

CHAPTER IV. SELECTION OF PRIORITY DEVELOPMENT SCHEMES

4.1 Basic Criteria for Selection of Priority Development Schemes

To confirm the priority ranking given to the proposed schemes by the previous screening and evaluation, and then, to select the priority development schemes for initiating the objective smallholder irrigation development in Morogoro region, a priority evaluation on the proposed 16 schemes has been conducted in this Study since the agricultural setting and socio-economic situation in each proposed scheme area have been greatly changed through recent implementation of structural adjustment of the national economy. To prepare the specific criteria for priority evaluation, the following Irrigation Development Policy set forth in NIDP is taken into consideration.

- Improvement and/or rehabilitation of the existing smallholder irrigation schemes be given the first priority.
- The farmers shall have the initiatives for implementation of the schemes (farmer's participatory approach to the irrigation development).
- The schemes shall contribute to the national food security program especially through increase of maize and rice production.

With due consideration of the conditions mentioned above and also the present situation of the agricultural and socio-economic setting in each proposed scheme area, the priority evaluation criteria are prepared with particular emphasis as shown in Section 5.2 of Division-I in Annexes. Based on the evaluation criteria, the scoring by items is made for each scheme as follows:

Score Ranking on Proposed Irrigation Development Schemes							
Schemes	Technical Aspect	Social Aspect	Institut./ Organiz.	Financial Aspect	Economic Aspect	Environ. Aspect	Total Score
<u>Zone-I: Mountainous Zone</u>							
Mgeta	34	21	26	5	2	14	102/69
<u>Zone-II: Alluvial Plain Zone</u>							
Mgongola	39	15	20	6	3	18	103/70
Kilangali	35	17	19	4	2	15	92/63
Manyenyere	36	17	17	5	2	15	92/63
<u>Zone-III: Piedmont Plain & Fan Zone</u>							
Mlali	43	24	23	3	3	18	114/78
Mkula	47	21	20	5	2	17	111/76
Sonjo	45	20	19	6	3	15	109/74
Mvumi	44	16	18	4	2	16	100/68
Msolwa	44	19	15	5	3	15	100/68
<u>Zone-IV: Valley/Riverine Terrace Zone</u>							
Nyinga	46	25	22	4	3	17	117/79
Maloto	46	25	22	6	3	16	118/80
Mgogozi	46	25	21	5	3	16	116/79
Lumuma	45	25	21	5	3	16	115/78
Chabi	42	21	19	6	3	17	112/76
Ndole	42	20	22	3	3	15	106/72
Chabima	39	16	14	3	2	16	90/61

Note: Figures are the scored points. In total score, the first figures show total points from all the items evaluated, while later figures are the adjusted percentage point. The financial and economic aspects will be assessed in due time when the relevant information from the farm economic survey is completed.

Mgogozi scheme is divided into Mwega and Kikalo sub-schemes by river source. Mgogozi-Mwega sub-scheme is joined with Nyinga scheme for effective water resources development and rational rehabilitation of water management facilities.

4.2 Selection of Priority Development Schemes

All the field observation as well as relevant information on the sociological and institutional/organizational aspects obtained from the villages concerned are fully incorporated into this evaluation.

Apart from the above evaluation, as well as taking into account the strong intention of GOT to implement these schemes as a pilot project for NIDP, the priority development schemes are selected from each physiographical zone with particular attention to the following conditions:

- The selected priority schemes shall act as a model or pilot project for implementation of smallholder irrigation development which could lead to the development of other schemes in a later period.
- The leading farmers or representatives of the village community shall be motivated to take initiative on the farmer's participatory approach to irrigation development. If they adopt a positive attitude concerning motivation, it shall also be taken into consideration.
- Technical and financial requirement for irrigation development shall not exceed farmer's capacity to properly operate and manage the schemes.

To select the priority schemes, special attention has been paid to each subject mentioned above, namely, the priority schemes, which will be suitable for implementing the model or pilot project for leading the other irrigation development programs, must have (i) the highest ranking in each zone in the priority evaluation, (ii) relatively good access to the scheme area, namely the scheme could be implemented without heavy investment to such construction and/or rehabilitation of the access road, and (iii) almost none negative development impacts to the natural environment. As for the second subject, the following two essential factors shall be taken into account: (i) farmers are sufficiently motivated in irrigation-based agricultural development, and (ii) the farmers' organization is being established and under taking respective activities. Selection of the priority schemes based on the third subject shall be made with particular attention to the following factors: (i) majority of farmers have already experiences in irrigated farming, and (ii) large capacity to pay is expected from farm households under the conditions with the project. Making reference to all the above conditions, the priority schemes to be subject to the feasibility study are selected as shown in the following table:

The Mgeta scheme is an unusual case in the irrigated agriculture development, not only for the Wami River Basin but also for Morogoro region. The traditional furrow system was developed in the extremely steep-sloped land since long time ago with production of maize as the subsistence staple food crop and high-valued economic crops, i.e., vegetables and fruit by smallholder farming system. Consolidation of the existing irrigation system is the basis for further stabilization of the agricultural production, and hence, maintaining a sustainable development of such smallholder farming. It is also acceptable as an essential means for the land conservation in this area.

Priority Schemes Selected

Schemes	Existing Irrigated Area (ha)	Proposed Irrigable Area (ha)	Proposed Crops	
			Rainy Season	Dry Season
Zone-I: Mountainous Steep Slope				
Mgeta Scheme	1,600	30 ¹	Maize	Vegetables
Zone-II: Alluvial Plain				
Mgongola Scheme	40 ²	620	Paddy	Paddy
Zone-III: Piedmont Plain/Fans				
Mkula Scheme	few	149	Paddy	Maize & Paddy
Zone-IV: Valley/Riverine Terraces				
Nyinga Scheme	110	130	Paddy & Maize	Onion
Mgogozi-Mwega Scheme	60	70	Paddy & Maize	Onion
Malolo Scheme	380	380	Paddy & Maize	Onion
Total	2,210	1,379		

Note: /1: The proposed irrigable area for Mgeta Scheme is demarcated only for model development.
 /2: The existing irrigated area in Mgongola Scheme is from Mkindo pilot scheme which is located in the uppermost reaches of the Scheme area.

The Mgeta scheme is composed of more than 300 micro- to small-scale traditional furrow systems, and is feeding irrigation water to approximately 1,600 ha in total within the respective four wards: Langali, Tchenzema, Kikeo, and Bunduki. In this study on the priority schemes, the representative three furrow systems commanding about 50 ha in Langali village, Langali ward are primarily selected as the development model for this scheme. The remaining large area is still under inventory survey, and subject to clarification and identification.

The Mgongola scheme is selected as a development model for the lowlying alluvial plain which suffers from frequent seasonal flooding hazard and poor drainage conditions. The Mkula scheme is selected as one of the typical model schemes in the Piedmont Plain and Fan zone in the Central Wami River Basin. Rehabilitation and improvement of the existing irrigation systems will make possible crop intensification and diversification. It can be expected that development impact of this scheme will directly extend to the surroundings, i.e. Msolwa and Sonjo schemes.

The Nyinga, Malolo schemes and downstream half of Mgogozi scheme (Mgogozi Mwega sub-scheme) are selected as a package from the technical viewpoint. Since arable land is limited in these scheme areas, it is essential to extend further intensification and diversification of the crop production together with rationalization of the irrigation water utilization.

PART - III FEASIBILITY STUDY ON THE PRIORITY SCHEMES

CHAPTER V. PRESENT CONDITIONS OF THE PRIORITY DEVELOPMENT SCHEMES

5.1 Physical Conditions of the Respective Scheme Areas

5.1.1 Location

The Study Area subject to the feasibility study includes six priority schemes, i.e. Mgeta, Mgongola, Mkula, Malolo, Nyinga, and Mgogozi-Mwega irrigation schemes. These six were selected as the highest priority-cum-model development schemes through the master plan study stated in the preceding Chapter IV. Amongst the above schemes, the Malolo, Nyinga and Mgogozi-Mwega schemes are being fed by the Mwega river as the common irrigation water source. It is considered to be the best if these three irrigation schemes are integrated together so that utilization of the said water source will become more efficient. Thus, in this study, a package of three schemes is formulated and renamed as "Mwega scheme."

As shown in the Location Map, the four schemes are located respectively in the easternmost, northernmost, southernmost and western-most parts of the Central Wani River Basin. Administratively, these four schemes belong to three districts, i.e. Morogoro, Kilombero and Kilosa districts of Morogoro region.

Locations of Irrigation Schemes

Name of Scheme	Administrative Unit (District)	Geographical Location	Physiographical Zone (Agro-Eco Zone)
Mgeta Scheme	Morogoro	Eastern most of Basin 50 Km from Morogoro city	Zone-I (Uluguru Mountains) Cool & Wet, Mountain Slope
Mgongola Scheme	Morogoro	Northern most of Basin 90 Km from Morogoro city	Zone-II (Mkata Plain) Savanna, Seasonal Flood Plain
Mkula Scheme	Kilombero	Southern most of Basin 180 Km from Morogoro city	Zone-III Savanna, Piedmont Plain & Fan
Mwega Scheme	Kilosa	Western most of Basin 220 Km from Morogoro city	Zone IV Semi-arid, Valley/Riverine Terrace

5.1.2 Topography

Essential topographic features of each scheme area are summarized below:

Topographic Conditions of Each Scheme Area

Name of Schemes	Topographic Features
Mgeta Scheme	- High altitude, extremely steep slopes at 1/3 or more, narrowly dissected by eroded gullies having serious environmental hazards, i.e. soil erosion, land sliding, water-shed degradation, etc. - Lowlying flat plain having an average gradient at 1/500 while a rich in the
Mgongola Scheme	meso- and micro-relief complex - Seasonal flooding depth at 40 to 100 cm in lower reaches of the area during the rainy season.
Mkula Scheme	- Gently undulating fan formation having an average gradient at 1/250 in the upper reaches, and flat to nearly flat topography in lowlying flood plain in downward
Mwega Scheme	- Narrow peneplain (fans) and riverine terraces having nearly flat to gently slope topography (1/200). - Seasonal flooding in the narrow area along the Mwega river - Forming the perennial swamp at the middle reaches of the area

5.1.3 Meteorology and Hydrology

(1) Meteorology

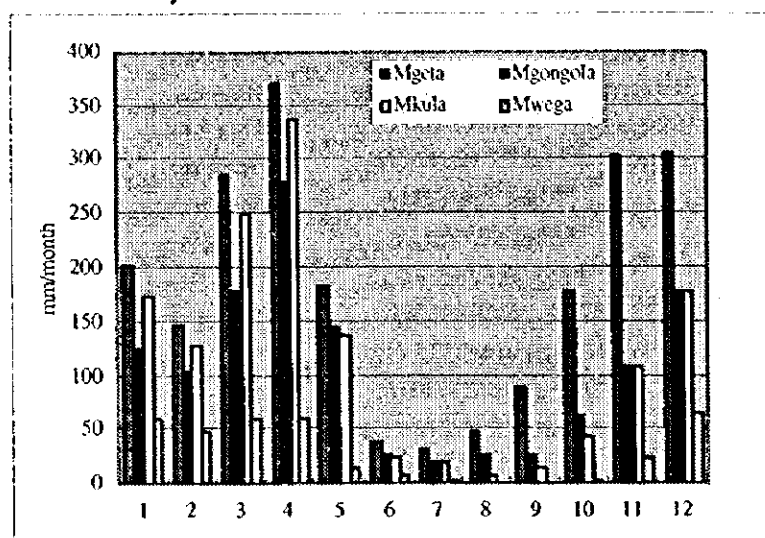
The Mgeta scheme is located in the Uluguru mountains, characterized by a cool and wet climate. In contrast, the Mwega scheme area is under a semi-arid climate. Both the Mgongola and Mkula schemes lie under a typical savanna climate. Annual mean rainfall in the respective four scheme areas is as shown below.

Annual Mean Rainfall in Each Scheme Area

Name of Scheme	Rainfall Station	Code Number	Annual Rainfall (mm)
Mgeta scheme	Bunduki station	973715	2,190
Mgongola scheme	Maskati station	963710	1,313
Mkula scheme	Kilombero station	963729	1,425
Mwega scheme	Malolo station	963606	362

Although the total annual rainfall varies amongst the schemes, the monthly rainfall distribution pattern is almost the same as shown in the following graph.

Monthly Rainfall Distribution in Each Scheme Area



Indicative data and information on other climatic parameters available at the Morogoro meteorological station and Ilonga meteorological station are summarized in the following table.

Summary of Meteorological Data

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
1. Morogoro Meteorological Station													
(1) MMaxT	31.6	32.1	31.6	29.6	28.4	27.6	27.2	27.8	29.8	31.4	32.0	31.8	30.1
(2) MMinT	21.1	21.1	21.1	20.6	18.9	16	15.1	15.4	16.7	18.1	19.9	20.6	18.7
(3) MT	26.4	26.7	26.4	25.1	23.7	21.9	21.2	21.6	23.3	24.8	25.9	26.2	24.4
(4) RH	80.2	80.5	82.7	89.2	89.4	86.0	85.2	82.8	78.0	73.8	72.7	75.9	81.3
(5) SD	7.5	7.6	7.4	5.4	5.4	6.6	6.5	6.4	6.8	7.7	8.2	7.8	7.0
(6) SR	16.8	18.4	15.5	13.9	12.6	12.8	12.7	12.9	15.1	15.9	17.5	16.8	15.1
(7) WV	2.5	2.2	1.7	1.0	0.9	1.0	1.3	1.7	2.1	2.4	2.5	2.7	1.8
(8) E	5.8	6.7	5.6	3.9	3.1	3.1	3.4	4.1	5.6	6.3	6.7	6.3	5.1
2. Ilonga Meteorological Station													
(1) MMaxT	31.4	31.4	31.5	29.8	28.4	27.4	27.7	28.4	30.2	31.6	32.6	31.9	30.2
(2) MMinT	20.7	20.6	20.8	20.2	18.7	15.7	15.1	16.2	18.0	19.9	20.7	21.0	18.7
(3) MT	26.0	26.0	26.1	25.0	23.5	21.5	21.4	22.3	24.1	25.8	26.7	26.5	24.4
(4) RH	83.4	83.2	84.3	84.7	81.8	74.9	73.2	74.4	73.1	72.9	74.1	78.0	78.2
(5) SD	6.8	7.0	7.1	6.3	6.5	7.8	7.5	6.8	6.9	7.8	8.1	7.5	7.2
(6) WV	1.2	1.2	1.0	0.9	0.9	1.1	1.2	1.3	1.5	1.8	1.7	1.5	1.3
(7) E	5.7	6.7	5.5	4.0	3.1	3.1	3.4	4.0	5.6	6.4	6.7	6.2	5.0
3. Mgeta Meteorological Station													
(1) MMaxT	25.2	25.8	25.2	23.0	21.7	20.8	20.3	21.0	23.2	25.0	25.6	25.4	23.5
(2) MMinT	17.1	17.1	17.1	16.7	15.2	12.7	11.8	12.1	13.3	14.5	16.1	16.7	15.0
(3) MT	21.2	21.4	21.2	20.0	18.7	17.0	16.4	16.8	18.3	19.7	20.8	21.0	19.4
(4) SD	5.3	5.3	5.2	3.8	3.8	4.6	4.5	4.5	4.8	5.4	5.8	5.4	4.9

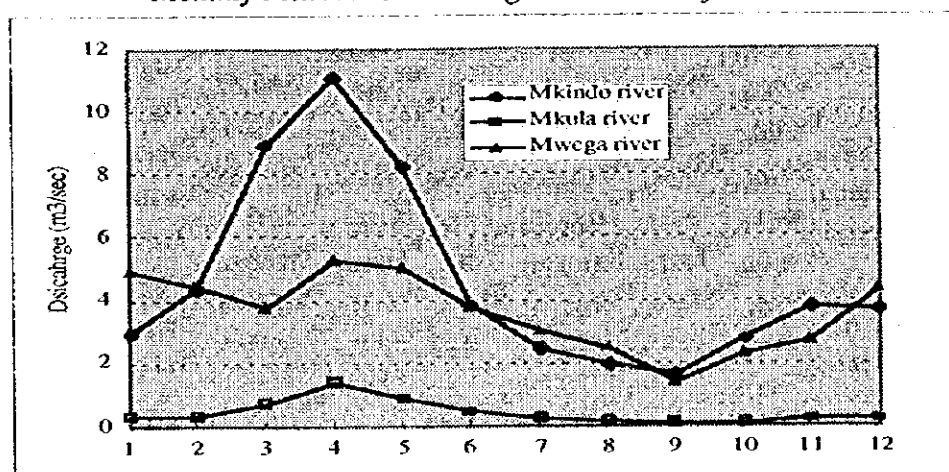
Remarks)

1. MMaxT : Mean Maximum Temperature (°C), MMinT : Mean Minimum Temperature (°C), MT : Mean Temperature (°C), RH : Relative Humidity (%), Sunshine Duration (hr/day), Solar Radiation (I/day), WV : Wind Velocity (m/s), E : Evaporation (mm/day)
2. Morogoro Meteorological Station : Data except evaporation is available for around 24 years, Ilonga Meteorological Station : Data is available for 19 years.

(2) Hydrology

Estimated monthly mean discharges of rivers, which are water sources of the three schemes, i.e. the Mkindo river for the Mgongofa scheme, the Mkula river for the Mkula scheme, and the Mwega river for the Mwega scheme including the Malolo, Nyinga and Mgogoz-Mwega complex-scheme, are shown in the following graph.

Monthly Mean River Discharges of Three Major Rivers



River flow usually increases from October and reaches a peak in April, then decreases until September.

(3) Rivers in Each Scheme

In the Mgeta scheme area, there are many small streams forming steep valleys. These are all extensively utilized for irrigation and domestic use at present. The normal discharge is estimated to be 10 to 100 lit./s in most streams.

In the Mgongola scheme area, there are three rivers, i.e. the Mkindo, Dizingwi and Mgongola rivers.

The Mkindo river is a water source of the existing Mkindo pilot irrigation scheme and expected to be the same for Mgongola scheme. The Mkindo river overflows its banks seasonally and floods the prospective development area of the Mgongola scheme. The floodwater depth is 0.5 m in the area along the river in the peak flood season according to hearing survey with inhabitants. There are no water users on this river other than the Mkindo scheme.

The Dizingwi river is a tributary of the Mkindo river. It is perennial and its water is always stagnant in the Mkindo area due to insufficient drainage capacity because of the shallow river bottom. The Mgongola river runs through the south edge of the Mgongola scheme area and flows eastwards. It habitually overflows into the Mgongola area in the rainy season. The flooding depth is 0.5 m along the river in the peak season.

The Mkula river is the main water source of the Mkula scheme. This river joins the Sonjo river about 1 km downstream of the existing intake weir site. After this junction, the river's freeboard gradually decreases and it starts to overflow from a point around 3.5 km downstream of the intake site. The river has no water users other than the Mkula scheme.

The Mwega river is the main water source of the Mwega scheme. It runs through the scheme area. The Nyinga upper and middle areas are habitually inundated by this river. In these reaches, the river has a very small cross-section with 2.5 m depth, 4 m width, and 1/2 side slopes. The gradient is approximately 1/250. The river banks are densely covered with tall elephant grasses and the roughness coefficient is estimated at 0.05 to 0.07. Under the said conditions, the river carrying capacity is limited to only 11 to 12 m³/s compared to the flood discharge estimated at 14 m³/s with a 2-year return period, 31 m³/s with a 5-year return period, 48 m³/s with a 10-year return period, and 67 m³/s with a 20-year return period.

In the reaches in the Nyinga lower area, the river depth gradually increases to about 4 m immediately after the existing aqueduct crossing point. Usually no flood occurs in this area, but the river banks are suffering from severe erosion due to fragile nature of soils and turbulent flood flow with steep river gradient. After joining the Kikalo river, the river gradually becomes shallow again and diverges to a few streams and forms a relatively large swamp. At the edge of the swamp, there are two concrete intakes (fixed type weir). In these reaches, the river frequently overflows its banks and these intakes are also submerged during the flooding season. After those intakes, the river gradually deepens again, and its flood carrying capacity increases to become enough. There are no water users on this river other than the Mwega scheme.

Other than the Mwega river, there are many small streams flowing into the basin from the surrounding hills. All these are seasonal rivers. The stream flowing across the Malolo settlement into the scheme area, so-called the Mwagila river is the biggest amongst all and have a drainage area of 56 km². This stream often damages the existing irrigation canals.

5.1.4 Soils and Vegetation

In the respective scheme areas, there are broadly six essential land forms, i.e. mountainous steep slopes, colluvial slopes, fans, flood plain, valley bottom riverine terraces, and natural levees. Soils in the respective scheme areas are derived from the alluvium, colluvium, and residuum. According to the FAO/UNESCO Soil Classification System, these soils are classified into three major soil units, i.e. Eutric Cambisols (CMe), Eutric Fluvisols (FLe), and Eutric Gleysols (GLE) on the basis of the morphological features of soil profiles, chemical properties, and physical nature. These soils are further classified into the following 16 soil units based on the morphological features, irrigability-cum-drainability, and soil textures. The extent of each soil unit and their essential features are summarized in the table below:

Soils in the Respective Scheme Area

Name of Scheme	Mapping Unit	Area (ha)	Soil unit	Land Form	Drainability	Soil Texture
Mgeta	Mgt-1	140	CMe	Mountainous steep slope	Well	CL/L
	Mgt-2 (Total)	80 220	CMe(stony)	Eroded steep slope	Well	SCL/L
Mgongola	Mgl-1	515	CMe	Flat alluvial plain	Imperfect	CL/C
	Mgl-2	25	FLe	Old natural levee	Mod. well	SL~SCL/C
	Mgl-3 (Total)	190 730	FLe/GLe	Levee/Alluvial plain	Poor/Imperfect	SCL~SL/L
Mkula	Mkl-1	70	CMe	Fan	Mod. well	CL/L~CL
	Mkl-2	75	FLe	Fan	Imperfect	CL/SiCL~CL
	Mkl-3	27	GLe	Fan	Poor	CL/SCL
	Mkl-4 (Total)	3 175	FLe	Natural levee	Excessive	SL/S
Mwega	Mwg-1	50	CMe(stony)	Colluvial slope	Excessive	L/SL
	Mwg-2	165	FLe	Higher river terrace	Excessive	L~SL/SL
	Mwg-3	25	FLe	Lower river terrace	Well	CL/CL
	Mwg-4	160	FLe	Valley bottom	Well	SL/SL
	Mwg-5	50	FLe	Valley bottom	Imperfect	CL/SCL
	Mwg-6	235	FLe	Valley bottom	Poor	L~SL/SL
	Mwg-7 (Total)	55 740	GLe	Valley bottom swamp	Very poor	CL/CL~SiL

The soils in the Mgeta scheme area are identified as the Eutric Cambisols, which originate from the weathered tuff. These soils are classified into two soil units, i.e. the Eutric Cambisols having clay to clay loam texture on the steep slopes (mapping unit Mgt-1) and the Eutric Cambisols with stony and rocky sandy clay loam texture in the eroded slopes (mapping unit Mgt-2). The land having slopes of less than 40% is mostly cultivated with upland crops, i.e. maize in the rainy season and some vegetables in the dry season using a terraced-field system. The natural vegetation in and around the scheme area is seriously deteriorated through traditional shifting-cultivation as well as collection of fuel wood up to the present.

The soils in the Mgongola scheme area are classified into three essential units, i.e. Eutric Cambisols (mapping unit Mgl-1), Eutric Fluvisols (mapping unit Mgl-2), and Eutric

Fluvisols associated with Eutric Gleysols (mapping unit Mgl-3). Each soil is characterized by the physiographical features, textures and water regime. At present, most of the land is extensively utilized for paddy cultivation in the rainy season using the seasonal floodwater as much as possible, while no land is used in the dry season. The existing Mkindo scheme (40 ha), a pilot scheme for irrigated paddy cultivation is developed in the Mgongola scheme.

Most land in Mkula scheme area has been extensively reclaimed, therefore, no natural vegetation is reserved at all. The soils in the scheme area are classified into three great soil groups, i.e. Eutric Cambisols, Eutric Fluvisols, and Eutric Gleysols, and further classified into four soil units according to the morphological soil features, i.e. soil texture, drainability, and moisture regime.

In the Mwega Scheme area, three great soil groups, the Eutric Cambisols, Eutric Fluvisols, and Eutric Gleysols and seven soil units based on the soil-series in the classification are identified according to the morphological soil features. The lands of mapping units Mwg-1 to Mwg-4 are cultivated with upland crops. The lands of Mwg-5 and Mwg-6 are cultivated with paddy during the rainy season, and with onion or beans during the dry season under irrigated conditions. The land of soil unit Mgt-7 is left fallow, and being covered with dense tall grasses (elephant grass).

5.2 Present Socio-economic Conditions in the Respective Scheme Areas

5.2.1 Administrative Division

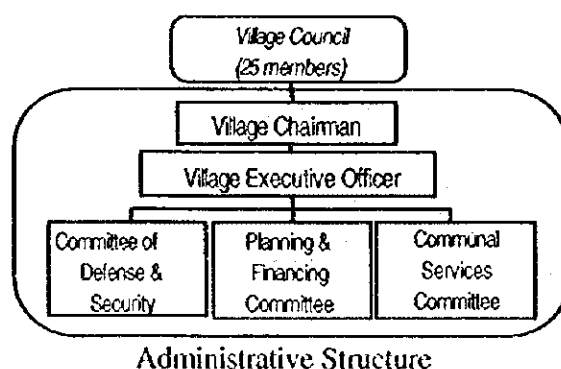
The following table shows the administrative divisions of the four priority schemes.

Administrative Divisions of the Four Priority Schemes

Scheme	Village	Ward	Division	District
Mgeta	Langali	Langali	Mgeta	Morogoro Rural
Mgongola	Mkindo	Hembeti	Mvomero	Morogoro Rural
	Dihombo	Hembeti	Mvomero	Morogoro Rural
	Hembeti	Hembeti	Mvomero	Morogoro Rural
Mkula	Mkula	Mkula	Mangochi	Kilombero
Mwega	Malolo	Malolo	Mikumi	Kilosa
	Mgogozi	Malolo	Mikumi	Kilosa
	Nyinga*	Malolo	Mikumi	Kilosa

(*) Nyinga is a sub-village of Malolo village

The village is the smallest unit of the public administrative structure. The following figure outlines the administrative structure of the village government.



The number of members involved in the village administration services varies from 16 to 25 depending on the size of the village. Members of the Village Council include the Village Chairman and members of the respective three Committees, "Defense and Security", "Planning and Financing", and "Communal Services." All members of the Village Council except the Village Executive Officer are elected by the villagers. The Village Executive Officer, who is in charge of administrative works, is selected among the villagers and employed by the Village Council. To facilitate communication and co-ordination between villagers and the village government, a number of clusters are build up amongst villagers as the operation unit of the village community society. The chairman of each cluster will be assigned as a member of the village administrative committee.

To supervise administrative activities of the Village Council, the Ward Committee consisting of a Ward Councilor, a Ward Executive Officer, and an assorted number of professionals is being organized in each ward. The Ward Councilor is elected from the different political parties in the ward. The Ward Councilor is supposed to attend the village meetings and represent the concerned villages at the meetings held at the District level.

At the Division level, the Divisional Secretariat unit is dealing specifically with security and defense matters. Then, at the District level, all the matters concerning district administration are undertaken by a specific board known as the Local Government Civil Service Commission. The highest authority is the District Commissioner in this function.

Revenue of the village government and the District Council is basically the levies and taxes to be collected at the village level. The main revenue sources for the villages are the development levy, traded crops levy, and local brew tax. The development levy is paid annually by every male aged 18 or more. The levy is at present Tsh.1,000. It must be paid between January and June every year. The penalty for delayed payment is Tsh.500. The traded crops levy is collected from the traders at the gateposts of the villages. The charge is Tsh.300 per purchased bag of products. The tax on local brew production is paid daily by each individual producer. The charge is Tsh.500. The tax and levies are collected by the Village Executive Officer who in turn gives to the Ward Councilor the share belonging to the District Council for its delivery. The rated shares of the above revenue sources are as summarized below:

Revue Type	% for the Village	%for the District Council
Development levy	20	80
Market stall tax		
- small stall	50	50
- big stall	10	90
Kiosks tax	50	50
Restaurants tax	50	50
Forest products extraction tax	10	90
Traded crops levy (paid by traders)	50	50
Bicycle license fee	10	90
Local brew production tax	30	70

5.2.2 Demographic Aspects

(1) Village Population and Households

The table below indicates of the population, households and average size of household in the respective villages in each scheme area.

Scheme	Village	Total Population	No. of Households	Household Size
Mgeta	Langali	3,000	600	5.0
	Bumu	1,400	290	4.8
Mgongola	Mkindo	4,220	844	5.0
	Dihombo	1,850	370	5.0
	Hembeti	2,400	480	5.0
Mkula	Mkula	2,944	490	6.0
Mwega	Malolo	4,000	525	8.0
	Mgogozi	1,265	211	6.0

Source : Ward executive officers, village executive officers, VEOs

The population composition of each village can be classified into the following categories:

- Pre-school age	: 0-6 years
- School age	: 7-14 years
- Working age	: 15-55 years
- Old age	: 56 years and above

The table below shows the population composition in terms of the ratio between each population category and total population for every village. As seen in the table, the ratio of working population/total population is high in all villages except Mkindo village.

Scheme	Village	Pre-school Age	School Age	Working Age	Old Age
Mgeta	Langali	22	25	46	7
	Bumu	n.a.	n.a.	n.a.	n.a.
Mgongola	Mkindo	19	44	28	9
	Dihombo	21	25	53	1
	Hembeti	24	16	50	10
Mkula	Mkula	25	26	42	7
Mwega	Malolo	21	19	57	3
	Mgogozi	27	20	46	7

Source: Data from DIVEOs and VEOs

In the case of Mkindo village, if this tendency continues, the low ratio would mean a deep dependence on labor outside the village for farming purposes. This would be a constraint for development of the area.

(2) Education

In Tanzania, primary schooling is from Standard I to Standard VII. Secondary schooling has two levels: Ordinary (Form I to Form IV) and advance (Form V to Form VI). The secondary schools are also classified into technical secondary schools,

agricultural secondary schools, and business, commerce, arts and science secondary school. The technical and agricultural secondary schools are termed as special schools; hence, nation-wise, there is a national selection of students from all over the country for entering those schools. The Government has put emphasis on agricultural education as this sector is the backbone of the economy.

In the Study Area, there is a primary school in or near all villages. This assures a relative easy access to schooling facilities. Most of the farmers have completed the primary level or at least have some years of primary schooling. On the other hand, those who have gone to the secondary level of education are few. In or near the villages, there are not any facilities for technical training. The agricultural or technical secondary schools are far away from the villages in the Study Area; it means that students have to live outside the villages to attend those schools and this represents an extra financial burden for their families.

5.2.3 Rural Infrastructure

(f) Roads

There is a local trunk road in the Mgeta scheme area, diverging from the highway A7 and going southward to Mgeta ward. The road is an earthen road relatively well maintained. However, once entering the mountainous area, rough rocky surfaces with deep gully erosion are observed at many portions. These road surfaces should be improved by cutting rocks and filling gullies so as to make them smooth and well drained.

Access to the Mgongola scheme is available by a trunk road of about 27 km from the Iringa-Dar-es-Salaam highway. The road is characterized by an alluvial muddy surface without pavement or embankment. During the mid-rainy season from February to March, therefore, it is often submerged with flooding water and the roads are frequently muddy. The scheme often becomes isolated during the flooding season.

The Mkula scheme has a good accessibility owing to the route B127, which runs along the foot of the Gologolo Mountains connecting Ifakara, capital of Kilombero district, to the highway A7. This road is being improved with asphalt pavement at the section from A7 junction to the Ruaha River crossing point (about 30 km) as the first phase and scheduled to be improved up to Ifakara as the second phase.

An access road to the Mwega scheme branches off from the highway A7 at about 500 m, from the bridge crossing the Great Ruaha river, on Mikumi side. This access road is used to reach Malolo and Mgogozi villages. The gross length is about 25 km from the A7 highway to Malolo village. This is an earthen road, relatively well maintained though most of the cross-drains shall be replaced with larger culverts.

In the scheme area, the local road from Malolo village to Mgogozi village runs northward across the Mwega river. This road is deeply pitted by heavy traffic as well as erosion due to serious water leakage from irrigation canals. A wooden bridge on the Mwega river collapsed in 1997.

(2) Basic Services

The table below shows the present set up of the basic services facilities at each respective village.

Basic Services in the Villages

Scheme	Village	Electricity	Water Supply
Mgeta	Langali	not available	limited piped water / river water
	Bumu	not available	river water
Mgongola	Mkindo	available for not more than 20 houses	river water
	Dihombo	available for only 3 houses	limited piped water / river water
	Hembeti	available for only 10 houses	limited piped water / river water
Mkula	Mkula	not available	river water / well
Mwega	Malolo	not available	river water
	Mgogozi	not available	river water

Source : Ward executive, village executive officer

Most of the villages do not have tap water. In the villages where a tap water supply system is available, it does not have enough capacity to feed water for all the village population. Sometimes the water source is not near the village and fetching water several times per day is too much time-consuming. Lack of electricity severely limits socio-economic activities in the villages.

(3) Social Infrastructure

The table below shows the situation of social infrastructure in the respective villages.

Social Infrastructure in the Villages

Scheme	Village	School	Dispensary	Church	Mosque
Mgeta	Langali	1	1	2	1
Mgongola	Mkindo	1	1	1	2
	Dihombo	1	-	1	1
	Hembeti	1	1	1	1
Mkula	Mkula	1	-	4	1
Mwega	Malolo	1	2	4	1
	Mgogozi	1	-	1	1

Source: Data from Ward Executive, Village Executive Officer.

Each village has a primary school. However, in some cases, like the school in Malolo village, school facilities such as desks, chairs, etc. are not sufficient to receive all the students wanting to attend school.

Most of the villages have a dispensary within or relatively near the village. The staff of these dispensaries usually consists of a medical assistant and/or registered nurse. For the cases requiring a better equipment and staff, the patients must be taken to an urban center.

5.2.4 Economic Activities

At present, almost 95% of the economically active population of the villages are engaged in agriculture-related activities, chiefly crop production.

There are no industries in the Study Area except the Kilombero Sugar Company, a parastatal company located near the Mkula scheme area. This sugar company provides employment opportunity to the villagers and most of the farmers who cultivate sugarcane in and around the Mkula scheme area depend on the demand coming from this company. However, due to diverse financial and management problems, the company has not been able to sustain a stable demand for sugarcane in recent years.

In the villages in the Study Area, processing of agricultural products is mostly centered on two main activities: milling of grains and preparation of the local brew. The former activity is carried out at small-capacity mills, aiming at satisfying the local demand of cereals. The latter one is also for domestic consumption. Women are in charge of this activity. This is, on the one hand, an important income source in the off-farm season for some families, and on the other hand, a stable source of revenue for the village authorities. Some farmers also engage in off-farm activities, i.e. petty business like sale of own agricultural products and foodstuff at market stalls; raising of poultry and pigs, goats, and livestock in general for selling purposes; hiring themselves as labor to third parties, etc. in order to supplement their income.

5.2.5 Constraints and Problems in Socio-Economic Activities

(1) Unclear Land Demarcation and Inadequate Land Registration

Unclear demarcation in the traditional land right leads to continuous conflicts within the village and among the farmers. The village authorities sometimes dispute the official surveyor's measurement of the village lands and this creates administrative problems concerning land allocation and management. Therefore, the cadastral survey to precisely demarcate the village borders as well as farming plots is imperative for all villages.

In addition, due to unclear regulation on traditional land rights, the land disputes are not always resolved, fairly and satisfactorily, either by the village authorities or by higher levels of decision, i.e., primary court and high court. Therefore, it is necessary to establish precise regulations on traditional land rights and on how they are subject to the higher power of the village rights on land allocation.

(2) Poor Rural Infrastructure

Most of the access roads would benefit from improvements. Inadequate conditions of the roads especially during the rainy season make transportation of inputs and products from and to the markets difficult. Access roads to the Mgongola scheme are often submerged by flood water in the depression and become muddy during the rainy season. The scheme areas are often isolated in the rainy season. These roads need drainage facilities. The access road to the Mwega scheme also needs improvement as the road becomes muddy during the rainy season and transport of products and persons is difficult.

The Study Area suffers from inadequate rural infrastructure, i.e., lack of storage, water and electricity supply facilities. This infrastructure insufficiency turns into constraints for further development of agricultural activities in the Study Area.

5.3 Present Set-up of Agriculture in the Study Area

5.3.1 Land Use

The present land use is classified into five units: 1) cultivated land; 2) forest/wood land including tree plantation; 3) grassland including scarce bushes and shrubs; 4) swamp and water surface like rivers; and 5) settlement area including right-of-ways such as roads and canals. The cultivated land is further classified into three sub-types: 1-a) paddy field; 1-b) upland field; and 1-c) sugarcane field. The area extent by land unit in each scheme area is summarized as follows:

Present Land Use

Name of Scheme	Cultivated Land				Grass-land	Forest/Woodland	Swamp/River	Settle-ment	Total
	Paddy	Upland	S.cane	Subtotal					
Mgeta	0	140	0	140	45	30	0	5	220
Mgongola	580	0	0	580	130	0	0	20	730
Mkula	108	42	11	161	0	10	0	4	175
Mwega	210	340	0	550	35	35	65	55	740
- Malolo	118	266	0	384	0	27	29	40	480
- Mgogozi	16	20	0	36	27	3	30	4	100
- Nyinga	76	54	0	130	8	5	6	11	160

5.3.2 Land Ownership and Tenure System

The land tenure system in the Study Area is generally based on traditional inheritance, land allocation by village council, land purchasing, land borrowing or renting. The most common tenure regime in the Study Area is the one based on "customary tenure", where land rights are transferred according to the ancestral land tenure system and/or the traditional inheritance accepted by the village council.

The landholding size per farm household in the four schemes is estimated to be 0.8 to 1.62 ha on average, based on the farm interview survey and field investigation carried out by the Study Team and topographic maps (1/5,000) prepared by JICA in 1997.

Average Landholding Size of Farmers in Each Scheme

Scheme	(Unit: ha/farm household)			
	Mgeta	Mgongola	Mkula	Mwega
Average holding size	0.80	1.62	1.29	1.28
inside scheme	0.30	0.34	0.55	0.79
outside scheme	0.50	1.28	0.74	0.49

The table below shows the landholding size frequency distribution estimated based on cadastral information obtained from the Mkula, Mgongola, and Mwega schemes. In the case of the Mgeta scheme, data were available only for Mindu village; nevertheless, it has been considered that the data is representative for the whole scheme.

Frequency Distribution of Landholding Size in Percentage

Scheme	Mkula	Mwega	Mgongola	Mgeta (*)
0 to <0.4 ha	15	2	0	43
0.4 to <0.8 ha	61	56	27	30
0.8 to <1.2 ha	20	24	21	20
1.2 to <1.6 ha	3	11	12	4
1.6 to <2 ha	1	4	9	2
2 to <4 ha	0	3	27	1
4 to <6 ha	0	0	3	0
6 to <8 ha	0	0	0	0
> 8 ha	0	0	1	0
TOTAL	100	100	100	100

5.3.3 Farming Practices and Agricultural Production

(1) Cropping Pattern and Farming Practices

1) Mgeta Scheme

The major cultivated crops in the rainy season are maize and pulse. They are cultivated under rainfed condition during the period from October / November to March / April. They are cultivated by means of intercropping with each other, or grown in single cropping. Generally, maize is cultivated for home consumption, while pulse is cultivated as cash crop.

Cabbage, potatoes, pulse, etc. are major crops in the dry season. They are predominantly cultivated under traditional irrigation system during the period from March / April to October / November. Besides, several kinds of vegetables such as lettuce, parsley, carrot, cauliflower, Chinese cabbage, onion, leek, sweet potato, tomato, green pepper, red pepper, egg plant, etc. are also cultivated in limited farmlands during the dry season. Figure 5.3.1 shows the present cropping pattern.

Present farming practices for major crops mentioned above are extensively carried out in the scheme. All farming practices are done manually. Application of fertilizer and agro-chemicals is not common, except for cabbage and pulse. Details of present farming practices are elaborated in Section 1.3 of Division-2.

2) Mgongola Scheme

The Mgongola scheme consists of the existing Mkindo pilot scheme and Mgongola extension area. The existing Mkindo pilot scheme is located in the upper reaches of the Mgongola scheme. This existing scheme originally consists of 40 ha of paddy field, in which 96 farmers have one acre plot each and cultivate paddy twice a year under fully irrigated condition. However, the paddy fields have been expanded up to around 60 ha at present. First cropping of paddy is carried out in the rainy season during the period from January to June, following land preparation in December. The second cropping is started from mid June and completed at the beginning of December. As for paddy cultivation in this area, transplanting and application of fertilizer are undertaken in common.

The Mgongola scheme has 520 ha of arable land in the lower reaches, which is called Mgongola extension area. This area is regularly inundated by habitual seasonal flooding in April. Single cropping of paddy is extensively practiced under rainfed condition, applying broadcasting method. Paddy is mainly cultivated in fields roughly plowed by farm tractors. Direct sowing is made during the period from December to January, depending on the availability of rainfall. Harvesting is mainly completed in May and June.

Figure 5.3.1 shows the present cropping pattern. Farming practices for paddy cultivation in the scheme are elaborated in Section 1.3 of Division-3.

3) Mkula Scheme

Maize and paddy are dominantly cultivated in the scheme, while other food crops and vegetables such as sweet potato, cassava, tomato, pulse, etc. are grown in some limited area. Further, there are around 30 farmers who cultivate sugarcane in the scheme and the cultivated area is estimated at around 11 ha.

Paddy cultivation is extensively carried out by broadcasting method in the lowlying area, relying on seasonal flooding in the rainy season. Application of fertilizer is not common. After harvesting paddy, maize is cultivated in some part during the dry season, using the natural soil moisture maintained by shallow groundwater.

In the upper reaches of the area, cultivation of maize under the rainfed condition is predominant in the rainy season. In the dry season, maize and other minor crops, i.e. cassava, sweet potato, pulse, etc. are cultivated in some part where the soils are moistened by capillary water from shallow groundwater. Application of fertilizer and agro-chemicals is not common.

Figure 5.3.1 shows the present cropping pattern. Farming practices for such major crops as paddy, maize, and pulse are elaborated in Section 1.3 of Division-4.

4) Mwega Scheme

Onion, paddy, maize, and pulse are dominantly cultivated in this scheme area. The growing season of onion varies, depending on the topographic condition of the scheme.

In the lower reaches of the scheme which belong to the Malolo area, onion is mainly grown during the period from mid March to late September after harvest of maize. Onion cultivation in this area is practiced by avoiding the high soil moisture in the rainy season and flooding risk during April. In the upper reaches of the scheme area which belong to the Mgogozi-Mwega and Nyinga areas, the main season of onion is mid May to late November.

Paddy cultivation relies on the seasonal flooding during the rainy season. The paddy cultivation area consists of the middle part of the scheme area which is topographically lower and also the upper reaches of the scheme area where excess water from the Mwega river is available. Further, maize and pulse are cultivated as succeeding crops to onion and paddy.

Figure 5.3.1 shows the present cropping pattern. All agricultural activities are carried out by hand in this scheme. Farming practices for major crops mentioned above are elaborated in Section 1.3 of Division-5.

(2) Crop Production

The farmlands in the four schemes are not satisfactorily and/or sufficiently reclaimed so far. Present farming practices are extensively carried out under the poor situation of supply of farm inputs. Under such inadequate field conditions, the productivity and unit yield of each crop are still at the subsistence level. The unit yield and production of major crops under the present condition are estimated as shown in Table 5.3.1 and summarized below:

Present Unit Yield and Production of Major Crops in Each Scheme

Major Crops	Mgeta		Mgongola		Mkula		Mwega	
	Unit Yield (ton/ha)	Production (ton)	Unit Yield (ton/ha)	Production (ton)	Unit Yield (ton/ha)	Production (ton)	Unit Yield (ton/ha)	Production (ton)
Rain Season								
Paddy	-	-	3.8	152	-	-	2	420
- Transplanted	-	-	1.6	864	2	216	-	-
- Broadcasted	1	30	-	-	1.5	63	1.5	399
Maize	-	-	-	-	-	-	-	-
Dry Season								
Paddy	-	-	3.8	152	-	-	-	-
Maize	-	-	-	-	1.5	60	1.5	171
Onion	-	-	-	-	-	-	10	1,820
Cabbage	10	60	-	-	-	-	-	-
Potato	3	9	-	-	-	-	-	-
Pulse	0.7	7	-	-	-	-	0.8	56

(3) Livestock and Inland Fishery

It is revealed that cattle raising is not so common in the Project area except for the Mwega scheme, but small livestock raising for home consumption is practiced. Cattle which is the major livestock in the Project area belongs to pastoralists who shift from one grazing area to another according to the season. Draught animals are not for plowing, harrowing, weeding, etc. in all the schemes.

Inland fishery is not practiced in the schemes except for the Mgeta scheme area where some farmers cultivate *Telapia* in small ponds for home consumption.

5.3.4 Extension Services

Major extension services under NAEP II are conducted under four components, that is (i) institutional strengthening, (ii) extension education and training, (iii) ex-tension communication support, and (iv) pilot initiatives, as shown in Figure 5.3.2.

(1) Institutional Strengthening

Institutional strengthening is aimed at consolidating organization and management of extension services under NAEP II. Under the programme of extension services new committees are formed to manage the execution of the services. These include the Project

Steering Committee, District Extension Steering Committee, and Training Co-ordinating Committee.

The Project Steering Committee (PSC) is defined as an inter-ministerial committee at the national level which supervises and reviews prevailing extension services at the national level and further strives to consolidate the future programme of the extension services. The District Extension Steering Committee (DESC) is an inter-departmental committee at the district level. A district is a main implementing unit under NAEP II. DESC has an important role of reviewing and supervising the implementation programme of the extension activities in the district concerned. Furthermore, the Training Coordinating Committee (TCC), which is an inter-ministerial committee, is responsible for review and approval of the training programme for extension staff and farmers.

The activities of MAC are lead by the Regional Agricultural and Livestock Development Officer (RALDO) at the regional level and the District Agricultural and Livestock Development Officer (DALDO) at the district level. RALDO and DALDO are assisted by the Subject Matter Specialists (SMSs) at region and district levels. As for extension activities, the Regional Extension Officer (REO) and the District Extension Officer (DEO) manage the services under RALDO and DALDO, respectively. DEO is entirely responsible for the management of the extension services at the district level. Further, a Division Extension Officer (DIVEO) is deployed in each division office, in order to coordinate extension activities at the division level. In principle, VEO should be deployed in each village in order to disseminate proper farming technology and give any advice to farmers. At present, the deployment of VEOs in the Project area is as shown below:

Scheme	Village concerned	VEO
Mgeta	Langali	1
	Bumu	1
Mgongola	Mkindo	1
	Hembeti	1
	Dihonbo	1
Mkula	Mkula	1
Mwega	Malolo	1
	Mgogozi	0

(2) Education and Training on Extension

The main objectives are to consolidate the ability and capacity of the frontline extension staff (DIVEOs and VEOs), extension trainers (REO, DEOs, and SMSs), and extension managers (senior MOAC staff at district, regional and national levels) and further to familiarize farmers with improved and/or advanced agricultural practices in addition to the ordinary contact with the frontline extension officers. This component consists of two programmes, that is staff training and farmers training. Contents of the two programmes are as follows:

- (a) Staff training programme
- Bi-monthly Workshop (BMW) for REO, DEOs, and SMSs
 - Monthly Training Session (MTS) for DIVEOs and VEOs
 - Retraining programme for VEOs

- (b) Farmers training programme
 - Adoption plots
 - Group meeting
 - Residential courses
 - Study tour
 - Field day

(3) Extension Communication Support

This is a new component in the delivery of the extension services introduced under NAEP II. The Zonal Communication Centre (ZCC) is established for dissemination of current extension services, applying the airing programme and such publications as posters, leaflets, booklets, magazines, audio-visual components, etc.

(4) Pilot Initiatives

The aim is to increase the coverage field of technical support for advanced farming guidance by the frontline extension officers (DIVEOs and VEOs). Especially, these pilot initiatives are to support farmers groups, improve extension management, and also to carry out input guarantee / supply systems.

(5) Extension Services Concerned in Morogoro Region

During the first fiscal year of 1996/97 of NAEP II, it was expected that the major activities during the first and second quarters were to smoothen the transition between NALERP and NAEP-II, while during the third and fourth quarters, the project was expected to concentrate on initiating and strengthening some new features which respond to the lessons learned in Phase I.

It is, however, reported that the implementation of the 1996/97 extension programme has remained stagnant due to several factors, that is i) sporadic allocation of budget, ii) retrenchment exercise, iii) delay of deployment of staff to the districts and rural area (Annual Work Programme for 1997/98, Morogoro Region).

Twelve Monthly Training Sessions (MTSs) in each of the 4 districts were expected to be held for improvement and enhancement of knowledge and technique of DIVEOs and VEOs, however one or two MTSs were merely held in each district. Bi-monthly Workshops (BMWs) were not held at all in the last fiscal year.

To increase their skills in both livestock and crop production aspects, VEOs have obligation to attend the retraining programme. Currently, 262 VEOs are available in 458 villages in the whole Morogoro Region. Of these 262 VEOs, 120 VEOs attended the retraining programme on crop production or livestock by 1996/97. Moreover, during the fiscal year of 1997/98, 68 VEOs are required to attend the programme. As a result, the remaining 74 VEOs would attend the programme in 1998/99 onward.

5.3.5 Rural Credit

In the Study Area there are two main credit sources:

(1) Banking Institutions

At present there are two main banks operating in Morogoro region: the National Bank of Commerce (NBC) and the CRDB (1996) Limited. They have restrictions on agricultural loans' granting.

NBC stopped granting soft loans due to the poor performance of the loans granted to small-scale farmers.

CRDB (1996) Limited started operations just in July 1996. It is only since April 1997 that it has started to grant new loans but they are they mostly commerce and services sectors' loans. The bank has infrastructure and staff constraints which make the approach to farmers for credit promotion difficult.

(2) FAO Special Programme on Food Production

The programme provides inputs to organized farmers' groups in the Mgongola Scheme (Mkindo and Hembeti villages) involved in the programme at the beginning of the farming season and allow them to pay part of the costs after harvesting.

From the above, it can be said that the rural credit within the Study Area is, with the exception of the programme mentioned before, almost completely absent and access to formal credit sources is very difficult for small-scale farmers. Farmers have to ask relatives, friends, or other informal credit sources for funds.

5.3.6 Marketing System of Agricultural Products

At present, the marketing of agricultural products is being done under a free market system. It means that there is no governmental intervention in the marketing process. Through this process, prices are set up freely. The prices are agreed between the traders and farmers through a negotiation process.

Figures 5.3.3, 5.3.4, and 5.3.5 schematically show the marketing flows for maize, rice, and horticultural products.

Table 5.3.2 shows the market and farm gate prices within Morogoro region. Tables 5.3.3 and 5.3.4 provide average crop prices in the main Dar-es-Salaam market and main regional markets, respectively. According to verbal inquiries to traders in Morogoro city, prices of main crops, after allowing transportation and handling costs, do not greatly vary from market to market.

5.3.7 Farm Economy

The results of farm budget calculation for each scheme are shown in Table 5.3.5. The Table below is the summary of the results of Table 5.3.5.

Summary of Farm Economy Analysis

(Unit: Tsh. 1,000)

	Mgeta	Mgongola	Mkula	Mwega
Holding Size (ha)	0.80	1.62	1.29	1.28
- within the scheme area	0.3	0.34	0.55	0.79
- outside the scheme area	0.5	1.28	0.74	0.49
Gross Farm Income	341	424	309	516
Off Farm Income	109	130	85	67
Gross Income	450	554	394	583
Production Cost	54	123	99	116
Net Income	396	431	295	467
Living Expenditure	297	419	256	375
Tax and Duties	6	7	4	12
Reserve (profit)	93	5	35	81

(a) Off-farm income represents 24% of gross income in the Mgeta scheme, 23% in the Mgongola scheme, 22% in the Mkula scheme, and 11% in the Mwega scheme. It means that Mgeta, Mgongola, and Mkula schemes' dependence on off-farm income for obtaining a reserve (profit) is moderate; in the case of the Mwega scheme, the off-farm income is not so important for obtaining a reserve (profit).

(b) The breakdown of off-farm income sources is as follows:

Breakdown of Off-farm Income Sources

(unit : %)

	Mgeta	Mgongola	Mkula	Mwega
Casual labor	2	3	5	15
Cottage industry	23	25	56	60
Petty business	47	41	17	12
Money remittance	18	15	12	2
Others	10	16	10	11

The above table indicates that petty business (sales of products in market stalls, small-scale sale of animals, etc.) and cottage industry (mainly production of local brew) are main sources of off-farm income. For the Mkula and Mwega schemes, cottage industry is the main source of off-farm income (56% and 60% respectively); in the case of the Mgongola and Mgeta schemes, petty business is the main source representing 41% and 47% of total of-farm income, respectively.

(c) The table below gives the share of expenditure items within total expenditures:

Percentage Breakdown of Expenditure Items

(unit : %)

	Mgeta	Mgongola	Mkula	Mwega
Food	52	47	48	43
Clothing	19	24	23	26
Education	10	8	9	11
Medical expenses	15	10	12	14
Petty expenses	3	6	6	3
Leisure	1	5	2	3

The food is the main expenditure item for all schemes, ranging from 43% for Mwega scheme to 52% for the Mgeta scheme. Clothing expenditures share in total expenditure varies from 19% for the Mgeta scheme to 26% for the Mwega scheme. Education expenditures have a share from 9% in the Mkula scheme to 11% in the Mwega scheme. Medical expenses share varies from 15% for the Mgeta scheme to 10% for the Mgongola scheme. Petty and leisure expenditures represent 1% to 6% of total expenditures. It must be noted that for all schemes, food intake is supplemented by self-consumption of the crop products, i.e., maize, rice.

- (d) Most of the farmers do not have storage facilities or farming machinery. Farming assets usually consist of only simple tools like hand hoes, pangas, etc.
- (e) Banks are located far from the villages, forcing farmers to keep their savings at home. There are no mobile units from the banks coming to the villages for promotion of banking activities.
- (f) The survey results also indicated that food security, in the sense that the household members always have at least three meals per day, has been becoming weak for some farmers. Farmers have expressed their worries that in re-cent years, at one time or another, their families have skipped one or two meals per day due to the lack of food or resources to buy them.

5.4 Irrigation Schemes in the Study Area

5.4.1 Irrigation Schemes and Related Infrastructure

(1) Mgeta Scheme

Mgeta scheme consists of numerous small and micro scale traditional furrow systems with a total irrigable area of 2,000 ha in gross. These are scattered all over the Uluguru mountains in Mgeta Division of Morogoro District. These irrigation furrows lie in steep slopes ranging from 10% to 40% and altitude ranging from 800 m to 2000 m above sea level. Most intakes are of free flow type, simply made of locally available materials such as stones, soils, wood and weed. Only a few intakes are constructed partly with cement mortar or masonry works. As such, they are subject to repair or reconstruction every year at the beginning of the dry season. All the canals are earth canals without any related structures. These canals are more or less facing erosion problems.

(2) Mgongola Scheme

The Mgongola scheme is a new scheme currently producing rice under rainfed condition. It is to be extended from the Mkindo scheme, which is a pilot scheme as one of model areas for smallholder irrigation-based paddy production.

The Mkindo pilot scheme was constructed in the 1980s. It is currently under operation with double-cropping of paddy a year. At present the planted area reaches about 60 ha a little extending to the area surrounding the original development area. Irrigation water is diverted from the Mkindo river just upstream of a natural fall, about 2 km upstream of the bridge on the trunk road B127 across the Mkindo river. There is a concrete intake equipped with two slide gates and two spillway cum sand-flushing gates.

Just after the intake gates, a side spillway drains excess water to the Mkindo river. The structure is still intact, but seems to have insufficient capacity against a big river flood. All the gates are not working well. Thus it is hardly possible to control diversion discharge. Water is conveyed to the Mkindo area through the main canal passing on a very steep slope in the upper reaches of about 250 m long. The flow capacity is estimated only around 50 lit/s. One paddy plot had been originally planned to be rectangular with an area of are, but it has been divided into 4 to 8 smaller rectangular plots to solve the micro relief problem.

The Mgongola scheme has no irrigation facilities at present. The area lies between the Dizingwi-Mkindo river and the Mgongola river and is habitually inundated by floodwater from both rivers in the mid dry season. The inundation depth is less than 0.5 m in most of the area along the Dizingwi-Mkindo river, 0.8 m in the upper part and 0.5 m in the lower part of the area along the Mgongola river at the peak flood time.

(3) Mkula Scheme

Present irrigation facilities, which consist of a headworks and canals of about 1 km in total length were constructed to irrigate 60 ha of land at the beginning of the 1980's. Then, the intake gate and the canal were rehabilitated under technical assistance of the Zonal Irrigation Office, Morogoro in the period from 1993 to 1995.

The headworks are located on the Mkula river about 20 m upstream of the bridge on the road B127. The headworks consist of a fixed weir and an intake. The weir height is only 0.3 m to 0.6 m from the upstream river bed. The intake consists of a side channel spillway of 7 m long, and an inlet equipped with a steel slide gate just after the side channel spillway. It is observed that water is leaking through the bottom of the fixed weir and the side channel spillway. The inlet crest height is only 0.5 m, which is insufficient against flood and so water overflows the inlet even at small flood time.

The existing canal is provided with wet stone masonry lining in the upstream reaches of about 300 m, and then immediately after passing through a culvert crossing under the road B127, the canal has a rectangular shape. It is made of wet stone masonry at the bottom slab and wet brick masonry for walls. The inner surface of the canal has been eroded at many points. Due to this damage and to the serious leakage of water, the main canal has never been used in the lower half reaches. Further, the outside faces of the main canal walls are not plastered and are just exposed without embankment covering. Such defective situations have accelerated water leakage and also weakened the canal foundation. Under such canal conditions, irrigation is meagerly practiced by a few water users.

(4) Mwega Scheme

The Mwega Scheme consists of three sub-schemes with adjoining land, namely the Nyinga, Mgogozzi-Mwega, and Malolo sub-schemes. All these sub-schemes abstract water principally from the Mwega river.

1) Nyinga sub-scheme

There exist three intakes. All the intakes are simply made of earth, stones and wooden works. All the canals are of earthen type. A canal from the first intake almost runs alongside the existing access road for about 1.5 km from the intake site. The commanding area is a narrow strip of about 21 ha

in gross extending between the Mwega river and the canal. The second intake commands an area of about 30 ha in gross on the right bank of the river. The third intake was constructed by farmers in 1994 with an earthen canal about 2.5 km upstream of a former intake, since the former intake was completely washed away during the rainy season in 1993. The new canal is connected with the old canal system. The gross area commanded by this canal is about 74 ha on the left bank of the river. In addition, this system is serving a part of the Mgogozi-Mwega sub-scheme as explained below.

The Mwega river has insufficient flood carrying capacity in the Nyinga area, therefore habitual flooding occurs in the upper and middle parts of the Nyinga area.

2) Mgogozi-Mwega sub-scheme

A free intake serving the Mgogozi-Mwega area was completely washed away by a seasonal flood in 1995, causing an acute water shortage in the area. This situation was partly improved after the construction of an aqueduct across the Mwega river in 1996 with assistance of TIP. The aqueduct consists of a 30 cm PVC pipe supported by concrete piers and is supplying irrigation water coming from the third Nyinga intake. The conveyance capacity seems to be insufficient to cover all the Mgogozi Mwega area of 60 ha in gross.

3) Malolo sub-scheme

There are two irrigation systems, the Malolo intake-A system and Malolo intake -B system.

Both intake sites are at the edge of the seasonal swampy area in the central part of the Malolo basin. The Malolo intake-A is located about 1.5 km upstream of the Malolo intake-B. Both intakes were built with concrete in 1972. The intake A consists of an overflow weir and an intake and the intake-B consists of a fixed weir and a right intake and a left intake for diverting water separately to the right and left river terraces. The crest length of the overflow weir is only 5 m in both intakes A and B.

The presence of a weir in the intake-B has caused sand sedimentation of about 1 m thick in the upper reaches. The sedimentation reduces the river carrying capacity and causes flood in the basin, and probably results in the submerged condition of the intake-A. The intake-A is half buried under sand deposits. It is estimated that the riverbed is raised by about 1 m in both the upper and lower reaches of the weir of the intake-A, and almost equal to the adjacent field height upstream of the weir at present. Due to this insufficient freeboard and insufficient crest length of the weir, the river water often overflows the whole structure and inundates the whole area around the intake.

The intakes A and B are diverting water to the irrigable area without any discharge control system or in other words, the diversion discharge largely depends on the river water level. Also, as the river water often overflows the whole structure, the diversion discharge cannot be controlled at the flood time.

All the canals are of earth type. The lengths and commanding areas of existing major canals are as follows:

Primary Features of Major Existing Canals in Malolo Sub-Scheme

Name of canal	Origin	Length (km)	Irrigation area in gross (ha)
Canal-A	from the intake-A	9	167
Canal-B	from the intake-B	8] 250 including canal-C area
Canal-C	from the intake-B	2	
Canal-D	from the intake-B	3	

5.4.2 Irrigation Practices

In most traditional irrigation systems, water is continuously diverted from a river without inflow regulation and conveyed through an irrigation canal. Water conveyed through a canal is diverted to a field ditch or directly to fields through a simple earth turnout, which is just a soil clod blocking water on the major canal or just a canal-bank cutting allowing water to be diverted. Diverted water is conveyed and eventually delivered to a series of small rectangular basins. The water supply to these basins is such that water is first admitted to the first basin, once this first basin is filled, the first inlet is closed and the second inlet is opened for supplying the second basin. This process goes on until all such basins are saturated. In areas where basins are arranged on a uniform sloping land, a cascade water supply through a series of basins is also observed. Such irrigation practices are executed on a rotational basis. In the rainy season when water is abundant, water is continuously flowing with little regulation. In the Mgeta scheme, a canal diverts water to terraced farm plots through small furrows (side ditches) on a rotational basis. It is often seen that water application is done by a person holding a bowl and repeatedly fetching water from the side ditch and splashing directly to the plant with about one to three throws. Once water supply to the first terrace is satisfied, the first inlet is closed and water is directed to flow to the second lowlying terrace. The same application method as for the first terrace is repeated in the second terrace and subsequent terraces.

5.5 Present Set-up of Farmers' Organizations

5.5.1 Activities of Government Supporting Services

Figure 5.5.1 shows the governmental agencies involved in the agricultural development in Morogoro region as of August 1997. At the regional level, the agricultural support services are handled by the office of RALDO belonging to the Commissioner of Agriculture and Livestock Development (CALD), MAC. Under RALDO, the office of DALDO is responsible for the agricultural support services to the farmers in each district. In Morogoro region, there are three DALDO offices; Morogoro, Kilosa, and Kilombero district offices.

In 1996, GOT had a regional government restructuring plan. According to the Regional Government Office, the agencies at regional level such as RALDO and the Regional Cooperative Officer (RCO) will be drastically reorganized in their structure and staffing. This restructuring plan is presented in Figures 5.5.2 and 5.5.3. Overall, the regional government agencies will be reorganized and simplified, while the district government agencies will be strengthened. For instance, the present office of RALDO will be closed, and only two officers (RALDO and livestock officer) belong directly to the

Regional Secretariat which is newly organized under the Regional Commissioner and belongs to the Prime Minister's Office. Then other officers/engineers having knowledge and experience in the RALDO office will be shifted to the district agencies (DALDO's offices).

The Zonal Irrigation Office (ZIO) which belongs to the Assistant Commissioner of Irrigation under CALD may also be restructured, but no detailed information is available up to date. The organizational structure and staffing of ZIO as of August 1997 are presented in Figure 5.5.4.

GOT has adopted a basic policy that the irrigation systems should be managed and maintained by the beneficiaries themselves through their efforts. All the irrigation systems in the project area have accordingly been managed and maintained by the farmers under supporting services of the Government. At present, these supporting services for O&M of irrigation systems have been provided by the offices of DALDO. These offices have however a lot of problems, i.e. lack of funds, poor knowledge level of front-line staff, and insufficient communication facilities between their offices and the sites. In addition, each DALDO' office has only one to several irrigation officers and has no field irrigation technicians below the district level, except for the Mkindo and Mgogozzi schemes. The organizational structure and staffing of each DALDO' office are shown in Figure 5.5.5.

At present, the office of RCO is responsible for registration of the farmers' organizations including WUGs and encouragement of their activities. The office of the District Cooperative Officer (DCO) under RCO has direct responsibility for providing these activities to all farmers' organizations in the district. DCO has however only one to two assistant officers and no field staff is assigned below district level. Their main task is to encourage the activities of all farmers' organizations, but they have no experience on WUG. The number of staff in each DCO' s office as of August 1997 is as shown in the table below:

Location of Offices	Staff
RCO's Office	3
Morogoro Municipality	3
Morogoro	3
Kilosa	3
Kilombero	2
Uranga	3
Total	17

Note: no staff below district level.

5.5.2 Farmers' Cooperatives

(1) Cooperative Unions in Morogoro Region

In Morogoro region, there exist three cooperative unions for agricultural marketing as shown below.

Cooperative Unions in Morogoro Region

	Morogoro Farmers Cooperative Union Ltd. (MFEACU)	Kilosa Cooperative Union Ltd.	UKICU Cooperative Union Ltd.
(1) District	Morogoro	Kilosa	Kilombero & Ulanga *2
(2) Year established	1995	1995	1995
(3) No. of primary coop. societies	33	12	28
(4) No. of total members	874	4,000	2,500 *3
(5) Total amount of loan issued to members in 1995/96 *1	6,400 litre TSh.40 million	10,800 litre TSh.49 million	16,700 litre TSh.58 million
(6) Facilities	9-Godowns, 2-Ginning factories	1-Lorry, 1-Godown, Ginning factory (15-machines), 1-Oil extracting factory	1-Lorry, 5-Godowns, 3-Ginning factories.

*1 Mainly insecticides for cotton cultivation and loan in kind.

*2 Kilombero District: 1,000 members, Ulanga District: 1,500

*3 Actual members: 527

Source: Information obtained from cooperative union in each district.

Under these three unions, 73 primary cooperative societies have been organized as of September 1996. The main objectives of the unions are to improve marketing of crops and to support farm inputs supply to the farmers. As of September 1996, these three unions have extended insecticides loans totaling of Tsh.147 million. These loans have been issued to the cotton farmers in kind and without interest. The funds are provided by the cotton buyers. The problems with their activities are deterioration of ginning machines, lack of funds, and poor transportation facilities.

(2) Existing Farmer's Cooperatives in the Irrigation Schemes

In the project area, there are only two primary cooperative societies as shown in the following table.

Existing Farmer's Cooperatives in the Irrigation Schemes

Schemes	Villages	Population	No. of Coop.	Year established	No. of farmer	Remarks
Mgeta	Twalangize Coop.		1	1995		Twalangize Cooperative covers
	Langali	3,000			n.a.	Langali and Bunduki wards.
	Bumu	1,400			n.a.	Marketing of coffee
Mgongola	Dizingwi Rural Cooperative Society Ltd.		1	1991		Dizingwi Cooperative covers
	Mkindo	4,220	}		14	three villages of Mkindo,
	Dihombo	1,850			6	Dihombo and Hembeti
	Hembeti	2,400			15	Mainly marketing of cotton
Mkula	Mkula	2,940	-	-	-	
Mwega	Nyinga *1	200	-	-	-	
	Malolo	3,800 *2	-	-	-	
	Mgogozi	1,270	-	-	-	

*1 Sub-village of Malolo.

*2 Excluding population of Nyinga sub-village

Source: Information and data obtained from ward executive officer, village executive officer, village extension officer and farmers.

The Twalangize Cooperative Society has handled mainly cooperative shipping of coffee. The membership of the Twalangize is Society less than 300 farmers, and its management area covers many villages in Langali and Bunduki Wards. It seems that its service area is too large relative to its management capability, because it does not have transportation and communication facilities such as lorries and telephone.

The Dizingwi Cooperative Society was organized for the purposes of providing marketing services to the farmers on farm inputs and all storable crops including rice, maize, cotton, etc., but its present activities are concentrated on the marketing of cotton. This Cooperative consists of about 40 members in the three villages of Mkindo, Dihombo, and Hembeti. At present, this cooperative has almost no activity because of inactive cotton cultivation in the three villages.

Both of the above cooperatives have been registered as authorized organizations under the Co-operative Act. No.15, 1991. The members who benefit from both cooperatives are mainly cotton and coffee cultivators. At present, these cooperatives have management problems such as lack of funds for marketing of crops, lack of storage facilities, etc.

5.5.3 Water Users' Groups

In the project area, many water users' groups (WUG)¹ have been organized in the 4 schemes, as shown in the following table. The details are presented in Table 5.5.1.

Outline of Existing WUGs in the Irrigation Schemes

Schemes	Village	WUG	Year established	No. of farmers	Water charge	Regist	Water right	By-laws	VE O	If *8
Mgeta *1	Langali	WUGs*1	*2	n.a.	-	-	-	-	1	-
	Bumu	WUGs*1	*2	n.a.	-	-	-	-	1	-
Mgongola	Mkindo	1	1984	96	70 kg of paddy /year/plot	1997	-	Exist	1	1
	Dihombo	(No irrigation system)	-	-	-	-	-	-	1	-
	Hembeti	(No irrigation system)	-	-	-	-	-	-	1	-
Mkula	Mkula	(1)*3	1994	(110) *3	-	-	-	-	1	-
Mwega	Nyinga *4	3	1940s-1996	110 *5	-	-	-	-	-	-
	Malolo	4	1980s-1993	610-660	-	-	-	-	1	-
	Mgogozi	2	1994	550 *6	(30 kg of onion/season/acre)*9	-	-	Exist	-	1

*1 Many WUGs have been organized by each intake weir or branch canals.

*2 Many irrigation facilities had been constructed since long time ago (before independence).

*3 Organization planned in 1994. At present, this organization consists of an irrigation area of only 5 with 4 acres, and has almost no activities.

*4 Sub-village of Malolo.

*5 Including Nyinga farmers only.

*6 Farmers in Mgogozi have farm lands covered by both WUGs.

*7 Village extension officer

*8 Irrigation technician

*9 In 1996, the Mgogozi WUGs had a plan for collecting fixed irrigation service charge amounting to 30kg of onion under the guidance of TIP, but its collection is not commenced yet as of August 1997.

Source: Information and data obtained from ward executive officer, village executive officer, VEO, leaders of WUG and farmers.

The Mgeta scheme which was selected as one of the priority projects covers two villages, Langali and Bumu. There are many small scale irrigation facilities in both villages, and all these facilities have a certain organization for operation and maintenance. WUG of the Mkula scheme has almost no activity since 1994. The Mgongola scheme includes 3 villages of Mkindo, Dihombo and Hembeti, and there is one WUG in Mkindo village. The Mwega scheme includes Malolo and Mgogozi villages, and there are

¹ This report refers all of farmers' organizations or groups related to the operation and maintenance of irrigation facilities as "water users' group (WUG)." In Tanzania, such organizations are classified into two types: "Association" and "Cooperative", and the former is registered with the Ministry of Home Affairs and the latter with MAC. "WUG" in this report has no relation with those organizations and it is one ad hoc technical term.

9 WUGs in total. In general, a WUG has a general meeting and an executive committee (water users' committee) consisting of 5-10 members (see Table 5.5.1). In case of large scale systems, several sub-groups or irrigation blocks belonging to WUG have been organized by each sub-village or on a branch canal basis.

(1) Organizational Structure and O&M of Irrigation Facilities

Overall, the water distribution from plot to plot or diversion to the branch canals is decided by mutual consent of farmers. In most cases, maintenance of facilities is done by farmers as communal work. Traditionally, the village people have such communal work system as a custom in their community, and maintenance work by this system has been accepted by the farmers without any problems. At present, almost all farmers in each WUG contribute to the communal work, and it may be said that this maintenance work system itself has functioned well. There are some water disputes among the farmers or between irrigation groups. But these are not so serious, and have been settled by farmers themselves. The details of each WUG organized in the irrigation schemes are described below.

Mgeta Scheme

Many irrigation facilities had been constructed by the farmers a long time ago (before the independence), and farmers have a long experience in irrigation farming over 40 years. Among the facilities investigated by the Study Team, the most oldest facility was constructed in 1936 and the latest one in 1996. A WUG is organized for each intake weir or each branch canal. The size of each WUG differs largely. The largest groups has 170 member farmers and the smallest one only 4 member farmers. It is estimated that half of WUGs have a leader and the remaining WUGs have no leader with loose organization.

WUGs in the villages are divided into two types from the standpoint of water distribution system; one is the WUGs having a rotational irrigation system and the other is those having a non-rotational irrigation system. In general, the former WUGs have a problem of water shortage, and the farmers have taken water in turn at 3- to 8-day intervals. In the latter WUGs, any member farmer can take water at any time under traditional rule² with mutual consent of farmers. The irrigating period is decided by the farmers themselves depending on the farm size and available water. For both types, irrigation is carried out in the daytime, but in the case of water shortage, farmers take water in the nighttime.

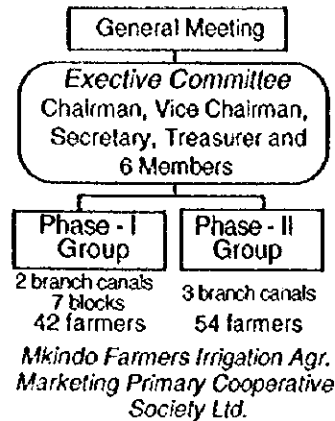
In most cases, maintenance of facilities is done by farmers as communal work. If farmers do not join the work, they are subject to fine by WUG. Collection of irrigation service charge is not common among WUGs, and if a WUG requires some funds for repairing of facilities, it collect contributions from the farmers.

Mgongola Scheme

The Mkindo irrigation scheme has been operated and maintained by a farmers' cooperative which has a registered name of "Mkindo Farmers Irrigation Agr. Marketing Primary Cooperative Society Ltd." This cooperative was initially organized in 1984, and

² A farmer who takes water puts stones or sticks at its intake. Other farmers shall take water only downstream of it.

after construction of Phase-II area, the farmers in this area joined the Cooperative in 1986. The number of farmers totals 96 as of August 1997. The cooperative was registered with MAC the Ministry of Agriculture and Cooperatives in April 1997. The organizational structure is presented in the following figure.



The Mkindo Cooperative Society has an executive committee consisting of 10 committee members under the general meeting. The member farmers are divided into two groups; Phase-I and Phase-II groups. Each group has a group leader. The former group consists of 7 irrigation blocks, and each block takes water for one day. It means that water is distributed to individual farmer at 7-day intervals. The latter group has three branch canals, and each canal takes water for one day. Namely, a farmer in the Phase-II group can take water at 3-day intervals.

The Cooperative manages the communal work for maintenance of irrigation facilities twice a year (before every season) and one week per time. The Cooperative punishes absentees according to the following process: (i) 1st - warning to absentees, (ii) 2nd - fine of Tsh. 500, and (iii) 3rd - the Cooperative stops water distribution to absentees during one season. The secretary of the Cooperative said that almost all farmers have joined the communal work.

The Mkindo irrigation system has following several problems: (i) water leakage from canals, (ii) inappropriate design of canal profile, and (iii) weeds along the canals. As for the Cooperative's activity itself, it has functioned well and farmers have no water disputes among them. However, there are some water disputes with outside farmers who steal water from upstream main canal. In the last season (1996/97), the Cooperative encountered such problems 2 times, but these were settled by the village government.

Mkula Scheme

At present, the existing irrigation system has only 4 acres. In 1978, the irrigation development plan for 60 ha in Mkula village was commenced by the District Council, but the facilities were constructed imperfectly. In 1992, ZIO resumed the implementation of this plan with the budget of the Regional Government, with farmers participation to the construction works. At that time, a WUG covering 60 ha was established in Mkula village. The organizational structure of this WUG consists a water users' committee and three sub-WUGs which are organized by each sub-village. However, almost no activity is being conducted by this WUG at present, because the irrigation area developed by it is only 4 acres and its total membership is only 5.

Mwega Scheme

In the Mwega scheme, there are 8 WUGs; Upper Nyinga, Middle Nyinga, Lower Nyinga, Canal A, Canal B, Canal C, Canal D, and Mgogozi-Mwega. The present conditions of these WUGs are as follows:

1) Upper Nyinga

The irrigation facilities of Upper Nyinga had been constructed before the 1920s, and were completely damaged by the flood in the 1920s. In the 1940s, the canal was reconstructed by farmers. WUG consists of only 9 farmers including a chairman. WUG has no rotational irrigation system. Namely, water allocation is decided by the leader, and any farmer can take water at any time with the approval of the leader. In general, a farmer takes water twice a week. All canals and intake weir are maintained by farmers' as communal work which is carried out 1-2 times a year and 5 days each time. WUG collects one chicken/person from farmers who shirk the communal work.

2) Middle Nyinga

The irrigation facilities were constructed by the farmers in the 1980s. The number of farmers is estimated to be 40 excluding Mgogozi farmers. The organizational structure of WUG's committee consists of a chairman, a secretary, and 2 block leaders. Farmers are divided into 2 blocks. Each block takes water for 3 days per week, and the remaining one day is free to all farmers. Within a block, water allocation is decided by the block leader, considering the crops, farm size and soils. Irrigation is carried out only in the daytime, but farmers can take water in the nighttime. WUG arranges communal work for maintenance of irrigation facilities, which is carried out 2 times a year and 5 days each time. Absentees from communal work are punished with a fine of Tsh. 2,500/person, but almost all farmers have joined this work.

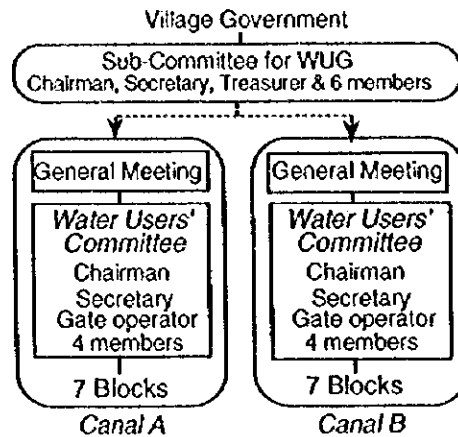
3) Lower Nyinga

The irrigation facilities were constructed by the farmers themselves in 1996. The organizational structure of WUG consists of a chairman, a secretary, and several block leaders. The number of farmers in this system is 60. Farmers are divided into 4 blocks, and each block takes water for 3 days (rotational irrigation at 12-day intervals). Within a block, water allocation is decided by a block leader, depending on the farm size. Irrigation is carried out normally in the daytime, though farmers can take water in the nighttime. Maintenance of facilities is carried out as communal work 2-3 times a year and 2-3 days each time. All facilities are maintained by all farmers and without piece work. Absentees from the work are punished with a fine of Tsh.500/person. According to the leader, almost all farmers have joined the communal works.

4) Canals A and B

The Canals A and B were constructed by the farmers before independence. The total number of farmers belonging to WUGs for both canals is 500-550. WUGs of both canals have the same organizational structure which consists of

a chairman, a secretary, a gate operator, and 4 committee members. In addition, they have almost same operation and maintenance activities for irrigation facilities between them. WUGs were organized in 1992-1993. Before the establishment of these WUGs, the farmers' groups having simple structure had been organized for both canals. An organization chart of these WUGs is illustrated below:



Both canals have 7 irrigation blocks each. Under the rotational irrigation system at 7-day intervals, each block takes water for 1 day. Each block applies a different water allocation pattern. In general, farmers in a block are divided into two groups, and each group takes water during 6 hrs. Thus a farmer takes water once a week, though the irrigation period differs depending on the farm size. Irrigation is carried out in the daytime, and in the case of water shortage, farmers can take water in the nighttime.

The operation and maintenance of facilities are carried out by farmers as communal work under management of the village government. For such services, the village government has a sub-committee belonging to the planning and financial committee. The sub-committee arranges the communal work for canals A and B. Namely, the leaders of WUGs report to the sub-committee the necessity of canal cleaning or maintenance of intake weir. In response to this report, the sub-committee dispatches several inspectors to the fields. If the necessity is confirmed by them, the sub-committee announces the communal work to all farmers of WUG as a village government order. The communal work is carried out 3-4 times per year. Each farmer takes over a portion of canals for maintenance, while the maintenance of the intake weir and emergency repair are carried out by all farmers. All canals are cleaned in the communal work for 2 days/week and within 2-3 weeks. Almost all farmers have joined canal cleaning work. The village government imposes a fine of Tsh. 1,200-2,000 on absentees from such work.

5) Canal C

The Canal C has unclear water allocation, because its operation was commenced by the farmers just in 1996. The canal C had been used by the District Council, and handed over to the farmers in 1996. The total number of farmers is estimated to be 80. WUG has almost the same organizational

structure as that of WUGs of canals A and B. The maintenance of facilities is carried out by farmers as communal work. Each farmer takes over a portion of canals, and the maintenance of intake weir is carried out by all farmers and without piece work. WUG arranges communal work and has no relation with the sub-committee of the village government like in the case of canals A and B.

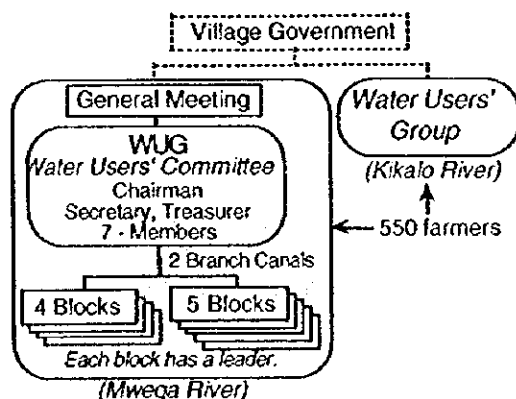
6) Canal D

The Canal D has been constructed by the farmers before independence. The total number of farmers is estimated to be 30 including Maasai people. The Canal D has two branch canals, and one branch takes water for 4 days and another branch for 3 days. Within a branch canal, any farmer can take water at any time. Water is allocated to each plot by mutual consent among the farmers. WUG arranges communal work for maintenance of facilities irrespective of the village government, as well as canal C. This work is carried out 2 times per year (June and November) and 2-3 days per time. WUG imposes a fine of Tsh.1,000 on absentees from the work.

7) Mgogozi-Mwega

There are two WUGs in Mgogozi village; one is for the Mwega river irrigation system and the other for the Kikalo river irrigation system. The former system is included in the Mwega scheme. These WUGs were established under the guidance of TIP in 1996, though irrigation groups consisting of simple structure had been organized formerly. Almost all farmers (estimated to be 550) in Mgogozi village hold the lands in both irrigation systems.

An organization chart of these WUGs is illustrated below:



The Mwega river irrigation system has two branch canals and 9 irrigation blocks which consist of 4 blocks belonging to one branch and 5 blocks to another branch. Each block takes water for 3 days, and within a block, each farmer takes water in turn depending on the farm size. Thus a farmer in the blocks of the former branch canal irrigates his land at 12-day intervals, and the latter at 15-day intervals. WUG in the Mwega irrigation scheme owns an intake weir jointly with WUG in the Nyinga lower irrigation system. Previously, water had been allocated to WUGs at 3-day intervals. Since the new aqueduct was constructed in 1996, both WUGs have taken water continuously.

The maintenance of the facilities is basically carried out by farmers as communal work 2 times a year and 2 days each time. However, there is no fixed schedule for this work, and farmers can carry out canal clearing individually and at anytime. The village government manages all the communal work. If a farmer shirks the cleaning work, the village government punishes him with a fine of Tsh. 500-1,000.

(2) Irrigation Service Charge

The maintenance of irrigation facilities in all schemes has been carried out by farmers as communal work which is arranged by WUGs or the village governments. In addition to the communal work, the Mkindo Cooperative and the Mgogozi WUG have a plan to collect irrigation service charge (ISC) from the farmers.

The Mkindo Cooperative commenced to collect ISC of Tsh.1,000/year/acre from the 1994/95 season. Out of 96 farmers, 85 farmers paid ISC to the Cooperative as of August 1997. The collected amount has been deposited into the Cooperative's bank account (NBC Morogoro) for maintenance fund. In 1997, the Cooperative has a plan to change the ISC payment system from "cash" to "in kind" and its rate to one paddy bag (70 kg)/year/acre.

The Mgogozi WUG plans to collect some water charges from the farmers. It was rated at 30 kg of onion/season/acre. According to the village chairman in Mgogozi, the collection of onions is not started yet as of July 1997. This was in accordance with the guidance of TIP, but farmers have no interest in paying water charge recommended by TIP. It seems that more propagation with some extension programme is needed to introduce such system.

The collection of ISC should be stipulated in by-laws. WUGs can collect from the project beneficiaries all ISC according to the Water Management Act 1974 (Act No. 42/74).

(3) By-laws and Registration of WUG

The Mkindo Cooperative and Mgogozi WUG have by-laws, but other existing WUGs have no such by-laws. By-laws are indispensable for registration of WUG. In addition, a punishment rule to be applied in the case of shirking communal work and evading payment of water charge mentioned earlier should be enforced by by-laws. By-laws must be authorized legally by the governmental agencies. In the case of the Lower Moshi Project located in the Kilimanjaro Region, the Moshi District Council has authorized the by-laws enacted by CHAWAMPU which is WUG of this project, with approval of the Minister responsible for Local Government. In 1996, CHAWAMPU sued the farmers who stole water, and 7 farmers were sentenced to 4-month penal servitude under the by-laws.

With exception of the Mkindo Cooperative, the existing WUGs in the project area are not registered yet, nevertheless they can be registered as authorized organizations under the Cooperative Act No.15, 1991. As one of the major reasons for not registering, it is pointed out that the farmers of WUG have a poor knowledge of the registration act. In addition, the district cooperative officers who handle registration have also a poor knowledge of the registration procedure in the case of WUGs, and most of them have misunderstood that WUG is an organization different from the cooperatives for marketing, saving, consumption, etc. and it cannot be covered by the above Cooperative Act No.15.

The Mkindo Cooperative was registered with MAC in April 1997, under the supporting services of the irrigation technician attached to the Mkindo irrigation system. RCO has the power to register primary cooperatives like the Mkindo Cooperative on behalf of the Registrar (Commissioner of Cooperative Development, MAC). The registration of the secondary cooperatives, and above (Cooperative Union, APEX, etc.) is handled by the Registrar.

The registered cooperatives should get auditing by an authorized organization once a year. In addition, the cooperatives should submit their final accounting books to an authorized auditing organization within 3 months from the end of the budget year. The Cooperative Audit and Supervision Corporation (COASCO) has provided these services to the registered cooperatives.

(4) Water Right

The Regional Water Engineer is responsible for registration of the water right under the Act No. 42 of 1974. With exception of the Mkindo Cooperative, all existing WUGs in the irrigation schemes have no official water rights, because they are not legally authorized yet. The Mkindo Cooperative in the Mgongola scheme has actually held water right for irrigation before the registration, and the official holder is RALDO on behalf of this Cooperative.

5.5.4 Activities of Other Community Societies

(1) Women's Group

In the villages within the irrigation schemes, there are 13 women's groups organized under foreign aid assistance programmes or with the guidance of village governments and/or by women themselves. The membership of a group is not larger than 20 women. Their activities are mostly crop cultivation in the rainy season and production of local beer in the off season. The table below provides information on the existing women's groups in the project area.

Existing Women's Groups in the Irrigation Schemes

Schemes	Village	Popula- tion	No. of Groups	Year Established	Supporting Agencies*2	Total Members	Activities
Mgeta	Langali	8,500	n.a.	n.a.		n.a.	
	Bumu	1,400	-	-		-	
Mgongola	Mkindo	4,300	1	1994		10	Paddy cultivation (1 acre)
	Dihombo	2,100	1	1976		20	Production of local beer
	Hembeti	2,200	2	1995 & 1996		10	Paddy cultivation (10 acres)
Mkula	Mkula	2,900	3	1995		30	Paddy and maize cultivation
Mwega	Nyinga	(400)	-	-		-	
	Maloto	3,800	5	n.a.	PRDVL	30	Crop cultivation / Local beer
	Mgogozi	1,300	1	n.a.	PRDVL	5-7	Afforestation

PRDVL: Planning of Rural Development at Village Level, the World Bank

Source: Information and data obtained from wad executive officer, village executive officer, village extension officer and farmers.

(2) Role of Women in Farming and Living

The table below shows the everyday and farming activities carried out by women in the villages:

Role of Women in Farming and Everyday Activities

	Mgeta	Mgongola	Mkula	Mwega
(1) Role of women in farming				
- Land preparation	B	B	B	B
- Seeding	B	B	B	B
- Transplanting	B	-	-	B
- Weeding	B	B	B	B
- Fertilizing	B	B	B	B
- Spraying of chemicals	B	M	M	M
- Irrigation	B	-	-	B
- Drying/bagging of products	M	B	B	B
- Harvesting	B	B	B	B
(Heavy work)	(M)	(M)		(M)
- Selling of products	M	M	M	M
(2) Transportation of water	F	F	F	F
- Distance (km)	0.5	0.3	0.5-1	0.5-2
- Frequency (times/day)	3	4	3-4	3-6
(3) Collection of fuel food	F	F	F	F
- Distance (hrs.)	*	3	3	3-5
- Frequency (times/week)	*	2	2	2

M = Male, F = Female, B = Both

Source: Interview survey to farmers, village executive officers and village extension officers.

In most cases, transportation of water and collection of fuel wood are entrusted to women, while spraying of chemical and selling of products are carried out by men. Other farm works are done by both men and women. It may be said that women play an important role in farming and everyday activities.

One important fact is that men usually control the household finance. The valuable products from farming are always sold by males, and all proceeds from farming activities are held by the male head of the household making women financially dependent on him. It is important that women should be empowered, not only by increasing their participation in the decisions governing the village but also by increasing the opportunities to become financially independent.

(3) Farmers' Groups under FAO Special Programme

In the Mgongola scheme, there are several farmers' groups which are being organized under the special programme for food production especially maize and rice, assisted by FAO. This programme provides farm inputs' loans with technical guidance for crop cultivation to those groups. The loans are lent in kind. The present condition of these farmers' groups is shown below.

Farmers' Groups under FAO Special Programme (as of Sept. 1996)

	No. of Groups	Total Members	Crops cultivated
Mgongola			
Mkindo Village	2	27	Paddy
Hembeti Village	4	Over 30	Paddy + Maize

Source: Information obtained from village executive officers.

5.6 Environment

5.6.1 Natural Environment

(1) Water Resources and Water Quality

A number of rivers and streams are found within the Study Area, many of which disperse and peter out in swampy areas and flatter lower plains. The rivers and streams are descending with narrow valleys having rocky riverbeds up to the point where they enter the plains. As a result of the considerable rainfall in the rainy season (March to May), many sizable waterlogged lands and seasonal inundated lower plains are found, while many dried riverbeds are observed in the dry season. The river courses in the upper part of the plains are frequently silted up.

Many of the villagers in the Study Area, which are located at lowlying plains, use water from irrigation canals, while those in hilly and mountainous areas use surface water from streams and do not have access to safe water sources because of poor facilities and long distance to such sources.

The Water Utilization Act (1974) was amended in 1981 with the declaration of the Urban Water Supply Act to make adequate water pollution control. Two guidelines on water quality; WHO Standards (WHO, 1963) and Tanzania Temporary Standard (1974), set the general standards for drinking water in Tanzania. According to the results of the field survey, no constraint on water quality is found, except poor quality of some water resources for drinking purpose due to turbidity and bacteriological contamination.

(2) Vegetation

Vegetation in the Study area could be classified into six Groups and 8 Types: Forest (Alpine Forest), Woodland (Woodland [closed], Woodland [open], Wooded Grassland), Bushland, Grassland (Dry Open Grassland, Grassland [Wetland]), Cultivated Areas (Bushland [other land]). Bushland and Shrub Thicket, Woodland (Woodland [closed], Woodland [open]) correspond to Miyombo Woodland which totally covers some hundred thousand sq. km of under-utilized land in Tanzania.

Cultivated lands and scattered settlements (Bushland [other land]) and Bushland [Bushed Grassland] widely cover most of the land within the proposed scheme areas. While grassland communities appeared to be the dominant vegetation in the Study area, only "islands" of woodlands and/or wooded grasslands are left. Woodland and Wooded Grassland could be commonly found in the surroundings, having rolling to hilly terrain of the villages in the Project Areas. However, the distance to Woodland from villages has been continuously increasing because of woodland degradation.

(3) Source of Fuel Wood

It is estimated that wood fuel exceeds 90% of total national energy supply (Tanzania Forestry Action Plan, 1989). Long run demand of fuel wood is considered to increase 1.5% per annum, though the annual yield of the net productive forest in Tanzania is estimated at about 65% of the total consumption volume. In addition, more than 85% of residents in urban areas use charcoals. Most of them come from the productive forest located 100-150 km from Dar es Salaam, which covers most of forest lands and woodlands in Morogoro Region.

Most of the inhabitants in the Study area depend heavily on biomass fuel resources collected from the woodland and thicket vegetation around settlements. A few farmers, problem around settlements in the Area.

Many households collect fuelwood as far as 3 to 7 km from their homes with a collection frequency of twice to three times every week spending 4 to 6 hours per one collection. The fuelwood consumption is estimated at around 3.6 t per family/year or 6 m³ per family/year. The total wood requirement for domestic consumption is estimated at 1.5 to 2.0 m³ per cap./year including wood for other purposes, i.e. construction, facing, etc.

(4) Wildlife

Wildlife within the Central Wami River basin and its surroundings is dominantly "generalist". They are mainly vermin species which include baboons, monkeys, wild pigs, and birds, except for the areas bordering the Mikumi National Park, Udzungwa National Park and the Selous Game reserve which is bordering some proposed Project Areas. Other wildlife species are denominated as "specialist" being restricted to specific zones. The wetlands in particular are rich in varieties and in number of animals of specialist species and birds, including aviary ones. Swamp and flooded lands which are not utilized for cultivation, form a very important refuge for these animals and birds. Thus, most of wildlife would be affected by the swamp and flooded land changes.

According to available literature, important species are Red Colobus Monkey, Buffalo, Dikidiki, Bush buck, Duiker, Eland, Hartebeest, Impala, Antelope, Rudock Steenbok, Warhog, Wildebeest, Ducks Geese, Franklin, Guinea Fowls, and Dove Pigeon. Additionally, some crop damage by wild animals (specially during the dry season) is reported, specially in the areas bordering the National Park.

Fisheries resources are widely found in the Wami river and its associated swamps /tributaries. A preliminary list of the species inhabiting in the main streams and rivers throughout the Area includes Ilapia and Clarias, Bagnis, Sisticodus, Citharinus, Eutropicus, Schilbe, Alestes, Mormyrus, Lases, Synodontis, Barbus, Hydrocinus, eels, trout, and shrimps. However, almost all the local communities consume fish but commercial fishing is not common, though some small fish farming is being carried out.

(5) Livestock and Pasture Land

The cattle population density in the Region is estimated at 10.8 heads/km² (11.5 ha/head) based on the number of cattle (National Sample Census of Agriculture 1993/94) and total range area of 30,000 km² (Morogoro Region Statistical Abstract, 1993). The cattle population growth rate in Tanzania is estimated at 15%.

The range within the Area is classified as Zone III (Dry- sub-humid to semi-arid) to Zone IV (Semi-arid) of Eco-climatic zones of East Africa (Pratt et al., 1966). Woodland and wooded grassland to bush/shrub grassland are the natural vegetation in the Zones. The ratios of livestock carrying capacity under subsistence pastoralism can be obtained at 1.6 ha per head in Zone III and 4.0 ha per head in Zone IV (Pratt, 1968). On the other hand, as suitable land for cattle grazing is estimated at 16,436 km² within the Region (MAC, 1986/87), the carrying capacity of rangeland is around 500,000 animal units equivalent, assuming a capacity of 3 ha per head. Thus, the potential for additional cattle keeping in the Region is not considered to be enough.

The cattle diseases in the Study Area could be grouped as general diseases, tick-borne disease, trypanosomiasis, calf disease, skin disease, and helminths. In the Study Area, the common varieties of Tse-tse flies (*Brevipalpis pallidipes* and *Austeni*) which spread trypanosomiasis, are found and Tse-tse-infected area in Morogoro Region is estimated at 23,053 km² (MAC, 1986/87). Traditional Tse-tse control has been based on bush-control operation which is carried out by creating belts of open country and control of wildlife, to eliminate reservoirs of infection and to prevent spread.

(6) Area for Natural Conservation

In and around the Study Area, there are two National Parks; Mikumi and Udzungwa N.P., Selous Game Reserve, Kilombero Game Controlled Area and Mkata Game Open Area. In the southern part of the surroundings of the Study Area covering the upper parts of the catchment of the Rudete and Msagere Rivers (tributaries of Ruvu River) and Mkata River (upper part of Wami River Basin); Udzungwa N.P. around the south-western part covering West Kilombero Scarp; Kilombero G.C.A. on the southern part of the area located in the Msolwa Plain; Mkata G.O.A. on the southern margin of the Mkata Plain borders on Mikumi N.P. in the west.

There are many forest reserves of various scales in the Region, most of which are located in hilly to mountainous areas, having a total area of 3,626 km² in the three districts within the Study Area. The most extended forest reserves are the Mkulazi Forest Reserve (68,627 ha) in Morogoro District, Ukwiva Forest Reserve (54,635 ha) in Kilosa District, and Udzungwa Scarp Forest Reserve (20,720 ha) in Kilombero District.

5.6.2 Socio-economic Environment

(1) Health Service

Regional and district hospitals have better facilities and more skilled personnel and better quality of diagnosis than dispensaries and health centers. However, it is obvious that the health service facilities in the Area fall short of WHO-recommended minimum requirements set. Considering the conditions of poor water supply and high risk of water-borne/vector-borne diseases, it is considered that the improvement of the service level is an urgent requirement.

(2) Morbidity Pattern

Diarrhea, meningitis and rabies are the top three diseases which are under the obligation to be reported. Malaria holds the top position in the out-patient morbidity figures and occupies the first position in frequency of diagnosis and treatment in the Region and in all health institutions in the Area. Diarrhea, skin diseases and diseases caused by intestinal worms occupy the second to fourth positions in frequency of diagnosis in most of health institutions. In addition, the reported cases of other vector-borne diseases such as schistosomiasis, are not considered to be low level, because more than 10,000 cases in the Region have been reported in 1992 and 1995.

(3) Water-borne Diseases

Malaria and schistosomiasis are vector-borne diseases transmitted by mosquitoes and snails respectively. Adult mosquitoes require water for breeding and snails transmitting schistosomiasis are dependent on freshwater for survival and multiplication.

According to the Assessment Study, the transmission potentials of malaria and onchocerciasis are estimated at high level and that of schistosomiasis is at a moderate level.

Thus, it is obvious that the high risk of water-borne/vector-borne diseases is universal. Such kind of risk is associated with environmental sanitation, and its control should be emphasized through such increases as provision of household latrines, proper method of waste disposal and vermin and insect control.

(4) Fertilizers and Agro-chemicals

The annual unit input of chemical fertilizers to farmlands is estimated at 13 kg/ha. However, according to a preliminary interview survey of the Study Team, the use of artificial fertilizers such as chemical fertilizers, is very unpopular in farmlands except in a few upland fields. Further, the use of pesticides is very limited and the total amount distributed in the Region is recorded at 890 tons of solid type and 444,000 liters of liquid type (Tropical Pesticides Research Institute, 1991).

Thus, the consumption of agro-chemicals in the Study Area is estimated to be at a very low level and their negative impacts on the environment are assessed as very small at present. On the other hand, pesticide is controlled at the national level by the Tropical Pesticide Research Institute (TPRI). The pesticides registered in Tanzania are classified into four categories; General Use for 5 years (Full Registration), General Use for 2 years (Provisional Registration), Restricted Registration, and Experimental Use Only.

5.6.3 On-going Environmental Conservation Actions/Programmes

A few programme for environmental conservation have been conducted and attempted to contribute towards attainment of an integrated sustainable development of agricultural activities through coordinated efforts in the field and to alleviate environmental problems in the Area. Particularly, TIP Programme, Kilosa District Rural Development Programme, Seed Distribution Services by WWF and Integrated Sustainable Agricultural Programme in Mgeta area are considered as important components of the actions for environmental conservation.

5.6.4 Environmental Problems

Considering the present environmental conditions in the Study Area as mentioned above, the following overall environmental problems could be listed, as a result of the determinable impacts of this trend.

- Deforestation due to fuel wood collection, fire and clearance for shifting cultivation and grazing area expansion, clearance for tse-tse fly control, etc.
- Pressure on the natural resources generated by farmers due to a steady growth of population
- Pressure to grazing land through alienation and conversion to agricultural land and expansion of settlements
- Trends of diseases and poor sanitary conditions in the Area
- Poor drainage and wet conditions during the rainy season
- Sewage discharge from agricultural and rural activities
- Non-legal village demarcation and securing right of land tenure

CHAPTER VI. BASIC APPROACH TO THE PROJECT

6.1 Development Needs

6.1.1 Political Needs in Smallholder Irrigation Development

As stated in Section 3.2, GOT has put the highest priority on the agricultural sector development with particular emphasis on attainment of the following objectives as the primary and most important issues for implementing the current socio-economic development programme.

- To satisfy subsistence requirement in a large part of the country;
- To generate local surpluses of main staple food products, especially maize and rice, in order to facilitate food security at the village, regional and national levels; and
- To ensure the production of crops much needed for dietary supplement, i.e. vegetables, fruit, oil seeds, etc.

Then, to materialize the above policy objectives, GOT has first launched the irrigation-based agricultural development in line with the strategic framework emphasizing on "*rehabilitation or upgrading of the traditional irrigation schemes*" and "*upgrading of traditional water harvesting technology*". To this end, GOT has highly expected that the maximum impact will have to be brought by irrigation beneficiaries themselves, who will freely but aggressively participate in the above-mentioned irrigation development based on a participatory approach.

6.1.2 Development Needs and Wishes of Irrigation Beneficiaries

The development needs and wishes of irrigation beneficiaries were identified through on-field guidance to and technical discussion with the farmers in each respective scheme area, and confirmed through the public meeting held with all the irrigation beneficiaries.

All the farmers benefiting from the existing irrigation systems attach the highest priority on "*rehabilitation and improvement of irrigation facilities*", and then, "*expansion of irrigable land*" as much as water resources become available. Concerning the above two points, farmers emphasize the assistance for efficient operation and management of the irrigation facilities as well as irrigated farming.

6.2 Development Purpose and Basic Strategy

As mentioned in the Master Plan Study in Sub-section 3.4.2, the fundamental objectives of the Project are to improve farmer's economy by promoting intensification and diversification of crop production in the dry season, and increasing and stabilizing basic food crops through supplementary irrigation to the rainy season cropping, in accordance with GOT's political needs and farmers' development needs. In addition, achievement of sustainable irrigation farming is also one of the important objectives. To attain these objectives, the following five items are taken as the basic development strategies of the Project:

1) Intensification of land use and increase of agricultural production

All schemes have been confronted with the following problems and constraints; i) shrinkage of farming units due to increase in population, ii) low

productivity due to traditional extensive farming, iii) decline of soil fertility due to plunder farming, and iv) soil erosion in the fields. To overcome these problems and constraints and to activate agricultural production in the schemes, improvement of land productivity is an essential factor. Therefore, the Project should take the following countermeasures: i) rotational cultivation between paddy and upland crops, ii) use of organic fertilizers, and iii) intensive use of farmland through crop diversification.

- 2) Rehabilitation and upgrading of existing irrigation systems, improvement of access roads and soil conservation in farmlands.

The crop production in the Mgongola and Mkula schemes fluctuates largely due to unstable rainfall pattern. In the Mgeta and Mwega schemes, although traditional irrigation systems constructed by the farmers have been extended widely, their crop production still has a weakness because of malfunction of those irrigation facilities.

In order to stabilize the present crop production, the existing traditional irrigation systems should be rehabilitated. In addition, to improve land productivity as a countermeasure against shrinkage, the irrigation area should be expanded as much as possible within the availability of water resources. The Project also focuses on the improvement of access and farm roads for supporting agricultural and socio-economic activities, construction of flood protection dike, and land protection against soil erosion.

- 3) Community development especially reinforcement of the existing farmers' organizations, i.e. the water users' groups

Strengthening of WUGs is a prerequisite factor for appropriate O&M of the production infrastructure. In addition, WUGs in the schemes should have functions of not only O&M but also agricultural support services such as marketing and agricultural credits, in order to ensure successful and sustainable irrigated farming. It is also pointed out that the participation of women to WUGs would bring a good result in activating their services.

- 4) Enforcement of agricultural support services

To achieve sustainable O&M by the farmers and maximize the development impact of the Project, there is still the need for a lot of continuous supporting services from the various government agencies concerned. It should therefore be required to strengthen those supporting agencies to be involved in O&M as well as management of WUGs. Particularly, deployment of frontline staff such as village extension officers and irrigation technicians and development of their knowledge are essential. Therefore, the Project should establish an effective agricultural support system in the schemes through close linkage with the existing training programme.

- 5) Social and/or agro-forestry approach to environmental protection-cum-conservation

To ensure a steady supply of fuel woods near the communities and to conserve the soil, the Project should take the afforestation development from the viewpoint of a long term plan and in liaison with the existing programme.