered by beneficiary group themselves.

## Environment

- a) In relation to agro-chemical use, it is important to refrain from their use for technical support to prevent pest and diseases and, instead, use methods such as crop rotation, inter-cropping and improvement of soil fertility.
- b) MOA should support horticulture as well as livestock raising, production of feed and manure synthetically. Extension offices should improve the know-how of agriculture and livestock raising, and visit farmlands periodically though road conditions are very bad. Further, it is important to approach the plan in combination with other projects being executed or being executed by other donors.

## Project Economy and Farm Budget

- a) It is recommended for the preparation of the detailed project plans of the proposed small-scale irrigation schemes that MOA should undertake a careful appraisal to examine project plans to be proposed by the communities concerned, placing emphasis on the appropriateness of the technology designed for irrigation systems and the accuracy of the cost estimate to be based on least-cost approaches.

In almost all the small-scale irrigation projects, many farmers are confronted with difficulties in loan repayment. This holds true even for the farmers of Ciambaraga Irrigation Schemes in Tharaka Nithi district, one of the well-managed projects among the 463 reviewed. Accurate cost estimates are important, since the cost is a crucial element in determining the financial and economic viability of the project and also for planning its funding.

- b) It is recommended that prior to the implementation of the project, a farm budget analysis of the representative farms should be conducted, through detailed farm surveys, with the primary objective of providing a basis for an assessment of the investment plans and debt repayment capacities of the farmers.

The farm budget analysis also provides a basis for setting repayment terms and conditions for credit that will be enough to encourage the farmers to participate in the project and make sure that the farmers would have sufficient cash to repay the loans. The ability of the farmers to pay is an instrument for promoting sustainability.

- c) It is recommended that intensive backing should be given to the farmers participating in the project until they have attained the full production targets, since it may take several years to reach these targets. To this end, the district governments should establish the District Project Management Office (DPMO), responsible for providing support services to the farmers, as proposed in this study.

The proposed DPMO shall formulate support services programs in close coordination with HCDA, FPEAK, DAO and NGOs as agricultural development could be realized only with the full cooperation of the agricultural services agencies, as well as the cooperation of the private entities concerned.

## Monitoring of the Project

- a) Monitoring of the progress of project and implementation should be carried out by external agencies under the supervision of an Executive Steering Committee (ECS), to cope with the following objectives;
- To obtain and judge how many goals and targets initially formulated under the Project are attained,
  - To judge whether or not follow-up support is required from the viewpoint of project sustainability under self-help management, and
  - To learn lessons, both positive and negative, from the Project in order to apply to other project areas for improvement.

b) Monitoring shall be conducted on the following items;

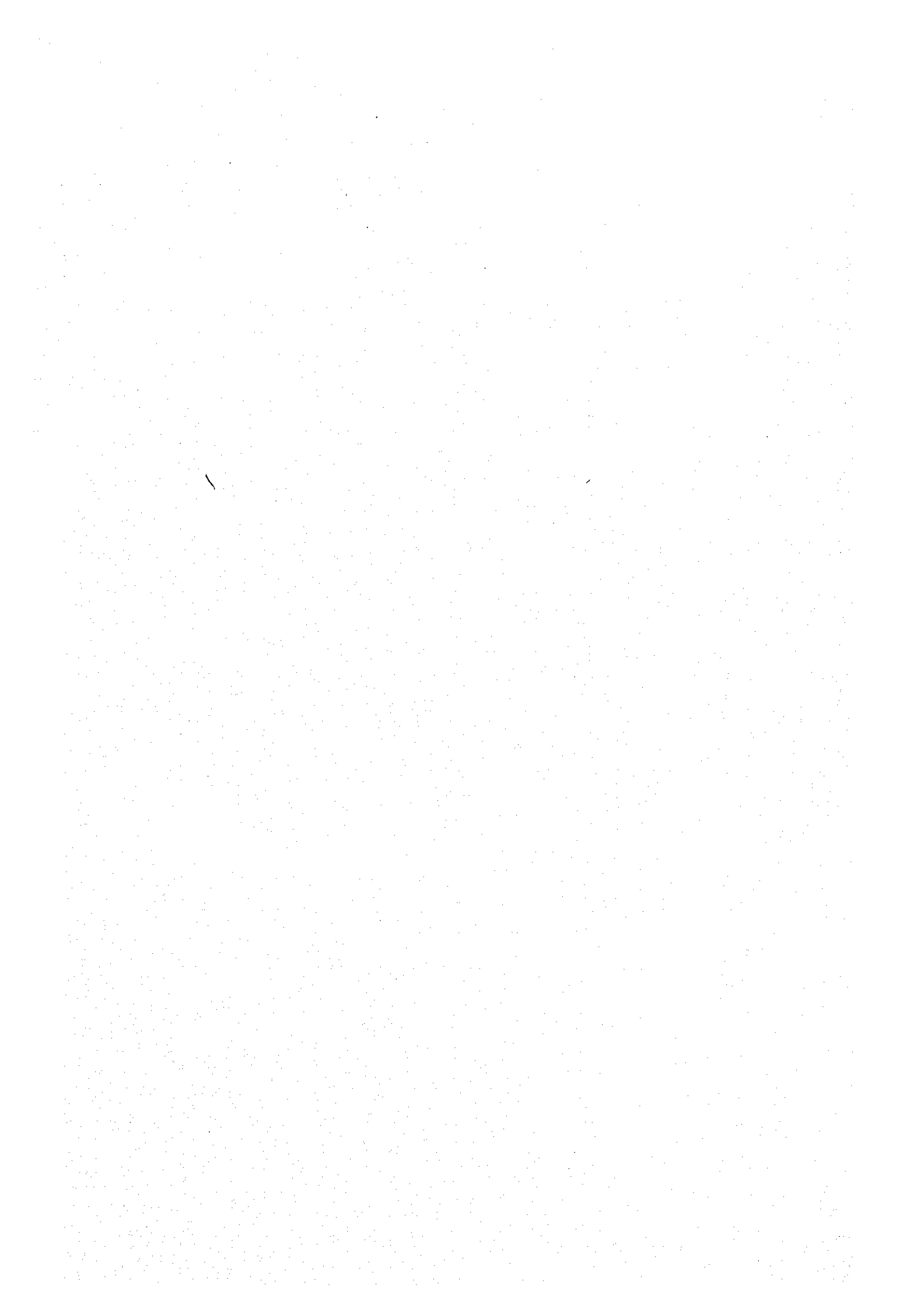
- Irrigation system operation
- Access and village/farm roads maintenance
- Agricultural aspect
- Institutional aspect
- Marketing aspect
- Farm economy aspect
- Control of soil erosion and watershed management

Table 4.5-1 indicates the required training items for the implementation of smallholder irrigation schemes in Ruungu/Karocho Irrigation Project.

**Table 4.5-1 Required Training Items for Ruungu/Karocho Irrigation Project**

	Training Items	Farmers/ Farmers' Group	Implementing Staff
1. Agriculture/Irrigation	- Land use and crop selection in relative dry area	●	●
	- Irrigated and rainfed crop farming for both horticulture and food crops	●	
	- Establishment of cooperative society to purchasing agricultural inputs	●	
	- Application of farm input	●	
	- Water saving farming	●	
	- Water management in open canal system	●	
	- O&M works for irrigation facilities	●	
	- Management of trial and demonstration farms	●	●
	- Monitoring of the project		●
	- Development of farm and water management manuals		●
	- Maximum residue levels (MRLs) and crop assurance for export crops	●	●
2. Marketing	- Establishment/strengthening of marketing group	●	●
	- Marketing techniques for both horticulture and food crops to brokers/exporters	●	
	- Promotion of contract farming	●	●
	- Collection/compilation of market information	●	●
	- Rehabilitation of access roads		●
3. Rural Society/Infrastructure	- Capability-building for farmers/farmers' group and implementing staff	●	●
	- Promotion of women's participation to the project	●	
	- O&M for water source facilities for rural water supply	●	
	- Construction and O&M of village and farm roads	●	●
4. Support Services	- WUAs' roles and performance	●	
	- Financial management for cooperative societies	●	●
	- Access to agricultural credit	●	●
	- Linkages with other institution		●
5. Environment	- Soil erosion control at sloping farms	●	●
	- Watershed Management and water conservation	●	●
	- Promotion of improved cooking stove	●	
	- Promotion of rural health	●	









JICA