Appendix D

Economic and Financial Evaluation For Model Irrigation Schemes

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

Action Plan Report

Appendix D

Economic and Financial Evaluation for Model Irrigation Schemes

Table of Contents

1. Kinyope Irrigation Scheme ..... D - 1
2. Magoma Irrigation Scheme ..... D - 8
3. Pawaga Irrigation Scheme ..... D - 15
4. Musa Mwinjanga Irrigation Scheme ..... D - 22
5. Mgongola Irrigation Scheme ..... D - 29
6. Lower Moshi Irrigation Scheme ..... D - 36
7. Kisese Irrigation Scheme ..... D - 43
8. Pamila Irrigation Scheme ..... D - 50
9. Nkenge Irrigation Scheme ..... D - 57
10. Luchili-Nyakasungwa Irrigation Scheme ..... D - 64

1. Kinyope Irrigation Scheme

Site Description

The project area occupies most of Rutamba Ward (Lindi Rural District) extending at the eastern part of the Lindi Region. Administratively it includes 3 villages, namely, Kinyope, Ruhoma and Myangara. Access to the project area in the Kinyope village is by an unmetaled feeder road from Lindi, of which length is about 36 km. The project area could be accessible even by normal vehicle, while being difficult or sometimes impossible during the rainy season.

Annual rainfall of the project area is relatively abundant, and ranges 600 mm to 920 mm having single peak in April. Milola river, water source for the Kinyope Scheme, is perennial in flow discharge.

The project area is located at the loose valley formed by the river running in a direction of west to east.

Scheme Description

Development Purpose

To ensure stable water supply to the fields through the improvement of the existing traditional irrigation system.

Basic Approach

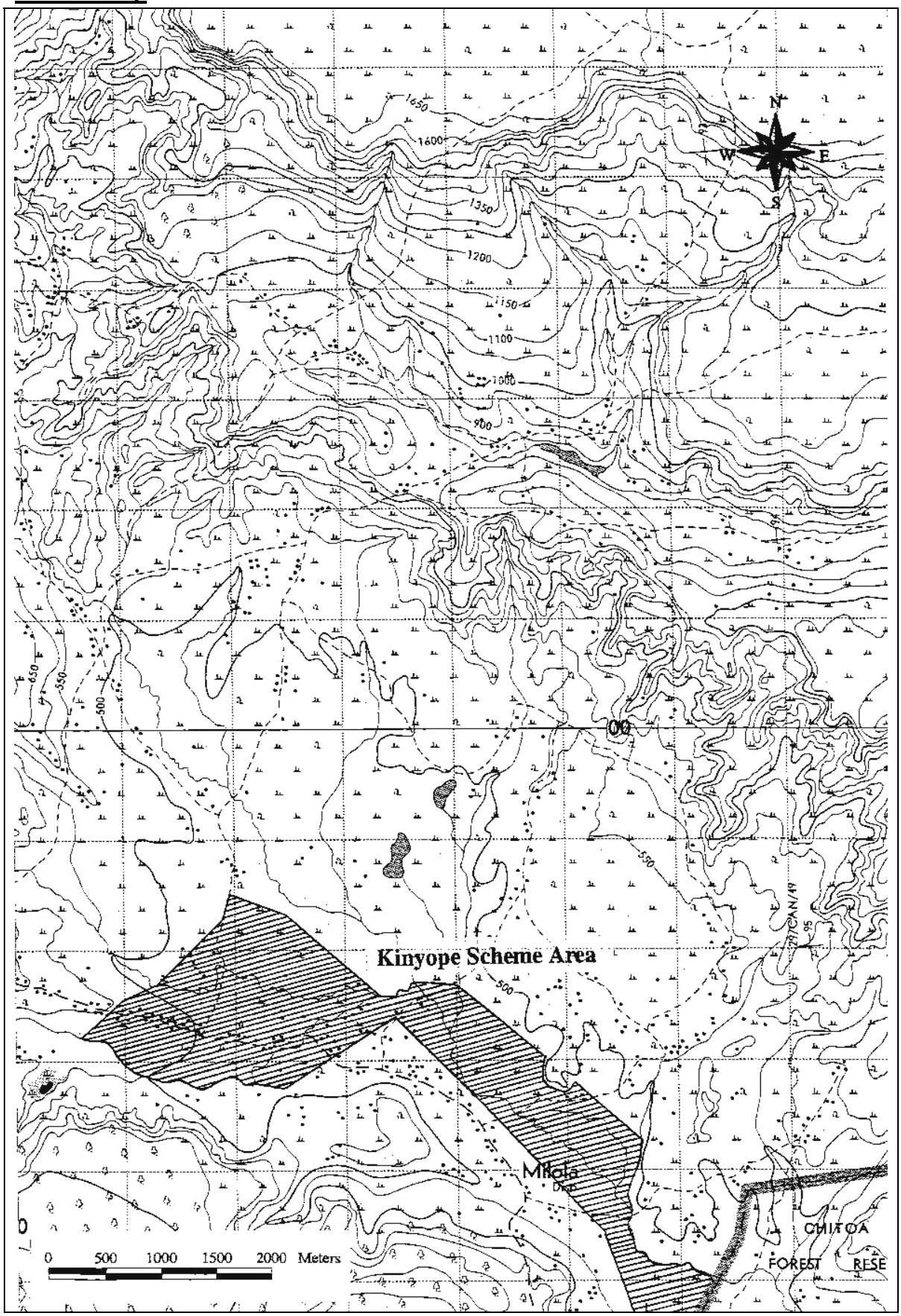
To enhance the irrigation efficiency by improving water abstraction and distribution by providing proper facilities at low cost.

Development Plan

The proposed scheme area is 480 ha in net. The existing weak intake weirs are to be replaced with stable and solid ones at the same locations, to reduce farmers' heavy load caused by frequent re-construction of intake weirs flushed out by floods. This is the highest priority in farmers' request. As for irrigation canal network, it is essential to provide farm-ditches for ensuring water delivery to on-farm level. These farm ditches should be constructed by farmers themselves as farmers' participation, in parallel with the scheme construction works. Drainage canals are also to be constructed in place to eliminate excess water from fields during rainy season. Inspection passes are provided along the existing main and secondary irrigation canals for easy O & M of canals and transportation of agricultural products. The proposed scheme facilities to be constructed are as follows:

(a) Intake weirs (13 nos. if necessary integrating several existing intake weirs)
(b) Main irrigation canal (unlined, length of 20,000 m)
(c) Secondary irrigation canal (unlined, length of 22,000 m)
(d) Turnouts (50 nos.)
(e) Farm ditches (length of 48,000 m)
(f) Drainage canal (length of 10,000 m)

Scheme Map


N
W
E
S
1650
1600
1350
1200
1150
1100
1000
900
650
550
500
550
Kinyope Scheme Area
500
Mfiota
Dam
CHITOA
FOREST
RESE
0
500
1000
1500
2000 Meters

Photographs

Entrance of village

Traditional intake

River diversion works

Command area

Irrigated paddy

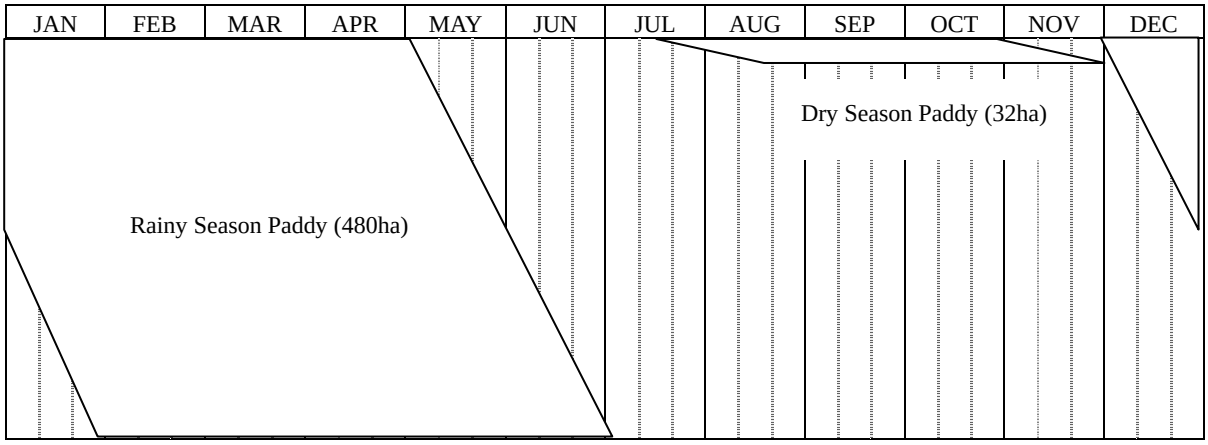
RRA workshop with farmers

Cultivated Area, Cropping Intensity and Average Yield

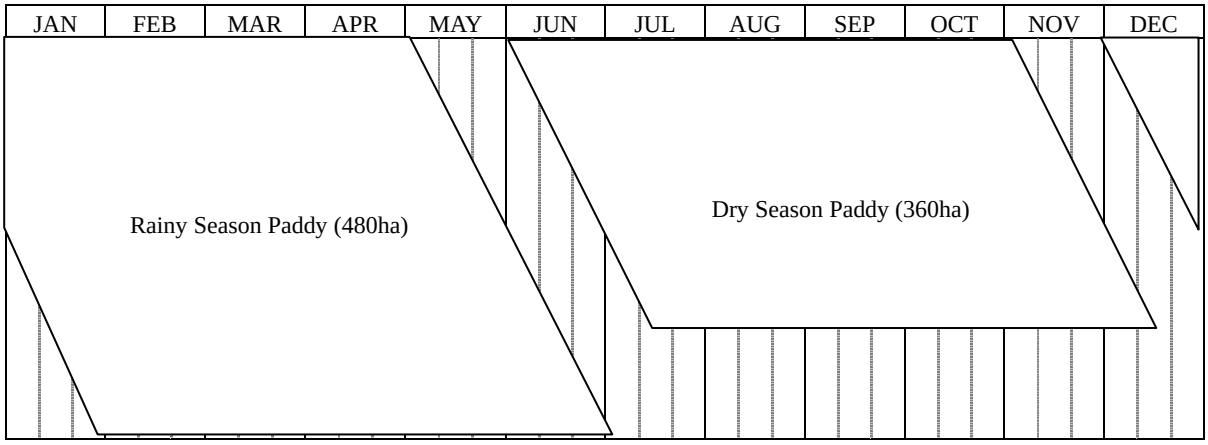
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy										
	Upland Crops										
Irrigated	Paddy		480	32		4.0		480	360		5.5
	Upland Crops										
Total		480	480	32	107		480	480	360	175	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.8ha (Irrigated Paddy)	0.8ha (Irrigated Paddy)
Outside the Scheme	1.2ha (0.8ha Maize/Sorghum + 0.4ha Sesame)	1.2ha (0.8ha Maize/Sorghum + 0.4ha Sesame)

Financial Crop Budget

Financial Crop Budget in Kinyope			Unit	Present Condition			Proposed Condition		
				Irrigated Paddy			Irrigated Paddy		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return								
	Yield		kg/ha		4,000			5,500	
	Farmgate Price		Tsh/kg	120			120		
	Gross Return		Tsh/ha			480,000			660,000
II	Production Cost								
	1. Farm Inputs								
	1.1 Seed		kg/ha	400	0	0	400	30	12,000
	1.2 Fertilizer								
		Urea (46% N)	kg/ha	340	0	0	340	175	59,500
		SA (21% N)	kg/ha	300	0	0	300	0	0
		TSP (46% P2O5)	kg/ha	340	0	0	340	90	30,600
		NPK	kg/ha	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0
	1.3 Agro-chemical								
		Pesticide	lit/ha	10,000	0	0	10,000	2	20,000
		Herbicide	lit/ha	5,000	0	0	5,000	2	10,000
		Fungicide	lit/ha	5,000	0	0	5,000	0	0
	1.4 Packing Material								
		Bags (100 kg)	nos/ha	500	40	20,000	500	55	27,500
		Sub-total				20,000			159,600
	2. Labour Requirement				Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		30	15	30,000	30	20	40,000
		Nursery	man/day		5	0	0	5	0	0
		Plant/Transplanting	man/day		20	10	20,000	20	10	20,000
		Weeding and Fertilizer	man/day		30	20	40,000	30	20	40,000
		Bird Scaring	man/day		15	5	10,000	15	5	10,000
		Harvesting	man/day		20	10	20,000	30	10	20,000
		Transport Marketing	man/day		0		0	0	0	0
		Irrigation, etc	man/day		0		0	0	0	0
		Threshing/Winnowing	man/day		10	5	10,000	10	5	10,000
		Sub-total		2,000	130	65	130,000	2,000	140	70	140,000
	3. Machinery or Draught Animal								
		Tractor	LS		0			0	
		Hand Tractor	LS		0			0	
		Draught Animal	LS		0			0	
		Sub-total				0			0
	4. Miscellaneous Cost								
		5% of Cost				7,500			14,980
		Total Cost				157,500			314,580
III	Net Return								
		Value				322,500			345,420

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Paddy	512	323	165,120	840	345	290,153	125,033
Total	512	323	165,120	840	345	290,153	125,033

Economic Crop Budget

Economic Crop Budget in Kinyope			Unit	Present Condition			Proposed Condition		
				Irrigated Paddy			Irrigated Paddy		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return								
	Yield		kg/ha		4,000			5,500	
	Farmgate Price		Tsh/kg	135			135		
	Gross Return		Tsh/ha			541,800			744,975
II	Production Cost								
	1. Farm Inputs								
	1.1 Seed		kg/ha	400	0	0	400	30	12,000
	1.2 Fertilizer								
		Urea (46% N)	kg/ha	187	0	0	187	175	32,725
		SA (21% N)	kg/ha	100	0	0	100	0	0
		TSP (46% P2O5)	kg/ha	192	0	0	192	90	17,280
		NPK	kg/ha	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0
	1.3 Agro-chemical								
		Pesticide	lit/ha	10,000	0	0	10,000	2	20,000
		Herbicide	lit/ha	5,000	0	0	5,000	2	10,000
		Fungicide	lit/ha	5,000	0	0	5,000	0	0
	1.4 Packing Material								
		Bags (100 kg)	nos/ha	500	45	22,500	500	55	27,500
		Sub-total				22,500			119,505
	2. Labour Requirement				Total	Hired		Total	Hired	
		Land prep., Puddle and Bund	man/day		30	15	48,000		30	20	48,000
		Nursery	man/day		5	0	8,000		5	0	8,000
		Plant/Transplanting	man/day		20	10	32,000		20	10	32,000
		Weeding and Fertilizer	man/day		30	20	48,000		30	20	48,000
		Bird Scaring	man/day		15	5	24,000		15	5	24,000
		Harvesting	man/day		20	10	32,000		30	10	48,000
		Transport Marketing	man/day		0	0	0		0	0	0
		Irrigation, etc	man/day		0	0	0		0	0	0
		Threshing/Winnowing	man/day		10	5	16,000		10	5	16,000
		Sub-total		1,600	130	65	208,000	1,600	140	70	224,000
	3. Machinery or Draught Animal								
		Tractor	LS		0				0	
		Hand Tractor	LS		0				0	
		Draught Animal	LS		0				0	
		Sub-total				0				0
	4. Miscellaneous Cost								
		5% of Cost				11,525			17,175
		Total Cost				242,025			360,680
III	Net Return								
		Value				299,775			384,295

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Paddy	512	300	153,485	840	384	322,808	169,323
Total	512	300	153,485	840	384	322,808	169,323

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		31,901	15,950			53,168	101,019		-101,019
2005	478,511	31,901	15,950			39,876	566,238		-566,238
2006		31,901	15,950	3,444		39,876	91,171	16,932	-74,239
2007				6,888			6,888	50,797	43,909
2008				6,888			6,888	118,526	111,638
2009				6,888			6,888	152,391	145,502
2010				6,888			6,888	169,323	162,435
2011				6,888			6,888	169,323	162,435
2012				6,888			6,888	169,323	162,435
2013				6,888			6,888	169,323	162,435
2014				6,888			6,888	169,323	162,435
2015				6,888	4,785		11,673	169,323	157,649
2016				6,888			6,888	169,323	162,435
2017				6,888			6,888	169,323	162,435
2018				6,888			6,888	169,323	162,435
2019				6,888			6,888	169,323	162,435
2020				6,888			6,888	169,323	162,435
2021				6,888			6,888	169,323	162,435
2022				6,888			6,888	169,323	162,435
2023				6,888			6,888	169,323	162,435
2024				6,888			6,888	169,323	162,435
2025				6,888	4,785		11,673	169,323	157,649
2026				6,888			6,888	169,323	162,435
2027				6,888			6,888	169,323	162,435
2028				6,888			6,888	169,323	162,435
2029				6,888			6,888	169,323	162,435
2030				6,888			6,888	169,323	162,435
2031				6,888			6,888	169,323	162,435
2032				6,888			6,888	169,323	162,435
2033				6,888			6,888	169,323	162,435
2034				6,888			6,888	169,323	162,435
								NPV (12%) =	**214,351**
								EIRR =	**16%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	2.0	2.0
- Within the Scheme Area (ha)	0.8	0.8
- Outside the Scheme Area (ha)	1.2	1.2
Gross Farm Income	634	1,147
Production Cost	196	501
Net Farm Income	438	646
Off-farm Income	158	158
Living Expenditure	366	366
Tax and Duties	13	13
Balance	218	425

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size within the Scheme Area	0.8 ha
b) Gross Income	924
c) Production Cost	440
d) Net Farm Income	484
e) Tax and Duties	13
f) O/M Cost	13
g) Net Profit (d-e-f)	458

2. Magoma Irrigation Scheme

Site Description

The scheme area extended over Makangara and Mkuajuni villages in Magoma Ward, Magoma Division in Krogwe District. Access to the project area is by an unpaved road in about 50 km distant from Krogwe. The scheme area is accessible by any type automobile even in the rainy season.

The scheme area is influenced by Indian Ocean in specific climate characteristic. Average temperature is approximately 30 ºC to 32 ºC during hot months (December to March), while it is approximately 23 ºC to 28 ºC during cool months (May to October). High atmospheric humidity is a characterised factor in this area, showing 100 % maximum and 65 to 70 % minimum. The amount of rainfall is about 1,100 to 1,400 mm in the area, however, it may exceed 2,000 mm per year in the catchment area of Lwengera river. The annual pattern of mean monthly rainfall is bi-mode with maximum monthly rainfall occurring in April and May.

According to the farmers living near the scheme area, the flood attacks the part of scheme area every year, and brought the inundation with half meter deep for about a week. The Lwengera river has a tendency of changing its river course at the foots of Usambara mountains during floods.

Scheme Description

Development Purpose

To ensure stable water supply to the fields through the improvement of existing traditional irrigation system.

Basic Approach

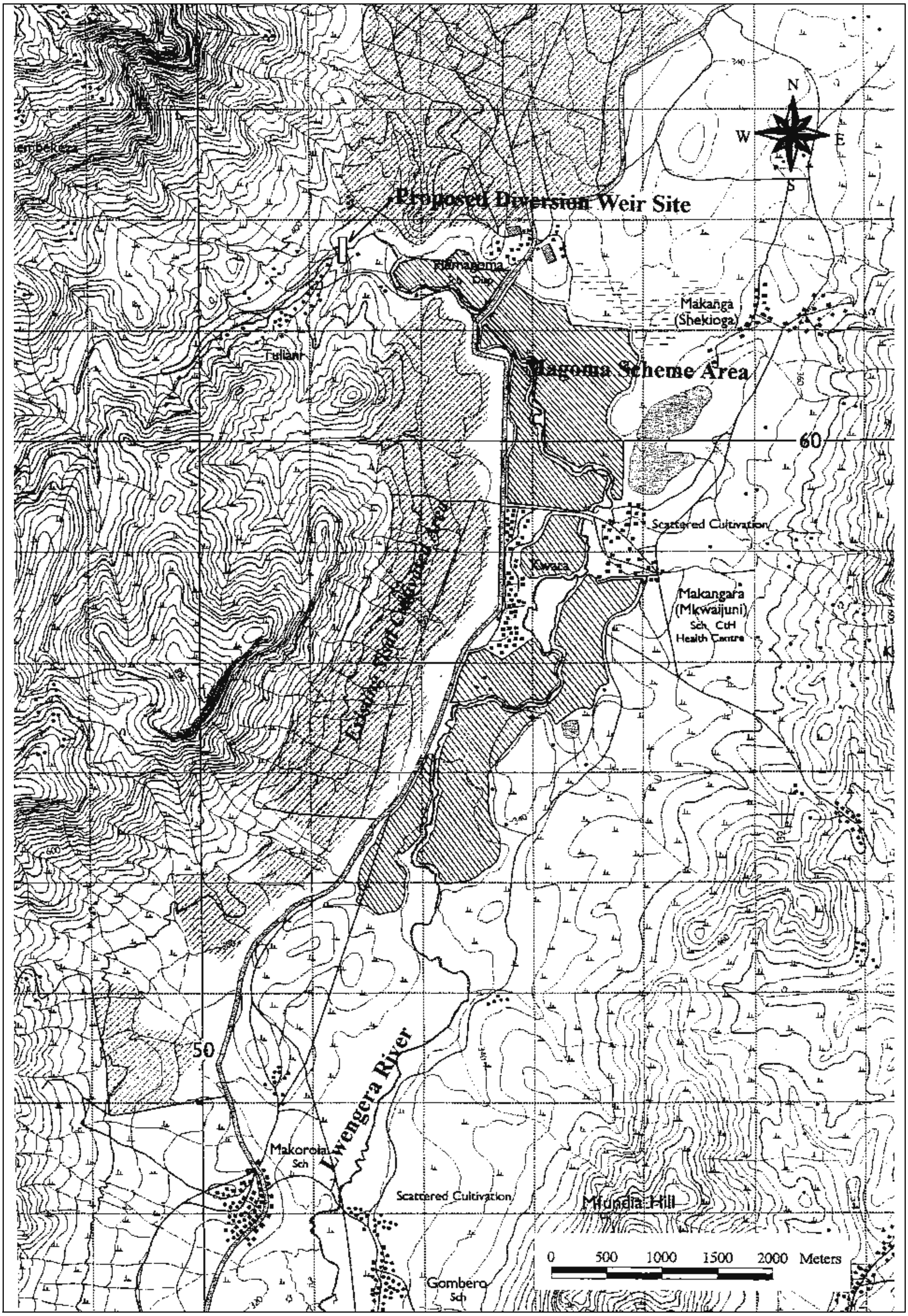
To create good irrigation circumstance for selected areas in the dry season, focusing on avoidance of magnificence of flood damage to other areas in the rainy season.

Development Plan

The proposed scheme area is 250 ha in net. In the rainy season, the scheme area is inundated in large ranges and in long term. Low lands of the scheme extending along the Lwengera river, which is a main water source for the scheme, are unavoidable to be affected by flood in the rainy season unless river training and wide ranging flood protection are totally provided. Flood protection targeting only to the scheme area would lead to worse inundation in downstream areas. The synthetic flood protection work for whole river course is so costly and not feasible. In this scheme, thus irrigation area should be selected from upland area which do not suffer from the floods, and drainage system in addition to irrigation canal system is provided to eliminate excess water. The proposed scheme facilities are as follows:

(a) Intake weir (1 site)
(b) Main irrigation canal (unlined, length of 10,000 m)
(c) Secondary irrigation canal (unlined, length of 11,000 m)
(d) Drainage canal (length of 10,000 m)
(e) Turnout with intake ponds for treadle pump use (20 nos.)
(f) Partial flood dike (length of 2,000 m)

Scheme Map


Proposed Diversion Weir Site
Magoma Scheme Area
Lwengera River
Makanga (Shekioga)
Tuliani
Scattered Cultivation
Kwara
Makangara (Mkwaijuni)
Sch CtH
Health Centre
Makorora
Sch
Gombero
Sch
Mlundia Hill
60
50
N
W
E
S
0 500 1000 1500 2000 Meters

Photographs

Magoma Village

Command Area

Lwengara River as Water Source

Proposed Intake Weir Site

Maize Cultivation in Low Land

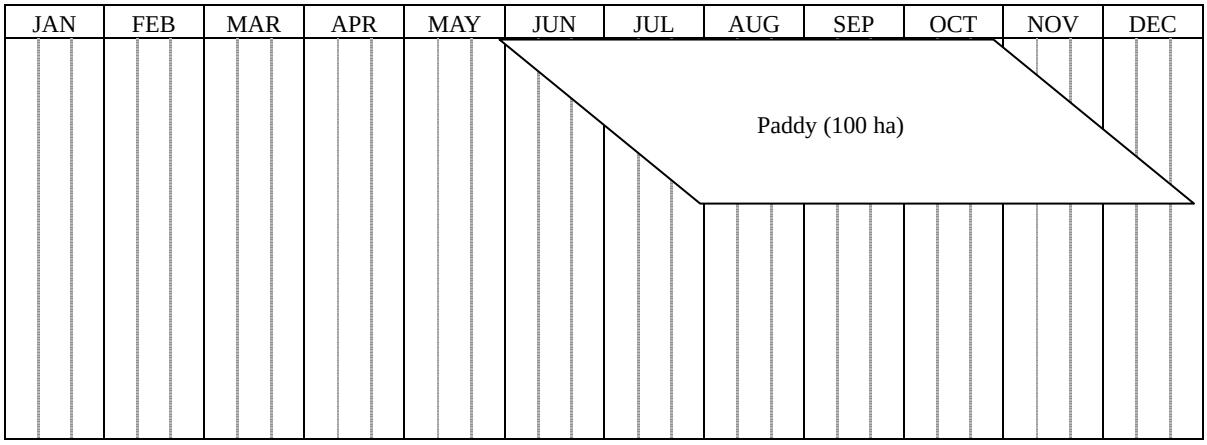
Discussion with Farmers

Cultivated Area, Cropping Intensity and Average Yield

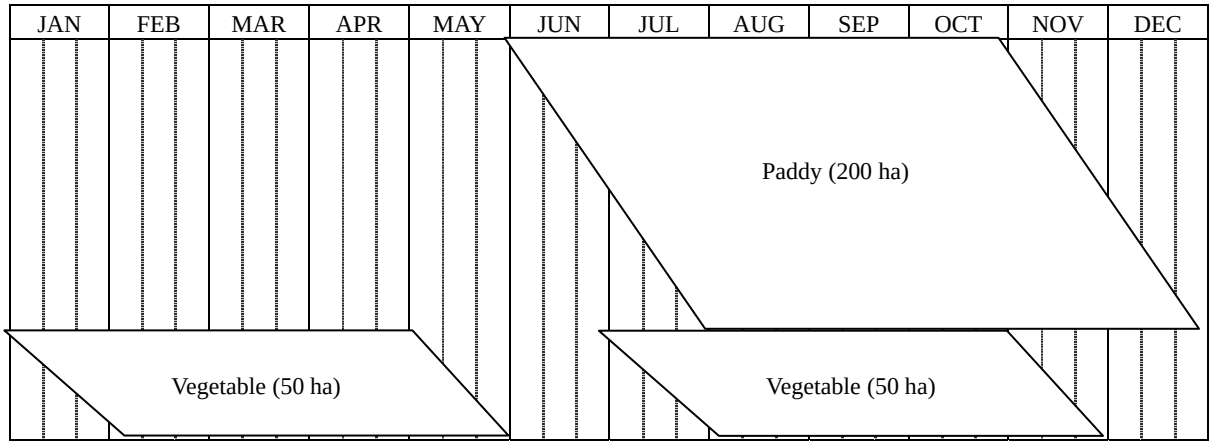
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy										
	Upland Crops										
Irrigated	Paddy			100		4.0			200		5.5
	Upland Crops							50	50		
Total		250	0	100	40		250	50	250	120	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.2ha (Irrigated Paddy)	0.5ha (Irrigated Paddy + Irrigated Vegetable)
Outside the Scheme	1.0ha (Rainfed Maize)	1.0ha (Rainfed Maize)

Financial Crop Budget

Financial Crop Budget in Magoma			Unit	Present Condition			Proposed Condition					
				Irrigated Paddy			Irrigated Paddy			Irrigated Cabbage		
				Price (Tsh)	Q'ty	Value (Tsh)	Price (Tsh)	Q'ty	Value (Tsh)	Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		4,000			5,500			10,000	
	Farmgate Price		Tsh/kg	120.00			120.00			150.00		
	Gross Return		Tsh/ha			480,000			660,000			1,500,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	0	0	400	30	12,000	45,000	0	9,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	340	0	0	340	150	51,000	340	0	0
		SA (21% N)	kg/ha	300	0	0	300	0	0	300	160	48,000
		TSP (46% P2O5)	kg/ha	340	0	0	340	70	23,800	340	65	22,100
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	2	20,000
		Herbicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	1	5,000
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	45	22,500	500	55	27,500	500	130	65,000
		Sub-total				22,500			129,300			169,100
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		30	5	10,000	30	5	10,000	30	5	10,000
		Nursery	man/day		5	0	0	5	0	0	20	0	0
		Plant/Transplanting	man/day		20	0	0	20	5	10,000	30	10	20,000
		Weeding and Fertilizer	man/day		30	0	0	30	0	0	30	0	0
		Bird Scaring	man/day		15	0	0	15	0	0	15	0	0
		Harvesting	man/day		20	5	10,000	30	10	20,000	30	10	20,000
		Transport Marketing	man/day		0	0	0	0	0	0	10	10	20,000
		Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
		Threshing/Winnowing	man/day		10	0	0	10	5	10,000	10	5	10,000
		Sub-total		2,000	130	10	20,000	140	25	50,000	175	40	80,000
	3. Machinery or Draught Animal											
		Tractor	LS		0			0			0	
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS		0			0			0	
		Sub-total				0			0			0
	4. Miscellaneous Cost											
		5% of Cost				2,125			8,965			12,455
		Total Cost				44,625			188,265			261,555
III	Net Return											
		Value				435,375			471,735			1,238,445

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Irrigated Paddy	100	435	43,538	200	472	94,347	50,810
Irrigated Cabbage	0	0	0	100	1,238	123,845	123,845
Total	100	435	43,538	300	1,710	218,192	174,654

Economic Crop Budget

Economic Crop Budget in Magoma			Unit	Present Condition			Proposed Condition					
				Irrigated Paddy			Irrigated Paddy			Irrigated Cabbage		
				Price (Tsh)	Q'ty	Value (Tsh)	Price (Tsh)	Q'ty	Value (Tsh)	Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		4,000			5,500			10,000	
	Farmgate Price		Tsh/kg	147.45			147.45			120.00		
	Gross Return		Tsh/ha			589,800			810,975			1,200,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	0	0	400	30	12,000	45,000	0.2	9,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	187	0	0	187	150	28,050	187	0	0
		SA (21% N)	kg/ha	100	0	0	100	0	0	100	160	16,000
		TSP (46% P2O5)	kg/ha	192	0	0	192	70	13,440	192	65	12,480
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	2	20,000
		Herbicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	1	5,000
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	45	22,500	500	55	27,500	500	130	65,000
		Sub-total				22,500			95,990			127,480
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		30	5	48,000		30	5	48,000		30	5	48,000
		Nursery	man/day		5	0	8,000		5	0	8,000		20	0	32,000
		Plant/Transplanting	man/day		20	0	32,000		20	5	32,000		30	10	48,000
		Weeding and Fertilizer	man/day		30	0	48,000		30	0	48,000		30	0	48,000
		Bird Scaring	man/day		15	0	24,000		15	0	24,000		15	0	24,000
		Harvesting	man/day		20	5	32,000		30	10	48,000		30	10	48,000
		Transport Marketing	man/day		0	0	0		0	0	0		10	10	16,000
		Irrigation, etc	man/day		0	0	0		0	0	0		0	0	0
		Threshing/Winnowing	man/day		10	0	16,000		10	5	16,000		10	5	16,000
		Sub-total		1,600	130	10	208,000	1,600	140	25	224,000	1,600	175	40	280,000
	3. Machinery or Draught Animal											
		Tractor	LS		0				0				0		
		Hand Tractor	LS		0				0				0		
		Draught Animal	LS		0				0				0		
		Sub-total				0				0				0
	4. Miscellaneous Cost											
		5% of Cost				11,525			16,000			20,374
		Total Cost				242,025			335,990			427,854
III	Net Return											
		Value				347,775			474,986			772,146

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Irrigated Paddy	100	348	34,778	200	475	94,997	60,220
Irrigated Cabbage	0	0	0	100	772	77,215	77,215
Total	100	348	34,778	300	1,247	172,212	137,434

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		29,673	14,837			49,455	93,965		-93,965
2005	445,096	29,673	14,837			37,091	526,697		-526,697
2006		29,673	14,837	1,794		37,091	83,395	13,743	-69,651
2007				3,588			3,588	41,230	37,643
2008				3,588			3,588	96,204	92,616
2009				3,588			3,588	123,691	120,103
2010				3,588			3,588	137,434	133,847
2011				3,588			3,588	137,434	133,847
2012				3,588			3,588	137,434	133,847
2013				3,588			3,588	137,434	133,847
2014				3,588			3,588	137,434	133,847
2015				3,588	4,451		8,039	137,434	129,396
2016				3,588			3,588	137,434	133,847
2017				3,588			3,588	137,434	133,847
2018				3,588			3,588	137,434	133,847
2019				3,588			3,588	137,434	133,847
2020				3,588			3,588	137,434	133,847
2021				3,588			3,588	137,434	133,847
2022				3,588			3,588	137,434	133,847
2023				3,588			3,588	137,434	133,847
2024				3,588			3,588	137,434	133,847
2025				3,588	4,451		8,039	137,434	129,396
2026				3,588			3,588	137,434	133,847
2027				3,588			3,588	137,434	133,847
2028				3,588			3,588	137,434	133,847
2029				3,588			3,588	137,434	133,847
2030				3,588			3,588	137,434	133,847
2031				3,588			3,588	137,434	133,847
2032				3,588			3,588	137,434	133,847
2033				3,588			3,588	137,434	133,847
2034				3,588			3,588	137,434	133,847
								NPV (12%) =	**114,310**
								EIRR =	**14%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	1.2	1.5
- Within the Scheme Area (ha)	0.2	0.5
- Outside the Scheme Area (ha)	1.0	1.0
Gross Farm Income	236	704
Production Cost	29	148
Net Farm Income	207	556
Off-farm Income	94	94
Living Expenditure	280	280
Tax and Duties	5	5
Balance	17	366

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.5 ha
b) Gross Income	564
c) Production Cost	128
d) Net Farm Income	436
e) Tax and Duties	5
f) O/M Cost	8
g) Net Profit (d-e-f)	424

3. Pawaga Irrigation Scheme

Site Description

The project area covers most of Itunundu Ward (Iringa District) at the west bank of the little Ruaha river. It administratively includes 6 villages: Itunundu, Kimande, Kisanga, Isele, Ndolea and Kisoloka. Access to the project area is mostly unpaved road, but passable even in the rainy season. Its distance from Iringa is approximately 80 km.

Average annual rainfall in the project area is 375 mm, so that agriculture is virtually dependent on irrigation. Originally, irrigation in the project area had started for some areas by diverting water from the tributaries of the Little Ruaha river. In the alluvial plain of the Little Ruaha river of about 7,000 ha, the irrigated area had come to around 2,000 ha with paddy cultivation through traditional irrigation system in the same manner mentioned above.

Scheme Description

Development Purpose

To ensure stable water supply to the fields through further rehabilitation of the existing traditional irrigation scheme once improved.

Basic Approach

To apply proper planning and designing of irrigation facilities, to remove major constraints such as improper condition of the weir, heavy silt intrusion into canal and insufficient water distribution into the fields.

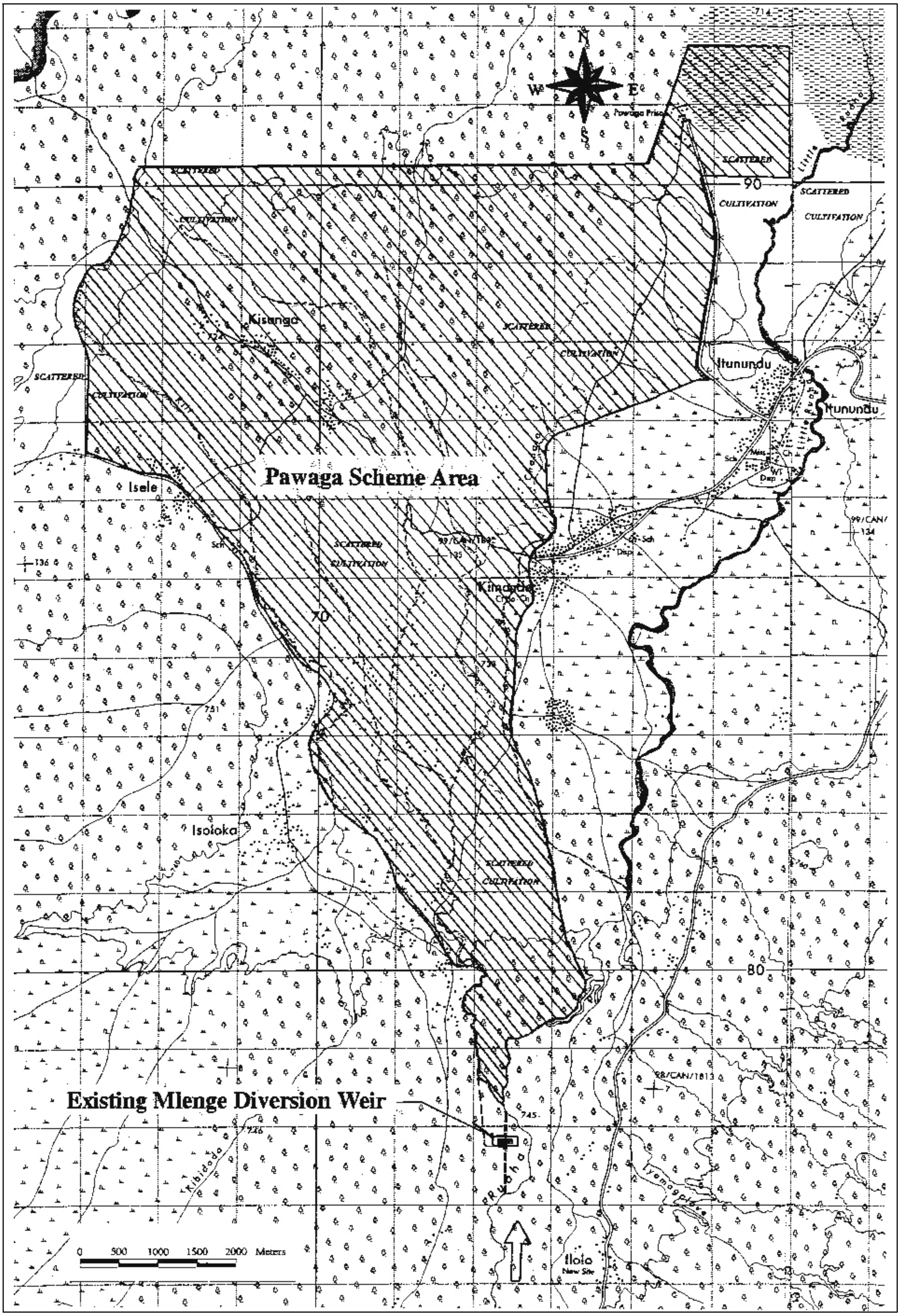
Development Plan

The proposed scheme area is 2,000 ha in net. The existing irrigation system had been once improved under the Pawaga Irrigation Project, Phase I, but thereafter it has not functioned well mainly due to poor intake weir, much siltation on canal and insufficient water distribution into fields. To recover the effects of the executed works, further rehabilitation is essential through appropriate plan and design works for the system.

The existing damaged gabion weir should be remodeled by applying concrete and gabion combination type. In addition to remodeling of the existing damaged gabion weir, silt extractor should be provided around the beginning point of diversion canal, to reduce siltation on canal. Presently, natural streams are used as distribution canals, which lead to insufficient water distribution to the scheme area. Remodeling of these natural channels are therefore required for achieving suitable irrigation water distribution in harmony with the enhanced water users' activities. The proposed works for the scheme are as follows:

(a) Remodeling of gabion weir (1 site)
(b) Silt extractor installation in the diversion canal (1 site)
(c) Remodeling of irrigation channels (unlined, length of 10,400 m)
(d) Construction of division structures (6 nos.)
(e) Construction of drainage canals (length of 10,000 m)

Scheme Map


N
W
E
S
Pawaga Scheme Area
Kisunga
Isele
Kimande
Itunundu
Isoloka
Existing Mlenge Diversion Weir
Ilolo
New Site
SCATTERED CULTIVATION
90
80
70
0 500 1000 1500 2000 Meters

Photographs

Diversion weir

Gabion protection at diversion weir

Irrigation canal

Paddy field

Discussion with farmers

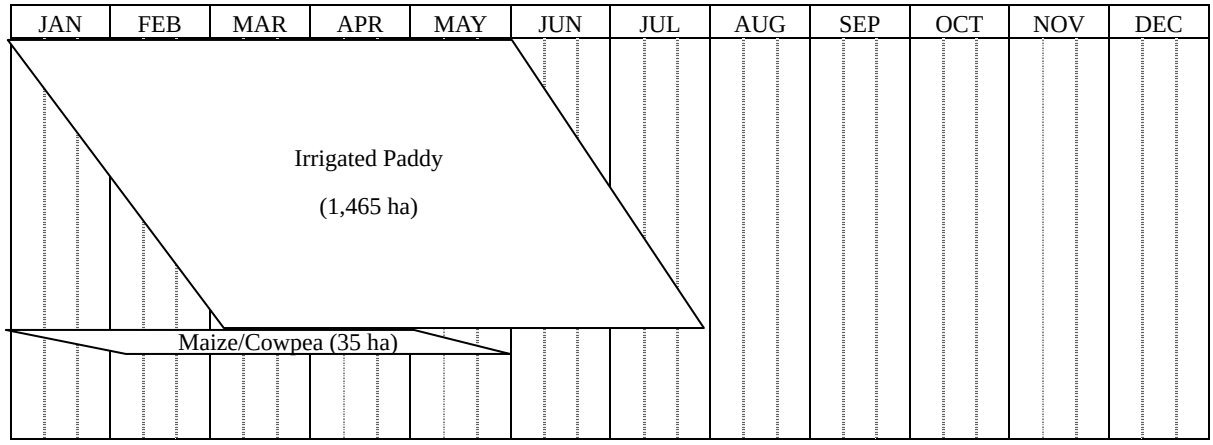
Farmers and JICA Study Team

Cultivated Area, Cropping Intensity and Average Yield

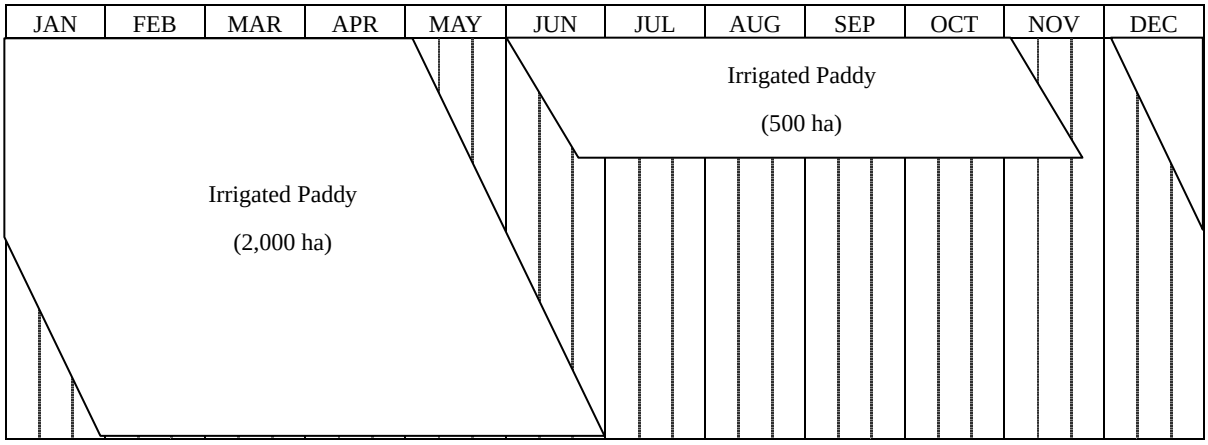
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy										
	Upland Crops		35								
Irrigated	Paddy		1,465			2.6		2,000	500		4.5
	Upland Crops										
Total		2,000	1,500	0	75		2,000	2,000	500	125	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	1.0ha (Irrigated Paddy + Rainfed Maize/Cowpea)	1.0ha (Irrigated Paddy)
Outside the Scheme		

Financial Crop Budget

Financial Crop Budget in Pawaga	Unit	Present Condition						Proposed Condition		
		Irrigated Paddy			Maize/Cow Pea			Irrigated Paddy		
		Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I Gross Return										
Yield	kg/ha		2,600			1,200/500			4,500	
Farmgate Price	Tsh/kg	120			70/200			120		
Gross Return	Tsh/ha			312,000			184,000			540,000
II Production Cost										
1. Farm Inputs										
1.1 Seed	kg/ha	400	0	0		0	0	400	30	12,000
1.2 Fertilizer										
Urea (46% N)	kg/ha	340	0	0	340	0	0	340	160	54,400
SA (21% N)	kg/ha	300	0	0	300	0	0	300	0	0
TSP (46% P2O5)	kg/ha	340	0	0	340	0	0	340	80	27,200
NPK	kg/ha	350	0	0	350	0	0	350	0	0
Manure	ton/ha		0	0		0	0		0	0
1.3 Agro-chemical										
Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	1	10,000
Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	1	5,000
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
1.4 Packing Material										
Bags (100 kg)	nos/ha	500	26	13,000	500	12	6,000	500	45	22,500
Sub-total				13,000			6,000			131,100
2. Labour Requirement			Total	Hired		Total	Hired		Total	Hired
Land prep., Puddle and Bund	man/day		30	10	20,000	5	0	0	30	10	20,000
Nursery	man/day		0	0	0	0	0	0	0	0	0
Plant/Transplanting	man/day		5	0	0	5	0	0	10	0	0
Weeding and Fertilizer	man/day		20	0	0	30	0	0	20	0	0
Bird Scaring	man/day		15	0	0	15	0	0	15	0	0
Harvesting	man/day		20	10	20,000	20	5	10,000	30	15	30,000
Transport Marketing	man/day		0	0	0	8	0	0	0	0	0
Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
Threshing/Winnowing	man/day		10	5	10,000	10	5	10,000	20	10	20,000
Sub-total		2,000	100	25	50,000	2,000	93	10	20,000	2,000	125	35	70,000
3. Machinery or Draught Animal										
Tractor	LS		0			0			0	
Hand Tractor	LS		0			0			0	
Draught Animal	LS		0			0			0	
Sub-total				0			0			0
4. Miscellaneous Cost										
5% of Cost				3,150			1,300			10,055
Total Cost				66,150			27,300			211,155
III Net Return										
Value				245,850			156,700			328,845

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1000 Tsh)	Incremental Benefit (1,000 Tsh)
Irrigated Paddy	1,465	246	360,170	2,500	329	822,113	461,942
Maize/Cowpea	35	157	5,485	0	0	0	-5,485
Total	1,500	403	365,655	2,500	329	822,113	456,458

Economic Crop Budget

Economic Crop Budget in Pawaga			Unit	Present Condition						Proposed Condition		
				Irrigated Paddy			Maize/Cow Pea			Irrigated Paddy		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		2,600			1,200/500			4,500	
	Farmgate Price		Tsh/kg	135			70/200			135		
	Gross Return		Tsh/ha			352,170			184,000			609,525
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	0	0		0	0	400	30	12,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	187	0	0	187	0	0	187	160	29,920
		SA (21% N)	kg/ha	100	0	0	100	0	0	100	0	0
		TSP (46% P2O5)	kg/ha	192	0	0	192	0	0	192	80	15,360
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	1	10,000
		Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	1	5,000
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	26	13,000	500	12	6,000	500	45	22,500
		Sub-total				13,000			6,000			94,780
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		30	10	48,000	5	0	8,000	30	10	48,000
		Nursery	man/day		0	0	0	0	0	0	0	0	0
		Plant/Transplanting	man/day		5	0	8,000	5	0	8,000	10	0	16,000
		Weeding and Fertilizer	man/day		20	0	32,000	30	0	48,000	20	0	32,000
		Bird Scaring	man/day		15	0	24,000	15	0	24,000	15	0	24,000
		Harvesting	man/day		20	10	32,000	20	5	32,000	30	15	48,000
		Transport Marketing	man/day		0	0	0	8	0	12,800	0	0	0
		Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
		Threshing/Winnowing	man/day		10	5	16,000	10	5	16,000	20	10	32,000
		Sub-total		1,600	100	25	160,000	1,600	93	10	148,800	1,600	125	35	200,000
	3. Machinery or Draught Animal											
		Tractor	LS		0			0			0	
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS		0			0			0	
		Sub-total				0			0			0
	4. Miscellaneous Cost											
		5% of Cost				8,650			7,740			14,739
		Total Cost				181,650			162,540			309,519
III	Net Return											
		Value				170,520			21,460			300,006

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Irrigated Paddy	1,465	171	249,812	2,500	300	750,015	500,203
Maize/Cowpea	35	21	751	0	0	0	-751
Total	1,500	192	250,563	2,500	300	750,015	499,452

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		90,135	45,068			200,300	335,503	0	-335,503
2005	540,811	90,135	45,068			100,150	776,164	0	-776,164
2006	721,082	90,135	45,068			100,150	956,435	0	-956,435
2007	540,811	90,135	45,068	8,610		100,150	784,774	49,945	-734,829
2008				14,351			14,351	149,836	135,485
2009				28,701			28,701	349,616	320,915
2010				28,701			28,701	449,507	420,806
2011				28,701			28,701	499,452	470,751
2012				28,701			28,701	499,452	470,751
2013				28,701			28,701	499,452	470,751
2014				28,701			28,701	499,452	470,751
2015				28,701			28,701	499,452	470,751
2016				28,701			28,701	499,452	470,751
2017				28,701	18,027		46,728	499,452	452,724
2018				28,701			28,701	499,452	470,751
2019				28,701			28,701	499,452	470,751
2020				28,701			28,701	499,452	470,751
2021				28,701			28,701	499,452	470,751
2022				28,701			28,701	499,452	470,751
2023				28,701			28,701	499,452	470,751
2024				28,701			28,701	499,452	470,751
2025				28,701			28,701	499,452	470,751
2026				28,701			28,701	499,452	470,751
2027				28,701	18,027		46,728	499,452	452,724
2028				28,701			28,701	499,452	470,751
2029				28,701			28,701	499,452	470,751
2030				28,701			28,701	499,452	470,751
2031				28,701			28,701	499,452	470,751
2032				28,701			28,701	499,452	470,751
2033				28,701			28,701	499,452	470,751
2034				28,701			28,701	499,452	470,751
								NPV (12%) =	**16,483**
								EIRR =	**12%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	1.0	1.4
- Within the Scheme Area (ha)	1.0	1.4
- Outside the Scheme Area (ha)	0.0	0.0
Gross Farm Income	309	911
Production Cost	65	356
Net Farm Income	244	555
Off-farm Income	88	88
Living Expenditure	300	300
Tax and Duties	6	6
Balance	26	337

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	1.4 ha
b) Gross Income	911
c) Production Cost	356
d) Net Farm Income	555
e) Tax and Duties	6
f) O/M Cost	22
g) Net Profit (d-e-f)	527

4. Musa Mwinjanga Irrigation Scheme

Site Description

The project area is located in Mijongweni village, Machame South Ward (Hai District) in the low land agro-ecological zone of the Kilimanjaro Region. It lies at the border of Moshi Rural-Hai District. Access to the project area in the Mijongweni village is by an unmetaled all-weather road from the centre of Moshi town, of which distance is about 7 km.

Annual rainfall of the project area is relatively scarce ranging between 400 mm to 570 mm having two rainy seasons, a major one in April to May and a minor one in September to November. Catching that precipitation, Weruweru river is perennial with certain flow over the year.

The project area extends alluvial plain located in right bank of Weruweru river. The area is much suitable for cultivation because of fertile and having gentle slope of 0 ~ 2 %.

Scheme Description

Development Purpose

To ensure stable water supply to the fields through further rehabilitation of the existing traditional irrigation scheme once improved.

Basic Approach

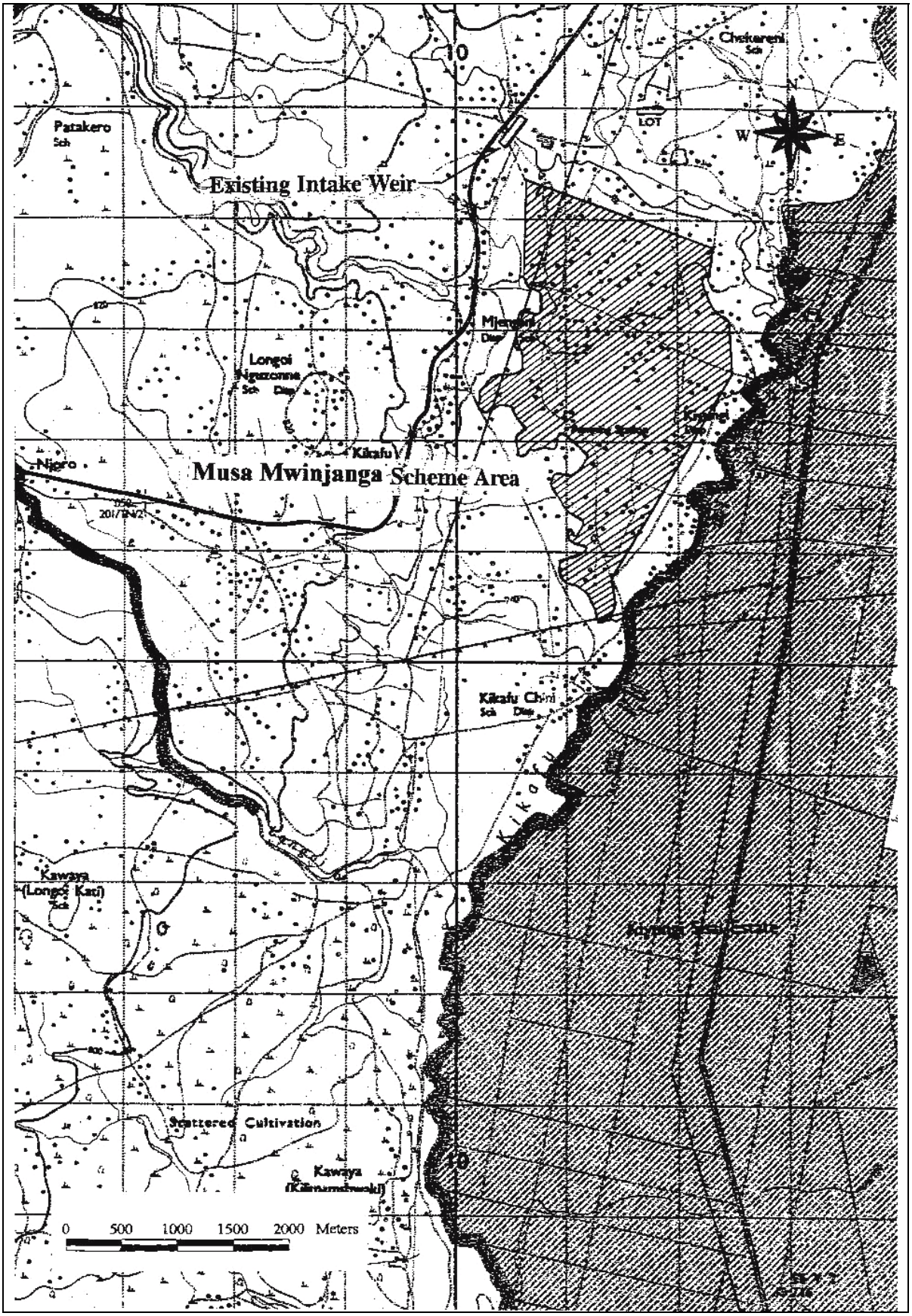
To provide firm intake weir and to improve improper facilities at low cost.

Development Plan

The proposed scheme area is 676 ha in net. Main problem of the scheme is a weak intake weir, so that the scheme area could not be irrigated at full scale. The existing weak gabion intake weir is to be restored with concrete-gabion combined intake weir, which is strong and stable against flood. The existing canal system functions almost well. However, there have found improper alignment in some parts of canal network and inadequate function of division structures in the scheme area. These portions should be improved. The southern parts of the scheme face poor drainage. The drainage canal should be provided for these parts. The proposed works for the scheme are as follows:

(a) Reconstruction of intake weir (1 site)
(b) Partly remodeling of canal alignment (length of 8,000 m)
(c) Improvement of division structures (12 nos.)
(d) Construction of drainage canal (length of 6,000 m)

Scheme Map


Existing Intake Weir
Musa Mwinjanga Scheme Area
Patakero Sch
Chekereni Sch
Longoi Sch
Njoro
Kikafu
Kikafu Chini Sch
Kawaya (Longoi Kati) Sch
Kawaya
Scattered Cultivation
Kikafu
0 500 1000 1500 2000 Meters

Photographs

Collapsed intake weir

Existing canal facilities

Command area

Transplanting of paddy

RRA meeting

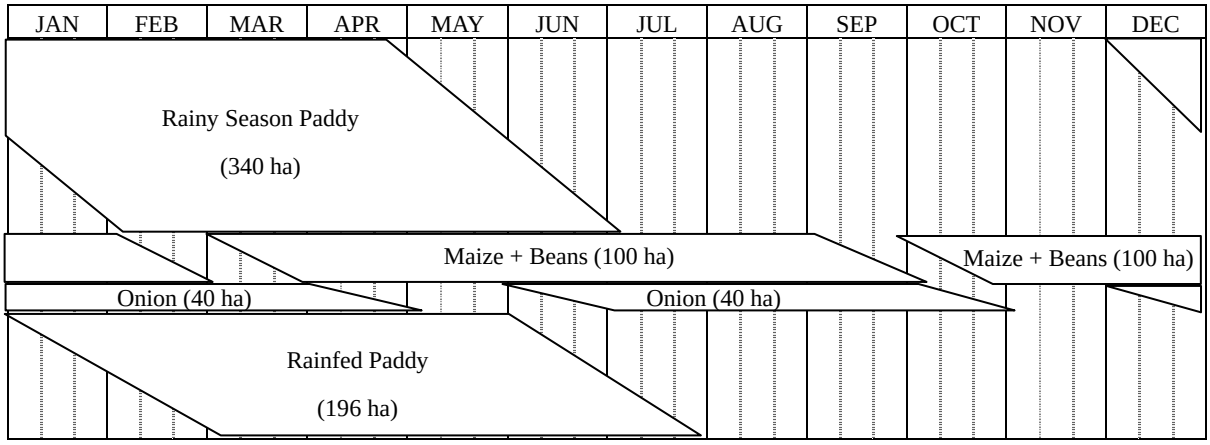
Interview with farmers

Cultivated Area, Cropping Intensity and Average Yield

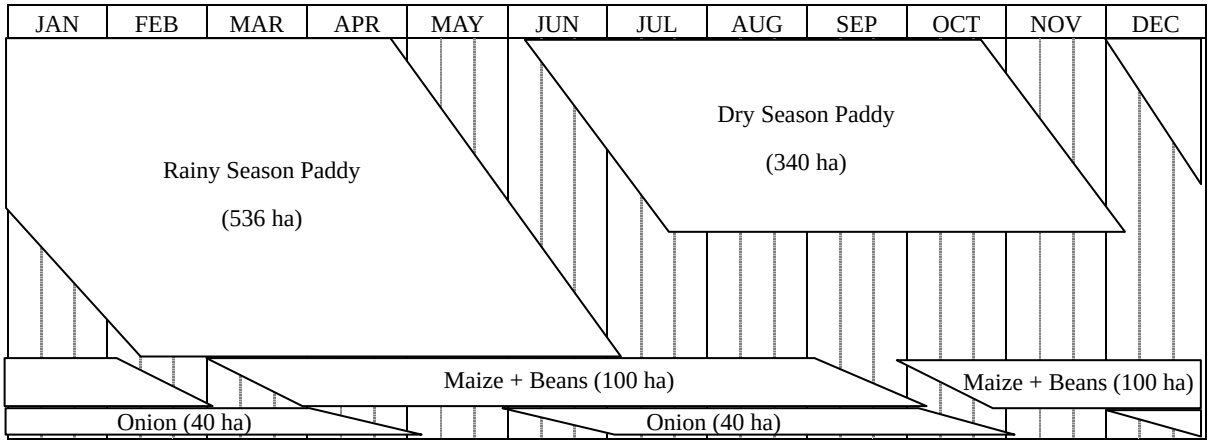
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy		196			1.3					
	Upland Crops										
Irrigated	Paddy		340			3.7		536	340		4.5
	Upland Crops		140	140				140	140		
Total		676	676	140	121		676	676	480	171	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.9ha (Rainfed Paddy, Irrigated Paddy, Irrigated Maize/Beans, Irrigated Onion)	0.9ha (Irrigated Paddy, Irrigated Maize/Beans, Irrigated Onion)
Outside the Scheme		

Financial Crop Budget

Financial Crop Budget in Musa Mwinjanga	Unit	Present Condition												Proposed Condition								
		Rainfed Paddy			Irrigated Paddy			Maize/Beans			Onion			Irrigated Paddy			Maize/Beans			Onion		
		Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I Gross Return																						
Yield	kg/ha		1,300			3,700			1,800/1,100			10,000			4,500			3,000/1,500			12,000	
Farmgate Price	Tsh/kg	120			175.00			70/200			300			175			70/200			300		
Gross Return	Tsh/ha			156,000			647,500			346,000			3,000,000			787,500			510,000			3,600,000
II Production Cost																						
1. Farm Inputs																						
1.1 Seed	kg/ha	400	0	0	400	0	0		0	0	6,000	5	30,000	400	30	12,000		0	0	6,000	6	36,000
1.2 Fertilizer																						
Urea (46% N)	kg/ha	340	0	0	340	150	51,000	340	0	0	340	90	30,600	340	150	51,000	340	0	0	340	0	0
SA (21% N)	kg/ha	300	0	0	300	0	0	300	0	0	300	90	27,000	300	175	52,500	300	180	54,000	300	220	66,000
TSP (46% P2O5)	kg/ha	340	0	0	340	30	10,200	340	0	0	340	0	0	340	70	23,800	340	0	0	340	150	51,000
NPK	kg/ha	350	0	0	350	0	0	350	0	0	350	0	0	350	0	0	350	0	0	350	0	0
Manure	ton/ha		0	0		0	0		0	0		0	0		0	0		0	0		0	0
1.3 Agro-chemical																						
Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	0	0	10,000	0	0	10,000	1	10,000	10,000	2	20,000	10,000	4	40,000
Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	1	5,000	5,000	0	0	5,000	0	0
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	6	30,000
1.4 Packing Material																						
Bags (100 kg)	nos/ha	500	13	6,500	500	37	18,500	500	32	16,000	500	120	60,000	500	45	22,500	500	40	20,000	500	150	75,000
Sub-total				6,500			79,700			16,000			147,600			176,800			94,000			298,000
2. Labour Requirement			Total	Hired		Total	Hired		Total	Hired		Total	Hired		Total	Hired		Total	Hired		Total	Hired
Land prep., Puddle and Bund	man/day		20	0	0	15	5	10,000	5	0	0	30	5	10,000	20	10	20,000	5	0	0	30	15	30,000
Nursery	man/day		0	0	0	6	0	0	0	0	0	10	0	0	5	0	0	0	0	0	10	0	0
Plant/Transplanting	man/day		1	0	0	20	10	20,000	5	2	4,000	40	5	10,000	15	15	30,000	5	5	10,000	45	15	30,000
Weeding and Fertilizer	man/day		20	10	20,000	35	15	30,000	30	5	10,000	40	5	10,000	35	15	30,000	35	15	30,000	45	15	30,000
Bird Scaring	man/day		15	0	0	15	0	0	15	0	0	30	0	0	15	0	0	15	0	0	15	0	0
Harvesting	man/day		15	0	0	25	10	20,000	20	5	10,000	40	10	20,000	30	15	30,000	30	10	20,000	50	20	40,000
Transport Marketing	man/day		5	3	6,000	15	10	20,000	8	3	6,000	30	10	20,000	20	10	20,000	15	4	8,000	45	15	30,000
Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	10	0	0
Threshing/Winnowing	man/day		5	0	0	10	5	10,000	10	3	6,000	30	5	10,000	15	5	10,000	20	5	10,000	40	20	40,000
Sub-total		2,000	81	13	26,000	2,000	141	55	110,000	2,000	93	18	36,000	2,000	255	40	80,000	2,000	155	70	140,000	2,000	125	39	78,000	2,000	290	100	200,000
3. Machinery or Draught Animal																						
Tractor	LS		0	37,500		1	30,000		0			0			1	37,500		0			0	
Hand Tractor	LS		0			0			0			0			0			0			0	
Draught Animal	LS		0			0			0			0			0			0			0	
Sub-total				37,500			30,000			0			0			37,500			0			0
4. Miscellaneous Cost																						
5% of Cost				3,500			10,985			2,600			11,380			17,715			8,600			24,900
Total Cost				73,500			230,685			54,600			238,980			372,015			180,600			522,900
III Net Return																						
Value				82,500			416,815			291,400			2,761,020			415,485			329,400			3,077,100

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Rainfed Paddy	196	83	16,170	0	0	0	-16,170
Irrigated Paddy	340	417	141,717	876	415	363,965	222,248
Maize/Beans	200	291	58,280	200	329	65,880	7,600
Onion	80	2,761	220,882	80	3,077	246,168	25,286
Total	816	3,552	437,049	1,156	3,822	676,013	238,964

Economic Crop Budget

Economic Crop Budget in Musa Mwinjanga	Unit	Present Condition												Proposed Condition								
		Rainfed Paddy			Irrigated Paddy			Maize/Beans			Onion			Irrigated Paddy			Maize/Beans			Onion		
		Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I Gross Return																						
Yield	kg/ha		1,300			3,700			1,800/1,100			10,000			4,500			3,000/1,500			12,000	
Farmgate Price	Tsh/kg	147			147			70/200			240			147			70/200			240		
Gross Return	Tsh/ha			191,685			545,565			346,000			2,400,000			663,525			510,000			2,880,000
II Production Cost																						
1. Farm Inputs																						
1.1 Seed	kg/ha	400	0	0	400	0	0		0	0	6,000	5	30,000	400	30	12,000		0	0	6,000	6	36,000
1.2 Fertilizer																						
Urea (46% N)	kg/ha	187	0	0	187	150	28,050	187	0	0	187	90	16,830	187	150	28,050	187	0	0	187	0	0
SA (21% N)	kg/ha	100	0	0	100	0	0	100	0	0	100	90	9,000	100	175	17,500	100	180	18,000	100	220	22,000
TSP (46% P2O5)	kg/ha	192	0	0	192	30	5,760	192	0	0	192	0	0	192	70	13,440	192	0	0	192	150	28,800
NPK	kg/ha	350	0	0	350	0	0	350	0	0	350	0	0	350	0	0	350	0	0	350	0	0
Manure	ton/ha		0	0		0	0		0	0		0	0		0	0		0	0		0	0
1.3 Agro-chemical																						
Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	0	0	10,000	0	0	10,000	1	10,000	10,000	2	20,000	10,000	4	40,000
Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	1	5,000	5,000	0	0	5,000	0	0
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	0	0	5,000	6	30,000
1.4 Packing Material																						
Bags (100 kg)	nos/ha	500	13	6,500	500	37	18,500	500	32	16,000	500	120	60,000	500	45	22,500	500	40	20,000	500	150	75,000
Sub-total				6,500			52,310			16,000			115,830			108,490			58,000			231,800
2. Labour Requirement			Total	Hired		Total	Hired		Total	Hired		Total	Hired		Total	Hired		Total	Hired		Total	Hired	
Land prep., Puddle and Bund	man/day		20	0	32,000	15	5	24,000	5	0	8,000	30	5	48,000	20	10	32,000	5	0	8,000	30	15	48,000
Nursery	man/day		0	0	0	6	0	9,600	0	0	0	10	0	16,000	5	0	8,000	0	0	0	10	0	16,000
Plant/Transplanting	man/day		1	0	1,600	20	10	32,000	5	2	8,000	40	5	64,000	15	15	24,000	5	5	8,000	45	15	72,000
Weeding and Fertilizer	man/day		20	10	32,000	35	15	56,000	30	5	48,000	40	5	64,000	35	15	56,000	35	15	56,000	45	15	72,000
Bird Scaring	man/day		15	0	24,000	15	0	24,000	15	0	24,000	30	0	48,000	15	0	24,000	15	0	24,000	15	0	24,000
Harvesting	man/day		15	0	24,000	25	10	40,000	20	5	32,000	40	10	64,000	30	15	48,000	30	10	48,000	50	20	80,000
Transport Marketing	man/day		5	3	8,000	15	10	24,000	8	3	12,800	30	10	48,000	20	10	32,000	15	4	24,000	45	15	72,000
Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0	5	0	8,000	0	0	0	0	0	0	10	0	16,000
Threshing/Winnowing	man/day		5	0	8,000	10	5	16,000	10	3	16,000	30	5	48,000	15	5	24,000	20	5	32,000	40	20	64,000
Sub-total		1,600	81	13	129,600	1,600	141	55	225,600	1,600	93	18	148,800	1,600	255	40	408,000	1,600	155	70	248,000	1,600	125	39	200,000	1,600	290	100	464,000
3. Machinery or Draught Animal																						
Tractor	LS		0		37,500	1		30,000		0			0			1	37,500			0			0	
Hand Tractor	LS		0			0				0			0			0				0			0	
Draught Animal	LS		0			0				0			0			0				0			0	
Sub-total					37,500			30,000			0			0			37,500			0				0
4. Miscellaneous Cost																						
5% of Cost					8,680			15,396			8,240			26,192			19,700			12,900			34,790
Total Cost					182,280			323,306			173,040			550,022			413,690			270,900			730,590
III Net Return																						
Value					9,405			222,260			172,960			1,849,979			249,836			239,100			2,149,410

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Rainfed Paddy	196	9	1,843	0	0	0	-1,843
Irrigated Paddy	340	222	75,568	876	250	218,856	143,288
Maize/Beans	200	173	34,592	200	239	47,820	13,228
Onion	80	1,850	147,998	80	2,149	171,953	23,955
Total	816	2,255	260,002	1,156	2,638	438,629	178,627

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	Total Cost	Incremental Benefit	Balance
2004		30,792	15,396			51,320	97,508		-97,508
2005	461,879	30,792	15,396			38,490	546,557		-546,557
2006		30,792	15,396	4,850		38,490	89,528	17,863	-71,666
2007				9,701			9,701	53,588	43,887
2008				9,701			9,701	125,039	115,338
2009				9,701			9,701	160,764	151,063
2010				9,701			9,701	178,627	168,926
2011				9,701			9,701	178,627	168,926
2012				9,701			9,701	178,627	168,926
2013				9,701			9,701	178,627	168,926
2014				9,701			9,701	178,627	168,926
2015				9,701	4,619		14,320	178,627	164,307
2016				9,701			9,701	178,627	168,926
2017				9,701			9,701	178,627	168,926
2018				9,701			9,701	178,627	168,926
2019				9,701			9,701	178,627	168,926
2020				9,701			9,701	178,627	168,926
2021				9,701			9,701	178,627	168,926
2022				9,701			9,701	178,627	168,926
2023				9,701			9,701	178,627	168,926
2024				9,701			9,701	178,627	168,926
2025				9,701	4,619		14,320	178,627	164,307
2026				9,701			9,701	178,627	168,926
2027				9,701			9,701	178,627	168,926
2028				9,701			9,701	178,627	168,926
2029				9,701			9,701	178,627	168,926
2030				9,701			9,701	178,627	168,926
2031				9,701			9,701	178,627	168,926
2032				9,701			9,701	178,627	168,926
2033				9,701			9,701	178,627	168,926
2034				9,701			9,701	178,627	168,926
								NPV (12%) =	**265,761**
								EIRR =	**17%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	0.9	0.9
- Within the Scheme Area (ha)	0.9	0.9
- Outside the Scheme Area (ha)	0.0	0.0
Gross Farm Income	745	1,387
Production Cost	164	507
Net Farm Income	582	880
Off-farm Income	186	186
Living Expenditure	480	480
Tax and Duties	15	15
Balance	273	571

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size within the Scheme Area	0.9 ha
b) Gross Income	1,387
c) Production Cost	507
d) Net Farm Income	880
e) Tax and Duties	15
f) O/M Cost	14
g) Net Profit (d-e-f)	851

5. Mgongola Irrigation Scheme

Site Description

The project area occupies most of Hembeti Ward (Morogoro Rural District) at the eastern part of the Morogoro Region. Administratively, it includes 3 villages, namely, Mkindo, Dihombo and Hembeti. Access to the project area in the Mkindo village is by an unmetaled all-weather road from Dakawa, of which the distance is about 10 km. The project area could be easily accessible by any kind of vehicle in every seasons, because the access roads are well maintained though it is unpaved.

Average annual rainfall of the project area is estimated at about 1,310 mm with double threads at the maximum in April. Mkindo river which is a water source of the project, has perennial flow. Average discharge of the river at the existing intake point was estimated at more than 8.0 m^3/sec, and even the lowest discharge in the dry season, say in September was estimated at above 1.9 m^3/sec.

Fertile alluvial plain extends downstream of the gouge of the Mkindo river. The project area is enclosed by the Mkindo river and its tributary, Mgongola river.

Scheme Description

Development Purpose

To ensure stable water supply to the existing pilot model project (Mkindo Pilot Project) and the surrounding areas, through improvement of existing irrigation facilities and provision of irrigation and drainage system.

Basic Approach

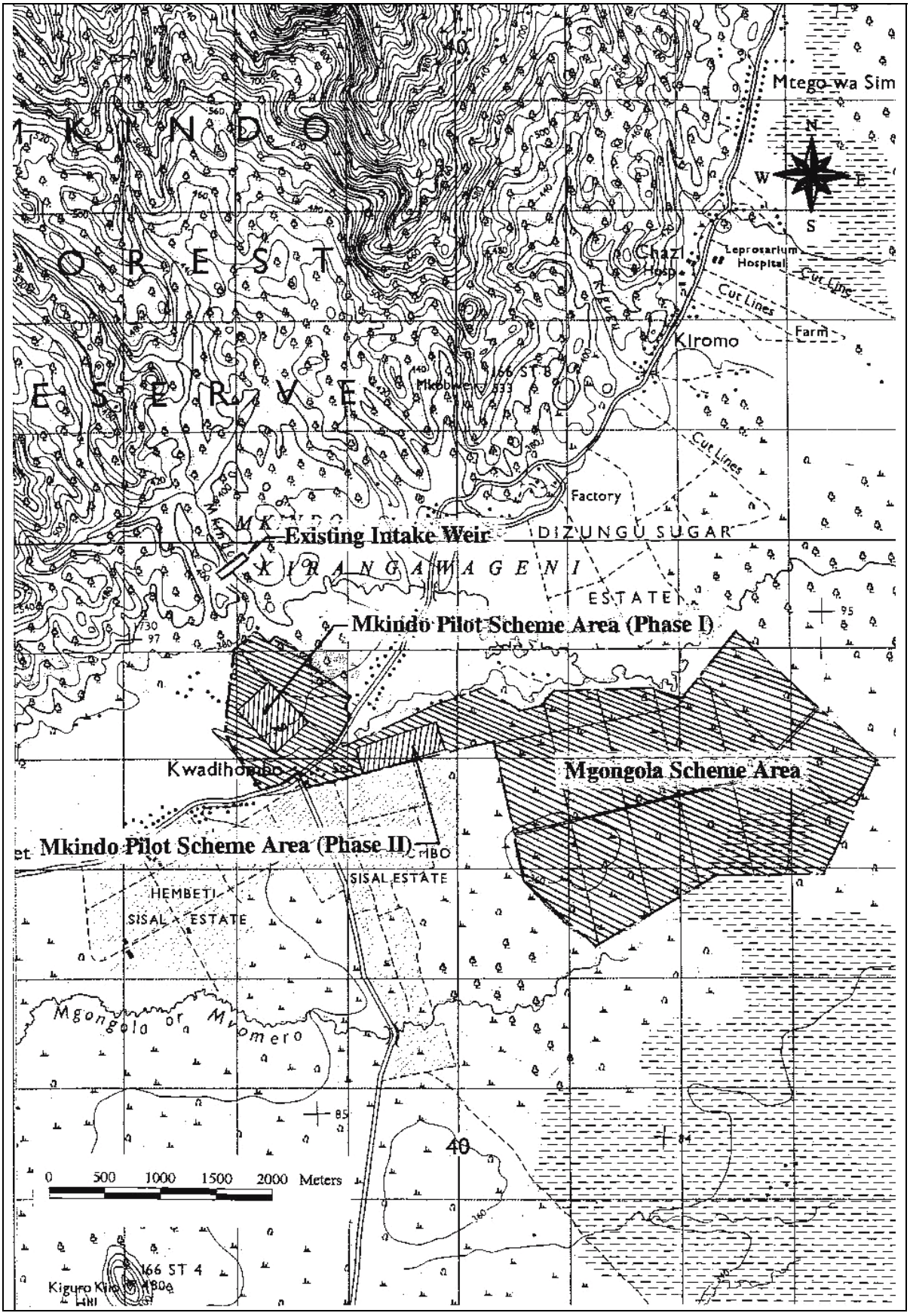
To employ the same irrigation development level with the pilot area to the surrounding areas.

Development Plan

The proposed scheme area is 620 ha in net. Farmers adjoining the pilot project have been motivated to introduce the new irrigation method being stimulated by the pilot model effects. Some of them have initiated irrigation practices executed in the pilot project. But those are done disorderly, and frequently troubles occur on water distribution with other farmers. Farmers are looking forward to an implementation of the irrigation scheme which enables them to cover surrounding potential areas with the same irrigation system. The scheme fully requires new construction of irrigation and drainage canal system and flood protection work for the surrounding areas. For the existing intake weir, it is necessary to make enlargement of intake gates so as to divert sufficient irrigation water to both the pilot project and surrounding area. The proposed works for the scheme are as follows:

(a) Remodeling of intake weir (1 site)
(b) Remodeling of diversion canal (unlined, length of 1,200 m)
(c) Construction of main irrigation canal (unlined, length of 2,400 m)
(d) Construction of secondary irrigation canal (unlined, length of 19,100 m)
(e) Construction of drainage canal (length of 13,100 m)
(f) Construction of flood dike (length of 9,800 m)
(g) Construction of related structures (Lump Sum)

Scheme Map


Mtego wa Sim
N
W
E
S
Chazi Hosp.
Leprosarium Hospital
Cut Lines
Farm
Kiromo
Mkobwe
Factory
DIZUNGU SUGAR
ESTATE
Existing Intake Weir
Mkindo Pilot Scheme Area (Phase I)
Mgongola Scheme Area
Kwadihombo
Mkindo Pilot Scheme Area (Phase II)
HEMBETI SISAL ESTATE
SISAL ESTATE
Mgongola or Mvomero
0 500 1000 1500 2000 Meters
166 ST 4

Photographs

Mkindo diversion weir

Broken aqueduct

Irrigation canal

Paddy field after harvest

Soil surface covered by Azzola

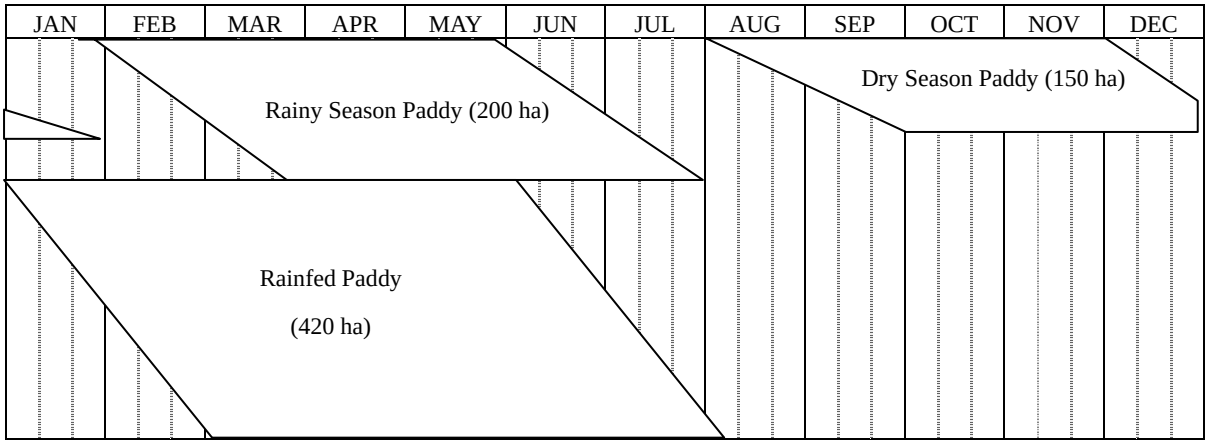
Presentation in RRA workshop

Cultivated Area, Cropping Intensity and Average Yield

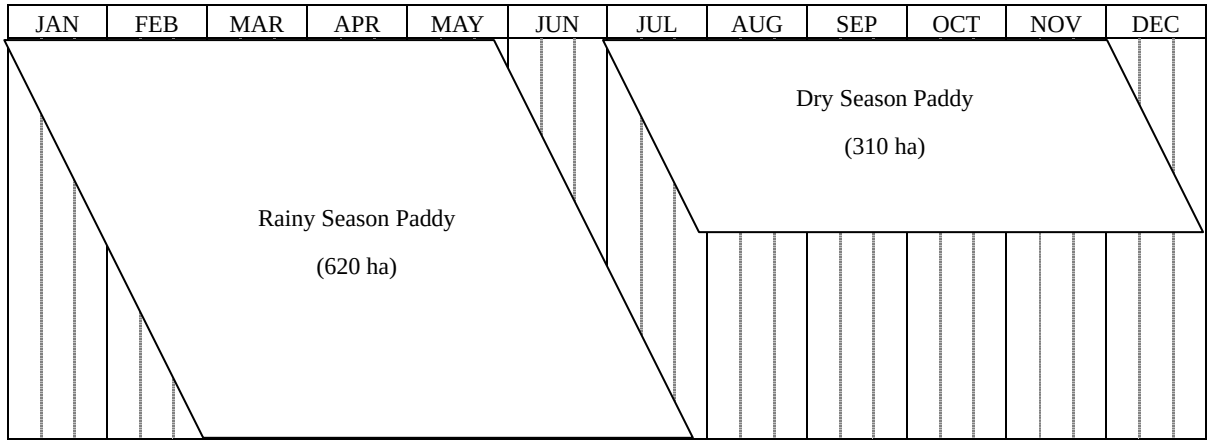
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy		420			1.3					
	Upland Crops										
Irrigated	Paddy		200	150		3.6		620	310		5.5
	Upland Crops										
Total		620	620	150	124		620	620	310	150	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.8ha (Rainfed Paddy + Irrigated Paddy)	0.8ha (Irrigated Paddy)
Outside the Scheme	1.2ha (Rainfed Paddy)	1.2ha (Rainfed Paddy)

Financial Crop Budget

Financial Crop Budget in Mgongola	Unit	Present Condition						Proposed Condition		
		Irrigated Paddy			Rainfed Paddy			Irrigated Paddy		
		Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I Gross Return										
Yield	kg/ha		3,600			1,300			5,500	
Farmgate Price	Tsh/kg	175.00			120.00			175.00		
Gross Return	Tsh/ha			630,000			156,000			962,500
II Production Cost										
1. Farm Inputs										
1.1 Seed	kg/ha	400	0	0	400	0	0	400	30	12,000
1.2 Fertilizer										
Urea (46% N)	kg/ha	340	150	51,000	340	0	0	340	175	59,500
SA (21% N)	kg/ha	300	0	0	300	0	0	300	200	60,000
TSP (46% P2O5)	kg/ha	340	30	10,200	340	0	0	340	90	30,600
NPK	kg/ha	350	0	0	350	0	0	350	0	0
Manure	ton/ha		0	0		0	0		0	0
1.3 Agro-chemical										
Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	2	20,000
Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	2	10,000
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
1.4 Packing Material										
Bags (100 kg)	nos/ha	500	36	18,000	500	13	6,500	500	55	27,500
Sub-total				79,200			6,500			219,600
2. Labour Requirement			Total	Hired		Total	Hired		Total	Hired
Land prep., Puddle and Bund	man/day		15	5	10,000	20	0	0	15	15	30,000
Nursery	man/day		6	0	0	0	0	0	6	0	0
Plant/Transplanting	man/day		20	10	20,000	1	0	0	20	20	40,000
Weeding and Fertilizer	man/day		35	15	30,000	20	10	20,000	35	15	30,000
Bird Scaring	man/day		15	0	0	15	0	0	15	0	0
Harvesting	man/day		25	10	20,000	15	0	0	30	15	30,000
Transport Marketing	man/day		15	10	20,000	10	5	10,000	15	15	30,000
Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
Threshing/Winnowing	man/day		10	5	10,000	5	0	0	10	10	20,000
Sub-total		2,000	141	55	110,000	2,000	86	15	30,000	2,000	146	90	180,000
3. Machinery or Draught Animal										
Tractor	LS		1		30,000		0	37,500		1	30,000
Hand Tractor	LS		0				0			0	
Draught Animal	LS		0				0			0	
Sub-total				30,000			37,500			30,000
4. Miscellaneous Cost										
5% of Cost				10,960			3,700			21,480
Total Cost				230,160			77,700			451,080
III Net Return										
Value				399,840			78,300			511,420

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Rainfed Paddy	420	78	32,886	0	0	0	-32,886
Irrigated Paddy	350	400	139,944	930	511	475,621	335,677
Total	770	478	172,830	930	511	475,621	302,791

Economic Crop Budget

Economic Crop Budget in Mgongola			Unit	Present Condition						Proposed Condition		
				Irrigated Paddy			Rainfed Paddy			Irrigated Paddy		
				Price (Tsh)	Q'ty	Value (Tsh)	Price (Tsh)	Q'ty	Value (Tsh)	Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		3,600			1,300			5,500	
	Farmgate Price		Tsh/kg	147.45			147.45			147.45		
	Gross Return		Tsh/ha			530,820			191,685			810,975
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	0	0	400	0	0	400	30	12,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	187	150	28,050	187	0	0	187	175	32,725
		SA (21% N)	kg/ha	100	0	0	100	0	0	100	200	20,000
		TSP (46% P2O5)	kg/ha	192	30	5,760	192	0	0	192	90	17,280
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	2	20,000
		Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	2	10,000
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	36	18,000	500	13	6,500	500	55	27,500
		Sub-total				51,810			6,500			139,505
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		15	5	24,000	20	0	32,000	15	15	24,000
		Nursery	man/day		6	0	9,600	0	0	0	6	0	9,600
		Plant/Transplanting	man/day		20	10	32,000	1	0	1,600	20	20	32,000
		Weeding and Fertilizer	man/day		35	15	56,000	20	10	32,000	35	15	56,000
		Bird Scaring	man/day		15	0	24,000	15	0	24,000	15	0	24,000
		Harvesting	man/day		25	10	40,000	15	0	24,000	30	15	48,000
		Transport Marketing	man/day		15	10	24,000	10	5	16,000	15	15	24,000
		Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
		Threshing/Winnowing	man/day		10	5	16,000	5	0	8,000	10	10	16,000
		Sub-total		1,600	141	55	225,600	1,600	86	15	137,600	1,600	146	90	233,600
	3. Machinery or Draught Animal											
		Tractor	LS		1	30,000		0	37,500		1	30,000
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS		0			0			0	
		Sub-total				30,000			37,500			30,000
	4. Miscellaneous Cost											
		5% of Cost				15,371			9,080			20,155
		Total Cost				322,781			190,680			423,260
III	Net Return											
		Value				208,040			1,005			387,715

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Rainfed Paddy	420	1	422	0	0	0	-422
Irrigated Paddy	350	208	72,814	930	388	360,575	287,761
Total	770	209	73,236	930	388	360,575	287,339

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		74,042	37,021			123,404	234,467		-234,467
2005	1,110,632	74,042	37,021			92,553	1,314,248		-1,314,248
2006		74,042	37,021	4,449		92,553	208,064	28,734	-179,331
2007				8,897			8,897	86,202	77,304
2008				8,897			8,897	201,137	192,240
2009				8,897			8,897	258,605	249,708
2010				8,897			8,897	287,339	278,441
2011				8,897			8,897	287,339	278,441
2012				8,897			8,897	287,339	278,441
2013				8,897			8,897	287,339	278,441
2014				8,897			8,897	287,339	278,441
2015				8,897	11,106		20,004	287,339	267,335
2016				8,897			8,897	287,339	278,441
2017				8,897			8,897	287,339	278,441
2018				8,897			8,897	287,339	278,441
2019				8,897			8,897	287,339	278,441
2020				8,897			8,897	287,339	278,441
2021				8,897			8,897	287,339	278,441
2022				8,897			8,897	287,339	278,441
2023				8,897			8,897	287,339	278,441
2024				8,897			8,897	287,339	278,441
2025				8,897	11,106		20,004	287,339	267,335
2026				8,897			8,897	287,339	278,441
2027				8,897			8,897	287,339	278,441
2028				8,897			8,897	287,339	278,441
2029				8,897			8,897	287,339	278,441
2030				8,897			8,897	287,339	278,441
2031				8,897			8,897	287,339	278,441
2032				8,897			8,897	287,339	278,441
2033				8,897			8,897	287,339	278,441
2034				8,897			8,897	287,339	278,441
								NPV (12%) =	**2,661**
								EIRR =	**12%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	2.0	2.0
- Within the Scheme Area (ha)	0.8	0.8
- Outside the Scheme Area (ha)	1.2	1.2
Gross Farm Income	691	1,342
Production Cost	285	635
Net Farm Income	405	708
Off-farm Income	173	173
Living Expenditure	430	430
Tax and Duties	14	14
Balance	134	437

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.8 ha
b) Gross Income	1,155
c) Production Cost	541
d) Net Farm Income	614
e) Tax and Duties	14
f) O/M Cost	13
g) Net Profit (d-e-f)	587

6. Lower Moshi Irrigation Scheme

Site Description

The Scheme is located in the Moshi Rural District of the Kilimanjaro Region. The Scheme covers six villages of Mabogini, Rau Ya Kati, Chekereni, Oria, Mandaka Mnono and Kaloleni. The population of these villages in 2002 is estimated at 21,110 using the 1988 population and annual growth rate 3.08 %.

The Scheme Area extends on the alluvial low land area being composed of gently sloping land with an average gradient of 0.5%. The elevation of the Study Area ranges from 700m to 760m.

Climate in the Scheme Area is characterized by three seasons: rainy season from March to May, dry season from June to October, and small rainy season from November to February. The mean temperature varies from 20 to 25^{o}C throughout the year. The monthly average of relative humidity varies from 64 to 77 %.

Water source of the Scheme consists of the Rau river and the Njoro river, a tributary of the Rau river. The Rau river originates from Mt. Kilimanjaro and traverses the Scheme Area until it is joined by the Ruvu river, collecting water from springs in the mountain area. The Mwanagurue spring located in Mandaka Mnono is acting as a stable water source of the river. The Njoro river, collecting water from such springs as the Njoro ya Dobi spring and Goa spring, has a relatively stable flow throughout the year. The estimated mean monthly discharge at Mabogini and Rau Ya Kati ranges from 1.23 m^3/sec to 1.59 m^3/sec and from 2.24 m^3/sec to 4.35 m^3/sec, respectively.

Eutric Cambisols, Phreatic are dominantly distributed in nearly flat lands in the Scheme Area, and are almost entirely used for crop cultivation. Vertic Camisols, Poorly Drained Phase are found to a limited extent in paddy fields in Kaloleni. The soils have no serious limitation for irrigated rice farming. Typic Eutric Gleysols, Poorly Drained Phase are found mainly low-lying areas extending paddy fields in the northeastern end of the Scheme. The soils have no serious limitation for irrigated rice farming.

The access to the Scheme Area is good, and possible even during the rainy season.

Scheme Description

Development Purpose

To realize even water use in upstream area (Expanded Area) and downstream area (Existing Lower Moshi Area) through strengthening water management.

Basic Approach

To provide necessary irrigation and drainage facilities for proper water management for upstream area and to make minimum rehabilitation work for downstream area, to enhance irrigation efficiency.

Development Plan

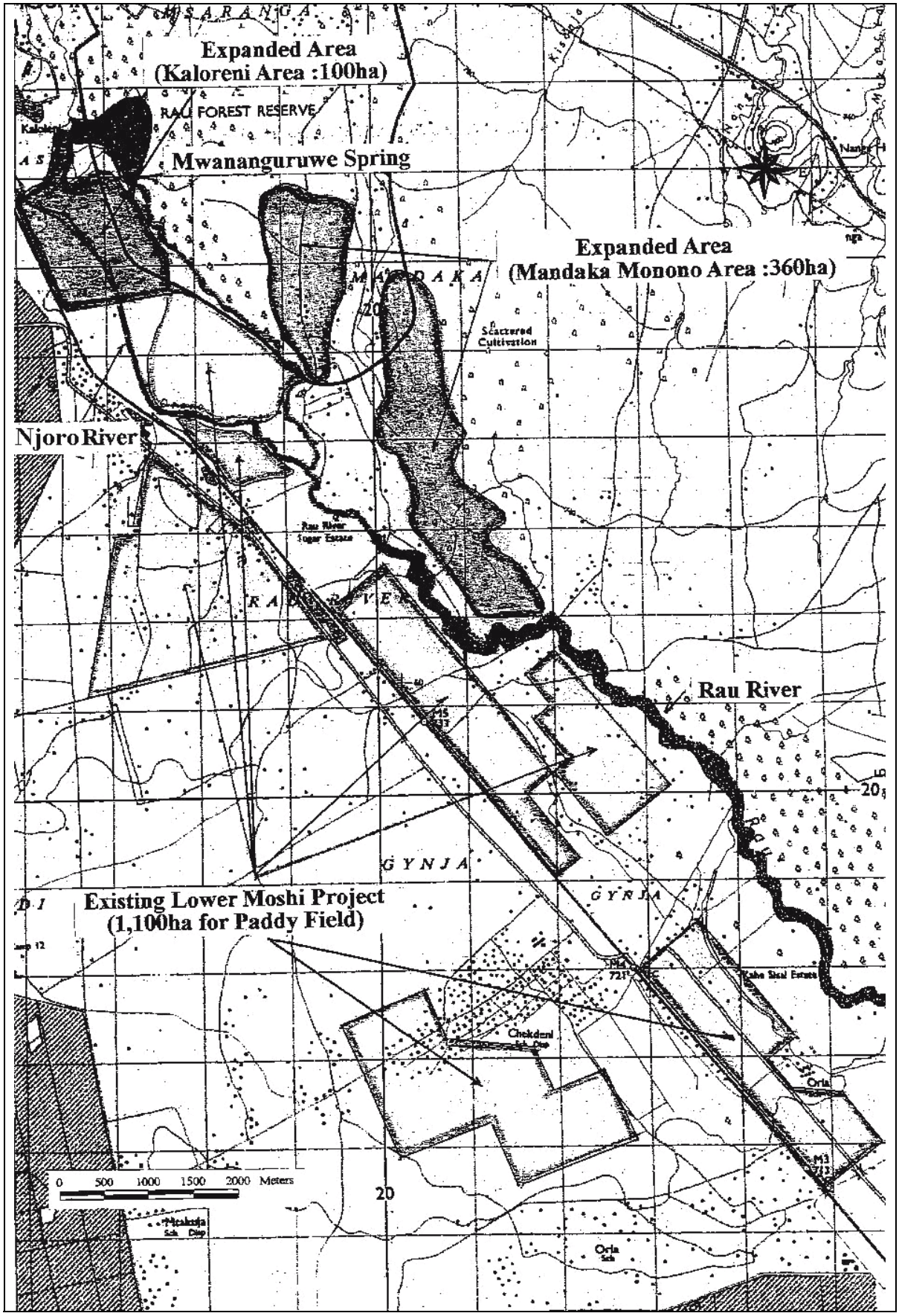
The proposed scheme area is 1,560 ha in net. The Existing Lower Moshi Project is provided with modernized irrigation and drainage system although rehabilitation works for damaged canal lining and gates are required for further effective water management.

The Expanded Area is presently covered with the farmers-built irrigation canal systems. These canal systems are not enough to realize the proper water management due to no control facility, poor canal condition, and lack of farm road. Besides, no drainage system including flood protection dyke is provided. Improvement of these unsuitable conditions is therefore indispensable to avoid unnecessary water tapping from the limited water sources, and also smoothly to eliminate excess water to the river. The required works mentioned above are summarized below:

(a) Existing Lower Moshi Project (1,100 ha paddy field only)
- Rehabilitation of two intake weirs (intake/scouring sluice gates): 4nos
- Repairing of canal lining : Lump Sum
- Repairing of drains: Lump Sum
- Repairing of related structures: Lump Sum

(b) Expanded Area (460 ha in total)
- Construction of intake facilities: 8nos
- Improvement of existing canals: 26 km
- Construction of drains: 21 km
- Rehabilitation/construction of farm roads: 30 km
- Construction of related structures: 244 nos.
- Construction of flood dike: 16 km

Scheme Map


Expanded Area
(Kaloreni Area :100ha)
RAU FOREST RESERVE
Mwananguruwe Spring
Expanded Area
(Mandaka Monono Area :360ha)
Njoro River
Rau River
Existing Lower Moshi Project
(1,100ha for Paddy Field)
0 500 1000 1500 2000 Meters

Photographs

Diversion point at Mwananguruwe spring

Irrigated area at Mandaka Mnono

Mabogini Intake

Paddy in Mabogini system

Canal system at existing Lower Moshi

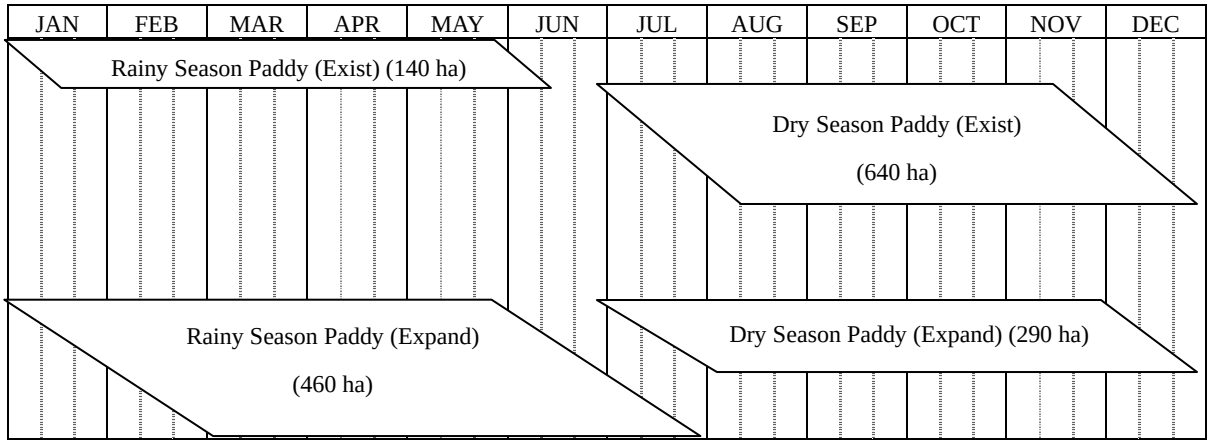
Interview with farmers

Cultivated Area, Cropping Intensity and Average Yield

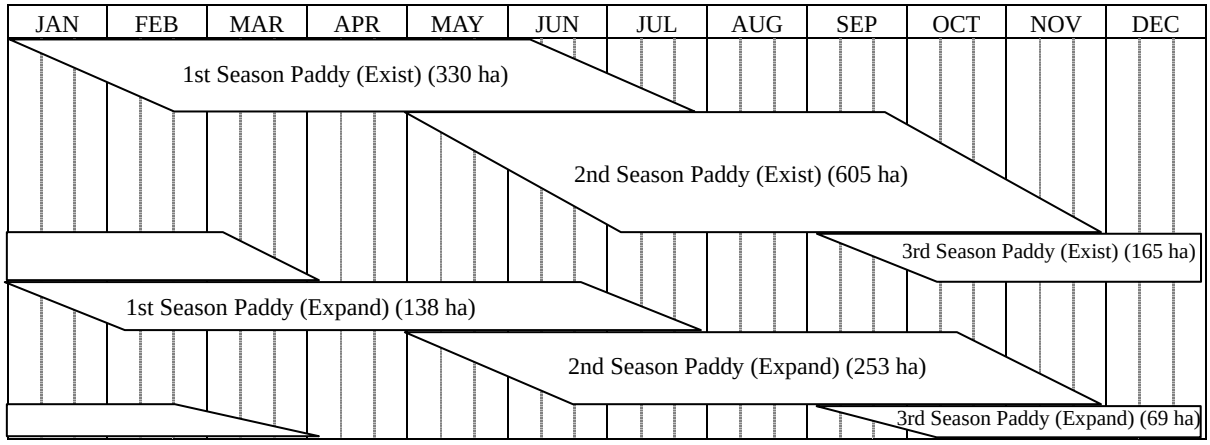
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed					
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)			Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				1st	2nd	3rd		
Rainfed	Paddy											
	Upland Crops											
Irrigated	Paddy		600	930		6.6/4.5		468	858	234		7.0
	Upland Crops											
Total		1,560	600	930	98		1,560	468	858	234	100	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.6ha (Irrigated Paddy)	0.6ha (Irrigated Paddy)
Outside the Scheme	0.4ha (Upland Crops)	0.4ha (Upland Crops)

Financial Crop Budget

Financial Crop Budget in Lower Moshi			Unit	Present Condition						Proposed Condition		
				Existing Irrigated Paddy			Expanded Irrigated Paddy			Irrigated Paddy		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		6,600			4,500			7,000	
	Farmgate Price		Tsh/kg	175			175			175		
	Gross Return		Tsh/ha			1,155,000			787,500			1,225,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	45	18,000	400	55	22,000	400	33	13,200
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	340	320	108,800	340	270	91,800	340	175	59,500
		SA (21% N)	kg/ha	300	110	33,000	300	0	0	300	350	105,000
		TSP (46% P2O5)	kg/ha	340	0	0	340	0	0	340	90	30,600
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	1	10,000	10,000	1	10,000	10,000	1	10,000
		Herbicide	lit/ha	5,000	1	5,000	5,000	1	5,000	5,000	1	5,000
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	66	33,000	500	45	22,500	500	70	35,000
		Sub-total				207,800			151,300			258,300
	2. Labour Requirement				Total	Hired					Total	Hired
		Land prep., Puddle and Bund	man/day		18	1	2,000	40	6	12,000	18	1	2,000
		Nursery	man/day		3	0	0	3	0	0	3	0	0
		Plant/Transplanting	man/day		30	10	10	30	15	30,000	30	10	10
		Weeding and Fertilizer	man/day		30	0	0	20	0	0	30	0	0
		Bird Scaring	man/day		15	0	0	15	0	0	15	0	0
		Harvesting	man/day		30	15	30,000	30	10	20,000	35	18	36,000
		Transport Marketing	man/day		15	15	30,000	10	10	20,000	18	18	36,000
		Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
		Threshing/Winnowing	man/day		10	0	0	10	10	20,000	10	0	0
		Sub-total		2,000	151	41	82,000	2,000	158	51	102,000	2,000	159	47	94,000
	3. Machinery or Draught Animal											
		Tractor	LS	50,000	1	50,000		0		50,000	1	50,000
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS		0			0			0	
		Sub-total				50,000			0			50,000
	4. Miscellaneous Cost											
		5% of Cost				16,990			12,665			20,115
		Total Cost				356,790			265,965			422,415
III	Net Return											
		Value				798,210			521,535			802,585

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Paddy (Existing)	780	798	622,604	1,100	803	882,844	260,240
Paddy (Expanding)	750	522	391,151	460	803	369,189	-21,962
Total	1,530	1,320	1,013,755	1,560	1,605	1,252,033	238,278

Economic Crop Budget

Economic Crop Budget in Lower Moshi	Unit	Present Condition						Proposed Condition		
		Existing Irrigated Paddy			Expanded Irrigated Paddy			Irrigated Paddy		
		Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I Gross Return										
Yield	kg/ha		6,600			4,500			7,000	
Farmgate Price	Tsh/kg	135			135			135		
Gross Return	Tsh/ha			893,970			609,525			948,150
II Production Cost										
1. Farm Inputs										
1.1 Seed	kg/ha	400	45	18,000	400	55	22,000	400	33	13,200
1.2 Fertilizer										
Urea (46% N)	kg/ha	187	320	59,840	187	270	50,490	187	175	32,725
SA (21% N)	kg/ha	100	110	11,000	100	0	0	100	350	35,000
TSP (46% P2O5)	kg/ha	192	0	0	192	0	0	192	90	17,280
NPK	kg/ha	350	0	0	350	0	0	350	0	0
Manure	ton/ha		0	0		0	0		0	0
1.3 Agro-chemical										
Pesticide	lit/ha	10,000	1	10,000	10,000	1	10,000	10,000	1	10,000
Herbicide	lit/ha	5,000	1	5,000	5,000	1	5,000	5,000	1	5,000
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
1.4 Packing Material										
Bags (100 kg)	nos/ha	500	66	33,000	500	45	22,500	500	70	35,000
Sub-total				136,840			109,990			148,205
2. Labour Requirement			Total	Hired					Total	Hired
Land prep., Puddle and Bund	man/day		18	1	28,800	40	6	64,000	18	1	28,800
Nursery	man/day		3	0	4,800	3	0	4,800	3	0	4,800
Plant/Transplanting	man/day		30	10	48,000	30	15	48,000	30	10	48,000
Weeding and Fertilizer	man/day		30	0	48,000	20	0	32,000	30	0	48,000
Bird Scaring	man/day		15	0	24,000	15	0	24,000	15	0	24,000
Harvesting	man/day		30	15	48,000	30	10	48,000	35	18	56,000
Transport Marketing	man/day		15	15	24,000	10	10	16,000	18	18	28,800
Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
Threshing/Winnowing	man/day		10	0	16,000	10	10	16,000	10	0	16,000
Sub-total		1,600	151	41	241,600	1,600	158	51	252,800	1,600	159	47	254,400
3. Machinery or Draught Animal										
Tractor	LS	50,000	1	50,000		0		50,000	1	50,000
Hand Tractor	LS		0			0			0	
Draught Animal	LS		0			0			0	
Sub-total				50,000			0			50,000
4. Miscellaneous Cost										
5% of Cost				21,422			18,140			22,630
Total Cost				449,862			380,930			475,235
III Net Return										
Value				444,108			228,596			472,915

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Paddy (Existing)	780	444	346,404	1,100	473	520,206	173,802
Paddy (Expanding)	750	229	171,447	460	473	217,541	46,094
Total	1,530	673	517,851	1,560	946	737,747	219,896

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		116,092	58,046			193,487	367,625		-367,625
2005	1,160,922	116,092	58,046			145,115	1,480,176	87,958	-1,392,217
2006	580,461	116,092	58,046	11,193		145,115	910,908	175,917	-734,991
2007				22,387			22,387	219,896	197,509
2008				22,387			22,387	219,896	197,509
2009				22,387			22,387	219,896	197,509
2010				22,387			22,387	219,896	197,509
2011				22,387			22,387	219,896	197,509
2012				22,387			22,387	219,896	197,509
2013				22,387			22,387	219,896	197,509
2014				22,387			22,387	219,896	197,509
2015				22,387			22,387	219,896	197,509
2016				22,387	17,414		39,801	219,896	180,096
2017				22,387			22,387	219,896	197,509
2018				22,387			22,387	219,896	197,509
2019				22,387			22,387	219,896	197,509
2020				22,387			22,387	219,896	197,509
2021				22,387			22,387	219,896	197,509
2022				22,387			22,387	219,896	197,509
2023				22,387			22,387	219,896	197,509
2024				22,387			22,387	219,896	197,509
2025				22,387			22,387	219,896	197,509
2026				22,387	17,414		39,801	219,896	180,096
2027				22,387			22,387	219,896	197,509
2028				22,387			22,387	219,896	197,509
2029				22,387			22,387	219,896	197,509
2030				22,387			22,387	219,896	197,509
2031				22,387			22,387	219,896	197,509
2032				22,387			22,387	219,896	197,509
2033				22,387			22,387	219,896	197,509
2034				22,387			22,387	219,896	197,509
								NPV (12%) =	**-844,056**
								EIRR =	**6%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	1.0	1.0
- Within the Scheme Area (ha)	0.6	0.6
- Outside the Scheme Area (ha)	0.4	0.4
Gross Farm Income	533	783
Production Cost	168	271
Net Farm Income	365	512
Off-farm Income	133	133
Living Expenditure	400	400
Tax and Duties	11	11
Balance	88	234

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.6 ha
b) Gross Income	735
c) Production Cost	253
d) Net Farm Income	482
e) Tax and Duties	11
f) O/M Cost	10
g) Net Profit (d-e-f)	461

7. Kisese Irrigation Scheme

Site Description

The project area covers most of Kisese Ward (Kondoa District) at the northern part of the Dodoma Region. It administratively includes 4 villages, namely, Kisese-Sauna, Kisese-Disa, Mapinduzi and Madisa. Access to the centre of the project area in the Kisese-Sauna is by an unmetaled seasonal-weather road from Kondoa, about 71 km long. The project area could be accessible only by 4WD vehicle even in the dry season because the access roads approaching from west are likely mountain pass with small width and steep slopes, otherwise other access roads approaching from south are erodible at the closings with tributaries. It is sometimes difficult to reach the area during rainy season even by any type automobile.

Annual rainfall of the project area ranges from 500 mm to 800 mm having single peak in April. Kisese river is a major water source of the project having about 100 km^2 of catchment area at the site. The river is intermittent or ephemeral in and below its middle reaches. Small streamlet has however been seen in the upstream of the river gushing out from several springs during the dry season. Watershed of the river is well-vegetated and exposing rocks in layers which seem to be relatively suitable for feeding springs.

As the downstream of project area and outside area extending downstream are cultivated in rainfed during the rainy season, water harvesting measures diverting flood flush are solitary possible for irrigation to these dry area. On the other hand, specified areas in upstream are presently irrigated by abstracting water in a traditional manner.

Scheme Description

Development Purpose

To ensure irrigation water by river-basin-wide water harvesting development.

Basic Approach

To apply suitable water harvesting methods for every specified river segment considering river morphologic form.

Development Plan

The proposed scheme area is 50 ha in net. The riparian area of Kisese river is classified into the following three segments from river morphologic form:

(1) First river segment

The well vegetation-covered catchment area of the Kisese river, bears relatively stable base-flow only its upstream reaches. This is categorized into the first river segment of the Kisese river. The river water is abstracted partially for irrigation purpose by earthen and fragile intake dikes at five points. Farmers are very eager to replace them with the solid and stable ones because these are flushed out by flood.

(2) Second river segment

Middle reach of the river, which is categorized into the second segment of the river, is not perennial but intermittent or ephemeral although there is considerable subsurface flow under the riverbed even during the dry season. Farmers abstract subsurface flow water from the river by digging riverbed during dry season. River section in this second segment forms deeply carved side banks, and its riverbed has been deepening year by year. Due to such characteristic of the river shape, water harvesting like flood flow diverting has not been practiced. The farm-lands concerning the type of second river segment could extract water from sub-surface flow of the river by pump, otherwise, harvest water by collecting flood water at upper side of adjoining mountain slopes like a method known as the external water harvesting.

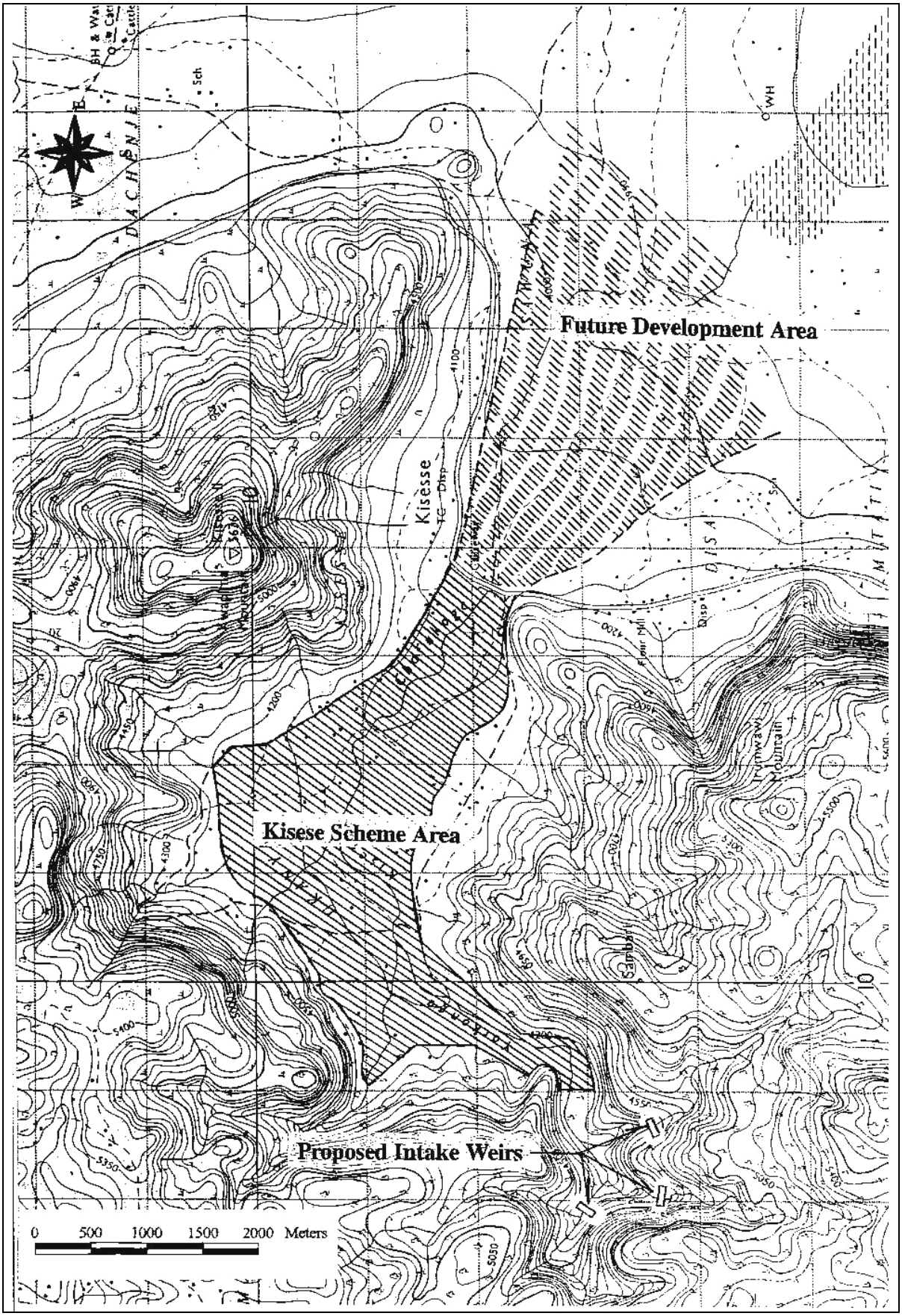
(3) Third river segment

Down reach of the river, which is categorized into the third segment of the river, is ephemeral. Farmers have not irrigated their lands in this river segment. However, there is a possibility to initiate irrigation applying conventional water harvesting method where farmers divert flood flow into their lands during flood time.

The whole reaches should be developed stage-wise considering the area size of respective reaches. As Phase 1, the first river segment is recommendable since about 38 ha is presently irrigated using river water. The irrigation development for the first river segment which targets 50 ha irrigation development, is regarded as pilot irrigation area the upper reach of the river. The required construction works for the scheme are summarized below:

(a) Intake weirs (3 sites)
(b) Irrigation canal (unlined, length of 17,900 m)
(c) Storage reservoir (1 site with capacity of 2, 60 m3)
(d) Drainage canal (length of 8,000 m)

Scheme Map


Future Development Area
Kisese Scheme Area
Proposed Intake Weirs
Kisesse
0 500 1000 1500 2000 Meters

Photographs

Kisese village

River for water source

Temporary intake

General landscape of command area

Contour band in the field of advanced farmer

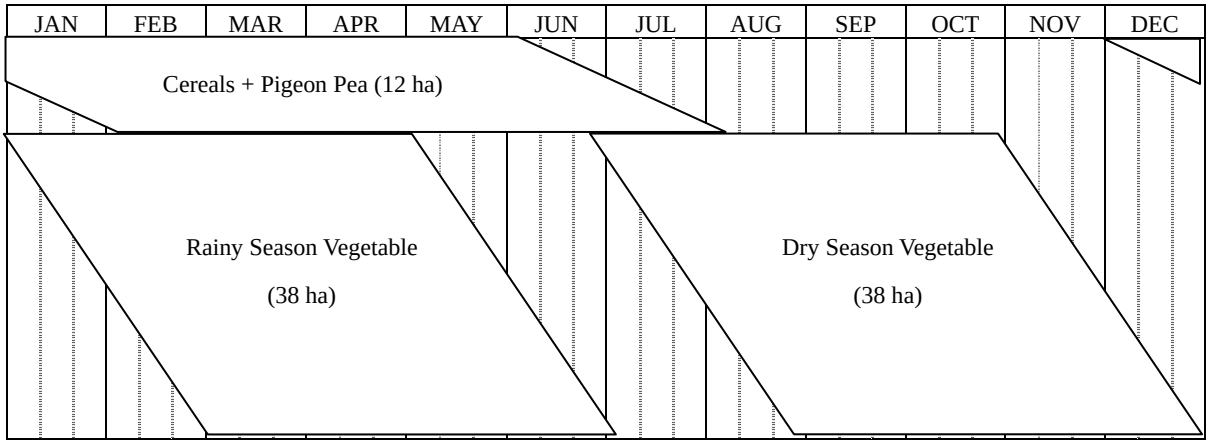
RRA workshop with farmers

Cultivated Area, Cropping Intensity and Average Yield

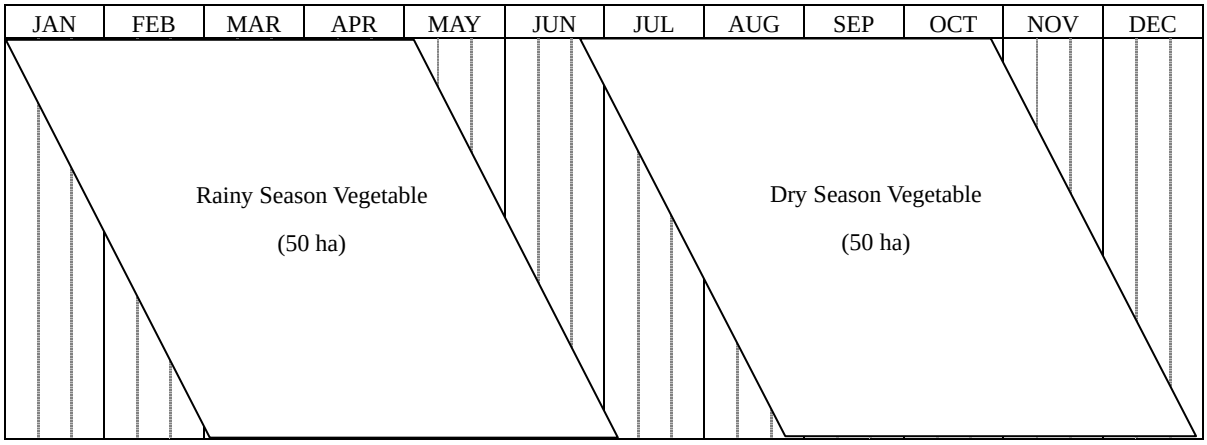
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy										
	Upland Crops		12								
Irrigated	Paddy										
	Upland Crops		38	38				50	50		
Total		50	50	38	176		50	50	50	200	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.05ha (Rainfed Cereals, Irrigated Vegetable)	0.05ha (Irrigated Vegetable)
Outside the Scheme	3.95ha (1.6ha Food Crops, 1.6ha Cash Crops such as Sunflower and Sesame, 0.75ha Other Crops)	3.95ha (1.6ha Food Crops, 1.6ha Cash Crops such as Sunflower and Sesame, 0.75ha Other Crops)

Financial Crop Budget

Financial Crop Budget in Kisese			Unit	Present Condition						Proposed Condition		
				Maize/Pegion Pea			Onion			Irrigated Onion		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		2,000/1,200			10,000			12,000	
	Farmgate Price		Tsh/kg	70/200			300			300		
	Gross Return		Tsh/ha			380,000			3,000,000			3,600,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha		0	0	6,000	5	30,000	6,000	5	30,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	340	0	0	340	125	42,500	340	0	0
		SA (21% N)	kg/ha	300	0	0	300	125	37,500	300	280	84,000
		TSP (46% P2O5)	kg/ha	340	0	0	340	0	0	340	200	68,000
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	1	10,000	10,000	2	20,000	10,000	6	60,000
		Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	6	30,000
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	32	16,000	500	120	60,000	500	150	75,000
		Sub-total				26,000			190,000			347,000
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		5	3	6,000	30	20	40,000	30	20	40,000
		Nursery	man/day		0	0	0	10	0	0	10	0	0
		Plant/Transplanting	man/day		5	0	0	50	25	50,000	40	20	40,000
		Weeding and Fertilizer	man/day		30	15	30,000	50	25	50,000	50	25	50,000
		Bird Scaring	man/day		15	5	10,000	15	0	0	15	0	0
		Harvesting	man/day		20	5	10,000	40	25	50,000	50	25	50,000
		Transport Marketing	man/day		8	4	8,000	30	20	40,000	40	30	60,000
		Irrigation, etc	man/day		0	0	0	5	0	0	5	0	0
		Threshing/Winnowing	man/day		10	5	10,000	30	15	30,000	30	15	30,000
		Sub-total		2,000	93	37	74,000	260	130	260,000	270	135	270,000
	3. Machinery or Draught Animal											
		Tractor	LS		0			0			0	
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS	15,000	1	15,000		0			0	
		Sub-total				15,000			0			0
	4. Miscellaneous Cost											
		5% of Cost				5,750			22,500			30,850
		Total Cost				120,750			472,500			647,850
III	Net Return											
		Value				259,250			2,527,500			2,952,150

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Maize/Pegion Pea	12	259	3,111	0	0	0	-3,111
Onion	76	2,528	192,090	100	2,952	295,215	103,125
Total	88	2,787	195,201	100	2,952	295,215	100,014

Economic Crop Budget

Economic Crop Budget in Kisese			Unit	Present Condition						Proposed Condition		
				Maize/Pegion Pea			Onion			Irrigated Onion		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		2,000/1,200			10,000			12,000	
	Farmgate Price		Tsh/kg	70/200			240			240		
	Gross Return		Tsh/ha			380,000			2,400,000			2,880,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha		0	0	6,000	5	30,000	6,000	5	30,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	187	0	0	187	125	23,375	187	0	0
		SA (21% N)	kg/ha	100	0	0	100	125	12,500	100	280	28,000
		TSP (46% P2O5)	kg/ha	192	0	0	192	0	0	192	200	38,400
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	1	10,000	10,000	2	20,000	10,000	6	60,000
		Herbicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	6	30,000
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	32	16,000	500	120	60,000	500	150	75,000
		Sub-total				26,000			145,875			261,400
	2. Labour Requirement				Total / Hired			Total / Hired			Total / Hired	
		Land prep., Puddle and Bund	man/day		5 / 3	8,000		30 / 20	48,000		30 / 20	48,000
		Nursery	man/day		0 / 0	0		10 / 0	16,000		10 / 0	16,000
		Plant/Transplanting	man/day		5 / 0	8,000		50 / 25	80,000		40 / 20	64,000
		Weeding and Fertilizer	man/day		30 / 15	48,000		50 / 25	80,000		50 / 25	80,000
		Bird Scaring	man/day		15 / 5	24,000		15 / 0	24,000		15 / 0	24,000
		Harvesting	man/day		20 / 5	32,000		40 / 25	64,000		50 / 25	80,000
		Transport Marketing	man/day		8 / 4	12,800		30 / 20	48,000		40 / 30	64,000
		Irrigation, etc	man/day		0 / 0	0		5 / 0	8,000		5 / 0	8,000
		Threshing/Winnowing	man/day		10 / 5	16,000		30 / 15	48,000		30 / 15	48,000
		Sub-total		1,600	93 / 37	148,800	1,600	260 / 130	416,000	1,600	270 / 135	432,000
	3. Machinery or Draught Animal											
		Tractor	LS		0			0			0	
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS	15,000	1	15,000		0			0	
		Sub-total				15,000			0			0
	4. Miscellaneous Cost											
		5% of Cost				9,490			28,094			34,670
		Total Cost				199,290			589,969			728,070
III	Net Return											
		Value				180,710			1,810,031			2,151,930

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Maize/Pegion Pea	12	181	2,169	0	0	0	-2,169
Onion	76	1,810	137,562	100	2,152	215,193	77,631
Total	88	1,991	139,731	100	2,152	215,193	75,462

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		12,593	6,296			20,988	39,878		-39,878
2005	188,894	12,593	6,296			15,741	223,525		-223,525
2006		12,593	6,296	359		15,741	34,989	7,546	-27,443
2007				718			718	22,639	21,921
2008				718			718	52,823	52,106
2009				718			718	67,916	67,198
2010				718			718	75,462	74,745
2011				718			718	75,462	74,745
2012				718			718	75,462	74,745
2013				718			718	75,462	74,745
2014				718			718	75,462	74,745
2015				718	1,889		2,606	75,462	72,856
2016				718			718	75,462	74,745
2017				718			718	75,462	74,745
2018				718			718	75,462	74,745
2019				718			718	75,462	74,745
2020				718			718	75,462	74,745
2021				718			718	75,462	74,745
2022				718			718	75,462	74,745
2023				718			718	75,462	74,745
2024				718			718	75,462	74,745
2025				718	1,889		2,606	75,462	72,856
2026				718			718	75,462	74,745
2027				718			718	75,462	74,745
2028				718			718	75,462	74,745
2029				718			718	75,462	74,745
2030				718			718	75,462	74,745
2031				718			718	75,462	74,745
2032				718			718	75,462	74,745
2033				718			718	75,462	74,745
2034				718			718	75,462	74,745
								NPV (12%) =	**140,574**
								EIRR =	**18%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	4.0	4.0
- Within the Scheme Area (ha)	0.05	0.05
- Outside the Scheme Area (ha)	3.95	3.95
Gross Farm Income	1,177	1,304
Production Cost	365	393
Net Farm Income	811	911
Off-farm Income	261	261
Living Expenditure	432	432
Tax and Duties	24	24
Balance	617	717

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.05 ha
b) Gross Income	360
c) Production Cost	65
d) Net Farm Income	295
e) Tax and Duties	24
f) O/M Cost	2
g) Net Profit (d-e-f)	270

8. Pamila Irrigation Scheme

Site Description

The Pamila Scheme is located in the Pamila Valley extending south of Pamila Village situated about 53 km east of Kigoma Town, capital of Kigoma Region. Beneficiaries of the Scheme are mostly living in Pamila Village having a total population of 3,469 in 2002. The households' number is 671.

The inhabitants of Pamila Village are mostly peasants. Their livelihood mainly depends on agricultural production of food and cash crops. As food crops, they cultivate rice, maize, cassava, sweet potatoes and pulses. Oil palms and sometimes rice are cultivated as cash crops. Fruits such as mangoes, oranges and bananas are grown on a small scale.

The project area is covered with comparatively flat topography sloping toward east. Its elevation ranges from 990 m to 1,000 m. The Scheme Area extends on the alluvial deposits being fairly fertile, well drained with fine to moderate textured clay loams and sandy clay loams. The soils have no serious limitation for irrigated rice farming.

The project area has bimodal type of rainfall. The first rainy season starts in mid. October through mid. January, and the second rainy season starts in late February and lasts in May. The average annual rainfall is about 1,200 mm. The average minimum temperature is 18^{o}C and the maximum temperature is 30^{o}C.

The access to the project area is fair and possible even during the rainy season. However, it is difficult to approach to plural intake sites due to high moisture soil during the rainy season.

Scheme Description

Development Purpose

To ensure necessary irrigation water by applying new water harvesting method using flood water.

Basic Approach

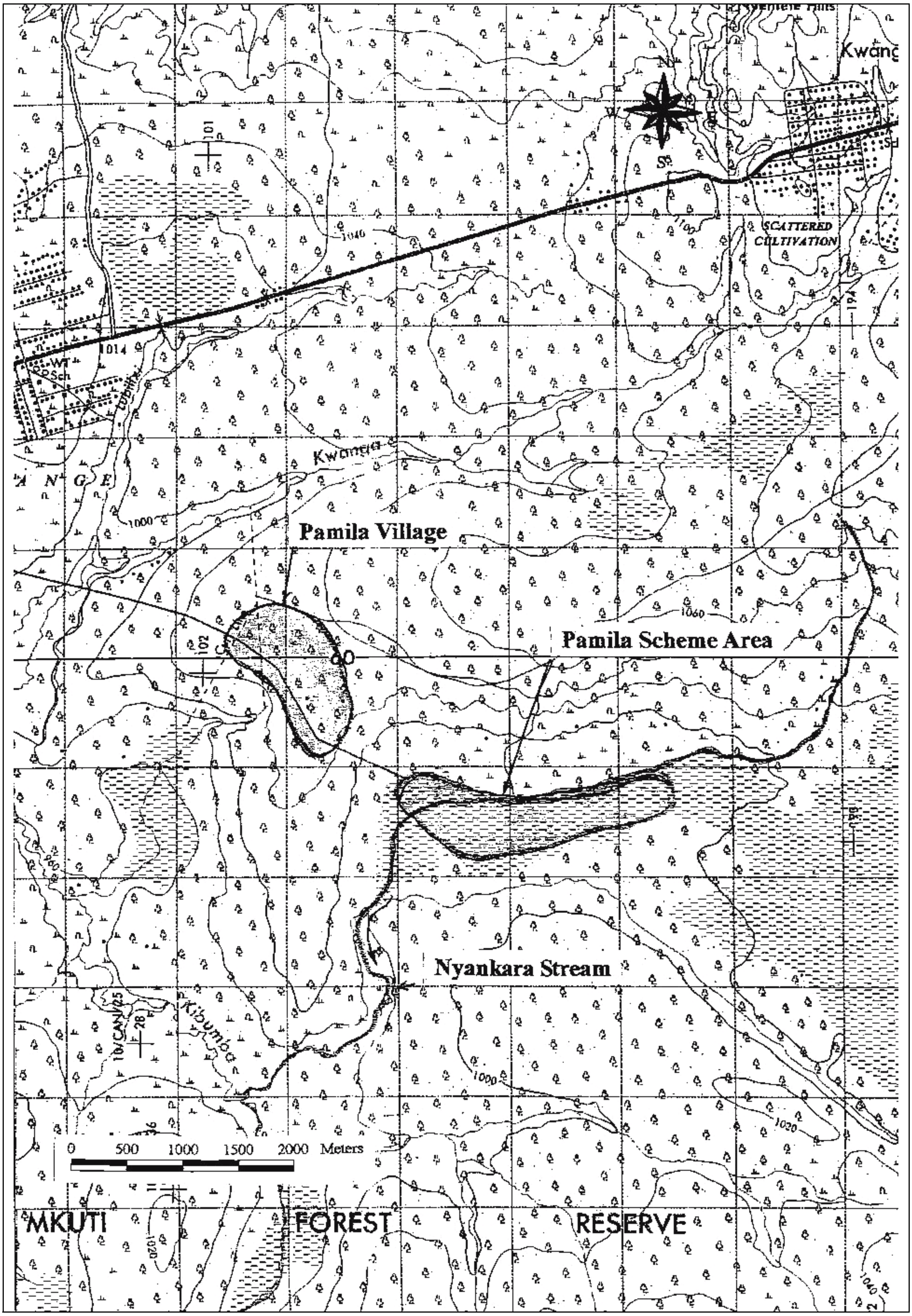
To establish and apply the water harvesting at field plot level at low cost.

Development Plan

The proposed scheme area is 30 ha in net. This is a pilot scheme to examine a new water harvesting method. The scheme is to verify the farmers' practice for water harvesting whether it is worthy for expanding other areas and improving the technology. Water harvesting is generally practiced in hilly sloping dry farm-lands, catching flood water from upper reach and reserving it into temporal artificial small pool or banded fields. In a different manner from it, some farmers utilize inundated water at field plots level during the rainy season. The scheme area extends to the low land basin unlike the typical water harvesting areas. During the rainy season, inundated water over the low basin is rising steadily to the scheme area. The permeated water into the scheme area stagnates, and then drains gradually at flood retardation time. Some farmers are presently using this natural phenomenon for irrigation. They confine the stagnant water at the paddy field plot by small bund during the rainy season, temporally named "Confining Water Harvesting", and succeed rice cultivation. However, such water harvesting is still required to refine its manners and to develop adequate skills for reliable operation. This scheme gives a proper site for examining the new water harvesting technology. The required works for the scheme are summarized below:

(a) Construction of farm-bunds (totally 30 ha)
(b) Construction of drainage canal (length of 1,300 m)
(c) Construction of farm-passes (length of 2,500 m)
(d) Procuring of equipment for verifying the new water harvesting method (L.S.)

Scheme map


Kwang
SCATTERED CULTIVATION
1040
1100
1014
WT
Sch
Kwanga
A N G E
1000
Pamila Village
1060
Pamila Scheme Area
Nyankara Stream
Kibumba
1000
1020
0 500 1000 1500 2000 Meters
MKUTI FOREST RESERVE
1020
1040

Photographs

Command Area

Command Area

Harvesting of paddy

Preparation of drainage canal

Vegetable production by residual moisture

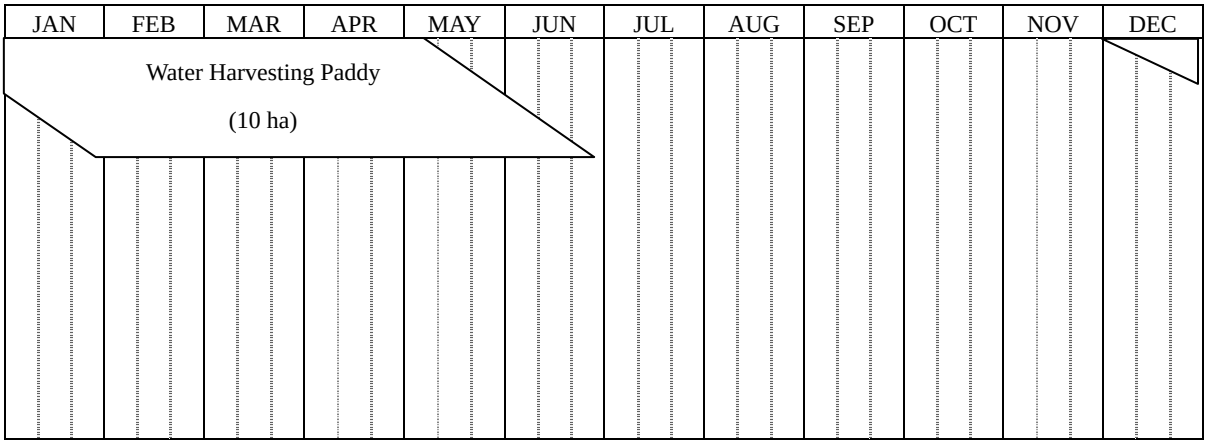
Interview with Farmers

Cultivated Area, Cropping Intensity and Average Yield

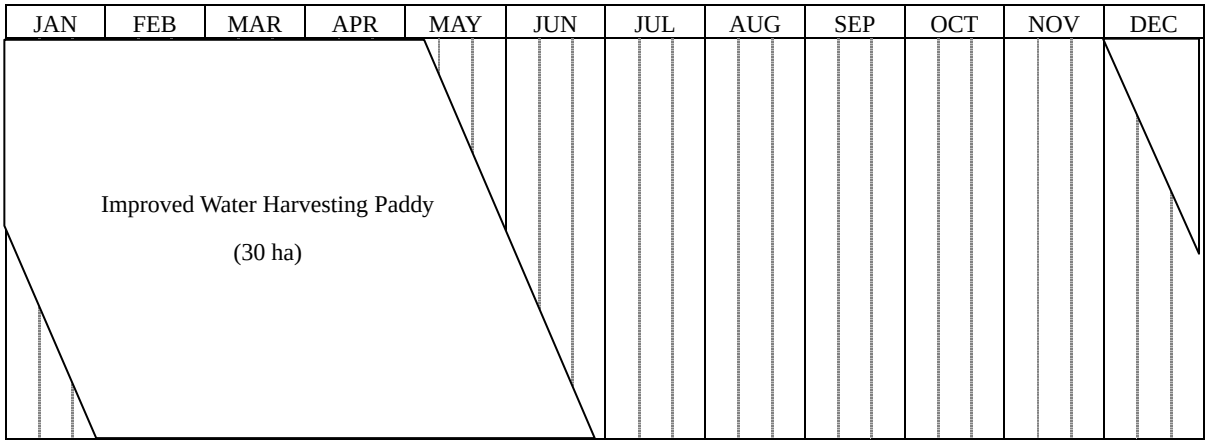
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy										
	Upland Crops										
Irrigated	Paddy		10			2.7		30			4.0
	Upland Crops										
Total		30	10	0	33		30	30	0	100	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.8ha (Water Harvesting Paddy)	0.8ha (Improved Water Harvesting Paddy)
Outside the Scheme	1.6ha (0.8ha Cassava/Maize, 0.8ha Beans/Sweet potato)	1.6ha (0.8ha Cassava/Maize, 0.8ha Beans/Sweet potato)

Financial Crop Budget

Financial Crop Budget in Pamila			Unit	Present Condition			Proposed Condition		
				Irrigated Paddy			Irrigated Paddy		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return								
	Yield		kg/ha		2,700			4,000	
	Farmgate Price		Tsh/kg	120			120		
	Gross Return		Tsh/ha			324,000			480,000
II	Production Cost								
	1. Farm Inputs								
	1.1 Seed		kg/ha	400	0	0	400	30	12,000
	1.2 Fertilizer								
		Urea (46% N)	kg/ha	340	0	0	340	160	54,400
		SA (21% N)	kg/ha	300	0	0	300	0	0
		TSP (46% P2O5)	kg/ha	340	0	0	340	80	27,200
		NPK	kg/ha	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0
	1.3 Agro-chemical								
		Pesticide	lit/ha	10,000	0	0	10,000	1	10,000
		Herbicide	lit/ha	5,000	0	0	5,000	1	5,000
		Fungicide	lit/ha	5,000	0	0	5,000	0	0
	1.4 Packing Material								
		Bags (100 kg)	nos/ha	500	27	13,500	500	40	20,000
		Sub-total				13,500			128,600
	2. Labour Requirement				Total	Hired		Total	Hired	
		Land prep., Puddle and Bund	man/day		30	20	40,000		30	20	40,000
		Nursery	man/day		5	0	0		5	0	0
		Plant/Transplanting	man/day		20	10	20,000		20	5	10,000
		Weeding and Fertilizer	man/day		30	0	0		30	15	30,000
		Bird Scaring	man/day		15	0	0		15	0	0
		Harvesting	man/day		20	10	20,000		30	10	20,000
		Transport Marketing	man/day		0	0	0		0	0	0
		Irrigation, etc	man/day		0	0	0		0	0	0
		Threshing/Winnowing	man/day		10	5	10,000		10	5	10,000
		Sub-total		2,000	130	45	90,000	2,000	140	55	110,000
	3. Machinery or Draught Animal								
		Tractor	LS		0				0	
		Hand Tractor	LS		0				0	
		Draught Animal	LS		0				0	
		Sub-total				0				0
	4. Miscellaneous Cost								
		5% of Cost				5,175			11,930
		Total Cost				108,675			250,530
III	Net Return								
		Value				215,325			229,470

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Paddy	10	215	2,153	30	229	6,884	4,731
Total	10	215	2,153	30	229	6,884	4,731

Economic Crop Budget

Economic Crop Budget in Pamila			Unit	Present Condition			Proposed Condition		
				Irrigated Paddy			Irrigated Paddy		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return								
	Yield		kg/ha		2,700			4,000	
	Farmgate Price		Tsh/kg	121			121		
	Gross Return		Tsh/ha			327,915			485,800
II	Production Cost								
	1. Farm Inputs								
	1.1 Seed		kg/ha	400	0	0	400	30	12,000
	1.2 Fertilizer								
		Urea (46% N)	kg/ha	187	0	0	187	160	29,920
		SA (21% N)	kg/ha	100	0	0	100	0	0
		TSP (46% P2O5)	kg/ha	192	0	0	192	80	15,360
		NPK	kg/ha	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0
	1.3 Agro-chemical								
		Pesticide	lit/ha	10,000	0	0	10,000	1	10,000
		Herbicide	lit/ha	5,000	0	0	5,000	1	5,000
		Fungicide	lit/ha	5,000	0	0	5,000	0	0
	1.4 Packing Material								
		Bags (100 kg)	nos/ha	500	27	13,500	500	40	20,000
		Sub-total				13,500			92,280
	2. Labour Requirement				Total	Hired		Total	Hired	
		Land prep., Puddle and Bund	man/day		30	20	48,000		30	20	48,000
		Nursery	man/day		5	0	8,000		5	0	8,000
		Plant/Transplanting	man/day		20	10	32,000		20	5	32,000
		Weeding and Fertilizer	man/day		30	0	48,000		30	15	48,000
		Bird Scaring	man/day		15	0	24,000		15	0	24,000
		Harvesting	man/day		20	10	32,000		30	10	48,000
		Transport Marketing	man/day		0	0	0		0	0	0
		Irrigation, etc	man/day		0	0	0		0	0	0
		Threshing/Winnowing	man/day		10	5	16,000		10	5	16,000
		Sub-total		1,600	130	45	208,000	1,600	140	55	224,000
	3. Machinery or Draught Animal								
		Tractor	LS		0				0	
		Hand Tractor	LS		0				0	
		Draught Animal	LS		0				0	
		Sub-total				0				0
	4. Miscellaneous Cost								
		5% of Cost				11,075			15,814
		Total Cost				232,575			332,094
III	Net Return								
		Value				95,340			153,706

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Paddy	10	95	953	30	154	4,611	3,658
Total	10	95	953	30	154	4,611	3,658

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		1,563	781			2,605	4,949	0	-4,949
2005	23,444	1,563	781			1,954	27,742	0	-27,742
2006		1,563	781	23		1,954	4,322	366	-3,956
2007				47			47	1,097	1,050
2008				47			47	2,560	2,514
2009				47			47	3,292	3,245
2010				47			47	3,658	3,611
2011				47			47	3,658	3,611
2012				47			47	3,658	3,611
2013				47			47	3,658	3,611
2014				47			47	3,658	3,611
2015				47	234		281	3,658	3,376
2016				47			47	3,658	3,611
2017				47			47	3,658	3,611
2018				47			47	3,658	3,611
2019				47			47	3,658	3,611
2020				47			47	3,658	3,611
2021				47			47	3,658	3,611
2022				47			47	3,658	3,611
2023				47			47	3,658	3,611
2024				47			47	3,658	3,611
2025				47	234		281	3,658	3,376
2026				47			47	3,658	3,611
2027				47			47	3,658	3,611
2028				47			47	3,658	3,611
2029				47			47	3,658	3,611
2030				47			47	3,658	3,611
2031				47			47	3,658	3,611
2032				47			47	3,658	3,611
2033				47			47	3,658	3,611
2034				47			47	3,658	3,611
								NPV (12%) =	**-11,344**
								EIRR =	**7%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	2.4	2.4
- Within the Scheme Area (ha)	0.8	0.8
- Outside the Scheme Area (ha)	1.6	1.6
Gross Farm Income	451	576
Production Cost	159	272
Net Farm Income	292	304
Off-farm Income	100	100
Living Expenditure	330	330
Tax and Duties	9	9
Balance	54	65

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.8 ha
b) Gross Income	384
c) Production Cost	200
d) Net Farm Income	184
e) Tax and Duties	9
f) O/M Cost	1
g) Net Profit (d-e-f)	173

9. Nkenge Irrigation Scheme

Site Description

The Nkenge Scheme is located in Mbale Village, Kitobo Ward, Kiziba Division, Bukoba District, and Kagera Region. The project area lies about 32 km northwest of Bukoba, capital of Kagera Region. The access to the Scheme Area is good and possible even in rainy season.

The project area extends in the Ngono river basin which is the most suitable and potential area for irrigated farming. The topography of the project area is gently sloped toward northwest. Its elevation ranges from 1,147 m to 1,155 m above mean sea level.

The climate of the project area is classified as "Moist-Sub Humid". The mean annual rainfall is about 1,300 mm. The rainy season is in March to May, and the dry season in June and July. The temperature is characterized by average daily minimum ranging from 13^{O}C to 16^{O}C and daily maximum from 24^{O}C to 25^{O}C.

The project area is underlain by alluvial deposits of the Ngono flood plain. These deposits are fine textured to a depth of at least 3 m and have high silt and clay contents which have no serious limitation for irrigated rice farming.

It is easy to approach to the pumping site and major structure sites because of exist of farm roads.

Scheme Description

Development Purpose

To ensure irrigation water through rehabilitation of the existing failed pump irrigation scheme.

Basic Approach

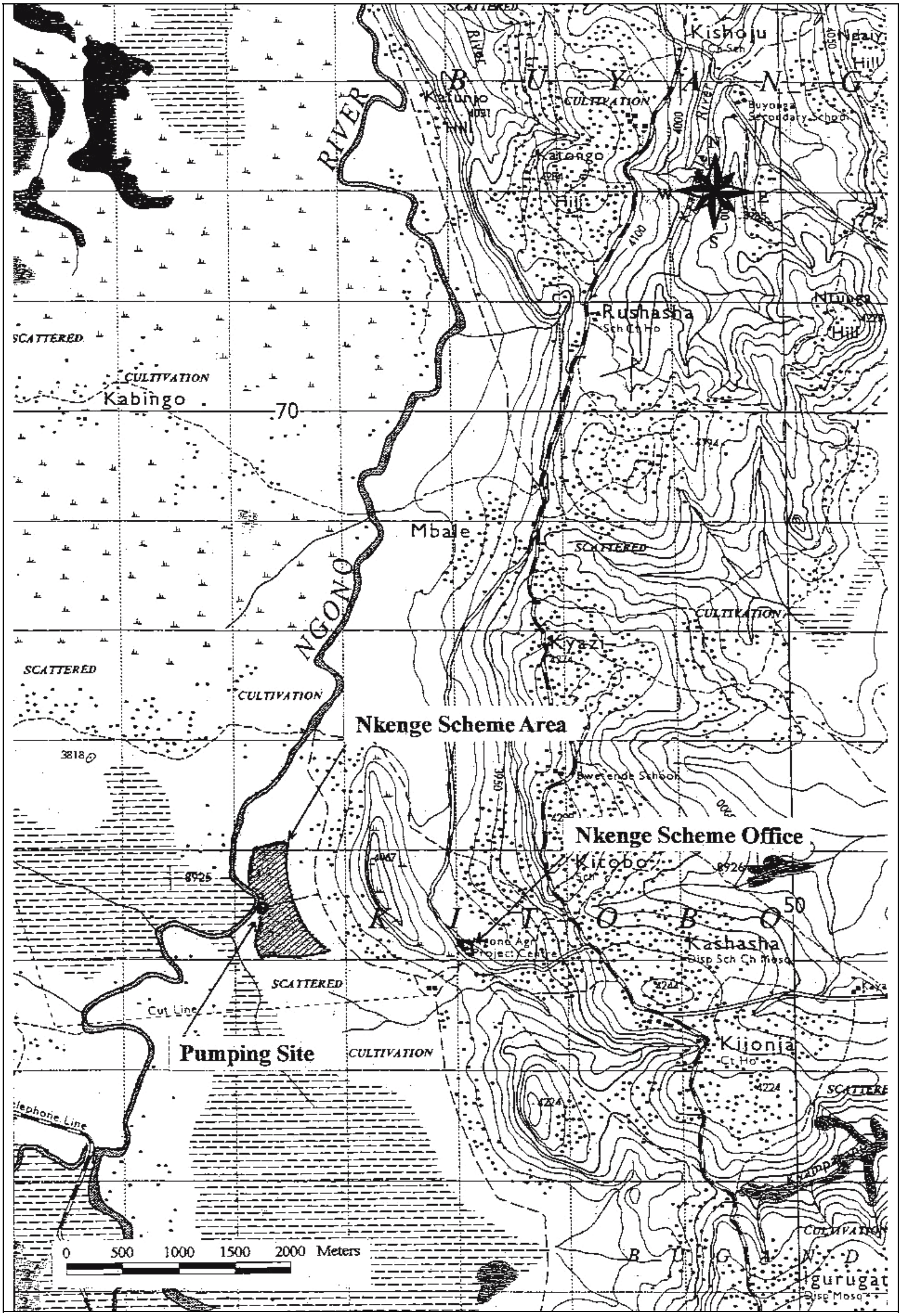
To introduce the conjunctive use of pump and surface irrigation system to save O & M cost.

Development Plan

The proposed scheme area is 32 ha in net. The exiting pump irrigation scheme was failed due to mismanagement, strong intervention by the Government and poor involvement of farmers. The rehabilitation of failed irrigation system should be therefore planned, designed and implemented based on lessons learned from the past. The Ngono river is the reliable water source for irrigation development of the scheme. The scheme is proposed to install low-head pump to lift water from the Ngono river, and to supply irrigation water to the farmlands using the previous irrigation network with reconstruction. In order to lighten financial burden of farmers on pump operation, and to realize the scheme sustainability, it is proposed to construct a small dam on perennial small stream flowing near the scheme area as a supplemental water source. The required works for the scheme are summarized below:

(a) Remodeling pump house and related intake facilities (1 site)
(b) Installation of pump and its accessory (1 set)
(c) Reconstruction of irrigation canal (unlined, length of 2,100 m)
(d) Reconstruction of drainage canal (length of 1,600 m)
(e) Construction of small dam (1 site)
(f) Diversion canal related to the small dam reservoir (length of 1,500 m)

Scheme Map


Nkenge Scheme Area
Nkenge Scheme Office
Pumping Site
0 500 1000 1500 2000 Meters
Kishoju
Rushasha
Kabingo
Mbale
Kyazi
Kitobo
Kashasha
Kijonja
NGONO RIVER
SCATTERED
CULTIVATION
Cut Line

Photographs

Ngono River

Water source

Spring

Pumping well

Main canal

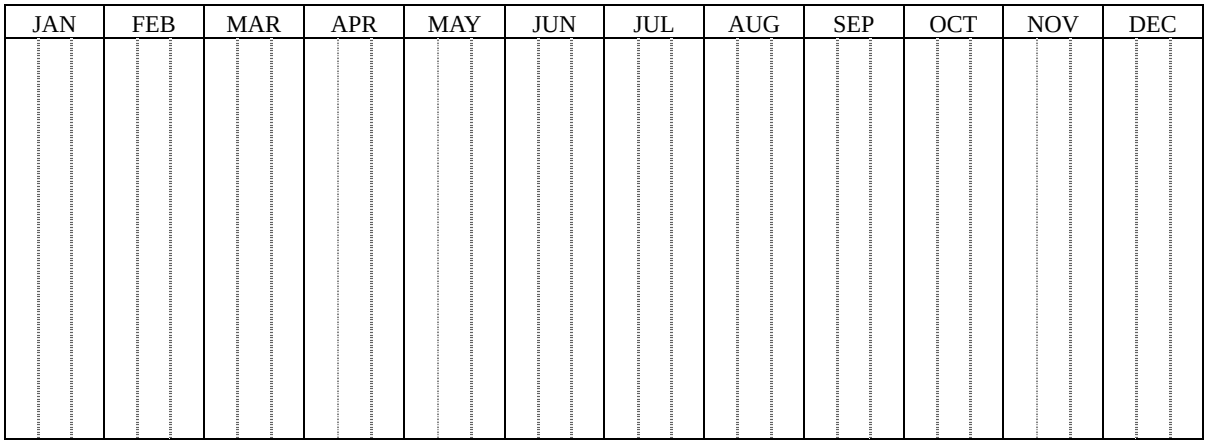
Interview with farmers

Cultivated Area, Cropping Intensity and Average Yield

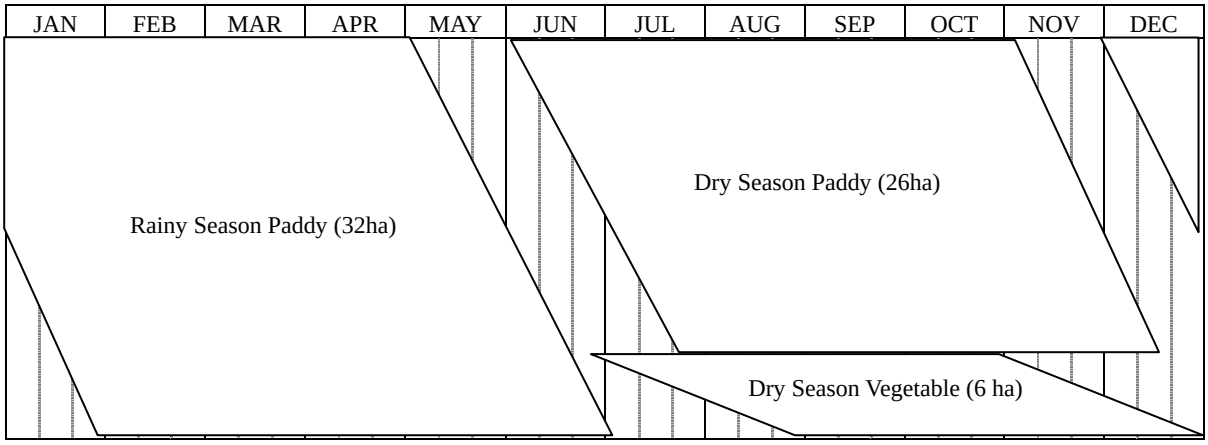
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy										
	Upland Crops										
Irrigated	Paddy							32	26		4.5
	Upland Crops								6		
Total		32	0	0	0		32	32	32	200	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.0ha	0.1ha (Irrigated Paddy, Dry Season Vegetable)
Outside the Scheme	1.0ha (0.6ha Banana/Coffee, 0.4ha Cassava/Sweet potato)	1.0ha (0.6ha Banana/Coffee, 0.4ha Cassava/Sweet potato)

Financial Crop Budget

Financial Crop Budget in Nkenge	Unit	Present Condition			Proposed Condition					
					Irrigated Paddy			Irrigated Cabbage		
		Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I Gross Return										
Yield	kg/ha		0			4,500			10,000	
Farmgate Price	Tsh/kg	0			120			150		
Gross Return	Tsh/ha			0			540,000			1,500,000
II Production Cost										
1. Farm Inputs										
1.1 Seed	kg/ha	400	0	0	400	30	12,000	45,000	0	9,000
1.2 Fertilizer										
Urea (46% N)	kg/ha	340	0	0	340	160	54,400	340	0	0
SA (21% N)	kg/ha	300	0	0	300	0	0	300	190	57,000
TSP (46% P2O5)	kg/ha	340	0	0	340	80	27,200	340	65	22,100
NPK	kg/ha	350	0	0	350	0	0	350	0	0
Manure	ton/ha		0	0		0	0		0	0
1.3 Agro-chemical										
Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	3	30,000
Herbicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	1	5,000
1.4 Packing Material										
Bags (100 kg)	nos/ha	500	0	0	500	45	22,500	500	130	65,000
Sub-total				0			131,100			188,100
2. Labour Requirement			Total	Hired		Total	Hired		Total	Hired	
Land prep., Puddle and Bund	man/day		0	0	0	30	10	20,000	30	20	40,000
Nursery	man/day		0	0	0	0	0	0	20	0	0
Plant/Transplanting	man/day		0	0	0	10	0	0	30	10	20,000
Weeding and Fertilizer	man/day		0	0	0	20	0	0	30	0	0
Bird Scaring	man/day		0	0	0	15	0	0	15	0	0
Harvesting	man/day		0	0	0	30	15	30,000	20	10	20,000
Transport Marketing	man/day		0	0	0	0	0	0	10	10	20,000
Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
Threshing/Winnowing	man/day		0	0	0	20	10	20,000	10	5	10,000
Sub-total		2,000	0	0	0	2,000	125	35	70,000	2,000	165	55	110,000
3. Machinery or Draught Animal										
Tractor	LS		0			0			0	
Hand Tractor	LS		0			0			0	
Draught Animal	LS		0			0			0	
Sub-total				0			0			0
4. Miscellaneous Cost										
5% of Cost				0			10,055			14,905
Total Cost				0			211,155			313,005
III Net Return										
Value				0			328,845			1,186,995

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Irrigated Paddy	0	0	0	58	329	19,073	19,073
Irrigated Cabbage	0	0	0	6	1,187	7,122	7,122
Total	0	0	0	64	1,516	26,195	26,195

Economic Crop Budget

Economic Crop Budget in Nkenge			Unit	Present Condition			Proposed Condition					
							Irrigated Paddy			Irrigated Cabbage		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		0			4,500			10,000	
	Farmgate Price		Tsh/kg	0			121			120		
	Gross Return		Tsh/ha			0			546,525			1,200,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	0	0	400	30	12,000	45,000	0.2	9,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	187	0	0	187	160	29,920	187	0	0
		SA (21% N)	kg/ha	100	0	0	100	0	0	100	190	19,000
		TSP (46% P2O5)	kg/ha	192	0	0	192	80	15,360	192	65	12,480
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	3	30,000
		Herbicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	1	5,000
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	0	0	500	45	22,500	500	130	65,000
		Sub-total				0			94,780			140,480
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		0	0	0	30	10	48,000	30	20	48,000
		Nursery	man/day		0	0	0	0	0	0	20	0	32,000
		Plant/Transplanting	man/day		0	0	0	10	0	16,000	30	10	48,000
		Weeding and Fertilizer	man/day		0	0	0	20	0	32,000	30	0	48,000
		Bird Scaring	man/day		0	0	0	15	0	24,000	15	0	24,000
		Harvesting	man/day		0	0	0	30	15	48,000	20	10	32,000
		Transport Marketing	man/day		0	0	0	0	0	0	10	10	16,000
		Irrigation, etc	man/day		0	0	0	0	0	0	0	0	0
		Threshing/Winnowing	man/day		0	0	0	20	10	32,000	10	5	16,000
		Sub-total		2,000	0	0	0	1,600	125	35	200,000	1,600	165	55	264,000
	3. Machinery or Draught Animal											
		Tractor	LS		0			0			0		
		Hand Tractor	LS		0			0			0		
		Draught Animal	LS		0			0			0		
		Sub-total				0			0				0
	4. Miscellaneous Cost											
		5% of Cost				0			14,739			20,224
		Total Cost				0			309,519			424,704
III	Net Return											
		Value				0			237,006			775,296

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Irrigated Paddy	0	0	0	58	237	13,746	13,746
Irrigated Cabbage	0	0	0	6	775	4,652	4,652
Total	0	0	0	64	1,012	18,398	18,398

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		5,158	2,579			8,596	16,333	0	-16,333
2005	77,366	5,158	2,579			6,447	91,550	0	-91,550
2006		5,158	2,579	1,653		6,447	15,837	9,199	-6,638
2007				3,306			3,306	14,718	11,412
2008				3,306			3,306	18,398	15,092
2009				3,306			3,306	18,398	15,092
2010				3,306			3,306	18,398	15,092
2011				3,306			3,306	18,398	15,092
2012				3,306			3,306	18,398	15,092
2013				3,306			3,306	18,398	15,092
2014				3,306			3,306	18,398	15,092
2015				3,306	3,868		7,175	18,398	11,223
2016				3,306			3,306	18,398	15,092
2017				3,306			3,306	18,398	15,092
2018				3,306			3,306	18,398	15,092
2019				3,306			3,306	18,398	15,092
2020				3,306			3,306	18,398	15,092
2021				3,306			3,306	18,398	15,092
2022				3,306			3,306	18,398	15,092
2023				3,306			3,306	18,398	15,092
2024				3,306			3,306	18,398	15,092
2025				3,306	3,868		7,175	18,398	11,223
2026				3,306			3,306	18,398	15,092
2027				3,306			3,306	18,398	15,092
2028				3,306			3,306	18,398	15,092
2029				3,306			3,306	18,398	15,092
2030				3,306			3,306	18,398	15,092
2031				3,306			3,306	18,398	15,092
2032				3,306			3,306	18,398	15,092
2033				3,306			3,306	18,398	15,092
2034				3,306			3,306	18,398	15,092
								NPV (12%) =	**-10,173**
								EIRR =	**11%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	1.0	1.1
- Within the Scheme Area (ha)	0.0	0.1
- Outside the Scheme Area (ha)	1.0	1.0
Gross Farm Income	451	577
Production Cost	158	202
Net Farm Income	293	375
Off-farm Income	100	100
Living Expenditure	350	350
Tax and Duties	9	9
Balance	34	116

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.1 ha
b) Gross Income	126
c) Production Cost	44
d) Net Farm Income	82
e) Tax and Duties	9
f) O/M Cost	11
g) Net Profit (d-e-f)	61

10. Luchili-Nyakasungwa Irrigation Scheme

Site Description

The project area covers most of Sengerema Ward (Sengerema District) at the shore of the Luchili Bay in the Lake Victoria. It administratively includes 2 villages, namely, Luchili and Nyakasungwa. Access to the project area is by an unmetalled road from Sengerema, of which distance is about 35 km.

Annual rainfall in the project area is about 930 mm distributing mainly during two periods of the short rains in October-December and the long rains from March to May. Agriculture especially during the dry season is virtually dependent on irrigation.

Scheme Description

Development Purpose

To ensure irrigation water through rehabilitation of the existing pump irrigation scheme.

Basic Approach

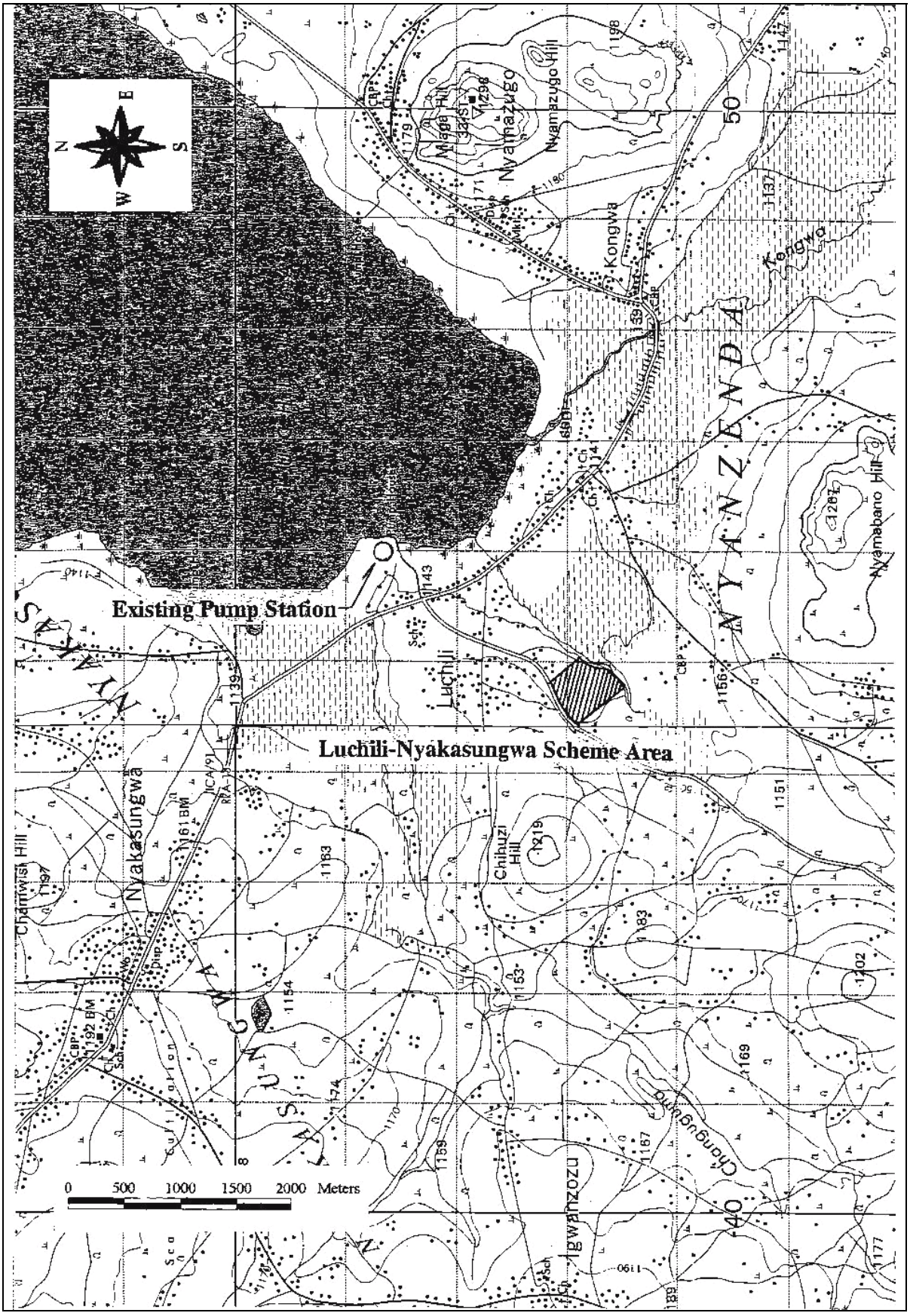
To make proper design of pump capacity and subsequent pipeline to save operation cost and to introduce high profitable crops.

Development Plan

The proposed scheme area is 20.5 ha in net. Deterioration of the pump irrigation scheme is mainly caused by undesirable performance of the pump irrigation system and unaffordable pump operation cost for farmers. Insufficient performance of the pump irrigation system is due to unsuitable design of the system. In the previous pump system, intake structure is designed with less consideration of lake water level fluctuation. Remodeling of the pump system should be done considering such problem. As for the operation cost, the cost reduction should be considered as much as possible. Replacing delivery pipeline from existing conduit to new ones with bigger diameter is an effective remedy for saving operation cost due to reducing friction losses. Existing gravity canal system with minor repairs, should be used to minimize construction cost. On the other hand, profitable crops should be introduced to the scheme in cooperation with other sub-sectors, to make farmers pay whole or part of O & M cost. The required works for the scheme are summarized below:

(a) Remodeling of pump system (1 site)
(b) Re-installation of pump facilities (1 set)
(c) Replacement of delivery pipe (length of 1,890 m)
(d) Repair of existing canal system (L.S.)

Scheme Map


Existing Pump Station
Luchili-Nyakasungwa Scheme Area
Luchili
Nyakasungwa
Chamwisi Hill
Chihuzi Hill
Nyamazugo Hill
Kongwa
Nyamabano Hill
MYANZENDA
0 500 1000 1500 2000 Meters

Photographs

Pump house

Pump

Abandoned irrigation canal

Cotton field around command area

RRA workshop

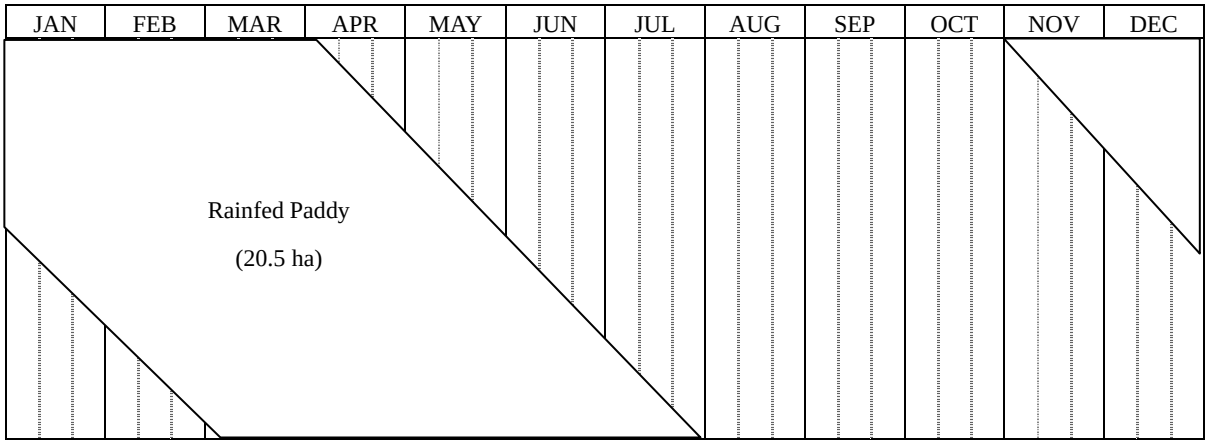
Group works in RRA workshop

Cultivated Area, Cropping Intensity and Average Yield

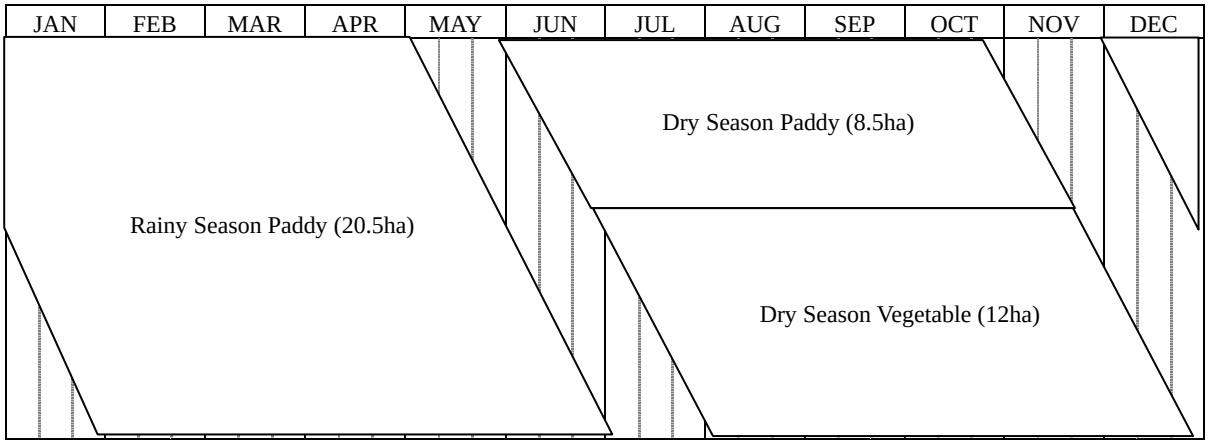
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy		20.5			2.0					
	Upland Crops										
Irrigated	Paddy							20.5	8.5		4.5
	Upland Crops								12		
Total		20.5	20.5	0	100		20.5	20.5	20.5	200	

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.3ha (Rainfed Paddy)	0.3ha (Irrigated Paddy, Dry Season Vegetable)
Outside the Scheme	2.1ha (0.5ha Rainfed Paddy, 1.6ha Upland Crops)	2.1ha (0.5ha Rainfed Paddy, 1.6ha Upland Crops)

Financial Crop Budget

Financial Crop Budget in Luchili			Unit	Present Condition			Proposed Condition					
				Rainfed Paddy			Irrigated Paddy			Irrigated Onion		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		2,000			4,500			12,000	
	Farmgate Price		Tsh/kg	120			120			300		
	Gross Return		Tsh/ha			240,000			540,000			3,600,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	0	0	400	30	12,000	6,000	5	30,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	340	0	0	340	160	54,400	340	0	0
		SA (21% N)	kg/ha	300	0	0	300	0	0	300	280	84,000
		TSP (46% P2O5)	kg/ha	340	0	0	340	80	27,200	340	200	68,000
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	4	40,000
		Herbicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	4	20,000
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	20	10,000	500	45	22,500	500	150	75,000
		Sub-total				10,000			131,100			317,000
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		20	20	40,000	30	20	40,000	30	20	40,000
		Nursery	man/day		0	0	0	5	0	0	10	0	0
		Plant/Transplanting	man/day		20	5	10,000	20	5	10,000	40	20	40,000
		Weeding and Fertilizer	man/day		30	15	30,000	30	15	30,000	50	25	50,000
		Bird Scaring	man/day		15	0	0	15	0	0	15	0	0
		Harvesting	man/day		20	0	0	35	10	20,000	50	25	50,000
		Transport Marketing	man/day		0	0	0	0	0	0	40	30	60,000
		Irrigation, etc	man/day		0	0	0	0	0	0	5	0	0
		Threshing/Winnowing	man/day		5	0	0	10	5	10,000	30	15	30,000
		Sub-total		2,000	110	40	80,000	2,000	145	55	110,000	2,000	270	135	270,000
	3. Machinery or Draught Animal											
		Tractor	LS		0			0			0	
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS		0			0			0	
		Sub-total				0			0			0
	4. Miscellaneous Cost											
		5% of Cost				4,500			12,055			29,350
		Total Cost				94,500			253,155			616,350
III	Net Return											
		Value				145,500			286,845			2,983,650

Financial Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Rainfed Paddy	20.5	146	2,983	0	0	0	-2,983
Irrigated Paddy	0	0	0	29	287	8,319	8,319
Irrigated Onion	0	0	0	12	2,984	35,804	35,804
Total	20.5	146	2,983	41	3,270	44,122	41,140

Economic Crop Budget

Economic Crop Budget in Luchili			Unit	Present Condition			Proposed Condition					
				Rainfed Paddy			Irrigated Paddy			Irrigated Onion		
				Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)	Unit Price (Tsh)	Q'ty	Value (Tsh)
I	Gross Return											
	Yield		kg/ha		2,000			4,500			12,000	
	Farmgate Price		Tsh/kg	121			121			240		
	Gross Return		Tsh/ha			242,900			546,525			2,880,000
II	Production Cost											
	1. Farm Inputs											
	1.1 Seed		kg/ha	400	0	0	400	30	12,000	6,000	5	30,000
	1.2 Fertilizer											
		Urea (46% N)	kg/ha	187	0	0	187	160	29,920	187	0	0
		SA (21% N)	kg/ha	100	0	0	100	0	0	100	280	28,000
		TSP (46% P2O5)	kg/ha	192	0	0	192	80	15,360	192	200	38,400
		NPK	kg/ha	350	0	0	350	0	0	350	0	0
		Manure	ton/ha		0	0		0	0		0	0
	1.3 Agro-chemical											
		Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	4	40,000
		Herbicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0
		Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	4	20,000
	1.4 Packing Material											
		Bags (100 kg)	nos/ha	500	20	10,000	500	45	22,500	500	150	75,000
		Sub-total				10,000			94,780			231,400
	2. Labour Requirement				Total	Hired		Total	Hired		Total	Hired
		Land prep., Puddle and Bund	man/day		20	20	32,000	30	20	48,000	30	20	48,000
		Nursery	man/day		0	0	0	5	0	8,000	10	0	16,000
		Plant/Transplanting	man/day		20	5	32,000	20	5	32,000	40	20	64,000
		Weeding and Fertilizer	man/day		30	15	48,000	30	15	48,000	50	25	80,000
		Bird Scaring	man/day		15	0	24,000	15	0	24,000	15	0	24,000
		Harvesting	man/day		20	0	32,000	35	10	56,000	50	25	80,000
		Transport Marketing	man/day		0	0	0	0	0	0	40	30	64,000
		Irrigation, etc	man/day		0	0	0	0	0	0	5	0	8,000
		Threshing/Winnowing	man/day		5	0	8,000	10	5	16,000	30	15	48,000
		Sub-total		1,600	110	40	176,000	1,600	145	55	232,000	1,600	270	135	432,000
	3. Machinery or Draught Animal											
		Tractor	LS		0			0			0	
		Hand Tractor	LS		0			0			0	
		Draught Animal	LS		0			0			0	
		Sub-total				0			0			0
	4. Miscellaneous Cost											
		5% of Cost				9,300			16,339			33,170
		Total Cost				195,300			343,119			696,570
III	Net Return											
		Value				47,600			203,406			2,183,430

Economic Net Benefit

	Without-Project			With-Project			
	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Cultivated Area (ha)	Net Return/ha (1,000 Tsh)	Benefit (1,000 Tsh)	Incremental Benefit (1,000 Tsh)
Rainfed Paddy	20.5	48	976	0	0	0	-976
Irrigated Paddy	0	0	0	29	203	5,899	5,899
Irrigated Onion	0	0	0	12	2,183	26,201	26,201
Total	20.5	48	976	41	2,387	32,100	31,124

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost							Project Benefit	
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	**Total Cost**	**Incremental Benefit**	**Balance**
2004		8,145	4,072			13,574	25,791		-25,791
2005	122,170	8,145	4,072			10,181	144,567		-144,567
2006		8,145	4,072	1,589		10,181	23,986	3,112	-20,874
2007				3,177			3,177	9,337	6,160
2008				3,177			3,177	21,787	18,610
2009				3,177			3,177	28,012	24,835
2010				3,177			3,177	31,124	27,947
2011				3,177			3,177	31,124	27,947
2012				3,177			3,177	31,124	27,947
2013				3,177			3,177	31,124	27,947
2014				3,177			3,177	31,124	27,947
2015				3,177	6,108		9,286	31,124	21,838
2016				3,177			3,177	31,124	27,947
2017				3,177			3,177	31,124	27,947
2018				3,177			3,177	31,124	27,947
2019				3,177			3,177	31,124	27,947
2020				3,177			3,177	31,124	27,947
2021				3,177			3,177	31,124	27,947
2022				3,177			3,177	31,124	27,947
2023				3,177			3,177	31,124	27,947
2024				3,177			3,177	31,124	27,947
2025				3,177	6,108		9,286	31,124	21,838
2026				3,177			3,177	31,124	27,947
2027				3,177			3,177	31,124	27,947
2028				3,177			3,177	31,124	27,947
2029				3,177			3,177	31,124	27,947
2030				3,177			3,177	31,124	27,947
2031				3,177			3,177	31,124	27,947
2032				3,177			3,177	31,124	27,947
2033				3,177			3,177	31,124	27,947
2034				3,177			3,177	31,124	27,947
								NPV (12%) =	**-17,101**
								EIRR =	**11%**

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	2.7	2.7
- Within the Scheme Area (ha)	0.3	0.3
- Outside the Scheme Area (ha)	2.4	2.4
Gross Farm Income	579	1,368
Production Cost	253	441
Net Farm Income	326	928
Off-farm Income	129	129
Living Expenditure	350	350
Tax and Duties	12	12
Balance	93	695

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.3 ha
b) Gross Income	861
c) Production Cost	216
d) Net Farm Income	646
e) Tax and Duties	12
f) O/M Cost	52
g) Net Profit (d-e-f)	582

Appendix E

Rapid Rural Appraisal Reports For the Selected Model Irrigation Schemes

Appendix E
List of Reports

E1 RRA Report for the Kinyope Irrigation Scheme
E2 RRA Report for the Luchili-Nyakasungwa Irrigation Scheme
E3 RRA Report for the Kisese Irrigation Scheme
E4 RRA Report for the Mgongola Irrigation Scheme
E5 RRA Report for the Musa Mwijanga Irrigation Scheme

RRA Report for the

Kinyope Irrigation Scheme

16th & 17th January, 2003
Kinyope village, Lindi Rural

Table of Contents

Introduction ..... E-1 - 1

Methodology ..... E-1 - 1

Main issues and observations ..... E-1 - 3

Socio-economy ..... E-1 - 3
- Land tenure ..... E-1 - 3
- Farmers' economy ..... E-1 - 4

Culture and Customs ..... E-1 - 4

Labour force and seasonal demand for labour ..... E-1 - 4

Agriculture ..... E-1 - 5
- Cultivation area ..... E-1 - 5
- Crop production ..... E-1 - 5
- Farming calendar ..... E-1 - 6
- Farmers' supporting system ..... E-1 - 6

Farmers' organization ..... E-1 - 6
- Institution ..... E-1 - 6
- Activities ..... E-1 - 6

O&M for irrigation and drainage facilities ..... E-1 - 7
- State of O&M facilities ..... E-1 - 7
- O&M regulations ..... E-1 - 7
- Training ..... E-1 - 8

Improvements to irrigation scheme ..... E-1 - 8

Conflicts (water and other) ..... E-1 - 8

Potential future constraints (based on past experiences) ..... E-1 - 9

Gender issues ..... E-1 - 9

Government of Tanzania support ..... E-1 - 10

Communication ..... E-1 - 10

Recommendations ..... E-1 - 11

Annexes ..... E-1 - 12

Annex 1: Registration ..... E-1 - 12

Annex 2: Workshop schedule ..... E-1 - 13

Annex 3: Farming calendar by gender ..... E-1 - 14

Annex 4: Seasonal calendar ..... E-1 - 15

Introduction

The governments of Japan and Tanzania are in the preparatory stages of drawing up the National Irrigation Master Plan (NIMP) of Tanzania. As part of the second study phase, seven irrigation schemes have been selected nationwide to serve as samples of 4 different types of irrigation scheme: traditional, modern, traditional improved and water harvesting. The data collected from these schemes will be used in the preparation of the Master Plan. Rapid Rural Appraisal (RRA) was selected as the most appropriate methodology to collect information about each scheme.

Kinyope Irrigation scheme is located in Lindi Rural District, some 70 odd km from Lindi Town along the road to Chindunda. The scheme has been in existence since 1964 when the first intake weir was constructed on the Mihinu, Milola and Nemba rivers. The number of weirs along this river has increased over the years such that today, there are 13 intake points within Kinyope village boundaries, the latest of which was installed about one decade ago. Today, farmers from four neighbouring villages cultivate on the Kinyope irrigation area (Kinyope, Ruhoma, Rutamba and Makangara). Other intakes do exist downstream and upstream of Kinyope, but the Kinyope scheme is the oldest and most developed in the area, catering for about 900 farmers.

The scheme is a traditional one and was developed over a period of many years without government intervention. Involvement of the Local government in this scheme is only just beginning with the desire to rehabilitate and improve the scheme being the main component of this intervention. Irrigating farmers of the Kinyope scheme have expressed the wish to improve their scheme so that it can provide water to more farms, more efficiently and with better predictability. The development of the National Irrigation Master Plan (NIMP) has brought about the possibility of including Kinyope scheme in the NIMP.

In order to fully understand the present scheme, its history and the desired future plans of the farmers that operate in the scheme it was deemed necessary to conduct a Rapid Rural Appraisal (RRA) with the Kinyope scheme farmers. The main objective of the RRA was to get a clear picture of how the schemes is presently managed, where the constraints are, and what the owners of the scheme envision as improvement of the scheme. Additionally, the objectives were to comprehend all the factors that affect agricultural production on the irrigated area and the dynamics involved in operations and maintenance of the scheme.

Methodology

Rapid Rural Appraisal is a methodology for quickly collecting information and assessing different aspects of a given society. The process consists of applying several other methodologies that enable information on desired topics to be effectively solicited with as much insight and depth as is possible. It is desirable to conduct RRA when time is dear and not adequate for conducting PRA, the more popular and desirable procedure. The methodologies used in RRA are very similar to those of PRA with the exception that the

information solicited belongs to the facilitator and analysis of the results during the exercise is not part of the procedure.

There are several tools that were utilised in order to obtain the required information. A brief description of each is provided in Table 1 below.

Table 1: Methodology and tools applied in RRA workshop

Tool	**Application**	**Output**
Bus game	Introduction of participants and facilitators	Division of panel into known groups that can be used as the basis for group work
Seasonality calendar	group work	Calendar depicting seasonal occurrence and availability of diseases, social services, financial services, etc.
Farming calendar and Gender	group work	Calendar depicting seasonal occurrence of farming activities and distribution of labour between men and women
Mapping	5-group group work	map depicting the scheme layout, land ownership and land use patterns
Structured questionnaires	Conducted with NIMP specialists in the 3-group group interviews/questionnaires	obtain information specific to irrigation, institution and agriculture
Open-ended questions	5-group group work	women issues and traditional & cultural constraints on agriculture.
Panel discussions	During presentation all issues were brought to the panel for discussion and general consensus.	gender issues, clarification of map, traditions & cultures, etc
Venn diagram	Panel and smaller groups	Diagram depicting relationship and level of interaction between local government and irrigation organisation.
Key Informant Interviews	Zonal and district irrigation officers and technicians were consulted for specific information regarding agricultural productivity.	

The 5-group group work sessions were aimed at collecting data about the life of the farmers throughout the year. They included a Seasonality Calendar, a Farming Calendar, Village Mapping, questions regarding Women's Issues and traditional customs that pertained to agriculture and irrigation. Participants were divided into groups and given an hour for group work, which was followed by session for presentation and plenary discussion. The structured questionnaire was prepared by Nippon Koei and consisted of 3 parts: Agriculture, Irrigation and Institution. These questionnaires were administered by a representative of the JICA Study Team, a government official and a facilitator. All questionnaires were supplemented by unstructured questions. The VENN Diagram exercise focused on the relationship between the intended beneficiaries, the farmers and

all other stakeholders related to the irrigation scheme up to the level of the district. The aim of this exercise was to determine the flow and intensity of communication between all stakeholders and to pinpoint any current and potential areas of conflict.

The RRA was conducted in a workshop setting whereby farmers from the Kinyope Irrigation Scheme (KIS) were invited. Selection of the participants was done by the village government, with some facilitation from the District Irrigation Office. The RRA in Kinyope (16th and 17th January 2003) was attended by 33 participants. Nine of the participants were women. The list of participants and general timetable for the workshop is summarised in Annex 1 and 2 respectively.

Main issues and observations

It was observed that participants in the workshop did not include farmers from the other three villages (Ruhoma, Rutamba and Makangara) who farm in the Kinyope scheme. The absence of these farmers means that their issues and concerns were not adequately addressed.

There was overall reluctance to air out problems related to land and water use and management of the scheme. Some level of dissatisfaction with the local government did percolate into the panel discussion but was quickly extinguished. Fear of jeopardising funding possibilities may have contributed to this, but the presence of district and other officials at the workshop may be the more probable reason.

The Kinyope irrigation scheme is understood and operated by a few key people, none of whom are women. Although the organisation structure is such that farmers elect leaders and the leaders act for the good of the group members, it is doubtful whether this actually happens. Weirs are clearly owned by those who initiated them and the influence of these people supersedes those of the other farmers.

The Kinyope irrigation scheme functions and this is the most important issue. In order for it to have functioned for as long as it has, and to have provided for the 900 farmers who depend on it without government intervention, means that something must be operating correctly. Formation of the irrigation association/union has been a District intervention whose benefits remain to be tested. Willingness and eagerness to improve the scheme, however, is undoubtedly strong among the irrigation farmers, and there are signs that their determination for stronger weirs and better water distribution will be achieved with much of the effort originating from within the association itself.

Socio-economy

Land tenure

Farming land is owned by means of a Right of Occupancy, which warrants someone to use the land and to pass it on the land to his/her family as a form of inheritance. Farmland

can be owned in this way by both men and women, although it is often in the hands of the former. Land can be acquired by inheritance, but it can also be leased and rented, as is the case for some of the farms in the Kinyope scheme. The current rate for leasing land is TSH 15000 per acre per season. Land can continue to be owned by someone who has moved out of the village. This is also the case in Kinyope and accounts for some of the non-Kinyope farmers who farm in the Kinyope scheme.

Purchase of land is possible, but legally, this can only happen if purchase if from the village government (which is has title deeds on the land) and not from individuals who have rights of occupancy only. Land in the floodplain has been bought in this way by the Naliendele Agriculture Research Centre of Mtwara (See map).

Weirs, on the other hand, are owned by individuals who then allow others to use them. This arrangement has been going on for long enough such that weirs, although associated with a particular person, are considered group property. The founders, however, are prominent group members and often hold important positions in the group. Their decisions are important and they are consulted on all matters concerning the weir.

Farmers' economy

Kinyope farmers depend solely on agriculture in which rice and maize are the main crops cultivated. Market prices are controlled by middlemen (except sesame & cashew sold via co-op) so often feel over-exploited on the prices. The rough road makes it very difficult to transport produce out of the area and distance to markets are too far to do so by bicycle. This being the case, agriculture is not quite able to meet the costs of daily expenditure although it is capable of meeting cost of production.

Culture and Customs

Kinyope community has done away with many of the cultures and customs related to agriculture that were performed by their forefathers. The need to preserve food, reduce costs and sell some food for hard currency is becoming increasingly important, and the participants said that they would like to see those customs and traditions that use up the most resources fade away. The particular custom that seems to be in the dispute is that of initiation for boys and girls. Apparently large amounts of resources go into enabling this event to take place immediately after the wet season harvest of paddy (July and August) takes place. Market prices are often low, but the pressure to sell in order to finance the celebrations is strong and a lot of food is lost this way.

Labour force and seasonal demand for labour

Kinyope farmers tend to farm their land themselves manually and without hiring any labour from elsewhere. Farms are cultivated and reaped by all family members that are able to help, including children after school and during their holidays. This being the case, the size that a given household can farm depends on the size of that household, with large

families capable of tilling up to 3 or 4 acres. Most families, however cultivate on 1.5 to 3 acres of land.

Women tend to have more responsibilities on the farm than their counterparts from April until December. This is because harvesting begins in April and post-harvest activities such as pounding, milling and winnowing are activities done mostly by women. Between January and March, responsibilities on the farm are the equal for both sexes.

July, August and September are the busiest time of year demanding both men and women to participate in transplanting, weeding, irrigating, harvesting and other post harvest activities. Although the farming calendar indicates that both men and women are involved in marketing of the food, the panel discussion revealed that this job is done mainly by men.

Agriculture

Cultivation area

Land that is available for agricultural purposes represents about 1600 ha of which 1280 are presently being cultivated. Of the latter, a little more than half the land (800 ha) is solely dependent on rain for water (rainfed area) while 480 ha are irrigated under the Kinyope scheme. Land that could potentially undergo irrigation totals to 800 ha.. The map produced by the RRA workshop indicates which these potential areas are in relation to presently rainfed and irrigated areas. Potential irrigation land is so allocated based on its relative proximity to the river and its flatness or low inclination.

Crop production

The main crops cultivated in Kinyope are rice, maize, sorghum, sesame, cassava and cashew nut. Rice is grown as paddy and is completely dependent on irrigation, while the rest of the crops are rainfed. There are two rice seasons, during the wet and dry periods of the year, but most of the rice is grown in the wet season when all 480 ha of irrigated land are utilised. Some farmers do try out a dry season, but in total, they cultivate only 32 ha of land. This may be due to the lower yield that is produced during this second season (3.5 tonnes/ha as opposed to 4.8 tonnes/ha in the wet season).

The rest of the crops are cultivated as presented in Table 2 below. Maize and sorghum are often planted together hence they occupy the same amount of cultivated area.

Table 2: Cultivated area and yield of rainfed crops, Kinyope

Crops cultivated	Cropped area (ha)	Average yield (ton/ha)
Maize/Sorghum	220	1.8/1.2
Sesame	80	2.1
Cassava	120	3.1
Cashew nut	80	Not known

Farming calendar

As mentioned above, Kinyope farmers are able to undertake both dry and wet season paddy production. Wet season production takes place between December and May while dry season paddy is grown in July and harvested in November. This means that the land is producing rice all year long, although the dry season yields are smaller and few farmers undertake this season of potential production. The farming calendar exercise indicates that the most busy season for everyone is in July and August when apart from buying farming implements and preparing for the dry season paddy, there is also post harvest activities related to the wet season paddy.

Farmers' supporting system

District extension officers come to Kinyope on a monthly basis to sensitise or provide information on issues that have been identified as necessary. This visit is welcomed but participants feel that it should occur more frequently. District did assist to with reinforcement of a weir on two occasions both of which were dissatisfactory since in both cases, the structures did not withstand the test of strength.

Farmers' organization

Institution

The Kinyope Association of Irrigation Farmers was formed in 2001 and is currently undergoing the process of registration. Formation of the group was initiated by advise from the District Irrigation Office that being part of an association that represents the entire scheme can be a beneficial strategy for complete management of the scheme. They were also told that as an association, they would be able to apply for loans and seek other sources of financial assistance as they would own a single bank account and minimise administration costs.

The Association consists of 13 irrigation groups, which have members ranging from 30 to 290 members, all of whom are farmers practicing irrigation farming in the area. The Association is formed by representation from each group (the chairperson, treasurer and secretary); it thus makes up to 39 members three of whom are democratically elected by all irrigating farmers through secret ballots.

The names of the groups are: Majawa, Msin'gole, Mtakuja, Namkapa, Ngwaye, Likondo, Ngajenga, Makwendelo, Mbungo, Kialile, Mpitani, Mahola and Nkiliva.

Activities

The Association does not have specific general meetings for all their members (i.e. 900 farmers) scheduled at specific times of the year; they meet as needs require. The same is the case for the irrigation groups. Committee meetings are held monthly, however, but also according to needs. There are no reports and documentation made of the general meeting, but committees do have some form of documentation that is based on whether

they need to record something or not. During general meetings, about 75% of the members show up.

They types of issues discussed in the meetings revolve around water shortage, broken structures and poor participation in operations and maintenance activities.

Activities carried out by the Association range from overseeing and supervising rehabilitation and repair of weirs, and reprimanding those who do not follow the regulations that have been set. Such regulations range from requiring uniform planting among members of the same group to participation of members in repair activities. There is no money collected by the treasurer presently, but plans to begin doing so once the Association has been registered were mentioned.

O&M for irrigation and drainage facilities

State of O&M facilities

The main activity carried out by the group members is that of maintaining the weirs. Because most weirs are made from traditional material that is often unstable, they often break and allow more water than is desired to spill into the farms. Groups have reported that during one season, weirs may need to be repaired up to 10 times. One Gabion structure has been placed in one of the weirs (with the help of Naliendele Research Centre) and it has apparently made tremendous difference in the time spent repairing this weir. A concrete structure is being placed at the main weir (with the help of RIPS), which will also reduce the time spent on maintenance.

Since most of the material is locally available and free, money is often not required to repair the weir, but when it is, it is done so from contributions by group members and/or by money collected from fines. This money is spent on materials and food that is prepared for those involved in repair.

Labour that is required to maintain the irrigation system does not always originate only from the group that works the weir. If damages are very large, the Association organises members from other groups to assist.

O&M regulations

The main regulation that has been formed as a result of water-use conflicts is to enforce uniform planting of rice for members of the same weir. The regulation has alloyed much of the conflicts, but there are still some who do not adhere to these rules.

Apart from this, every farmer will be required to contribute one bucket (20 litres) of rice to the Association this coming harvest (2003). The contribution will be sold and placed in the bank account (yet to be opened) and will facilitate achievement of some of the improvements desired by the irrigation farmers.

Training

There is very little training that has been done in the area of management, operation and maintenance of the irrigation scheme. There is thus very vague understanding of what the responsibilities of the leaders are and often there is replication of responsibilities between leaders. For example, although it is the responsibility of the treasurer to collect fines and fees, the chairperson and secretary often interfere in the procedure.

There are members that have received some form of training, but this was done before the formation of the present Association. Training was done by RIPS programme that operates in Lindi and Mtwara to 9 people (men and women) on transplanting and bund construction methods in 1996. Others were trained more recently (in 2002) at the KATC centre in Moshi on land preparation for paddy production, nursery and seedling preparation and cooperative management.

Improvements to irrigation scheme

There are three main improvements that the farmers and their Association would like to accomplish:

1. Reinforcement of the intake weirs by building permanent and stronger weirs
2. Introduction of a canal system to bring water directly to farms rather than plot to plot irrigation
3. Expansion of irrigated area
4. Training in O&M skills
5. Presence of a full-time, locally available district extension officer

The map produced clearly locates where Kinyope farmers feel that irrigation areas can be expanded to (see Annex 3). This area is along the northeast boundary of Kinyope Village area where intake weirs belonging to Ngwaye, Jeweka, Mbungo, Hiyara and Mpitani groups could be extended to reach this strip of land. Workshop participants have assessed this land to be good farming land in terms of fertility and capability of becoming land under irrigation. They feel that improvement of these weirs would allow for such expansion to take place. The irrigation expansion would be for rice production purposes, since this is a crop that can be both a food and a cash crop and can fetch good prices on the market.

Conflicts (water and other)

Water use conflicts do occur between farmers of the same irrigation group. The conflicts are a result of lack of uniformity in the stage of plants of different farms. The consequence is that there is differential water requirement caused by the irrigation method (plot-to-plot irrigation) applied. The Association has attempted to resolve this problem by making it a regulation that all users of one weir plant uniformly, but not all farmers heed to this demand.

Water use conflicts between weirs and especially downstream users did not surface. The participants insisted that there is enough water flowing in the rivers to satisfy everyone's needs. The truth to this was demonstrated by the fact that construction of the newest weir most upstream in the scheme did not result in confrontations and conflicts with other groups.

There seems not to be clear boundaries between the responsibilities of the Association and that of the village government such that each party finds itself interfering in each others' area of influence. There is thus great emphasis being put into registration of the Association that it may be autonomous from the village government and have authority to make its own decisions.

Potential future constraints (based on past experiences)

Future constraints will be based on undesirable elements of the present organisational system. The time that it is taking the association to register itself and open the bank account can be a sign of inefficiency, by the part of the Association or the bodies with which it must work with. Furthermore, it is doubtful that the leadership at both group and association level are able to effectively manage the funds that they may collect or receive from other sources.

Apart from this it remains to be seen whether a "mother group" such as the Association is in relation to the irrigation groups, is the best direction for effective improvement of the irrigation system. There will have to be very clearly defined lines on precisely what will be group-funded and what will be association-funded, lest farmers feel that they are being doubly charged. It will be important to investigate how groups functioned prior to the union and incorporating the methods that worked to place into the larger organisation.

Gender issues

The role of men and women and Kinyope are similar to that of men and women in rural Africa Muslim communities in which the man is dominant over the woman. In many cases, the man is the main decision maker in the family and depending on individuals, may or may not consult the wife (wives) on important decisions, especially when they relate to finance. Women in the workshop pointed out that although a farm can be farmed by both man and wife, it is the man who is the salesman when it comes to marketing the rice, and he makes the decision of how much of the harvest can be sold. According to the panel discussion, women's involvement in the irrigation scheme is minimal and often in the form of "unpaid labourers".

Women do have control of harvest that is saved for household consumption and decide on daily disbursement of that storage. Conflicts between sexes seem to arise when women use the stored harvest celebrations and feasts. Women admitted using household surplus for supporting such feasts claiming that this was to compensate for the lack of financial benefit they receive from the crop to which they contribute labour and time towards.

The farming calendar by gender (Annex 4) indicates that in most agricultural activities, men and women participate equally on the farm. From around April however, women's agricultural responsibilities increase as a consequence of post harvest activities such as pounding, winnowing and milling the rice, all activities considered "women's work". Women continue to contribute more to agriculture until December after which their responsibilities are reduced and become equal to their male counterparts. During repair of weirs, women contribute physical labour if the work is not too physically demanding. Otherwise they prepare the meals that are provided to those who are doing the repair work.

The position of women in the Kinyope society is variable depending on the particular aspect of society one looks at. Obviously, there are key women who hold important position in the society, and this are usually the herbalists, the traditional birth attendants, the nurses (if any) and the teachers. The representation of women in leadership positions in the Kinyope scheme is impressive since one third of the executive committee of the Association are women. Whether they are puppet figures or are equal participants and contributors the decisions that are made is not know, however.

Apart from agricultural activities, it is a well-known fact that women are responsible for many other household and social activities, which take up all most of their time. This means that involving them in new projects is often difficult since, however interesting the project may seem, they are unable to allocate any time for it. The situation in Kinyope is different, however, because women are already involved in the irrigation scheme and some are members of the irrigation groups. Improvement of the intake weirs for example, will reduce the amount of time that they (as well as men) spend repairing destroyed weirs and managing the damage caused.

Government of Tanzania support

Government support exists in the form of district extension workers who are allocated to Kinyope to provide farmers with skills and know-how of certain agricultural activities. The participants expressed, however, that this support is neither adequate nor always successful. Farmers have little knowledge of the other opportunities available to them, especially in the form of funds for certain activities.

The District is the main source of technical and advisory support that the Scheme could get, but prior to 2002, there has been very little interaction between the District and Kinyope. The result of this is that Kinyope farmers are not aware of the wealth of resources available to them directly from the district, not all of which require vast amounts of money or donor intervention.

Communication

Communication between Kinyope and other villages is by means of a road which is rough and on difficult terrain. Due to the terrible road condition, especially in the wet

season, very few vehicles come to Kinyope. Lack of other means of communication such as telephones isolates the village and inhibits flow of information from the district to the village. Weak links with the district means that issues such as dissatisfaction with the extension worker are rarely brought up and may lay dormant and unattended for a long time. Participants felt that such communication of dissatisfaction is the responsibility of their leaders.

Communication channels between the Association and village government are unclear although participants did mention that there are conflicts brought about by overlapping of authorities. The number of times that the Association meets with the all of its members is very few and dependent on arising needs; this leaves members very little room to raise issues that are of concern but not necessarily of great enough consequence to require a public meetings.

Recommendations

The following are recommendation that arose as a result of the RRA workshop in Kinyope:

- There is a need to ensure that they system is owned and understood by all so that everyone can participate in the decision-making processes regarding the scheme.
- There needs to be clear understanding of the responsibilities of the leaders and minimal overlapping of responsibilities.
- A lot of effort will need to be placed on pure managerial skills that leaders of the Association and groups will need to have to coordinate and operate the scheme effectively.
- The role of women should be enhanced and it has to be clear that they are more than mere puppet figures in the Association.

Annexes

Annex 1: Registration

Observers

	Name	Position	Office
1		District Irrigation Technician	Lindi Rural District
2	M. Osada	JICA Study Team	JICA
3	T. Igawa	JICA Study Team	JICA
4	H. Ohnuma	JICA Study Team	JICA
5	H. Shimazaki	JICA Study Team Leader	JICA
6	S. Matsushima	JICA Study Team	JICA
7	Mr Chikoleka	ZIE, Lindi	Zonal Irrigation office
8	R. R. Komanga	Sociologist	MAFS HQ – Irrigation

Participants

	Name	Occupation
1	Mariamu Kaunji	Farmer
2	Saidi Kipande	Farmer
3	Ali Hemedi	Farmer
4	Saidi Tambale	Farmer
5	Selamani Matipu	Farmer
6	T. J. Mponda	Farmer
7	Hasani Buriani	Farmer
8	Mohamed Rashidi	Farmer
9	Omari H Likondo	Farmer
10	Mwanaidi Kawale	Farmer
11	Thabit S A Chiutila	Farmer
12	Saidi Kombo	Farmer
13	Saidi Juma Machale	Farmer
14	Hassan H Ngwaye	Farmer
15	M M Ngombo	Farmer
16	Fatu Mkopi Nyeye	Farmer
17	Anacio Eratus Suedi	Farmer
18	Ilimije Salum Abdallah	Farmer
19	Mohamed Hiyala	Farmer
20	Hadija Salum	Farmer
21	Fatuma Pius	Farmer
22	Fatu Mbendu	Farmer
23	Mariamu Kindamba	Farmer
24	Zainari Mbungo	Farmer
25	J Buriani	Farmer
26	A S Malile	Farmer
27	M H Makuntiwa	Farmer
28	Juma Chidanda	Farmer
29	M A Puanga	Farmer
30	M Ikala	Farmer
31	M Mbungo	Farmer
32	F Abdallah	Farmer
33	Juma Mbule	Farmer

Annex 2: Workshop schedule

Table 2: General timetable for RRA workshop Kinyope Village, January 16 & 17, 2003

Time	Activity	Description	Tool
Day I			
Morning session	Introductions		Bus game
	Group work (5 groups)	Mapping Seasonal calendar Women's issues Farming calendar Tradition & culture	Mapping Seasonal calendar Open-ended questions Farming calendar Open-ended questions
Lunch			
Afternoon session	Presentation of group work		
	Group discussion/interviews (3 groups)	Agriculture Institution Irrigation	Structured interviews/questionnaires
Day II			
Morning session	Group discussion/interviews (3 groups) continued	Agriculture Institution Irrigation	
	Presentation of group discussion		
	Site inspection		
	Venn diagram		
Lunch			
	Identification and exploration of conflicts		Group discussions
Afternoon session	SWOT		
	Closure by NIMP Team Leader		

Annex 3: Farming calendar by gender

Kinyope Farming Calendar by Gender

Activity	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Purchase of farm inputs													✓	✓	✓	✓								
Clearing farms																			✓	✓	✓	✓	✓	✓
Nursery	✓	✓									✓	✓											✓	✓
Tilling	✓	✓	✓	✓																				
Transplanting	✓	✓	✓	✓									✓	✓	✓	✓								
Putting water into farms			✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓	✓						
Weeding			✓	✓	✓	✓									✓	✓	✓	✓						
Application of fertilisers																								
Application of agro-chemicals																								
Irrigation			✓	✓	✓	✓	✓	✓							✓	✓	✓	✓						
Protect crops from destructive animals					✓	✓	✓	✓									✓	✓	✓	✓				
Harvest crops							✓	✓	✓	✓									✓	✓	✓	✓		
Post harvest								✓		✓		✓		✓		✓		✓		✓		✓		✓
Storage											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Harvest celebrations/rituals													✓	✓	✓	✓								
Selling crops	✓	✓											✓	✓	✓	✓							✓	✓
TOTAL	4	4	5	5	4	4	4	5	1	2	2	3	6	7	8	9	5	6	4	5	3	4	4	5

Annex 4: Seasonal calendar

Kinyope Seasonality Diagram (Farmers' Economy)

Variables	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Credit												
Farm inputs												
Availability of extension services												
Employment women												
Employment men												
Employment children												
Rainfall												
Human diseases												
Crop pests												
Crop diseases												
Adequate irrigation water												
Income												
Expenditure												
Food scarcity												

RRA Report for the

Luchili-Nyakasungwa Irrigation Scheme

22nd & 23rd January, 2003
Nyakasungwa village, Mwanza

Table of Contents

INTRODUCTION **1**

METHODOLOGY **1**

OBSERVATIONS & PROBLEMS **2**

SOCIO-ECONOMY **2**

Land Tenure 2

Farmers' Economy & Life Style 2

Cultural Practices 3

Labour Force and Seasonal Demand for Labour 3

AGRICULTURE **3**

Cultivation Area 3

Crop Production 3

Farming Calendar 4

Farmers' Supporting System 4

Land Capability for Irrigation and Crop Suitability 4

Constraints in Crop Production, Input Supply and Marketing 4

FARMERS' ORGANISATION **4**

Institution 4

Activities 5

Organisational Analysis 6

O & M FOR IRRIGATION AND DRAINAGE FACILITIES **6**

Regulation of O & M 6

Situation of O & M for facilities 7

Improvement of Irrigation Scheme 7

Conflict over Water 7

Possible Future Constraints Based on Past Experience 8

GENDER ISSUES 8

Advantage and Disadvantage to Gender by Development Activity 9

SUPPORT FROM THE GOVERNMENT OF TANZANIA 9

Communication 11

RECOMMENDATIONS 12

Annex 1: Registration 14

Annex 2: Workshop Schedule 18

Annex 3: Workshop Evaluation 18

Annex 4: Mapping 19

Annex 5: Focus Group Discussion on Culture and Customs 19

Annex 6: Focus Group discussion on Women's Issues 20

Annex 7: Farming Calendar 21

Annex 8: Seasonal Calendar 22

Annex 9: Land Use and Agriculture Questionnaire Results 23

INTRODUCTION

The governments of Japan and Tanzania are in the preparatory stages of drawing up the National Irrigation Master Plan (NIMP) of Tanzania. As part of the second study phase, seven irrigation schemes have been selected nationwide to serve as samples of 4 different types of irrigation scheme: traditional, modern, traditional improved and water harvesting. The data collected from these schemes will be used in the preparation of the Master Plan. Rapid Rural Appraisal (RRA) was selected as the most appropriate methodology to collect information about each scheme.

The Nyakasungwa Irrigation Scheme is officially known as the Luchili Irrigation Scheme. The workshop participants explained that this was due to a misunderstanding at the time the scheme was constructed in 1976, when the JICA expert camp was set up in Luchili village. However, all the scheme members are in their entirety farmers from Nyakasungwa village and a unanimous request was made to rename the scheme the *Nyakasungwa Irrigation Project*.

The Nyakasungwa Irrigation Scheme is located in Sengerema district, Mwanza region. It was constructed within the boundaries of Nyakasungwa village and at present, 62 farmers own land within the developed area. This scheme is categorised as a pump irrigation scheme, which draws water from lake Victoria.

METHODOLOGY

In order to collect information, a 2-day RRA workshop was conducted in the 7 villages (refer to Annex 2 for the workshop schedule). The main objective of the RRA was to obtain a clear and broad picture of how the scheme is presently managed, the main constraints in operation, maintenance and organisation of the irrigation group, and the scheme members' ideas and for the improvement of the scheme's operation. More generally, the objectives were to comprehend all the factors that affect agricultural production and the dynamics involved in operation and maintenance of the scheme.

In order to collect information, a 2-day RRA workshop was conducted in the 7 villages (refer to Annex 2 for the workshop schedule). The methodologies administered during the workshop included structured questionnaire, VENN Diagram and various group work exercises. The 5 group work sessions were aimed at collecting data about the life of the farmers throughout the year. They included a Seasonality Calendar, a Farming Calendar, Village Mapping, questions regarding Women's Issues and traditional customs that pertained to agriculture and irrigation. Participants were divided into groups and given an hour for group work, which was followed by session for presentation and plenary discussion. The structured questionnaire was prepared by Nippon Koei and consisted of 3 parts: Agriculture (refer to Annex 9 for results), Irrigation and Institution. These questionnaires were administered by a representative of the JICA Study Team, a government official and a facilitator. All questionnaires were supplemented by unstructured questions. The VENN Diagram exercise focused on the relationship between the intended beneficiaries, the farmers and all other stakeholders related to the irrigation scheme up to the level of the district. The aim of this exercise was to determine the flow and

intensity of communication between all stakeholders and to pinpoint any current and potential areas of conflict.

OBSERVATIONS & PROBLEMS

The workshop for the Luchili-Nyakasungwa Irrigation Project was held on the 22nd and 23rd January in Nyakasungwa village. This irrigation scheme is categorised as modern, with an irrigation group consisting of 62 farmers. The first day of the workshop was held on the outskirts of the village, near the pump house. The second day was held in a classroom at the Nyakasungwa primary school.

The workshop was attended by 60 participants (refer to Annex 1 for the registration). Due to a miscommunication regarding the number of participants required for the workshop, all the 62 members of the scheme were invited to attend. However, female attendance and participation was low (6 women on Day 1, and 10 women and Day 2). The only active woman present was the Village Executive Officer of Nyakasungwa. The primary reason for the low attendance women is that in Sengerema district it is normally men who attend meetings (and hence receive invitations to attend meetings) and also because of a burdensome domestic workload. Due to a prior commitment to attend another seminar, there were few village government members present at the workshop. The long distance from Mwanza town to Nyakasungwa village, which included a ferry crossing, constituted a time constraint on the workshop schedule. During the VENN Diagram exercise, some of the actors being discussed were present, such as the community development officer and the district irrigation officer.

SOCIO-ECONOMY

Land Tenure

The land tenure system at Nyakasungwa is that of inheritance, although according to Tanzanian law, ultimately all village land is owned by the government. At Nyakasungwa, there are 44 ha available for farming. Of these, 20 ha have been developed in the pump irrigation scheme. This land was once belonged to a few farmers. When it was developed, it was confiscated without compensation, divided into equal-size parcels of 0.3 ha and distributed by group authority to 62 farmers, including the original owners of the land. Land under scheme cannot be sold.

Farmers' Economy & Life Style

Paddy and maize are the main source of income for farmers at Nyakasungwa. Cassava and cotton are cultivated and sold in smaller quantities. Farmers receive income from sale of crops between Apr-Jul, which are the harvest months of maize and paddy. The months of planting (Sep-Nov) are indicated as those with the highest expenditure, which require the purchase of farm inputs. In December, is when those farmers who have spent all the income from the previous harvest begin to borrow money from each other. With the sale of paddy, cotton, maize and cassava, farmers are able to recoup their production expenses, but there is no profit left after living expenses have been deducted. However, maize and cassava only bring in 16% of

farmers income[1]. Reasons for this include the fact that they are cultivated without the use of inputs due to the un-affordability of herbicide and agro-chemicals.

Cultural Practices

The autochthonous tribe of the area near Nyakasungwa village is the zinza tribe. However, this area has been subject to migrations, and at the moment, Nyakasungwa residents include members of the sukuma, kerewe, jito, haya and waha tribes. The only custom that may affect agricultural practice is the prohibition of farming on the location of graves or pruning/cutting trees planted to mark the spot of an ancestral grave. These graves are inhabited by 'msambwa', the spirits of the ancestors. Defiance of these prohibitions can result in a disability, such as blindness (if cultivation occurs near a grave) or death (if tree marking an ancestral grave is cut or pruned). If a tree must be pruned or cut, then villagers must appease the spirits by offering them a sheep and banana wine. The wine and sheep's blood are sprinkled over the area. The farm area marked for expansion of the scheme is not affected by these prohibitions. There are no prohibitions regarding the use of the waters from lake Victoria for irrigation.

Labour Force and Seasonal Demand for Labour

Both men and women participate in almost all agricultural activities. Men purchase farm inputs and clear the fields, while women are solely in charge of post-harvest activities such as milling. The most intensive time of the year is in October, when the planting season for maize and paddy coincide, and June, when the harvest of maize and paddy occur simultaneously. Extension services are available during these peak months only. Children work on the farm during their school holidays in June and December. According to the seasonality diagram, women's involvement in the cultivation of maize is greater than that of men. In Jul/Aug there are no agricultural activities.

AGRICULTURE

Cultivation Area

The total farm land available at Nyakasungwa is 44 ha. Of these, 20 ha have been developed under the irrigation scheme. The remaining 24 ha are currently rain-fed and is available to be developed for irrigation. Paddy is cultivated in both areas. The average household cultivates 1.6 ha of upland crops and 0.8 ha of paddy in lowland.

Crop Production

Paddy is the leading crop, and is cultivated in both irrigated and rain-fed farm land. Since the scheme broke down in 1996, there is only 1 cropping of paddy which is dependent on rainfall between Dec-May. Other crops include maize (2 varieties), cotton and cassava. Paddy and maize are cultivated using the traditional seed 'sukari sukari' and 'fao' respectively.

[1] Very little cassava is sold, as this is most of it is consumed and the rest is traded within the village.

Farming Calendar

Farmers begin preparing their fields in August for the planting of maize (Sep) and paddy (Nov). These crops are harvested in March and June respectively. This leaves July and August free of agricultural work for women. Crop pests and diseases coincide with the dry season in March and Oct/Nov.

Farmers' Supporting System

Farmers purchase farm inputs from Sengerema town in July and August. There are no government subsidies for fertiliser or agro-chemicals. Due to their low financial capacity, farmers are only able to purchase inputs for paddy and cotton. Seeds are obtained from the previous harvest. Crops are harvested using traditional tools, and stored in sacks. Paddy and maize are stored in the village warehouse by some farmers. These crops are then sold to middlemen immediately after harvest in order to repay debts incurred during the planting season. Extension services are provided by the district office and are mostly available during the June harvest period and the Sept-Nov planting season. There is an irrigation pump operator stationed in the village. There are not credit facilities available, so money is borrowed from relatives or neighbours, usually in December when the income from crop sales is running out.

Land Capability for Irrigation and Crop Suitability

The land identified for extension of irrigation is the 22 ha within the vicinity of the already developed area.

Constraints in Crop Production, Input Supply and Marketing

The irrigation system is not functioning. The pump has been non-operational since 1996, and the canals are damaged. As a result, farmers are unable to double-crop paddy. Other constraints that affect crop production include the unavailability and un-affordability of input, the outbreak of various disease (rice mottle, stem borer) and pests that destroy paddy, destructive animals such as rodents and birds. Furthermore, all agricultural activities (tilling, weeding, harvesting) are done manually[2]. There is a shortage of rice mill and storage facilities. Farmers do not have bargaining power with the middlemen, and the price or rice and maize lowers as the harvesting progresses[3].

FARMERS' ORGANISATION

Institution

The 18 farmers in the main section established the irrigation group in 1976. Today the scheme has 62 members, of which 20 are women. The organisational structure of the group composed of a chairperson, secretary, assistant secretary and treasurer.

[2] Although some farmers can afford to plough their fields.

[3] The price of a sack of rice will lower from 9000/- to 4500/-. A sack of maize will lower from 12,000/- to 3500/-.

There are no-subcommittees. The chairperson was elected by consensus, while the other leaders were elected by open election. Elections are not held regularly.

The irrigation group has not drafted a constitution, but by-laws are in place. However not every knows them and participants were unable to agree on which by-laws exist. The penalty for grazing livestock on the farm is 50,000/-, while the penalty for burning is unknown. Every May, all farmers must clean the blocks communally. Farmers who arrive late for communal farming activities are given a portion which they must cultivate on their own. There is no regulation/rule for when water is absolutely in shortage.

To date, the group has not been registered. Preparations are underway to register as an association, but farmers are unsure of the procedure. The main reason for wanting to register the group is so that they become eligible for aid. Furthermore, the executive committee has not collected money from the members to be able to pay for the registration fee. The group's preference to register as an association. None of the participants were able to explain the main difference between a cooperative and an association.

Activities

General meetings are organised according to need. The secretary invites each member by letter stating the agenda to be discussed. The meeting place is at the tree near the fields. Attendance is poor (about 50%). These meetings are not always documented. However, participants stated that there are no problems in conducting effective general meetings. The last general meeting was held in August[4]. The August meeting took place in the farm and the agenda centred on the contribution of 2000/- per farmer. Several reasons were cited for the purpose of this contribution including repair of the pump and payment of registration fee. Nevertheless, no one has paid their contribution so far[5]. Other issues discussed in general meetings include canal maintenance, security of the pump house. It is not clear when and with what frequency the executive committee meets. Their discussion deal with problems occurring in the scheme area and any violations of the by-laws.

The registration fee is 2000/-. An annual membership fee is supposed to be collected by the secretary, but the amount is unclear. No one has paid it this year. Forty farmers have paid the maintenance fee. The group does not have a bank account, but plans to open one at the National Microcredit Bank branch in Sengerema. There is no cash in hand at the moment.

One of the scheme members under took a 10-day training course on paddy production and rainwater harvesting for irrigated agriculture at the Sokoine University in January. Upon his return, a feedback seminar was held for leaders of IG. Participants identified training requirements in order of priority: management skills for irrigators

[4] It was not clear whether any other meetings took place in 2002.

[5] Participants were not very forthright about the reasons why no one has paid their contribution. More often, they cited that it was due to the loss of hope. However, off the record, there were reports of prior misuse of funds by the members of the executive committee.

association, leadership training, paddy production, pest management and a refresher course for the pump attendant. Based on past experience, in which the district was responsible for pump maintenance and repair, the participants also requested training for farmers in pump repair and maintenance.

Organisational Analysis

The leaders of the Irrigation Group do not understand their responsibilities. The secretary in particular cited by the participants as being the weakest as he does not keep meeting minutes and other documents. The tendency of not keeping or documenting minutes of the previous discussions means that the follow up of what is happening the group is not conducted resulting into poor management. The workshop participants lamented the fact that the group leaders did not follow-up on the decisions made by the group to improve the group's performance: the contribution of 2000/-, which all farmers agreed to make last year has not been collected, and leaders have not made any moves to mobilise farmers to pay their contribution.

Group money collected some years back disappeared in the hands of the group leaders (about 30,000/-). There was no explanation how the money was used. The group does not have bank account, which means money is kept by individuals, facilitating the potential misuse of funds. This situation has demoralised group members, and these are now reluctant to pay further contributions. The group members no longer trust their leaders with money.

The group leaders have failed to enforce by- laws enacted by the group and make follow up for its execution. For example, unknown livestock keepers graze animals in the field. To deter offenders, by-laws and fines have been enacted. To-date, cattle is still grazed on crops, nobody has been caught because of poor follow-up on the part of the group leaders. The group leaders have failed to set and enforce a farming calendar in order to reduce conflicts over water use. At present, farmers decide when to farm, and quarrels occur when some farmers plant late and require water when their neighbours do not want it.

The members of the irrigation group are very aware of the weak leadership but have failed to change it over years because of low attendance to meetings. Furthermore, there is no routine/procedures for conducting meetings. Always the column is inadequate to make important decision such as changing the group leadership. The lack of a constitution indicates that the group has no vision on how to run the group activities and operation of the irrigation system. This is one of the contributing factors to the poor performance in all aspects of management.

O & M FOR IRRIGATION AND DRAINAGE FACILITIES

Regulation of O & M

Prior to 1993, farmer purchased fuel communally and the plots were irrigated simultaneously. A pump attendant hired by the district office was in charge of

operating the pump[6]. He received training on pump maintenance (and a manual). From 1993 onwards, individual farmers who could afford to purchase fuel used it to operate the pump and irrigate their fields. In 1996, the pump finally broke down. In accordance with procedure, the pump attendant informed the district agricultural office that their pump needed to be repaired. The district council collected the pump, and since then it hasn't been returned.

Situation of O & M for facilities

The main reasons for the breakdown of the irrigation system, and in particular the pump were cited as follows:

Lack of funds to purchase fuel (both collectively and individually);

Canals have fallen into disrepair. There is no regular maintenance of the canals, except for two weeks in May;

The pipes were damaged by algae;

Improper design because farmers' advice was not heeded in construction phase. During the first phase of construction, it was assumed that water would irrigate the fields using the system of gravity. When this proved ineffective, the Japanese experts installed the pump. However, the pipes did not reach the water during the dry season and were unable to suction water from the lake.

Assumption that repair are responsibility of the district, who have to-date not repaired the pump;

None of the farmers received training on how to repair the pump.

The community was not involved in the planning and implementation of the project. This has resulted in a poor sense of ownership of the scheme. The villagers think that the district is responsible for the management of the scheme.

Improvement of Irrigation Scheme

The Nyakasungwa farmers assessed the following to be necessary to improve their crop productivity and consequently their standard of living: rehabilitation of irrigation infrastructure, technical support on improved farming practices, return of the tractor that was removed by the district council and expansion of the irrigated area. Participants requested the government's assistance on these areas by changing the source of energy of the pump to electricity, providing the farmers with tractor and a bulldozer (for levelling the farms in the expanded area), farming implements and loans to the group's members, the construction of a fence (ugo) to keep animals out of the farms and technical experts to assist with the rehabilitation and expansion of the scheme. In turn, the farmers will contribute their labour in digging canals, collecting rocks and providing security for the scheme's infrastructure. Monetary contribution will be in the form of 2000/- per farmer (which was agreed upon in August 2002), and an area in the village for the experts to set up camp.

Conflict over Water

There are no reported water conflicts during the rainy season. However, farmers experience water shortage during the dry season because some farmers make huge

[6] The pump attendant is still resident in the village and attended the workshop.

bunds causing neighbouring farmers to receive inadequate quantity of water. Furthermore, when a plot is not cultivated in its entirety, this can prevent water from flowing from one plot to another. Problems may also arise when planting does not occur simultaneously. A farmer who has planted late may not be able to receive water when s/he requires it. A fixed time for planting has not been set by the group's leaders, which would prevent conflicts over water use.

There are no reported cases of illicit tapping or destruction of irrigation facilities by farmers within irrigation group. However, participants stated that livestock keeper graze their cattle on their crops.

Possible Future Constraints Based on Past Experience

Lack of involvement or full participation of farmers in the project cycle. In this case it is felt more in the planning/ design stages and has resulted in an inadequate sense of ownership. This could be considered a key cause of the facility's breakdown and behind the farmers' inability to organise to get it repaired.

As it is now, there is no indication that the group has felt the need to change the group leadership or draft a constitution in order to strengthen the group. The absence of any regulations on how to run the group and a clear vision may have detrimental impact on future operation of the scheme.

Past incidences of group leaders misusing funds. One of the contributing factors is that the money is kept by individuals instead of being deposited in the bank. This can only be remedied if the group opens a bank account, which must be accessed by 3 signatories. Without this measure, misuse of funds is likely to continue happening even if the group leadership is changed.

The pump attendant and farmers have inadequate technical knowledge on how to operate the pump this has created a dependence on the district experts, who live far from the village. None of the farmers have received training on either pump maintenance or repair. If only one person knows how to operate and maintain the pump, this will create a situation of extreme dependency on a government employee.

There is 'cold war' between farmers and district council because of how district handled the situation of pump breakdown. The chairperson of district council was from Luchili (Joseph Mbata) and he pushed for the removal of tractor from Nayakasungwa. (because he was bitter that the project was given to Nyakasungwa instead of Luchili). A sour relationship between the irrigation group and farmers is not conducive to the smooth functioning of the irrigation scheme.

The district technical staff do not have adequate participatory skills for dealing with problems or issues involving communities. Without these, the relationship between the district and the farmers will remain laden of power relations. Participatory and empowerment approaches training might be required.

GENDER ISSUES

In Nyakasungwa, the traditional division of labour prevails. The few women who attended the workshop were also in charge of preparing the food. Even the Village Executive Officer of Nyakasungwa, a woman, did not sit with the other male leaders during lunch and instead served food. Regardless of farming and canal maintenance

activities, women are still responsible for all domestic work, which is quite considerable.

Of the 62 members in the scheme, 20 are women. These women all own land within the scheme, they are heads of their household. Women do not own land unless they have been widowed or they have inherited from their parents or more rarely, they have purchased it. Married women do not register their land separate from their husband. Divorced women will either work on their parents' farm or rent land. Within the group's leadership there are no women. The reason for this is primarily cultural. Women do not attend meetings in sinza culture. As such the invitation to a general meeting will usually be addressed to the (male) head of household.

Most work is done jointly by men and women. However, men tend to take responsibility of clearing the fields, because it is recognised as work that is too difficult for women to do. Within the household, men are the main decision-makers and hold the money. Therefore, it is men who travel to Sengerema to purchase farm inputs. It emerged that in Nyakasungwa there a high level of mistrust between the two genders. Men declared that "women are not to be trusted" to spend money sensibly and women claimed that men waste most of the family's income on alcohol. These statements underlie an entrenched conflict over money (which men keep after the sale of crops) and women's labour (which men require in order for grow and sell crops). Improved productivity of agriculture will not necessarily improve women's social position or decision-making power.

Advantage and Disadvantage to Gender by Development Activity

Women are not satisfied with the way husbands handles the farm income. This is because women do a lot of farm work with few benefits from the produced output. Men have a tendency of handling all cash leaving very little if at all to women. This conflict over family income is detrimental to agricultural development. The dominance of men in the family income demoralises their wives to participate heartily in the farming activities. This is detrimental for farming activities if the issue is intensified. Women might develop resistance technique in farming activities that may negatively affect productivity.

Nyakasungwa women not are involved in the decision-making within the household or in regard to agriculture. There is no woman leader in the irrigation group. Lack of involvement of women in the decision-making has the negative impact in the agricultural development activities as it decreases participation. Nyakasungwa women do not attend meetings of the group because they do not receive invitations. These are always addressed to the (male) head of the household.

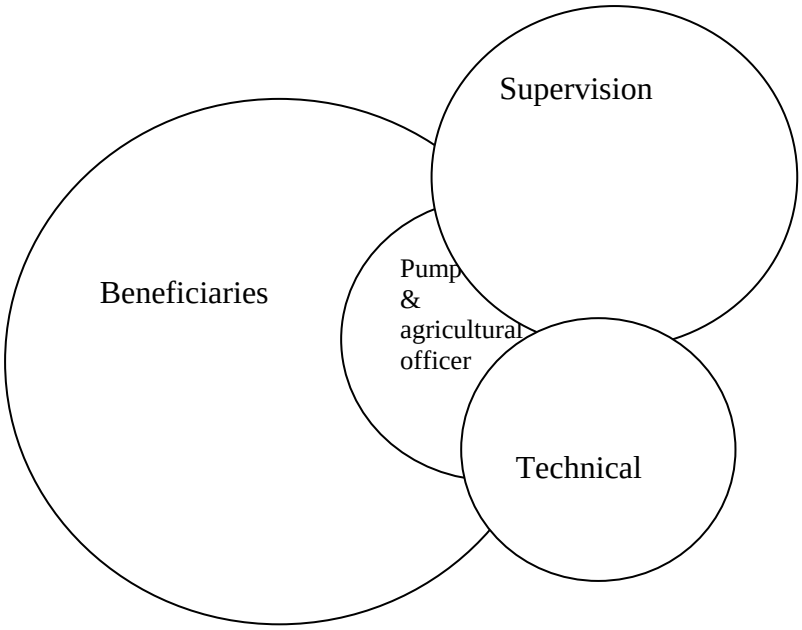
SUPPORT FROM THE GOVERNMENT OF TANZANIA

The VENN Diagram methodology was used to determine the importance of each of the actors in the farmers' supporting system (persons or institutions), the intensity and type of interaction with the farmers as well as a rough assessment of the communication between them and the irrigation group. Participants identified key persons or institutions up to the regional level whose action/inaction may impact on

agricultural activities in Nyakasungwa. These were grouped under five main headings based on the nature of their relationship with the irrigation group.

BENEFICIARIES:	Farmers, Irrigation Group leaders
Technical support (village):	Pump Attendant & Ward Agricultural Officer
Supervision:	Village Government, Councillor, Ward Secretary, Village Executive Officer, Village Economic Committee
Technical support/advice (district):	District Agricultural Officer, Ward Secretary, Division Agricultural Officer, District Irrigation Officer, District Cooperative Officer
Authority:	Councillor, Ward Executive Officer, District Commissioner, MP

The figure below indicates the level of interaction between the farmers and the persons/institutions in their support system, at different levels of government hierarchy. The technical support staff at village level are the most crucial individuals to the agricultural/irrigation activities in Nyakasungwa. In a role of supervision are the supervisors, most importantly the village government, executive officer and councillor. There is some direct communication between the farmers and the technical support at district level, as the district agricultural, irrigation and cooperative officers provide support to the farmers and their irrigation group.



Communication

At the village level, farmers may turn to the pump attendant and the ward agricultural officer. The pump attendant is a government employee and resides in the village. Since the breakdown of the pump in 1996, he has continued farming in the village. The ward agricultural extension officer visits the village regularly to discuss issues related to agriculture and to encourage farmers to cultivate in the valley. S/he communicates with either the group leaders or visits the farmers in their fields.

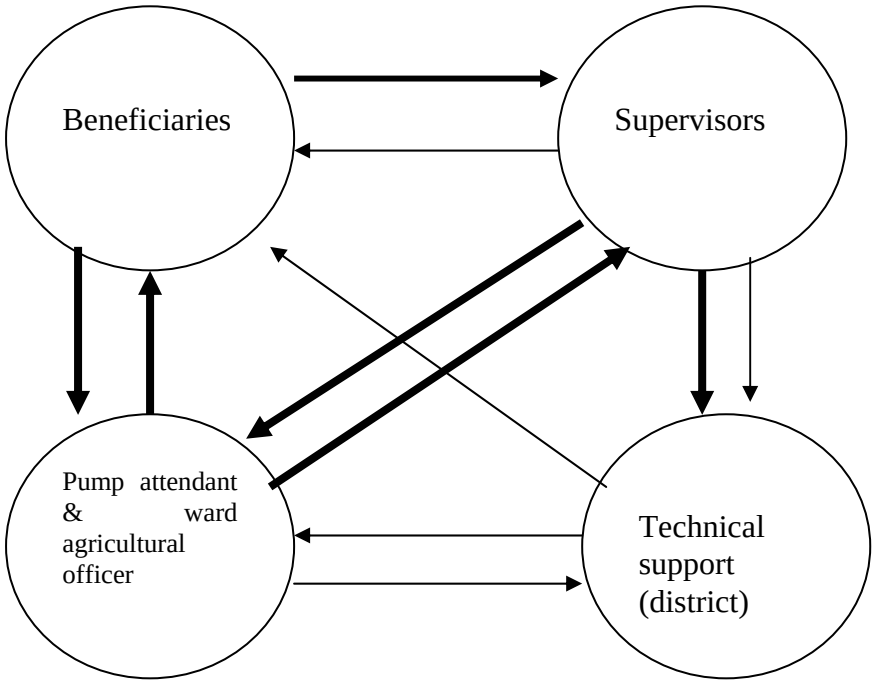
Despite the proximity of the village government with the farmers, communication is nor regular. The chairperson or secretary of the irrigation group may meet with the village government to discuss problems (such as livestock spoiling crops, or the status of the pump) that farmers are experiencing or in the case of visitors to the village. Minutes of these meetings are kept by the Village Executive Officer. The Ward Executive Officer was also identified as having an important role to play in the village. At present, he is mediating the conflict between the farmers and livestock keepers. He was also one of the workshop participants. He can be approached directly by the group's leaders, and all meetings held with him are documented.

It was not clear how frequently the District Irrigation officer visits the village[7], however, participants complained that he does not visit enough. Participants suggested that he visit at least twice a month, and that a schedule of meetings between farmers and the district irrigation office be drawn up in advance. The issues discussed include the status of the canals and how to become formally registered. Therefore, the assistance of the district irrigation officer is of great importance. The participants claimed there is no communication with the Zonal office.

[7] In one forum, participants complained that he only visits twice a year. In yet another they said that he meets frequently with the irrigation group. The latter comment was made with the district irrigation officer present.

As an overall evaluation, it was agreed that all actors fulfil their responsibilities when contacted by the group, including councillor and district commissioner.

The figure below summarises in visual form the frequency and flow of communication within the farmers' support system.



RECOMMENDATIONS

In future, farmers should be involved throughout project cycle. T will help to create a sense of ownership of the irrigation infrastructure thereby, fostering a sense of responsibility towards the security and maintenance of infrastructure and increased compliance of the group's regulations. The handover of the operation of the scheme should begin as soon as the construction work does.

The sustainability of the scheme is at danger as the farmers irrigation group is not yet mature/organised enough to run the irrigation system without government support. This can be concluded by the fact that the group has no funds to run it self and the irrigation infrastructure. One may be tempted to say that villagers are not yet empowered to take some of the scheme operation responsibilities and become self-reliance, In order to achieve that training on several aspects is required: management of the group property and irrigation skills. Lack of training on the above was cited as on of the major problems affecting the operation of the scheme and which contributed to its failure. In addition, a select number of farmers should receive training on pump maintenance and repair.

To solve some of the problems faced by farmers, it is important for the group to draft its own constitution. The constitution will help the farmers to have a vision of the group and to create proper by-laws to protect the scheme's infrastructure.

Weak leadership/misuse of funds can only dealt with if capacity building on both levels (leaders and farmers) is conducted. This will strengthen both the capacity of leaders to manage the group and the capacity of farmers to hold their leaders accountable. Indeed, of utmost importance is to set a timetable for regular elections that are free and fair. Participants requested more workshops such as this one (meaning RRA workshops) in capacity building and advice on organisational matters. The group should open a bank account to avoid keeping money with individuals. This might solve the problem of misuse of irrigation group fund and it's disappearing.

Farmers were unable to run the irrigation system because of high operational costs of purchasing diesel. To solve the problem, an alternative source of energy should replace the use of diesel Participants reported that it will be possible to connect the pump to electricity in the future.

The government employed the pump attendant station at site permanently. The community had no responsibility of running the pump or its security, and consequently farmers have no sense of ownership. The community feels that the project belongs to the government not yet handed over to operate it. For future sustainability the Government has to reduce the degree of involvement and instead should maintain the role of advisor technical support to the farmers when required. The rest should be left to the farmers. Training for Zonal/District officers on participatory approaches to deal with community problem is also necessary.

Annex 1: Registration

Observers

	Name	Position	Office
1	Butoto Lameck	DCDO	Sengerema District Council
2	I. C. B. Kiula	Irrigation Technician	Sengerema District Council
3	M. Osada	JICA Study Team	JICA
4	T. Igawa	JICA Study Team	JICA
5	H. Ohnuma	JICA Study Team	JICA
6	H. Shimazaki	JICA Study Team Leader	JICA
7	S. Matsushima	JICA Study Team	JICA
8	E. W. Siyame	ZIE, Mwanza	Mwanza Irrigation Zonal Off.
9	Mbogo Futakamba	Sr. Irrigation Engineer	MAFS HQ – Irrigation
10	R. R. Komanga	Sociologist	MAFS HQ – Irrigation
11	Abdul D. A. Kataballo	Soil Scientist	Mwanza Irrigation Zonal Off.

Participants- Day 1

	Name	Occupation	Irrigation Group
1	Jackison Mafieso	Farmer	Nyakasungwa
2	Peter Chelele	Farmer	Nyakasungwa
3	Abeli J Mafiso	Farmer	Nyakasungwa
4	Silivester Donald	Farmer	Nyakasungwa
5	Makula Barabara	Farmer	Nyakasungwa
6	Mongongwa Makwega	Farmer	Nyakasungwa
7	T. P. Mlemi	Farmer	Nyakasungwa
8	Zephapa Jackison	Farmer	Nyakasungwa
9	Meja Ndobele	Farmer	Nyakasungwa
10	Doto William	Farmer	Nyakasungwa
11	Mpemba William	Farmer	Nyakasungwa
12	Yona John	Farmer	Nyakasungwa
13	Peter Wilson	Farmer	Nyakasungwa
14	Helemuni Cucas	Farmer	Nyakasungwa
15	Mtende Mbaga	Farmer	Nyakasungwa
16	Clemend Danadi	Farmer	Nyakasungwa
17	Simon Kazungu	Farmer	Nyakasungwa

18	Pius Yollo	Farmer	Nyakasungwa
19	Philemoni Charles	Farmer	Nyakasungwa
20	Pendwamili Paulo	Farmer	Nyakasungwa
21	Malewa Busonga	Farmer	Nyakasungwa
22	Nyerere Busonga	Farmer	Nyakasungwa
23	Gabriel Changwa	Farmer	Nyakasungwa
24	Lukas John	Farmer	Nyakasungwa
25	Feluzi Rajabu	Farmer	Nyakasungwa
26	Robati Mbanga	Farmer	Nyakasungwa
27	Kadogo Mathayo	Farmer	Nyakasungwa
28	Peter Isaca	Farmer	Nyakasungwa
29	Simon Joseph	Farmer	Nyakasungwa
30	Jamsi Misalamba	Farmer	Nyakasungwa
31	Sijaona J.	Farmer	Nyakasungwa
32	Mambula M.	Farmer	Nyakasungwa
33	James Mashine	Farmer	Nyakasungwa
34	Majuto Husseni	Farmer	Nyakasungwa
35	Helgni M	Farmer	Nyakasungwa
36	Matalamba Maganzi	Farmer	Nyakasungwa
37	Emanuel	Farmer	Nyakasungwa
38	Witines	Farmer	Nyakasungwa
39	Z. Mbulimbisi	Farmer	Nyakasungwa
40	Bugoga Katebi	Farmer	Nyakasungwa
41	Daniel Mbaga	Farmer	Nyakasungwa
42	Dorika Ntmza	Farmer	Nyakasungwa
43	Pasikazia Kachacha	Farmer	Nyakasungwa
44	Johary Rashidi	Farmer	Nyakasungwa
45	Mboha Mswangali	Farmer	Nyakasungwa
46	Majige L.	Farmer	Nyakasungwa
47	Nyerere Busoga	Secretary	Nyakasungwa
48	Lazaro Grass	Farmer	Nyakasungwa
49	Charles William	Farmer	Nyakasungwa
50	Chelele William	Farmer	Nyakasungwa
51	Fidelis Mbulimbis	Farmer	Nyakasungwa
52	Mathayo Hamuli	Farmer	Nyakasungwa
53	Lusia Mabala	Farmer	Nyakasungwa
54	Iminde Mususi	Farmer	Nyakasungwa
55	Gregory Nkalwizila	Farmer	Nyakasungwa
56	Agustini Cheyemba	Farmer	Nyakasungwa

57	Theopista Jamhuri	Farmer	Nyakasungwa
58	Shelembi	Farmer	Nyakasungwa
59	Rutobeka William	Farmer	Nyakasungwa
60	Andrea Erosi	WEO Ward	Nyakasungwa
61	Christopher Busoba	Farmer	Nyakasungwa

Participants- Day 2

	Name	Occupation	Irrigation Group
1	Jackson Mafieso	Farmer	Nyakasungwa
2	Feluzi Rajabu	Farmer	Nyakasungwa
3	Z. Mbulimbis	Farmer	Nyakasungwa
4	E Mswanzali	Farmer	Nyakasungwa
5	Nyerere Busogo	Farmer	Nyakasungwa
6	Mabula Barabara	Farmer	Nyakasungwa
7	Silivester Donad	Farmer	Nyakasungwa
8	Ibulahimu Shelembi	Farmer	Nyakasungwa
9	Mtende Mbaga	Farmer	Nyakasungwa
10	Nguro Michael	Farmer	Nyakasungwa
11	Maduhu Nturu	Farmer	Nyakasungwa
12	Robati Mbanga	Farmer	Nyakasungwa
13	Matuto Mbaga	Farmer	Nyakasungwa
14	Peter Chelele	Farmer	Nyakasungwa
15	Kisio Rulwa	Farmer	Nyakasungwa
16	Gabriel Changwa	Farmer	Nyakasungwa
17	Ibadogo Mathayo	Farmer	Nyakasungwa
18	Majige L	Farmer	Nyakasungwa
19	Daniel Mbaga	Farmer	Nyakasungwa
20	Zephania J. Mafuso	Farmer	Nyakasungwa
21	Peter Isaca	Farmer	Nyakasungwa
22	Isacca Nestory	Farmer	Nyakasungwa
23	Kelemiti Donati	Farmer	Nyakasungwa
24	Gergory Kalwizila	Farmer	Nyakasungwa
25	Augustini Luneyemba	Farmer	Nyakasungwa
26	Philemeni Charles	Farmer	Nyakasungwa
27	Doto William	Farmer	Nyakasungwa
28	Benedict Daudi	Farmer	Nyakasungwa
29	Clement Donard	Farmer	Nyakasungwa
30	Dromizi Donard	Farmer	Nyakasungwa
31	Doriki Ntuza	Farmer	Nyakasungwa

32	Paskazia Kachacha	Farmer	Nyakasungwa
33	Theopister Jamhuri	Farmer	Nyakasungwa
34	Mbeli Jackison	Farmer	Nyakasungwa
35	Nyerere Busogo	Farmer	Nyakasungwa
36	Naoha Mswanzali	Farmer	Nyakasungwa
37	Mpemba William	Farmer	Nyakasungwa
38	Gabriel Mathayo	Farmer	Nyakasungwa
39	Chelele William	Farmer	Nyakasungwa
40	Idyanabo Patrick	Farmer	Nyakasungwa
41	Pendomuns Panto	Farmer	Nyakasungwa
42	Tasiana P. Melmi	Farmer	Nyakasungwa
43	Mabura Nesotry	Farmer	Nyakasungwa
44	Malila Lutunga	Farmer	Nyakasungwa
45	Joha Rashid	Farmer	Nyakasungwa
46	Andrea Enosi	WEO	Nyakasungwa
47	Mongoziswa	Secretary	Nyakasungwa
48	Emmal William	Farmer	Nyakasungwa
49	Charles William	Farmer	Nyakasungwa
50	Mpemba William	Farmer	Nyakasungwa
51	James Mashine	Farmer	Nyakasungwa
52	Meja Wdobehe	Farmer	Nyakasungwa
53	Enosi Muswazod	Farmer	Nyakasungwa
54	Adela Kalazu	Farmer	Nyakasungwa
55	Stephano Keya	Farmer	Nyakasungwa
56	Kulwa Magembya	Farmer	Nyakasungwa
57	Maritha Ndobela	Farmer	Nyakasungwa
58	Adela Kalabu	Farmer	Nyakasungwa
59	Ciristopher Busoga	Farmer	Nyakasungwa
60	Ragina Bonephac	VEO Ward	Nyakasungwa

Annex 2: Workshop Schedule

Day 1

Registration of participants
Begin workshop Introduction Workshop rules General information about the scheme
Group work
Lunch
Presentation of group work & discussion

Day 2

VENN Diagram & Discussion
Group work: Institution, Agriculture, Irrigation
Presentation of group work & discussion
VENN Diagram & Discussion (continued)
Closing
Group picture
Lunch

Annex 3: Workshop Evaluation

☺ workshop has highlighted the importance of irrigation
☺ openness in contributing opinions
☺ good preparation
☺ to be able to speak to JICA experts
☺ opportunity for farmers to state the problems faced in rice production
☺ farmers will own the project/scheme
☺ government knows farmers' problems
☺ evidence that government cares about farmers
☺ Good relationship between Tanzania and other countries

☹ Lack of sitting allowance
☹ Short notice before start of workshop
☹ Weak leadership of irrigation group
☹ District council took the scheme's farming implements (tractor)

Annex 4: Mapping

Ramani ya rasilimali za mradi wa
umwagiliaji ionyeshe taarifa zifuatazo:

mipaka ya kijiji
kilimo cha umwagiliaji kinafanyika wapi?
Maji ya umwagiliaji ni yapi na yamegawanywa kivipi?
mifereji ya umwagiliaji
vitaro vya mashamba na mmilikaji (kikundi au mtu binafsi)
eneo la kilimo cha mvua
eneo la umwagiliaji
banio
mifereji ya umwagiliaji
mlango, vifaa na miundo-mbinu vya umwagiliaji
eneo lote kulimika
na mengineo yanayohusiana na kilimo cha umwagiliaji

Annex 5: Focus Group Discussion on Culture and Customs

Shughuli za kimila na utamaduni kuhusiana na kilimo cha umwagiliaji

Taja mila, desturi na utamaduni zote zinazohusiana na kilimo cha umwagiliaji:
wakati wa kusafisha mashamba
wakati wa kupanda
wakati wa kuvuna mazao
zinazohusika na kuhifadhi mazao

Elezea mila na desturi hizi sinavyoweza kusaidia au kuathiri shughuli za kilimo.

Taja njia zinazoweza kupunguza athari mlioelezea na kuboresha zile zinazosaidia kilimo (haswa cha umwagiliaji).

Je, kuna miiko au vikawazo vinavyohusiana na umwagiliaji kwa kutumia maji katika mila zenu?

Kama zipo, mnafanyaje ili kuepuka na majanga yanayoweza kutokana na mila hizo? Mnazidhibiti vipi?

Katika umwagiliaji, kuna mila na desturi yoyote zinazoathiri jinsia ya wanaume au ya wanawake?

Annex 6: Focus Group discussion on Women's Issues

Ushirikishwaji wa Wanawake Katika Kilimo cha Umwagiliaji

Je, mgao wa shughuli za kilimo kati ya wanaume na wanawake (ngazi ya kaya) unalingana?
Kama haulingani, umnafikiria mnaathirika vipi na mfumo huo? Tunaweza kuuboresha vipi?

Mnashirikishwaje katika
ujenzi na ukarabati wa miundo-mbinu ya mradi (shughuli zipi?)
uendeshaji na matunzo wa mradi (shughuli zipi?)

Kama hamshirikishwi katika kazi za ujenzi/ukarabati, ni shughuli gani nyingine mnazozifanya mbali ya zile za ujenzi/ukarabati? Km. kupiga chakula.

Kuna kazi ambazo hamruhusiwi kushiriki au kuzifanya?

Kuna adhabu zozote kuwaadhibu wasioshiriki kwenye kazi za ukarabati, matunzo na uendeshaji wa kilimo cha umwagiliaji? Je, wanawake mnalipa faini hizo?

Je, wanawake mnapewa nafasi sawa na wanaume kwenye masuala ya mafunzo ya kilimo cha umwagiliaji? Kama mmepewa, ni mafunzo yapi na wanawake wangapi walioshiriki katika mafunzo hayo?

Je, wanawake mnamiliki ardhi?
Kama ndiyo, wanawake wangapi wanamiliki ardhi katika skimu hii?

Je, katika skimu hii, mwanamke aliyeolewa anamiliki ardhi chini ya kivuli cha mumewe au yeye mwenyewe?

Wanawake walioachika, wanapataje ardhi ya kulima?

Mashamba yakiwa ya mtu na mke wake, je, mnashirikishwa katika mikutano ya vikundi vya umwagiliaji?
Kama mnashiriki, mnachaguliwa kama viongozi?
Kama mnachaguliwa, wanawake wanashika nafasi zipi na ni wangapi?

Annex 7: Farming Calendar

Activity	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Purchase of farm inputs															✓									
Clearing farms															✓									
- Tilling																			✓	✓	✓	✓	✓	✓
Sowing	✓	✓	✓	✓	✓	✓															✓	✓	✓	✓
- Nursery																			✓	✓	✓	✓	✓	✓
Weeding	✓	✓	✓	✓	✓	✓	✓	✓																
Application of agro-chemicals/fertilizers	✓	✓	✓	✓	✓	✓																		
Irrigation									✓	✓	✓	✓	✓	✓										
Protect crops from destructive animals					✓	✓	✓	✓	✓	✓	✓	✓												
Harvest crops							✓	✓	✓	✓	✓	✓	✓	✓										
Post harvest		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓
Storage							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						

Annex 8: Seasonal Calendar

Variables	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Credit												
Income												
Expenditure												
Employment women												
Employment men												
Employment children												
Employment general												
Rainfall												
Diseases human												
Crop pests/diseases												
Adequate irrigation water												
Availability of extension services												
Availability of agricultural products												
Farm inputs												

Annex 9: Land Use and Agriculture Questionnaire Results

- Land Use with Annual Fluctuation

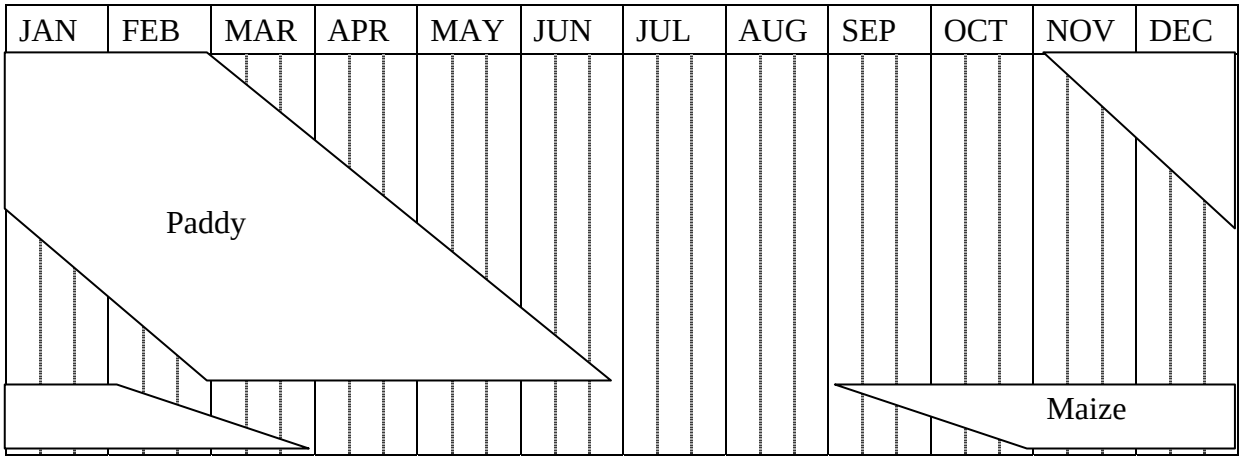
Land Use	Area in ha
Total Farm Land	44 ha
Total Cultivated Area	Less than 30 ha to 44 ha
Rainfed Area	24 ha
Irrigated Area	20 ha
Potentially Irrigable Area	44 ha or more

- Crop Production

Major crops cultivated	Rainfed		Irrigated (rainy season)		Irrigated (dry season)	
	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)
(1) Paddy	40	2.1/4.2				
(2) Maize	4	2.2				
(3) Cotton	-	0.6/1.0				
(4) Cassava	-	3.0				
(5) Paddy (Irrigated)			-	5.2		

- Farming Calendar and Cropping Pattern

Wet season Paddy	from	Nov	to	Jun
Dry season Paddy	from		to	
Upland Crops				
1. Maize	from	Sep	to	Mar
2. Maize (different variety)	from	Feb	to	Jun
3. Cotton	from		to	
4. Cassava	from		to	



- Land Ownership Situation and Problems

Total 20 ha was developed for irrigation scheme and 62 households were allocated for the scheme. Land under the scheme was distributed to each household by group authority and the area per household is 0.3 ha.

The land for upland crops is mainly owned individually through inheritance. Ordinary farmer (6-10 members/family) owns about 2.4 ha of farmland and usually 0.8 ha for paddy in low land and 1.6 ha for upland crops such as maize, cotton and cassava.

- Farm Size Distribution --- No data
-

- Major Constraints in Crop Production, Input Supply and Marketing

Problems/Difficulties	Notes
Irrigation system is not functioning properly	
Manual works for tillage, weeding, harvesting and so on	
Destructive birds, rodents and other animals	
Outbreak of various diseases and pest for rice	Rice mottle, Stem borer
No input due to unavailability and un-affordability	
Shortage of rice mill	Mainly for consumption and not for marketing
Low farm gate price	Local storage for better price

Farmers Supporting System

- Post Harvest

Crop	Harvest Method	Storage Method	Storage Facility
Paddy	By hand	Bag	Local storage (some farmer)
Maize	By hand	Bag	Local storage (some farmer)
Cassava	By hand	Bag	No facility

- Marketing and Prices

Crop	Market Channels	Farm Gate Price (low/high) in Tsh/kg	Season (low/high)
Paddy	Middleman	50-100/140-180	Mar-Jun/Dec-Mar
Maize	Middleman	40/90-130	Feb-Mar/Dec-Jan
Cotton	Society/Middleman	155-200	
Cassava	Among villagers	60	

- Input Supply

Kind of Input	Obtained from where	Purchasing Method	Availability and Source of Loan	Availability of Subsidy
Certified Seed	Previous products			
Fertilizer				
Chemical				
Machinery				
Others ( )				

- Extension Service

1) Are you a member of any organizations or cooperatives?	Irrigation Group
2) Which organization provides you with technical assistance?	DALDO
3) How frequently do you have technical assistance?	Irrigation technician stationed in the scheme
4) What kind of support do you get from them?	Canal cleaning etc.

- Indigenous Knowledge

Unique knowledge for effective use of limited natural resources, environmental conservation, unique technologies for crop production: No answer

Farm Economics (for typical farm family of 6-10 members)

- Farm Income

(1) 0.8 ha for paddy including the land under scheme
Rainfed Paddy:((0.8 ha x 3 ton/ha x 1,000 kg/ton) – 800 kg for consumption) x 100 Tsh/kg = 160,000 Tsh
(2) 1.6 ha for upland crops
0.8 ha Cotton: (0.8 ha x 1.0 ton/ha x 1,000 kg/ton) x 200 Tsh/kg = 160,000 Tsh
0.8 ha Maize/Cassava:
Maize: ((0.4 ha x 2.2 ton/ha x 1,000 kg/ton) - 440 kg for consumption) x 40 Tsh/kg = 17,600 Tsh
Cassava: ((0.4 ha x 3.0 ton/ha x 1,000 kg/ton) – 500 kg for consumption) x 60 Tsh/kg = 42,000 Tsh

- Production Cost

(1) Paddy (Tsh/ha)	Tillage	37,500
	Weeding	25,000
	Etc.	37,500
		100,000
(2) Cotton (Tsh/ha)	Tillage, Weeding, Insecticide, etc.	125,000
(3) Maize (Tsh/ha)	No inputs with family labour	
(4) Cassava (Tsh/ha)	No inputs with family labour	

- Expenditure

1,000 Tsh/day x 30 days/month x 12 months/year = 360,000 Tsh/year

- Farm economics for typical farm family of 6-10 members

(Unit: 1,000 Tsh.)

	Holding Size (ha)	Harvest Area (ha)	Farm Income	Off Farm Income	Gross Income	Product Cost	Net Income	Living Expense	Net Profit
Inside the scheme									
Rainy season paddy		0.8	160			100			
Sub-total	0.8		160			100	60		
Outside the scheme									
Cotton		0.8	160			125			
Maize		0.4	18			0			
Cassava		0.4	42			0			
Sub-total	1.6		220			125	95		
Total	2.4		380	205	585	225	360	360	0

RRA Report for the

Kisese Irrigation Scheme

27th & 28th January, 2003
Kisese Ward Office, Dodoma

Table of Contents

INTRODUCTION **1**

METHODOLOGY **1**

OBSERVATIONS **2**

SOCIO-ECONOMY **2**

Land Tenure 2

Farmers' Economy & Life Style 2

Cultural Practices 2

Labour Force and Seasonal Demand for Labour 3

AGRICULTURE **3**

Cultivation Area 3

Crop Production 3

Farming Calendar 3

Farmers' Supporting System 4

Land Capability for Irrigation and Crop Suitability 4

Constraints in Crop Production, Input Supply and Marketing 4

FARMERS' ORGANISATION **5**

Institution 5

Activities 5

Organisation Analysis 6

O & M FOR IRRIGATION AND DRAINAGE FACILITIES **7**

Regulation of O & M 7

Situation of O & M for Facilities 7

Conflict over Water 7

Improvement of Irrigation Scheme 7

Possible Future Constraints Based on Past Experience 8

GENDER ISSUES 8

Advantage and Disadvantage to Gender by Development Activity 9

SUPPORT FROM THE GOVERNMENT OF TANZANIA 9

Communication 10

RECOMMENDATIONS 12

Annex 1: Registration 14

Annex 2: Workshop Schedule 17

Annex 3: Workshop Evaluation 17

Annex 4: Mapping 18

Annex 5: Focus Group Discussion on Culture and Customs 18

Annex 6: Focus Group discussion on Women's Issues 19

Annex 7: Farming Calendar 20

Annex 8: Seasonal Calendar 21

Annex 9: Land Use and Agriculture Questionnaire Results 22

INTRODUCTION

The governments of Japan and Tanzania are in the preparatory stages of drawing up the National Irrigation Master Plan (NIMP) of Tanzania. As part of the second study phase, seven irrigation schemes have been selected nationwide to serve as samples of 4 different types of irrigation scheme: traditional, modern, traditional improved and water harvesting. The data collected from these schemes will be used in the preparation of the Master Plan. Rapid Rural Appraisal (RRA) was selected as the most appropriate methodology to collect information about each scheme.

The Kisese Irrigation Scheme is characterised as a water harvesting scheme, using the waters from the river Mlava. It caters to 4 neighbouring villages, Mapinduzi, Kisese Sauna, Madisa and Kisese Dissa, with a total population of 8,851. Kisese is located in Kondoa district, Dodoma region.

METHODOLOGY

In order to collect information, a 2-day RRA workshop was conducted in the 7 villages (refer to Annex 2 for the workshop schedule). The main objective of the RRA was to obtain a clear and broad picture of how the scheme is presently managed, the main constraints in operation, maintenance and organisation of the irrigation group, and the scheme members' ideas and for the improvement of the scheme's operation. More generally, the objectives were to comprehend all the factors that affect agricultural production and the dynamics involved in operation and maintenance of the scheme.

The methodologies administered during the workshop included structured questionnaire, VENN Diagram and various group work exercises. The 5 group work sessions were aimed at collecting data about the life of the farmers throughout the year. They included a Seasonality Calendar (see Annex 8), a Farming Calendar (see Annex 7), Village Mapping (see Annex 4), focus group discussion regarding Women's Issues (see Annex 6) and Cultural practices and Customs (see Annex 5) that pertained to agriculture and irrigation. Participants were divided into groups and given an hour for group work, which was followed by session for presentation and plenary discussion. The structured questionnaire was prepared by Nippon Koei and consisted of 3 parts: Agriculture (see Annex 9 for results), Irrigation and Institution. These questionnaires were administered by a representative of the JICA Study Team, a government official and a facilitator. All questionnaires were supplemented by unstructured questions. The VENN Diagram exercise focused on the relationship between the intended beneficiaries, the farmers and all other stakeholders related to the irrigation scheme up to the level of the district. The aim of this exercise was to determine the flow and intensity of communication between all stakeholders and to pinpoint any current and potential areas of conflict.

OBSERVATIONS

The workshop was held at the Kisese Ward office on the 27th and 28th January. There were 28 participants (of which 7 were women) on the Day 1, and 34 participants (of which 8 were women) on Day 2 (refer to Annex 1 for a registration list). Most of the female participants were elder women and their participation was average. Ward and village leaders included the councillor, the village chairperson of Madissa and the Division Executive Secretary and the Councillor of Special Sets.

During the course of the workshop, it emerged that the participants in attendance were not all members of the irrigation group. Invitees included farmers with land in the Kisese area, not necessarily those that are irrigating their crops. The letter of invitation did not state the purpose of the workshop, merely that there was to be a meeting between the farmers and district leaders. The long distance from Kondoa town to Kisese Dissa village constituted a time constraint on the workshop schedule.

SOCIO-ECONOMY

Land Tenure

The prevalent land tenure system of that of inheritance. However, there is also land available for purchase or rent. On average, one household will own between 4-5 pieces of land totally between 10-20 acres. A village by-law stipulates that the minimum land requirement for one family is 5 acres which are to be subdivided to 2 acres for cash crops, 2 acres for food crops and 1 acre for emergency crops (cassava, sweet potato). There are some land ownership disputes, but these are solved through negotiation between the parties concerned.

Farmers' Economy & Life Style

Kisese farmers are required by law to cultivate a combination of cash crops and food crops. The main cash crops include sunflower and sesame, while the main food crops are maize and pigeon pea. Income from the sale of these crops occurs between June-Oct, after harvest of cereals, sunflower, paddy, sesame, groundnut and pigeon pea. These are also the peak expenditure months as farmers begin a busy planting season and purchase all necessary farm inputs (Oct/Nov). This is also the time when farmers loan each other money. After deducting production costs and living expenses, calculations show that Kisese farmers are able to recoup their investment and make a small profit. However, farmers do experience slight food scarcity just before the harvest begins.

Cultural Practices

The main tribe at Kisese village is the Irangi tribe. The majority of them subscribe to Islam. However, it seems to be a syncretic form of Islam, as their religious beliefs intermingle comfortably with their tribal pre-Islamic practices. There are many cultural practices that are still widely in use in this area, and some of them are directly related to agriculture. The main performers are the elders, both men and women.

Rituals are held before the start of many activities, such as before digging a canal or clearing a field. In latter case, the elders will take the plant stem smeared with and cut while reciting a prayer. After the harvest, a few chosen paddy stems are stored until the rains begin, when they are mixed with a traditional medicine. Other rituals are held with the purpose of appeasing the forces of nature ('kupooza nchi hii'). Therefore a sheep will be sacrificed in order to ask for rain that will water the fields but not destructive rain which causes floods. There is another ritual which takes place at the spring, and which must be carried out by an elder woman. White beads and white soil are offered to the spirits ('mizimu') of the spring, after which an elder man will sacrifice a sheep. The purpose of this ritual is to ask the spirits to allow water to flow into the river, but not with a destructive force.

Labour Force and Seasonal Demand for Labour

Aside from food crops, which are cultivated all year round, all crops are planted in Dec-Mar and harvested between Apr-Jul. Therefore, the peak months of labour are the months between Nov-Jul. Between, Oct-Dec the preparations for planting, and the planting itself, is done by men, women and children. Men are take responsibility of purchasing farm inputs. Children also help out with the harvest during their school holidays in July. Between Jan-Apr, both men and women are very busy with weeding and dealing with crop diseases (prevalent Jan-Mar). This is also the time when most human diseases occur, malaria being the most recurrent illness. Eye infections are rife during October, when farmers are preparing for the next planting season. Extension services are available for short periods of time at the beginning of the planting season in January (cereals, maize, sunflower) and Aug/Sep (pigeon pea, groundnut, paddy, sesame). August and September are the months of rest, with minimum agricultural activity.

AGRICULTURE

Cultivation Area

The farm area available to Kisese Sauna, Mapinduzi, Kisese Dissa and Madisa is 12,000 ha. Of this area, only 150 ha are irrigated (mostly in Mapinduzi, the upstream village). The other 11,850 ha are rain-fed. Of these, there is 2000 ha which are potentially irrigable.

Crop Production

The main crops cultivated, and sold, are maize and pigeon pea and cereals (sorghum, finger millet, pearl millet). Other food crops include cassava and sweet potato. Sunflower and sesame are the main cash crops. Irrigated crops include fruit/vegetables, paddy and mostly sugarcane (105 ha).

Farming Calendar

There is only production per year. The objective of the irrigation scheme is to allow for a dry season cropping, especially for vegetables (onion, tomato), which have a good all-year market. Farmers begin clearing and tilling the farms, and applying fertiliser in September. Planting of ground-nut, sesame, paddy, pigeon pea begins in

December, followed by cereals and sunflower in Jan-Mar. The weeding period, which also includes application of agro-chemicals was cited as the most intensive. Farmers must also protect crops from monkeys as the harvest time approaches (Mar-May). The harvest period (May-Jul) is followed by slightly leisurely months of August and September before the planting season begins.

Farmers' Supporting System

Harvesting is done with traditional tools, such as the hoe and the sickle. Crops are stored in sacks in their homes. A few farmers have constructed a local storage facility. Farmers obtain certified seed for vegetables (onion, tomato) from the on-farm seed production project. Fertiliser and agro-chemicals are available in the neighbouring village. However, these are expensive, and some farmers may travel to Dodoma or Arusha to purchase inputs. None of the farm inputs are subsidised by the government. There is no credit facility, therefore, farmers will loan each other money after the harvest. Crops are sold to middlemen, who use their bargaining power to lower the prices of most cash crops. There is a ward agricultural extension officer stationed in the village who is always available for advice.

Land Capability for Irrigation and Crop Suitability

Kisese farmers have identified 2000 ha of land that are suitable for irrigation.

Constraints in Crop Production, Input Supply and Marketing

The key constraints cited are grouped under the following headings:

Water scarcity, particularly in downstream village such as Kisese Sauna and Madisa. Many farmers have resorted to digging wells, where they can collect water and use it to irrigate their farms manually. If the well is at a distance from the field, donkeys are used to transport the water. Water shortage is caused erratic rainfall (particularly during the short rains) and the high rate of seepage caused by the sandy soil on the river-bed and the canals. This was identified as the main cause of water scarcity. Farmers are keen to develop an irrigation system that will effectively utilise water.

Livestock keepers and irrigators have come into conflict because cattle trample on and damage traditional canals.

All infrastructure has been constructed using locally available materials and indigenous knowledge. The intake, the canals and the dug wells are temporary and easily damaged. At the end of each season, they require rehabilitation. During the rainy season, floods cause soil erosion. Contour band and contour ridge preparation is done by planting grass to more effectively harvest water on slope fields.

Farm inputs (agro-chemicals, herbicide, storage agro-chemicals) are available in the neighbouring village, but expensive. In order to purchase inputs at a better price, farmers must travel to Dodoma or Arusha. Herbicide is used but in little small quantities.

Insect pests (army worm for cereals, stinking grasshopper for cereals, sunflower and root crops, borer for stored grain and stalk borer) attack crops every 3-4 years during the dry season, but with devastating consequences. Querea birds are also a menace to crops (Mar-May). Dogs are used to scare them away. Farmers also dig traps to catch monkeys.

FARMERS' ORGANISATION

Institution

The Kisese Irrigation Group was founded in 1999, when two farmers from Kisese Dissa returned from a training course on vegetable (onion and tomato) seeds in Kondoa. They recruited 13 other farmers, to make total of 15 members (9 male, 6 female). Besides from selling seeds to other farmers, the purpose of the group was to be a self-help group, helping each other by taking turns to work on all their farms, and to improve the irrigation system.

The Kisese Irrigation group was founded in 1999 and has a total of 15 registered members, who are also the founder members. The exact number of participating farmers is unknown. Only one member per household may register the family's land, and all members must be residents of the 4 scheme villages. Tenants are not allowed to join the group. The executive committee is made up of a chairperson, secretary and treasurer (♀). These were elected on 17th December 2002. There 3 sub-committees: planning & finance, monitoring & evaluation and logistics. The irrigation group does not have a constitution, but is the process of drafting one[1]. The group has not established by-laws. However, mini-regulations are in place e.g. if a member misses 3 consecutive meetings, the penalty is 1000/-.

The IG is not registered and functions as an informal organisation. Participants were not able to state the main differences between a cooperative and an association.

Activities

The current leadership was elected in December 2002. The method used was secret ballot. The frequency of elections has not been decided. A schedule for general meetings is being drawn up. To date, no general meetings have taken place, except for emergency meetings. These have a high attendance rate of the founder members, but other informal members do not attend regularly. Other problems include poor participation and mobilisation of farmers. In future, general meetings will take place every 2 months. The sub-committees meet once a month. There is no documentation for any of the meetings. Topics discussed include improved farming methods, planning a timetable for communal canal maintenance, setting procedure for produce marketing and how to increase membership of the group. In 2002, 16 farmers were given training in paddy production. Future training requirements were prioritised into the following list: operation and maintenance, financial management, pest management, leadership, maintenance of canals.

[1] All village groups are currently drafting their constitution.

Group members are required to participate in communal activities, including canal maintenance. The penalty for not participating in planned group activities is 1000/-. Furthermore, the group covers all expenses related to maintenance. For example, in May 2002, every farmer was due to contribute 1000/-. A total of 7000/- was collected. The group treasurer is given all the registration and annual membership fees, which may be paid to any member of the committee. The registration fee has been set at 2000/- and the purchase of at least 1 share (which costs 10,000). This fee has been paid by only 1 member. The annual membership fee has been set at 1000/-, and is due to be collected in December 2003. At the moment, the group treasurer has 2000/- in hand. There are plans to open a bank account at the National Microfinance Bank branch at Kondoa. So far, no book-keeping activities are being done, there is no budget and no reports.

Organisation Analysis

Kisese farmers have past experience in communal work, in the construction of public buildings: school, health centre, and government office. This indicates there is good potential for farmers' communal participation in the construction of irrigation infrastructure. Furthermore, there are many small groups in village (not registered) of beekeepers, seed production, cattle (milk), gravel, goats (milk), and tree planting. These groups have collaborated to form a Ward Bank (2003). Each group has contributed towards opening a bank account in Kondoa, which will serve as the Ward Bank. Individuals from the groups will be able to apply for credit. The Ward Bank has its own committee, which are in charge of handling credit applications and banking money collected. Applications for loans are done through the individual's group. The idea of opening the Ward bank account is the good on if at all the community could be serious and develop an effective management system. This would increase credit accessibility to farmers so that can improve their capital base for farming. However this needs a lot of effort and commitment. If no precautions are taken it might lead to communal conflict.

Like other irrigation scheme visited Kisese has a weak leadership. The meetings are seldom conducted and meetings are not documented. Fees are not collected and a bank account is not in place. The group is not registered and consequently has no direction or vision for the future. The group leaders do not execute by-laws and penalties set by the group although the defaulters are known. For example the group set a fine of 1000/- for anybody who does not participate in communal work. To-date no body has ever paid this amount due to lack of follow-up. This is happening because the group leaders are not fulfilling their responsibilities.These factors, in one way or the other negatively affect the operations and management of the group.

The participants could not yet on what the registration fee was and different sources stated either 5000/- or 2000/-. None of the members have fulfilled the conditions for membership registration (purchase of at least one share worth 10,000/-). Since on money is collected therefore nothing to be banked. The group has no budget. One doubts whether the group is serious on the ideal of joining the ward bank to be opened in the near future. This seems to be a dream as the situation is now only one person has paid 2000Tshs to the group finance. Not the group chairperson and other leaders

have paid their fees, and as such are not setting a good example to be followed by their fellow members.

O & M FOR IRRIGATION AND DRAINAGE FACILITIES

Regulation of O & M

There is one main intake located upstream of river Mlava. It has been constructed using locally available materials (woven baskets filled with rocks). This intake is built in the same place every year after it is washed away during the floods. Downstream of the intake (in Mapinduzi village), several gates ('mchepuko' **tuyu: are these gates or headworks? confused**) have been constructed with the assistance of irrigation experts in order to divert water to the fields. All the canals leading from the gates were initially excavated by the farmers. Each gate serves between 10-15 farmers. Irrigation takes place in a rotation system since 1998, when the district irrigation officer arranged water management training for the farmers. When the volume of water is reduced during the dry season, the water distribution rule is revised.

Situation of O & M for Facilities

All irrigation infrastructure (intake, canals, headworks and dug wells) have all been built using traditional methods and local materials, and are temporary. The intake is built using woven baskets filled with rocks. It is washed away with the floods and needs to be rebuilt every year in June/July in the dry season and before the rainy season. The main problems of water-harvesting are the high loss of water through seepage. Participants claimed that there are large quantities of water at the source. However, as the water flows downstream, a lot of water is lost through seepage into the river-bed. This problem also occurs once water has been diverted into the temporary canals. This situation prompted the farmers to request assistance with the construction of a reservoir near the water source, and canals in order to direct water to the fields efficiently.

Conflict over Water

There are 2 types of conflict related to irrigation at Kisese. Farmers and livestock keepers have are in conflict over land use. Livestock keepes graze their animals near the farms, which results in damage to the traditional canals. There is conflict over water between farmers. This occurs particularly during the dry season (Jul-Nov), when the villages downstream of Mlava river (Kisese Sauna, Kisese Kissa and Madisa) do not receive enough water to satisfy demand. Some illicit tapping (and destruction of canals) has occurred, particularly at night. To date, all problem have been mediated by the village government and Ward Secretary, and distribution rules have been set.

Improvement of Irrigation Scheme

Farmers have identified measures necessary to mitigate the high level of water loss through seepage and damage to canals by water and livestock to be the construction of permanent canals and the construction of a reservoir, which will harvest and store spring and river water that will be used during the dry season. Farmers have appealed

to the District Council, the local MP (Ali Suru) and other leaders for expert and financial assistance in this matter.

To date, all attempts to improve the irrigation system/infrastructure have been the product of personal efforts or the work of small groups of farmers. However, the financial and expert requirements of building a reservoir and permanent canals, is beyond the mean of the farmers of Kisese. The irrigation group is requesting government support to provide technical expertise for the construction of the reservoir, and financial aid in order to purchase cement, a stone crusher, and to rent lorries for the transportation of building materials such as stones, pipes, gates etc. Farmers contribution to the construction work will consist of their labour in the excavation of canals, construction work as required and the collection of locally available building materials such as stones and sand.

Possible Future Constraints Based on Past Experience

Financial requirements for membership is not clear. The group secretary said it is 2000/- while the Chairperson said it is 5000Tshs. This contradictory information itself is evidence of the group's district-organisation and lack of internal communication/agreement. However, capacity building will probably remedy this because farmers willingness and ability to work together has been demonstrated in the large number of informal organisations (each with chairperson and secretary) in the village and the past history of communal work in the construction of the school, health centre and government office. With the proper mobilisation, farmers will participate in the construction of irrigation infrastructure.

There is obviously not enough water to irrigate the land available for cultivation. This is bound to result in conflict in future, particularly with irregular rainfall patterns of the last decade. Conflict management training is crucial. All border disputes should be resolved before as soon as possible.

GENDER ISSUES

The division of labour in Kisese follows the traditional form. Men are the head of the household, the main decision-makers and money managers. Women are above all wives and mothers. Their domain is that of the domestic work and rearing of children. Participants noted that although women have an equal participation in farm-work and canal maintenance, the domestic work required of them each day is heavy and all income is kept by the men.

There are 6 women who are founder members of the irrigation group. Of these, 4 are married and other 2 are single. In Irangi culture, most women do not own land, and if they do it is registered with the scheme under their husband's name. A few women inherit small portions of land. Divorced women will either purchase or rent land, but are more likely to rent land and be confronted with the problems typical to renting land[2].

[2] No profit or returns on investment in a year with erratic rainfall; insecurity of tenure; double-renting (when a landowner rents the same plot of land to 2 people).

Within the scheme, women position may appear as that of an almost-equal partner: women attend meetings and in theory may be elected as leaders and attend training workshops. Although, women attend group meetings, based on their participation in the RRA workshop it is doubtful that their participation is very active. A (male) participant claimed that it was because of women's lack of confidence that they did not participate more fully in meetings and training workshops. Furthermore, there are no female leaders. The reason cited for this was the heavy domestic workload, which does not allow women the time to become deeply involved in other activities. In the focus group discussion, it was revealed that some husbands do not allow their wives to stand for leadership positions. Although women are given the opportunity to attend training courses, only 1 woman was able to attend a course last year. The crux of the problem for female participation, leadership and opportunity for training lies in the time-consuming domestic workload that women have at present.

Advantage and Disadvantage to Gender by Development Activity

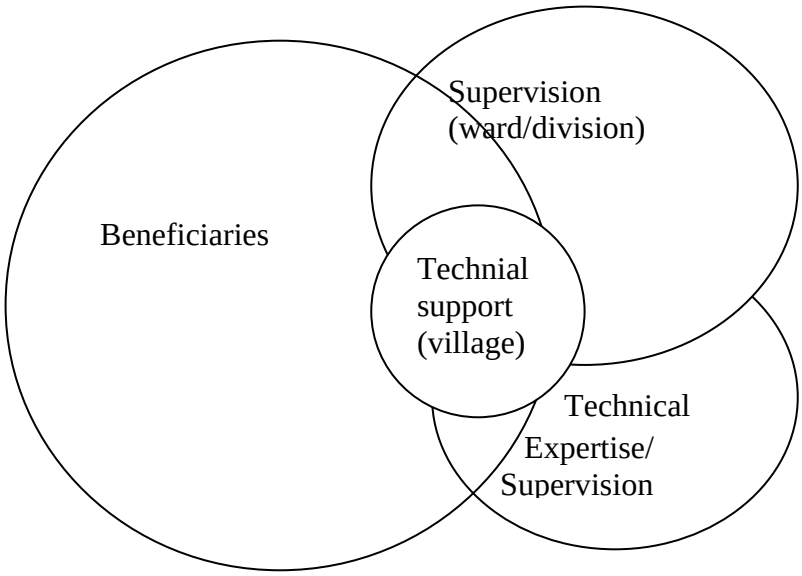
When the farmers are able to produce a higher yield in their farms, there is a danger that men will re-direct women's labour from cultivating the food crops that feed the family, towards working in fields where cash crops are grown. This increased labour time on the farm does not diminish women's responsibility to 'women's work' i.e. the domestic workload. Judging from the current state of affairs, this will only serve to increase the income to men. The large domestic workload is also a barrier to women's ability to attend training courses.

SUPPORT FROM THE GOVERNMENT OF TANZANIA

The VENN Diagram methodology was used to determine the importance of each of the actors in the farmers' supporting system (persons or institutions), the intensity and type of interaction with the farmers as well as a rough assessment of the communication between them and the irrigation group. Participants identified key persons or institutions up to the district level whose action/inaction may impact on agricultural activities in Kisese. These were grouped under five main headings based on the nature of their relationship with the irrigation group.

Beneficiaries:	Farmers, Village leaders
Technical support (ward/village):	Agricultural Extension Officer
Supervision (ward/division):	Ward Executive Officer, Village/Ward leaders, Division Secretary, Councillor, Ward Natural Resources Officer
Technical expertise (district):	District Agricultural Officer, District Irrigation Officer, District Natural Resources Officer
Supervision/Authority:	District Commissioner, District Director, MP (Ali Suru), Councillor

The figure below indicates the level of interaction between the farmers and the persons/institutions in their support system, at different levels of government hierarchy. The technical support staff at village level, in this case the ward agricultural extension officer, is the most crucial individual to the agricultural/irrigation activities in Kisese. In a role of supervision are the village government, Ward Executive Officer, Councillor and Division Secretary. They interact with both the farmers and the agricultural extension officer, mostly in the role of mediator. There is some direct communication between the farmers and the technical support at district level, as the district agricultural, irrigation and natural resources officers provide support and advice to the farmers. However, a lot of the communication is channelled through their representative at the village level, the agricultural extension officer. Several actors are the level of authority/supervision (district) also communicate directly with the farmers or through the village government.



Communication

The Ward agricultural extension officer was identified as the important actor in the VENN Diagram exercise. He is resident in the village of Kisese Dissa, and is the first point of contact for farmers who require advice (e.g. how to obtain certified seed) or seeking a solution to an agricultural problem (e.g. crop diseases) that the group has not been able to solve internally. Within the group, the committee members are responsible for initiating contact with the agricultural extension officer. However, the agricultural extension officer visits the group leaders approximately twice a week. If there is an emergency, the group may contact him directly at his office or the field (if the problem requires a field visit). And if the problem is beyond his capacity/expertise e.g. pests, the agricultural extension officer will contact the district agricultural officer. The agricultural extension officer's communication with the district office usually involves the village government. Participants expressed their satisfaction with the agricultural extension officer and lauded his efforts in facilitating training opportunities for the farmers.

The ward and village leadership are closely involved with the group and the agricultural extension officer. The village government will liase with the agricultural extension officer regarding preparations for the planting season e.g. purchase of certified seed, as well as mobilising and ensuring that all farmers are cultivating[3]. Together with the Ward executive officer and Councillor, the village government is in charge of mediating village conflicts including those that concern water distribution. The Division Secretary communicates very frequently with the irrigation group. Participants seemed very satisfied with their relationship with all the actors in the Supervision group. The Ward Natural Resources officer is resident in the village and serves as a communication link with the district.

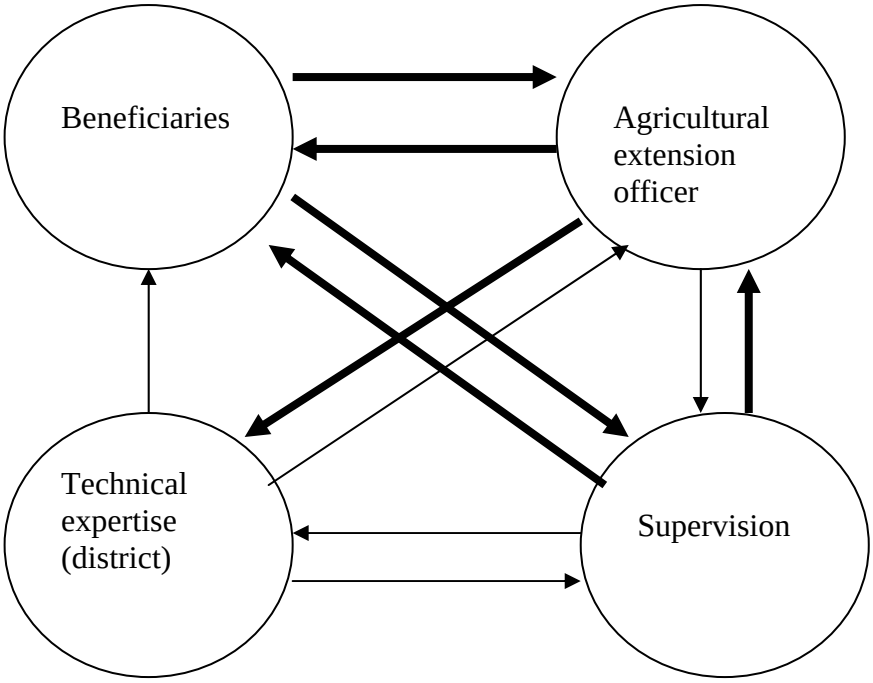
The District Irrigation officer gives advice regarding irrigation practices and farming during his frequent visits to the village. The District Irrigation officer is credited as the person responsible for following up on the village's proposal for the construction of a reservoir, by searching for funds/expertise necessary for its construction. In general, farmers have a good relationship with the district, as all decisions are made in consultation with farmers and all inquiries/problems are followed up.

The participants were less impressed with their relationship with the district agricultural officer. Although he is responsive to requests for insecticide or expertise, his response is not always prompt or sufficient. During the latest pest (stinking grasshopper, army worm) infestation on 8th January 2003, the district agricultural officer sent only 1 litre of insecticide to each village. There has been no response to the farmers complaint about the ineffectiveness of the storage agro-chemicals for maize. Participants suggested that the councillor relay complaints to the district and act as mediator between the farmers and the district.

The District Commissioner visits the village and talks directly to the farmers about their problems. He visited twice in 2002, and has already paid one visit to the village in January 2003. The Member of Parliament (Ali Suru) also visited the village in 2003. In 2002, he visited on 3 occasions. By contrast, the District Director never meets with the farmers, meeting instead with the Village Executive Officer and the Ward Executive officer.

The figure below summarises in visual form the frequency and flow of communication within the farmers' support system.

[3] The village government will seize the livestock of farmers who refuse to cultivate their farms. The village government is implementing a campaign to prevent loitering of youth in the village.



RECOMMENDATIONS

The group is in an infant stage. There are a lot of things to learn for improvement of the organisation. Participants expressed their inexperience on how to go about it. One of the proposals to improve the situation is to increase the capacity of the group members by providing them several training on issues such as: strategies on how to collect money from group members, bookkeeping, accounts (financial management), management of the group activities, general leadership for group leaders, maintenance of canals and pest management. Weak leadership can only dealt with if capacity building on both levels (leaders and farmers) is conducted. This will strengthen both the capacity of leaders to manage the group and the capacity of farmers to hold their leaders accountable

The sustainability of the scheme is at danger as the farmers irrigation group is not yet mature/organised enough to run the irrigation system. The district staff, particularly the Irrigation Department, have deliberately to put some extra effort to help the group and it has potential for development. The areas that need immediate attention include the registration of the group, opening of the bank account and collection of fees from the member. To solve some of the problems faced by farmers, it is important for the group to draft its own constitution. The constitution will help the farmers to have a vision of the group and to create proper by-laws to protect the scheme's infrastructure. The group should open a bank account to avoid keeping money with individuals. This can only be done when some enough shillings have been collected to open one. Most banks require a minimum deposit of 10,000/- to open an account.

During the workshop the participants showed high expectation and dependence on Government assistance. The farmers should be encouraged to take a lead and help themselves, particularly in contributing towards the expenses of the scheme's construction. The government policy is that the communities have to develop and run the facilities with little support from the government. The policy should be followed. And government staff should play merely a supporting role from the beginning of the project.

Land use planning should be executed to allocate a specific area for livestock grazing. This will minimize the existing conflict between farmers and livestock keepers.

The participants would like to see more support from the District agricultural Officer. It is therefore recommended that the deliberate effort is needed to improve the relationship. The same situation also applies to the District Director whom the workshop participants claimed that never meet with the farmers instead he meets the Village Executive officer and the ward Executive officer. Training for Zonal/District officers on participatory approaches to deal with community problem is also necessary.

Annex 1: Registration

Observers

	Name	Position	Office
1	P. M. Gukurra	Ag. Zonal Irrigation Engineer	Box 1053, Tabora
2	Ally H. Simba	Sen. Irr. Eng.	Box 9192, DSM
3	R. R. Komanga	Sociologist	Box 9192, DSM
4	S. G. Ngoti	Crop Officer	Box 200, Kondoa
5	D. S. Jiday	Irrigation Tech	Box 200, Kondoa
6	H. Ohnuma	Study Team Member	JICA
7	M. Osada	Study Team Member	JICA
8	T. Igawa	Study Team Member	JICA
9	S. Matsushima	Study Team Member	JICA

Participants- Day 1

	Name	Occupation	Irrigation Group
1	Habiba Isere	Farmer	
2	Kudura Mhumba	Farmer	
3	Chanoiku Kusa	Farmer	
4	Mwanahamisi Athumani	Farmer	
5	Hamisi Issaka	Farmer	
6	Mwajuma Bella	Farmer	
7	Iddi Ayisa	Farmer	
8	Shabani Bura	Farmer	
9	Iddi Mwenga	Farmer	
10	Hasani Nyeya	Farmer	
11	Rajabu Juma	Farmer	
12	Hamadi Mtena	Farmer	
13	Ramadhan Kaniki	Farmer	
14	Salum Mtimbayagi	Farmer	
15	Bakari Ikute	Farmer	
16	Hamisi Issa Mkundele	Farmer	
17	Isa Omari Ikoi	Farmer	
18	Omari Hassani Mkwakwate	Farmer	
19	Kasim Kingonyu	Farmer	
20	Mohamedi Seha	Farmer	
21	Shabani Auto	Farmer	
22	Abdala Iyombe	Farmer	
23	Hamisi Mkove	Farmer	

24	Abdala Kilili	Farmer
25	Rajabu Osi	Farmer
26	Hamisi Mwenda	Farmer
27	Omari Issaka	Farmer
28	Fataalli Sahm	Farmer

Participants- Day 2

	Name	Occupation	Irrigation Group
1	Athumani Mumbiri	Farmer	
2	Kasim Shary	Farmer	
3	Hassan Nyenga	Farmer	
4	Hamedi Mtena	Farmer	
5	Chausiku Kusa	Farmer	
6	Ally Marusu	Farmer	
7	Mwanahamisi Athumani	Farmer	
8	Mwanahamisi Faume	Farmer	
9	Selemani Lika	Farmer	
10	Yusuf Saidi Nkumbi	Farmer	
11	Fataa Ally Salim	Farmer	
12	Omari Isaka	Farmer	
13	Hadija Abuu Hasani	Farmer	
14	Maulidi Nkundelo	Farmer	
15	Hamisi Ramadhani Mwenda	Farmer	
16	Omari Hassan Mkwakwate	Farmer	
17	Mwenda Selemani Kidunda	Farmer	
18	Ali Iwair	Farmer	
19	Iddi Ioyu	Farmer	
20	Mohamedi Athumani Saya	Farmer	
21	Kudura Kumbu	Farmer	
22	Habiba Issere	Farmer	
23	Isa Ikoi	Farmer	
24	Abdilah Mohamedi Milondo	Farmer	
25	Shabani Salimu Anto	Farmer	
26	Hamisi Issaka	Farmer	
27	Rajabu Selemani	Farmer	
28	Juma Rashidi	Farmer	
29	Athumani Lwado	Farmer	
30	Yusufu Bura	Farmer	
31	Musa Tutu	Farmer	

32	Swalehe Hida	Farmer
33	Asha Bura	Farmer
34	Asha Kaita	Farmer

Annex 2: Workshop Schedule

Day 1

Registration of participants
Begin workshop Introduction
Group work (5)
Presentation of group work
Lunch
Group work (3): Institution, Agriculture, Irrigation

Day 2

Continuation of Group work
VENN Diagram & Discussion
Presentation of group work: Institution, Agriculture, Irrigation
Workshop Evaluation
Closing
Lunch

Annex 3: Workshop Evaluation

☺ good time-keeping: facilitiators and participants
☺ good and high participation during the workshop
☺ workshop means that farmers have not been forgotten
☺ meeting representatives of Japan
☺ to broaden our horizon and kuondoa maneno machafu machafu
☺ the opportunity to express our problems to experts
☺ to have been selected for the project, so that our income increases

☹ if we had not been chosen for the irrigation project
☹ if we don't get techn ical advice from experts to assist us
☹ no allowances for workshop participants on Day 1

Annex 4: Mapping

Ramani ya rasilimali za mradi wa
umwagiliaji ionyeshe taarifa zifuatazo:

mipaka ya kijiji
kilimo cha umwagiliaji kinafanyika wapi?
Maji ya umwagiliaji ni yapi na yamegawanywa kivipi?
mifereji ya umwagiliaji
vitaro vya mashamba na mmilikaji (kikundi au mtu binafsi)
eneo la kilimo cha mvua
eneo la umwagiliaji
banio
mifereji ya umwagiliaji
mlango, vifaa na miundo-mbinu vya umwagiliaji
eneo lote kulimika
na mengineo yanayohusiana na kilimo cha umwagiliaji

Annex 5: Focus Group Discussion on Culture and Customs

Shughuli za kimila na utamaduni kuhusiana na kilimo cha umwagiliaji

Taja mila, desturi na utamaduni zote zinazohusiana na kilimo cha umwagiliaji:
wakati wa kusafisha mashamba
wakati wa kupanda
wakati wa kuvuna mazao
zinazohusika na kuhifadhi mazao

Elezea mila na desturi hizi sinavyoweza kusaidia au kuathiri shughuli za kilimo.

Taja njia zinazoweza kupunguza athari mlioelezea na kuboresha zile zinazosaidia kilimo (haswa cha umwagiliaji).

Je, kuna miiko au vikawazo vinavyohusiana na umwagiliaji kwa kutumia maji katika mila zenu?

Kama zipo, mnafanyaje ili kuepuka na majanga yanayoweza kutokana na mila hizo? Mnazidhibiti vipi?

Katika umwagiliaji, kuna mila na desturi yoyote zinazoathiri jinsia ya wanaume au ya wanawake?

Annex 6: Focus Group discussion on Women's Issues

Ushirikishwaji wa Wanawake Katika Kilimo cha Umwagiliaji

Je, mgao wa shughuli za kilimo kati ya wanaume na wanawake (ngazi ya kaya) unalingana?
Kama haulingani, umnafikiria mnaathirika vipi na mfumo huo? Tunaweza kuuboresha vipi?

Mnashirikishwaje katika
ujenzi na ukarabati wa miundo-mbinu ya mradi (shughuli zipi?)
uendeshaji na matunzo wa mradi (shughuli zipi?)

Kama hamshirikishwi katika kazi za ujenzi/ukarabati, ni shughuli gani nyingine mnazozifanya mbali ya zile za ujenzi/ukarabati? Km. kupiga chakula.

Kuna kazi ambazo hamruhusiwi kushiriki au kuzifanya?

Kuna adhabu zozote kuwaadhibu wasioshiriki kwenye kazi za ukarabati, matunzo na uendeshaji wa kilimo cha umwagiliaji? Je, wanawake mnalipa faini hizo?

Je, wanawake mnapewa nafasi sawa na wanaume kwenye masuala ya mafunzo ya kilimo cha umwagiliaji? Kama mmepewa, ni mafunzo yapi na wanawake wangapi walioshiriki katika mafunzo hayo?

Je, wanawake mnamiliki ardhi?
Kama ndiyo, wanawake wangapi wanamiliki ardhi katika skimu hii?

Je, katika skimu hii, mwanamke aliyeolewa anamiliki ardhi chini ya kivuli cha mumewe au yeye mwenyewe?

Wanawake walioachika, wanapataje ardhi ya kulima?

Mashamba yakiwa ya mtu na mke wake, je, mnashirikishwa katika mikutano ya vikundi vya umwagiliaji?
Kama mnashiriki, mnachaguliwa kama viongozi?
Kama mnachaguliwa, wanawake wanashika nafasi zipi na ni wangapi?

Annex 7: Farming Calendar

Activity	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Purchase of farm inputs																					✓			
Clearing farms																	✓	✓	✓	✓	✓	✓	✓	✓
Tilling																			✓	✓	✓	✓	✓	✓
Nursery																	✓		✓	✓	✓	✓	✓	✓
Transplanting	✓	✓	✓	✓	✓	✓																		
Weeding	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓														
Application of fertilisers																	✓	✓	✓	✓	✓	✓	✓	✓
Application of agro-chemicals			✓		✓	✓	✓	✓																
Irrigation											✓	✓	✓	✓	✓	✓								
Protect crops from destructive animals					✓	✓	✓	✓	✓	✓														
Harvest crops													✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Post harvest																		✓		✓		✓		✓
Storage																		✓	✓	✓	✓	✓	✓	✓
Selling crops																		✓	✓	✓	✓	✓	✓	✓

Annex 8: Seasonal Calendar

Variables	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Credit												
Farm inputs												
Availability of extension services												
Employment women												
Employment men												
Employment children												
Rainfall												
Diseases human												
Crop pests												
Crop diseases												
Adequate irrigation water												
Income												
Expenditure												
Food scarcity												

Annex 9: Land Use and Agriculture Questionnaire Results

- Land Use in the Target Area (4 villages of Sauna, Dissa, Mapinduzi, Madisa)

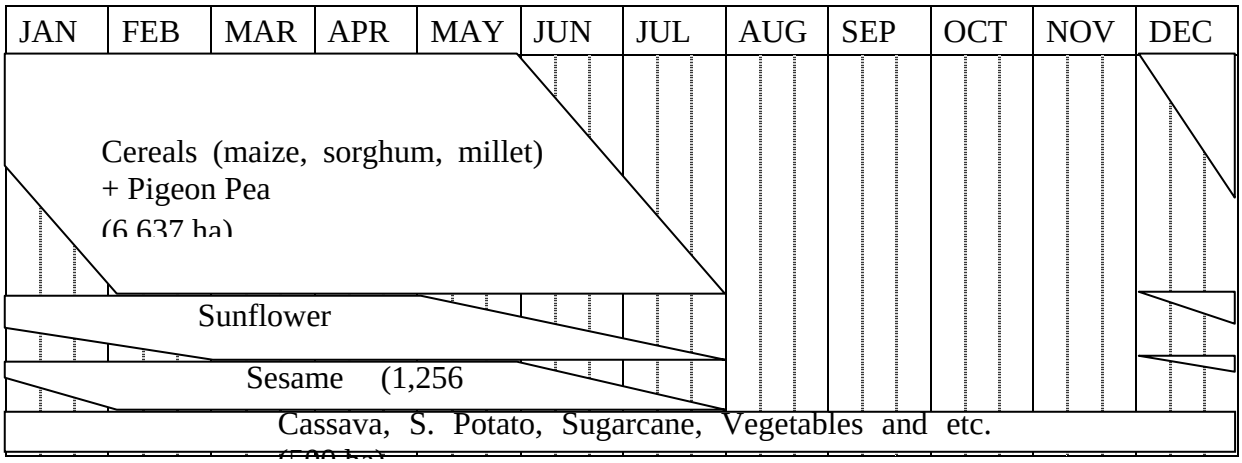
Item	(Area in ha)
Total Number of Household	1.585 H/H with the population of 8,851
Total Farm Land	12,000 + fallow
Total Cultivated Area and Fluctuation	12,000
Rainfed Area	11,850
Irrigated Area	150
Potentially Irrigable Area	2,000

- Crop Production

Major crops cultivated	Rainfed		Irrigated (rainy season)		Irrigated (dry season)	
	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)
(1) Maize	4,511	2.0~2.5				
(2) Sorghum	1,083	1.8~2.5				
(3) Pearl Millet	645	1.2				
(4) Finger Millet	398	1.8				
(5) Sunflower	1,315	1.4				
(6) Sesame	1,256	0.7				
(7) Pigeon Pea	2,255	1.2				
(8) Groundnut	52	1.4				
(9) Cassava	229	-				
(10) Sweet Potato	160	-				
(11) Fruit/Vegetables			38	-		
(12) Paddy			7	3.5		
(13) Sugarcane			105	-		

- Farming Calendar and Cropping Pattern

Upland Crops				
1. Maize, Sorghum, Millet	from	Dec/Jan	to	Jun/Jul
2. Sunflower	from	Dec/Feb	to	Mar/Jul
3. Sesame	from	Dec	to	Jun/Jul
4. Pigeon Pea (mixed with Maize)	from	Dec	to	Aug
5. Groundnut	from	Dec/Jan	to	Apr/May
6. Paddy	from	Dec	to	Jun
7. Cassava, S. Potato, Sugarcane	from	Anytime	to	Anytime
8.	from		to	



- Land Ownership Situation and Problems

Most farmers own their lands individually through inheritance and one household usually owns 4-5 pieces of land with the total area of 10 – 20 acres. There are some disputes on land ownership due to unclear boundaries and usually solved through discussion among villagers. There is a by-law stipulated that the minimum land requirement for one family is 5 acre; 2 acre for food crops, 2 acre for cash crops and 1 acre for emergency crops such as cassava and sweet potato.

- Farm Size Distribution (No data)

- Major Constraints in Crop Production, Input Supply and Marketing

Problems/Difficulties	Notes
Insect pests	Army worm for cereals, Stinking grass hopper for cereals and root crops, Stalk borer, Borer for stored grain
Bird and animal pests	Querea, Monkeys
Unavailability of inputs	Spare parts for animal driven tools, seeds and fertilizer
Erratic rainfall and soil erosion by flood	Contour bands and contour ridges are constructed
Depending on unreliable rain water	Farmers are keen to introduce irrigation system for the effective utilization of rain water

- Major Significance for the Introduction of Irrigation System

Irrigation is needed to increase the production through dry season cropping specially vegetables such as onion and tomato because of high marketability

Farmers Supporting System

- Post Harvest

Crop	Harvest Method	Storage Method	Storage Facility
All	By hand	Bags in room	Some farmer construct
			local storage

- Marketing and Prices

Crop	Market Channels	Farm Gate Price (low/high) in Tsh/kg	Season (low/high)
Maize	Middleman	60/70/100	Jun-Jul/Jan/Feb
Sorghum	Middleman	70	-
F. Millet	Middleman	100/200	Jun-Jul/Dec-Jan
Sunflower	Middleman	140/170	May-Jul/Oct-Dec
Sesame	Middleman	270/330	Jun-Jul/Jan-Feb
Pigeon Pea	Middleman	200	-
Paddy	Middleman	170	-

- Input Supply

Kind of Input	Obtained from where	Purchasing Method	Availability and Source of Loan	Availability of Subsidy
Certified Seed	Vegetable (onion, tomato) seeds from on-farm seed production project			
Fertilizer	Shops in neighbor village but expensive	Cash	No loan	No subsidy
Chemical				
Machinery				
Others ( )				

- Extension Service

1) Are you a member of any organizations or cooperatives?	-
2) Which organization provides you with technical assistance?	Extension agent is stationing in the village
3) How frequently do you have technical assistance?	Available at anytime
4) What kind of support do you get from them?	Various technical advice on crop and livestock

- Indigenous Knowledge

Unique knowledge for effective use of limited natural resources, environmental conservation, unique technologies for crop production: Contour band and contour ridge preparation with grass planting for effective water harvesting in slope field.

Farm Economics (for typical farm family of 6 members)

- Farm Income

(1) 1.6 ha for Food Crop: Mixed culture of maize and pigeon pea
Maize:((1.6 ha x 2.0 ton/ha x 1,000 kg/ton) – 1,500 kg for consumption) x 70 Tsh/kg = 119,000 Tsh
Pigeon pea: (1.6 ha x 1.2 ton/ha x 1,000 kg/ton) x 200 Tsh/kg = 384,000 Tsh
(2) 1.6 ha for Cash Crops
0.8 ha Sunflower: (0.8 ha x 1.4 ton/ha x 1,000 kg/ton) x 150 Tsh/kg = 168,000 Tsh
0.8 ha Sesame: (0.8 ha x 0.7 ton/ha x 1,000 kg/ton) x 300 Tsh/kg = 168,000 Tsh
(3) 0.8 ha of Emergency Crops
0.8 ha of mixed culture of cassava, sweet potato etc. for self-consumption without cash income

- Production Cost

(1) Maize/Pigeon pea (Tsh/ha)	Field preparation	7,500
	Ox plowing	15,000
	Sowing	10,000
	Weeding	15,000
	2nd weeding + earthing up	10,000
	Pesticides	5,000
	Scarring animals	18,000
	Harvesting	7,500
	Transportation from field to home	15,000
	Processing (threshing and bagging)	18,000
	Total	121,000
(2) Sunflower (Tsh/ha)	Field preparation	7,500
	Plowing	15,000
	Sowing	10,000
	Weeding	15,000
	Harvesting/Threshing	7,500
	Transportation from field to home	6,000
	Bagging	7,000
	Total	68,000

(3) Sesame (Tsh/ha)	Field preparation	7,500
	Plowing	15,000
	Sowing	10,000
	Weeding	15,000
	Pesticides	5,000
	Harvesting	30,000
	Threshing	5,000
	Transportation from field to home	6,000
	Bagging	7,000
	Total	100,500

- Expenditure

1,200 Tsh/day x 30 days/month x 12 months/year = 432,000 Tsh/year

- Farm economics for typical farm family of 6 members

(Unit: 1,000 Tsh.)

	Holding Size (ha)	Harvest Area (ha)	Farm Income	Off Farm Income	Gross Income	Product Cost	Net Income	Living Expense	Net Profit
Food Crops									
Maize			119						
Pigeon Pea			384						
Sub-total		1.6	503			194	309		
Cash Crops									
Sunflower		0.8	168			54			
Sesame		0.8	168			80			
Sub-total		1.6	336			134	202		
Emergency Crops									
Cassava etc.									
Sub-total		0.8	0						
Total	4.0+α	4.0	839		839	328	511	432	79

RRA Report for the

Mgongola Irrigation Scheme

30th & 31st January, 2003
Mkindo Farming Training Centre, Morogoro

Table of Contents

INTRODUCTION ..... E-4 - 1

METHODOLOGY ..... E-4 - 1

OBSERVATIONS & PROBLEMS ..... E-4 - 2

SOCIO-ECONOMY ..... E-4 - 2

Land Tenure ..... E-4 - 2

Farmers' Economy & Life Style ..... E-4 - 2

Cultural Practices ..... E-4 - 2

Labour Force and Seasonal Demand for Labour ..... E-4 - 3

AGRICULTURE ..... E-4 - 3

Cultivation Area ..... E-4 - 3

Crop Production ..... E-4 - 3

Farming Calendar ..... E-4 - 4

Farmers' Supporting System ..... E-4 - 4

Land Capability for Irrigation and Crop Suitability ..... E-4 - 4

Constraints in Crop Production, Input Supply and Marketing ..... E-4 - 4

FARMERS' ORGANISATION ..... E-4 - 5

General Information ..... E-4 - 5

Institution ..... E-4 - 5

Activities ..... E-4 - 6

Organisation Analysis ..... E-4 - 8

OPERATION AND MAINTENANCE (O & M) FOR IRRIGATION AND DRAINAGE FACILITIES ..... E-4 - 8

Regulation of O & M ..... E-4 - 8

Situation of O & M for Facilities ..... E-4 - 9

Conflict over Water ..... E-4 - 9

Improvements to the Irrigation Scheme ..... E-4 - 9

Possible Future Constraints Based on Past Experience ..... E-4 - 10

GENDER ISSUES ..... E-4 - 10

Advantage and Disadvantage to Gender by Development Activity ..... E-4 - 11

SUPPORT FROM THE GOVERNMENT OF TANZANIA ..... E-4 - 11

Communication ..... E-4 - 13

RECOMMENDATIONS ..... E-4 - 14

Annex 1: Registration ..... E-4 - 16

Annex 2: Workshop Schedule ..... E-4 - 18

Annex 3: Workshop Evaluation ..... E-4 - 18

Annex 4: Mapping ..... E-4 - 19

Annex 5: Focus Group Discussion on Culture and Customs ..... E-4 - 19

Annex 6: Focus Group discussion on Women's Issues ..... E-4 - 20

Annex 7: Farming Calendar ..... E-4 - 21

Annex 8: Seasonal Calendar ..... E-4 - 22

Annex 9: Land Use and Agriculture Questionnaire Results ..... E-4 - 23

INTRODUCTION

The governments of Japan and Tanzania are in the preparatory stages of drawing up the National Irrigation Master Plan (NIMP) of Tanzania. As part of the second study phase, seven irrigation schemes have been selected nationwide to serve as samples of 4 different types of irrigation scheme: traditional, modern, traditional improved and water harvesting. The data collected from these schemes will be used in the preparation of the Master Plan. Rapid Rural Appraisal (RRA) was selected as the most appropriate methodology to collect information about each scheme.

The Mgongola Irrigation Scheme is named after the Mgongola river, which irrigates the plots of phase 1 and phase 2 at Mkindo village. However, beneficiary villages of this scheme are from Mkindo, Hembeti and Dihombo village (with a total population of 10,108). The Mgongola scheme is located approximately 60 km from Morogoro town, and is characterised as modern scheme. It was constructed with the assistance of the Food and Agriculture Organisation in 2 phases, in 1982 and 1989.

METHODOLOGY

In order to collect information, a 2-day RRA workshop was conducted in the 7 villages (refer to Annex 2 for the workshop schedule). The main objective of the RRA was to obtain a clear and broad picture of how the scheme is presently managed, the main constraints in operation, maintenance and organisation of the irrigation group, and the scheme members' ideas and for the improvement of the scheme's operation. More generally, the objectives were to comprehend all the factors that affect agricultural production and the dynamics involved in operation and maintenance of the scheme.

The methodologies administered during the workshop included structured questionnaire, VENN Diagram and various group work exercises. The 5 group work sessions were aimed at collecting data about the life of the farmers throughout the year. They included a Seasonality Calendar (see Annex 8), a Farming Calendar (see Annex 7), Village Mapping (see Annex 4), focus group discussion regarding Women's Issues (see Annex 6) and Cultural practices and Customs (see Annex 5) that pertained to agriculture and irrigation. Participants were divided into groups and given an hour for group work, which was followed by session for presentation and plenary discussion. The structured questionnaire was prepared by Nippon Koei and consisted of 3 parts: Agriculture (see Anenx 9 for results), Irrigation and Institution. These questionnaires were administered by a representative of the JICA Study Team, a government official and a facilitator. All questionnaires were supplemented by unstructured questions. The VENN Diagram exercise focused on the relationship between the intended beneficiaries, the farmers and all other stakeholders related to the irrigation scheme up to the level of the district. The aim of this exercise was to determine the flow and intensity of communication between all stakeholders and to pinpoint any current and potential areas of conflict.

OBSERVATIONS & PROBLEMS

The workshop for the Mgongola irrigation group was held at the Mkindo Agricultural Institute on the 30th & 31st of January. In attendance were 36 participants (of which 10 were women). The chairperson of the irrigation group, together with the chairpersons of the 4 sub-committees were present. Other main actors included the village chairperson, Village Executive Officer and the agricultural extension officer.

Among the workshop rules established was the importance of being open and transparent and respecting others' opinion. These were followed throughout the 2 days. However, there were some dominant personalities that spoke up more, and in one instance one farmer was able to override others during group-work. Although women's attendance was encouraging, women's participation in the workshop was average. The position of women at Mkindo village seems to vary along a wide spectrum, so no generalisations can be made about their lives. We are unable to know exactly how many participants attended from Mkindo, Hembeti and Dihombo respectively.

SOCIO-ECONOMY

Land Tenure

The prevailing land tenure system is that of inheritance. There are a considerable number of b order disputes within the rain-fed area (1900 ha). Over half of Mgongola Valley farmers own 0.4 ha or less. The irrigated land in phase 1 and phase 2 was divided into 1-acre sized plots, and distributed to 98 farmers. These are not subject to land disputes. There is a portion of the rain-fed area in Mkindo (bordering with Kambala village) that has been purchased by an Italian named Emiliano Begi.

Farmers' Economy & Life Style

Paddy is the main source of income for Mgongola farmers. Overall, rainfed paddy is more profitable than irrigated paddy by a very slim margin. However, a single sack of irrigated paddy fetches a much better price than a sack of rain-fed paddy. The main reason for this is that a farmer will cultivate 1.6 ha of rainfed paddy and only 0.4 ha of irrigated paddy, but irrigated paddy is worth more on the market. Comparatively, irrigated paddy has a much better yeld than rainfed paddy (and it can also be double-cropped). The main periods of income are just after harvest of the dry season paddy in January and the wet season paddy in July. The seasonality diagram indicates that expenses occur throughout most of the year. Income from sale of paddy is cancelled out by the production cost and living expenses. Therefore, agriculture is not a profitable business for Mgongola farmers.

Cultural Practices

The main tribes resident within the Mgongola Valley are the uluguru and the zigwa. Other tribes that have migrated to the area include the chaga, the kogoso and the ngoni. While Hembeti and Dihombo villagers constitute an equal share of Muslims and Christians, Mkindo's inhabitants are mostly Muslim. However, it seems to be a syncretic form of Islam, as their religious beliefs intermingle comfortably with their tribal pre-Islamic practices. Traditional rituals or practices related to agriculture are

carried out in Mkindo. However they are not carried out o a regular basis, and instead usual take place when there is a problem, for e.g. when the rains are late or insufficient. The actors are village elders (men and women), and take place in the forest. Participating elders wear black clothes (or a simple black cloth) and a black chicken is sacrificed under a tree or stone. A prayer is also spoken to request something e.g. rain. There are no prohibitions on land use or related to irrigation using waters from the river.

Labour Force and Seasonal Demand for Labour

The most demanding period of farming occurs between Jan-Jul when rain-fed paddy, wet season irrigated paddy and maize cultivation coincides. Both men and women participate in all agricultural tasks. However, the seasonality diagram indicates that women's labour is more intensive[1]. The busiest time of the year is between Dec-Mar when dry season irrigated paddy (December) and maize (Jan/Feb) is harvested and preparations are underway for planting of rainfed paddy (Jan), wet season irrigated paddy and maize (Feb/Mar). Children's contribution to farm work occurs during their school holidays in June and December. These coincide with harvest of maize, wet season irrigated paddy and rain-fed paddy. During the school term, children may help to scare birds away. Both genders rest in Sep/Oct after planting the dry season paddy. Agricultural work is also reduced in April and October when the rainy season is at its peak and human diseases, such as diarrhoea epidemics, are prevalent.

AGRICULTURE

Cultivation Area

The total farm land available in Mgongola Valley is 2750 ha. Of this 2100 ha are farmed. In 1982 and 1989, 200 ha were developed into Phase 1 and Phase 2 irrigated paddy farms. All the remaining farm land (2550 ha) is potentially irrigable area.

Crop Production

Paddy is the main crop (1400 ha), which is both consumed and sold. Maize is also cultivated, but on a lesser scale (20 ha). Paddy is cultivated in both irrigated and rain-fed areas, but irrigated paddy (although cultivated on less land) has a much higher yield than rain-fed paddy. Furthermore, irrigated paddy is double-cropped (Feb-Jun & Aug-Dec)[2], and dry season irrigated paddy produces a better yield than wet season paddy. Maize is also double-cropped, but the dry season cropping is dependent on rainfall. Every household has a small food garden where cassava, banana and vegetables (onion, tomato, spinach and cabbage) are cultivated.

---

[1] In the focus group discussion with women, it emerged that some men will decide on a certain day to not accompany their wives to the farm. On these days, women must carry out all the agricultural tasks alone.

[2] The objective of expanding the irrigated farm land is to be able to double crop paddy over a larger area, thereby increasing the production yield of paddy.

Farming Calendar

The planting and harvest periods for paddy and maize coincide throughout the year. Between Dec-Jun, the cultivation and harvest of paddy and maize occur within the tight span of time (Dec-Mar), followed by weeding and application of fertiliser, agro-chemicals and herbicide. The latter part of the year is less intensive, requiring only the planting of dry season paddy (150 ha, instead of 200 ha) in Aug/Sep and maize in October. Farmers can apply for credit at the village SACCOS (Saving and Credit Society) throughout the year[3]. Insect pests (army worm) and diseases (yellow mottle virus) occur throughout the year. Destructive animals include rats (June) and querea birds (April). The seedlings are vulnerable to these animals as well as to water fowl and grasshoppers.

Farmers' Supporting System

Paddy and maize are cultivated and harvested using manual tools and then stored in sacks. There is no warehouse at Mkindo, therefore crops are stored in individual homes. Certified seed (Saro) is obtained at the Dakawa Research Centre every 2-4 seasons. Indeed, the proximity of such institutions as the Sokoine University of Agriculture, the Mkindo Farming Training Centre has brought to the farmers at village level a whole range of technical support and advice as well as increased the opportunities for training that Mgongola scheme farmers can receive. Machinery can be hired from the village group. Other inputs can be purchased in neighbouring villages. However, none are subject to government subsidy. All crops are purchased by middlemen. A cooperative has been formed (and registered 1997), by some of the members of the irrigation group, but it is not operational as yet. Extension services are available particularly during the planting seasons (Feb-Apr & Aug-Oct).

Land Capability for Irrigation and Crop Suitability

The commanding area proposed for extension of the irrigation scheme is the remaining farm-land in the Mgongola valley that has not been developed for irrigation, in particular 650-660 acres. This area is currently rain-fed, although a few farmers with plots neighbouring the irrigated phase may also receive water. The irrigation expansion would be for rice and maize production purposes.

Constraints in Crop Production, Input Supply and Marketing

The key constraints cited are grouped under the following headings:

Farm inputs are available in neighbouring villages. Participants reported that these are too expensive, even when compared with prices elsewhere. Furthermore, most farmers lack the expertise on how to use herbicide and agro-chemicals. At the moment, farmers borrow inputs from the group shop in the village. Fertiliser is used only in irrigated fields because in other fields, it gets washed away. Insecticide is only used when there are locusts (which occur twice a year). In future, the irrigation group plans to purchase inputs for all farmers jointly. As a substitute for some farm

[3] Participants reported that the SACCOS is not used very effectively by farmers as most are unable to comply with its strict conditions.

inputs, many farmers continue to use the traditional inputs including plant liquids (tobacco, tephlosia, neem) as pesticides. Others apply azzola in the paddy field to improve soil fertility.

There is also a shortage of farming implements. The tasks of clearing fields, tilling, planting, weeding, harvest, and post-harvest crop processing are carried out using low quality traditional tools. The tractor that is available for rent is beyond the financial capacity of many farmers and in high demand. Many farmers use hand tractors for tilling. Those who can afford it hire casual labour as extra help during harvest. In order to preserve their harvested crops, some farmers smoke the harvested grains such as maize and beans. These are then mixed with the ashes of husk and straw.

Marketing of crops. The lack of storage facilities forces many farmers to sell their crops as soon as they are harvested. Most crops are sold to middlemen who push down the price at which they purchase the crops.

Water scarcity is caused primarily by the condition of the canals. The main canal is deemed too narrow and hence unable to sustain the volume of water required by the irrigated plots. Some of the canals within phase 1 and phase 2 are damaged. Ensuring that farmers have enough water for irrigation is extremely important, given the drought problems experienced in the rain-fed area and erratic rainfall patterns. To date, farmers have planted certain grass specias (Nepia grass, Elephant grass, MATETE) along the canal as protection from erosion.

FARMERS' ORGANISATION

General Information

Construction of the Mgongola irrigation scheme began in 1982. The Food and Agriculture Organisation with Dutch funding sponsored the construction of phase 1 (42 acres). This included the construction of the intake and canals, division boxes, small bridges and drainage canals (back into the river). All construction work was undertaken by the farmers together with a few masons that were hired by the regional office[4]. Farming began in 1985. The second phase (56 acres across the road from phase 1) were developed in 1989. Since then, rehabilitation work has been carried out on phase 1 (1999) and phase 2 (2002).

Institution

In 1987, the irrigation group (with only 42 members) was founded with the selection of an executive committee (10 members). A constitution was drafted and by-laws were established in accordance with guidelines of the district office[5]. The irrigation group registered as the Mkindo Water Users Association (MRG 229) the same year and was granted water rights to irrigate 500 acres (no. 4798). Every member contributed 2000/- towards registration (a total of 84,000/-). Of this 20,000/- was paid

[4] Participants emphasised that there was no paid supervisor during the construction of phase 1. All organisation and work was done by the farmers.

[5] However, not all group members know them.

to the Regional Agricultural Development Office (RADO), and the remainder (64,000/-) deposited in the bank account and is used to cover canal maintenance costs.

Currently the association has 98 members (58 men, 40 women). In 1997, 30[6] of these association members registered as a cooperative upon the advice of the District Cooperative Officer[7]. Therefore, there are two types of organisation at Mgongola. The association includes all irrigators, and 30 of these also belong to the cooperative. However, when pressed, the participants were not sure of the different between (and the benefits of) an association and a cooperative aside from the fact that a cooperative involves the joint sale of crops. At the moment however, farmers are not sure whether to continue having a cooperative, as it is not functioning properly.

The organisation structure of the association is comprised of an executive committee, which has a chairperson, vice-chairperson, secretary, treasurer and 6 members (of which 3 are women). Elections are scheduled to take place every 3 years, by secret ballot. From this committee, 2 sub-committees have been formed: planning & finance (treasurer and 2 members) and 'agriculture' (secretary and 3 members, 3 women). Despite its name, the members of the 'agriculture' committee are in charge of inspecting all irrigation infrastructure and coordinating all communal maintenance work. There is a third, independent sub-committee entitled 'monitoring and evaluation' (chairperson and 2 members, 1 woman) whose members are not members of the executive committee.

The prerequisites for membership are to own a plot, to agree to abide by the group's constitution, willingness to contribute towards expenses when required, and to pay the annual membership fee. However, tenant farmers are not allowed to join. In recent years, farmers who cultivate plots neighbouring the irrigated plots have been applying for membership to the irrigation group[8]. To date, this group of 'outsider' farmers consists of more than 50 farmers. The association has requested that they form their own farmers/irrigators group and elect their leadership.

Activities

There is no timetable for meetings. The executive committee normally meet every 6 months, while the sub-committees meet whenever the need arises. However, all meetings are documented. Issues on the agenda include problems that occurred in the previous season, canal maintenance, farmers contribution and drainage problems. Problems in conducting effective meetings include poor participation, absentee landowners[9], un-creative leaders. As a consequence some issues remain unsolved even after several discussion.

---

[6] The minimum number of people required to form a cooperative is 30.

[7] According to the participants, the currently policy is to encourage the formation of cooperatives.

[8] Although they are not allowed to formally join the group, they may receive water upon payment of the 5000/- water fee. Other prerequisites include a visit by the extension officer to check the level of the field vis-à-vis the canal. If it is too high, the farmer may be required to level their field. Irrigation for 'outsiders' takes place for 2 days at a time.

[9] 15% of farmers do not live in the village

There have been some recent changes in the financial management of the group. Until August 2002, farmers were not paying a water fee. This was paid for them by the Ministry of Agriculture. Since August 2002, farmers are now obliged to pay 5000/- water fee (per acre) to the district. In addition to the water fee, a canal maintenance/repair fee is also collected. However, it varies from season to season[10] and is a member of the planning and finance sub-committee will deposit it in a bank account that was opened in the SACCOS[11] branch of Hembeti. The rate of default was not clear, but between 20-40% of farmers did not pay their seasonal fees last year. The next payment is due in February 2003.

The inspection of field canals is conducted by individual farmers, in collaboration with the 'agriculture' sub-committee. The main canal is the sole responsibility of the 'agriculture' sub-committee. When maintenance is required, a schedule is drawn up allocating a section to each farmer. The contributions collected are used towards the purchase of materials (cement, pipes) necessary for the repairs. The group sometimes requests technical expertise from government.

A financial report is prepared twice a year, but a budget is not prepared. Ward revenue collectors audit the group's accounts and an auditor's report is presented to the group's members. Mkindo farmers have been the beneficiaries of the agricultural institute that they host in their village. Most training has concentrated on paddy production and pest management and has taken place in the following centres:

1993, 3 people (1 woman) attended a training course on paddy production in Indonesia;

1996, 4 people (1 woman) attending a course at the Kilimanjaro Agricultural Training Centre (KATC) in Moshi;

1997, 3 people (2 women) attended a course on paddy production

1998, 3 people (1 woman) attended a training course at the Kilimanjaro Agricultural Training Centre (KATC) in Moshi;

1999 1 man attended a training course at the Kilimanjaro Agricultural Training Centre (KATC) in Moshi;

1999, 53 people (22 women) attended a course of farmer field skills at the Mkindo FTC;

2001, 3 men attended a training course on agricultural mechanisation at the Kilimanjaro Agricultural Training Centre (KATC) in Moshi;

2002, 44 people (17 women) attended a training course on vegetable production at the Mkindo FTC;

2002, 3 people (1 woman) attended a training course at the Kilimanjaro Agricultural Training Centre (KATC) in Moshi.

Future training requirements are prioritised as leadership, storage of crops, annual O&M plan and financial management

[10] the canal maintenance fee was 1000/- in the last season

[11] Savings and Credit Society. The group's bank account currently has a deposit of 60,000/-.

Organisation Analysis

The group has established an independent monitoring committee to follow-up and give feedback to the executive committee on the progress and bottlenecks of the group's performance. This is a positive development and a good indicator of the farmers' spirit of accountability and will facilitate preventative action whenever a problem in the group's organisation begins to develop.

The group's executive committee presents the financial report at the general meeting. By doing so, they are fostering a relationship of trust with the group members, which will not only strengthen the cooperation of farmers (to participate in communal work to contribute money etc.) and will undoubtedly spill over into other development activities in the village. The group has already opened a bank account and thus are not faced with the potential for misuse/loss of cash and prevents the development of mistrust within the group.

The water fee of 5000/- per season per acre that farmers are expected to pay is comparatively high. In light of the fact that farmers did not pay this fee until last year, it is difficult to predict what the rate of default will be. However, based on the production cost and living expenses, some farmers are likely to find it difficult to pay a minimum of 10,000/- per year per acre.

There is strong government intervention and supervision. The agricultural officers provide farmers with a lot of technical input, and the group has benefited from its proximity to the Mkindo FTC by receiving many training courses. The group's relationship with the village government is also good. By inviting the group's secretary to the village government, communication channels will remain open.

OPERATION AND MAINTENANCE (O & M) FOR IRRIGATION AND DRAINAGE FACILITIES

Regulation of O & M

The 'agriculture' sub-committee together with the agricultural extension officer are in charge of setting the start and end date for irrigation. There is no rotation, water distribution takes places simultaneously, flowing first into phase 1 and then onto phase 2. Members of the 'agriculture' sub-committee are in charge of operating the intake. Field canals are managed by the farmers themselves.

An yearly O & M schedule is drawn up every season that delineates when planting should begin and when rehabilitation/maintenance activities are due to take place by the 'agriculture' sub-committee. Maintenance work occurs every season. Emergency canal rehabilitation takes place whenever there is a shortage of water in order to minimise water loss and widen the canal to allow more water to flow. Each farmer is allocated 6 metres of canal on which to carry out maintenance. Activities clearing, de-silting, bank forming and cleaning drainage canals. Other farmers will be given the task of clearing the intake: removing rocks, sand and branches, greasing the gate and bund-forming. All work is communal. Field canals are the responsibility of individual farmers. Penalty for non-performance of maintenance work is 3000/- and

doing the job. Farmers who do not pay this amount are reported to the village government and required to pay it in instalments.

Situation of O & M for Facilities

Presently, the intake does not require repair or rehabilitation, apart from the maintenance carried out every season. The main canal requires rehabilitation at the end of every season. It is usually damaged the force of the water because it is too narrow to control the water properly. Furthermore, it is badly damaged every year by falling rocks from the hills. Recently, the group jointly purchased pipes, which were fitted in a section where the canal was badly damaged (and leaking). Some of the field canals are also damaged. Most of the damage is caused by farmers from the 'outsider' group who break the canals in order to divert water towards their plots. The canal between phase 1 and phase 2 is particularly vulnerable to this practice and requires extensive rehabilitation. All canals were deemed as being too fragile and thus easily damaged.

Conflict over Water

The most evident conflict is between the phase farmers and 'outsider' farmers. These are blamed for damage to the canal between phase 1 and 2, which is causing water shortage and conflicts within phase 2. The case is still in court. As a coping mechanism, farmers from phase 2 were using water from the Dizingwi river. However, water flow in this river has been reduced since an intake was built upstream, in Dihombo.

The problems related to the above-mentioned portion of canal (damage) and the main canal (too narrow, damaged by rocks) have been discussed within the group and rehabilitation of the canals has been attempted. However, the problem is considered beyond the technical (widening the canal) and financial capacity of the farmers, as it extends over a large area and because the canals require extensive construction work in order to strengthen them.

There is another conflict, over the village border. The Maasai claim that the village border of Mkindo is along the Mgongola river, while Mkindo claims that their border lies along Msera river. Fuelling this animosity is the fact that the Maasai allow their cattle to graze on crops within the irrigated area. The case is still pending in court.

Improvements to the Irrigation Scheme

The farmers' proposal can be divided into 2 parts: rehabilitation of existing infrastructure and expansion of irrigated area. Participants recommended that 650 ha of the currently rain-fed land be developed for irrigation[12]. The main rehabilitation requirements include the widening of the main canal and repair of field canals where damaged. The participants' request to the government is for technical expertise and construction material. Farmers will volunteer their labour for the actual construction.

[12] When this land is developed, land tenure will change. A person will only be allowed to own 1 acre. All other land will be sold/distributed to neighbours/children.

Possible Future Constraints Based on Past Experience

Due to the way the scheme was constructed, all farmers including those who haven't paid their fees will receive water when irrigation begins. This situation is likely to be a cause of conflict between those pay and those who don't pay. The only possible penalty for defaulters is to not be allowed to cultivate their plot (and this penalty is unreasonable for subsistence farmers). Options available to the group leadership is to provisionally subsidise the poorest farmers (until they can afford the water fee) from the group's budget; request that the district reduce this amount so that all farmers can afford it, or establishing an payment-by-instalments system that will accommodate the poorer farmers.

The rain-fed area of Mgongola valley is subject to numerous land disputes. Special care must be take to clearly demarcate plots when the area is developed. Even more importantly, land re-distribution must be done fairly in order to prevent the vulnerable groups in the village, such as single women or youth, from being discriminated against. Furthermore, the land between Mgongola and Msera river must be resolved in Court in order to prevent the problems currently experienced (of cattle grazing on crops) from re-occurring.

The large number of absentee landowners/farmers is a constraints towards the smooth operation of the irrigation group. These members are less likely to plant on time (which is crucial) or participate in maintenance activities. It is essential for the group to establish a set amount that will be paid by those farmers who are unable (for whatever reason) to carry out their share of maintenance work.

GENDER ISSUES

As noted earlier the position of women at Mkindo is difficult to generalise. The focus group discussion with some of the female participants revealed that there are many variations in the lives that women lead. What can be generalised is that household gender relations remain traditional: women are in charge of all domestic work. Communication within the marriage in some cases is very good and women are included in decision-making processes regarding farming activities. The farming calendar that was presented at the workshop revealed that there are many activities that women do not participate in. Although, women did not comment on this in the ensuing discussion, informal discussions revealed that women participate equally in all agricultural and construction/maintenance activities[13], in particularly single women and widows. This statement is corroborated by the seasonal calendar, which revealed that men and women participate equally in farm work throughout the year. The only activity that is normally carried out more by men is the purchase of farm inputs. Although this is usually indicative of the presence of conflict over income, the workshop participants did not indicate that this was the case.

Female participation in the irrigation group is on the whole positive, as a consequence of gender relations within the community. Many women in Mkindo own land, which

[13] In some cases, husbands do not do their share of farm-work, leaving it for their wives.

is either inherited, purchased, rent or part of a divorce settlement[14]. Within the scheme, even married women have registered their land separately from their husbands. Although women's participation at the workshop was average, they seem to granted equal status within the group. There are three female members of the executive committee. Additionally the secretary of the 'agriculture' sub-committee and the chairperson of the monitoring sub-committee are women. The female participants were satisfied with the training opportunities granted to women.

Advantage and Disadvantage to Gender by Development Activity

Women's good participation in meetings indicates that their ideas are considered and they are involved in major group decisions. Mkindo women have relatively good accessibility to the means of production, in this case land. Married women were more likely to experience the traditional gender division of labour in which men take control of household income and expenditure. When agricultural yield is improved, income will increase. It is important that women benefit equally from whatever improvements occur in agriculture, as they are most likely to be the main source of farm labour. Unless women's domestic workload is reduced, the benefits obtained from development activity will not be equal as that of men.

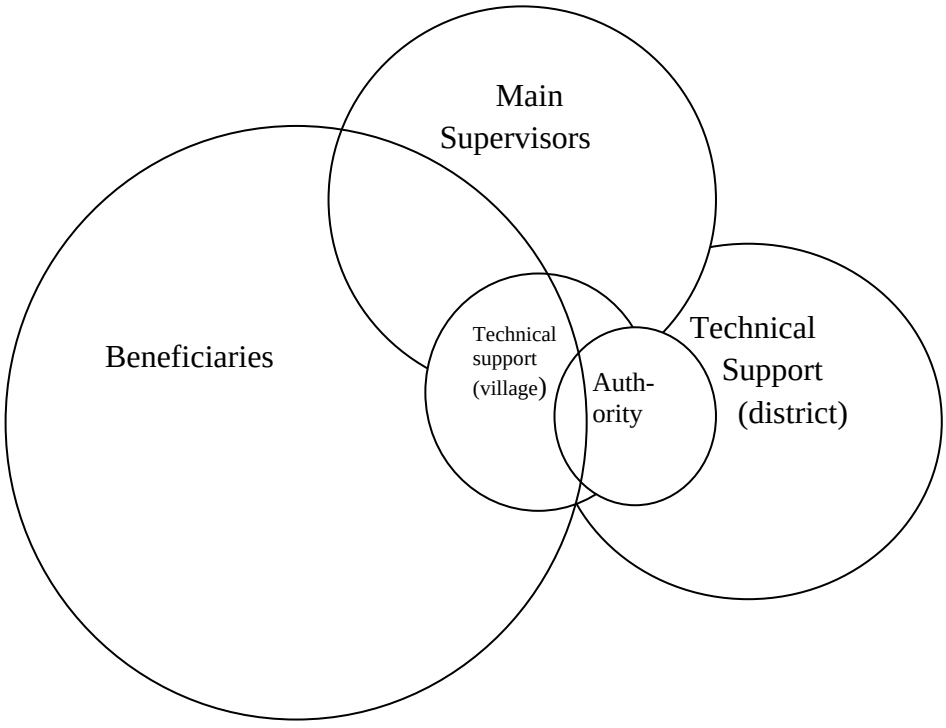
SUPPORT FROM THE GOVERNMENT OF TANZANIA

The VENN Diagram methodology was used to determine the importance of each of the actors in the farmers' supporting system (persons or institutions), the intensity and type of interaction with the farmers as well as a rough assessment of the communication between them and the irrigation group. Participants identified key persons or institutions up to the regional level whose action/inaction may impact on agricultural activities for Mgongola Valley farmers. These were grouped under five main headings based on the nature of their relationship with the irrigation group.

[14] There was disagreement among the female participants as to the percentage of land that a woman will receive from her ex-husband. Therefore, it can be concluded that a divorced woman may receive between 50% to 0% of the land that was jointly owned with her husband.

Beneficiaries:	Farmers
Technical Expertise/Advisors (Village):	Agricultural Extension Officer, Irrigation Officer, Natural Resources Officer, Mkindo Agricultural Institute
Technical expertise/advisors (district)	District Agricultural Officer, District Natural Resources Office, District Cooperatives Office
Main supervisors	Natural resources officer, Division secretary Ward executive officer, Village secretary, Village Government, Councillor
Leaders/Authority:	District commissioner, District director, MP, Court

The figure below indicates the level of interaction between the farmers and the persons/institutions in their support system, at different levels of government hierarchy. The technical support staff at village level are the most crucial individuals to the agricultural/irrigation activities at Mgongola, principally the agricultural extension officer and the irrigation officer. In a role of supervision, the most important actors are the village government and the councillor. There is very little direct communication between the farmers and the technical support at district level, as the district agricultural, irrigation and cooperative officers provide support to the farmers and their irrigation group. It is more likely that communication and expertise is channelled through the technical staff at village level. The high number of land disputes has brought the farmers in direct contact with the Court.



Communication

The agricultural extension officer does not have his own office, therefore farmers may contact him at his home. Alternatively he may contact a farmer if, while on field inspection, he notices a problem in a particular plot. The agricultural extension officer also visits the fields regular to consult farmers. The main topics of discussion with the agricultural extension officer include how to obtain good quality seeds and how to deal with crop diseases and destructive animals/birds. The agricultural extension officer reports to the district office. When there is a severe pest problem at Mkindo he will also collect and distribute insecticide. The agricultural extension officer also communicates with the village government to inform them of any developments.

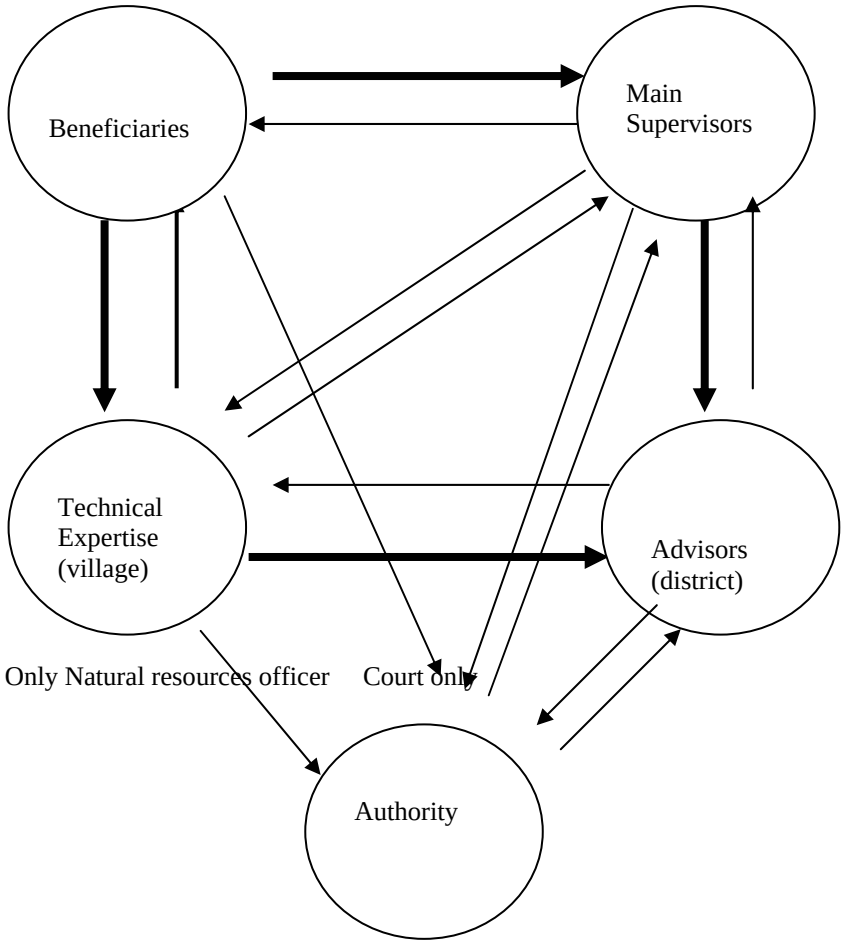
The village government is also in contact with the irrigation group. The group's secretary is invited to attend all village government meetings. Other forms of communication include visits to the government office and by letter. Discussions with the village government centre on the problems related to the group's leaders, poor attendance to meetings, rehabilitation and maintenance of canals, the procedure of handling fee defaulters and the conflict with Maasai. The participants were satisfied with the relationship between the irrigation group and the village government.

Participants reported that there is no direct communication with the district level. Rather it is channelled through the main supervisors and the village technical support actors. However, the district agricultural and irrigation officers may visit the group leaders or write to them. The district officers are credited with assisting the Mkindo farmers during rehabilitation work by providing transportation for sand and stones. Other problems discussed with the district officers is how to obtain farm inputs. Although participants said they were satisfied with the district officers' performance, they requested that appointments for visits be kept.

Communication with the Zonal office centres around the farmers' participation in the Nane Nane exhibition. However, farmers are not satisfied with this relationship, and suggested that there frequency of interaction should be increased with the Zonal office.

The farmers of Mkindo have come into direct contact with court on several occasions, regarding the land disputes in the rain-fed area, their conflict with livestock keepers, and the border dispute with the Maasai. However, it is more commonly the district office who intercede on behalf of the farmers at the leaders/authority level. The participants claimed that their MP has been of great assistance to them in 2002 providing assistance with the construction of a bridge. However, they not satisfied with frequency of communication with him.

The figure below summarises in visual form the frequency and flow of communication within the farmers' support system.



RECOMMENDATIONS

When training occurs, it seems that the ratio of men to women is 3:1, in spite of the fact that 40% of the group's members are women. Measures should be take to ensure that women are given equal opportunity to men to attend training courses.

The irrigation group requires expert advice on how to run a cooperative. Although a cooperative was formed and registered in 1997, farmers have not been able to take full advantage of it.

The high government intervention in this scheme is reflected in the fact that farmers have been paying water fees since 2002. This approach is detrimental towards fostering a sense of ownership of the scheme. Farmers' involvement in future development work should be maximised. District and Zonal staff should receive training in participatory and empowerment approaches.

Although the participants were satisfied with the support received from the District agricultural officer, they suggested that he make more effort to keep his appointments with the farmers. Farmers would like to see more of the Zonal staff.

The group's leaders should receive training on group management and financial training. Capacity building is necessary especially in how to deal with members who have not paid their fees. Other areas that require improvement include record keeping (monthly and annual reports).

The middlemen control the price at which they purchase crops. This situation is most frustrating for farmers who do not make any profit from agriculture. The government should assist in searching for a market for farmers. Furthermore, the cooperative formed by some members of the group should be revived.

Annex 1: Registration

Observers

	Name	Position	Office
1	H. Ohnuma	Study Team Member	JICA
2	M. Osada	Study Team Member	JICA
3	H. Okada	JICA Expert	Morogoro Zonal Off.
4	S. Matsushima	Study Team Member	JICA
5	H. Shimazaki	Study Team Leader	JICA
6	RR Komanga	Sociologist	MAFS Irrigation HQ
7	Ally H. Simba	Chief Counterpart NIMP Study	MAFS Irrigation HQ
8	T. Igawa	Study Team Member	JICA
9	Eng. S. P. Luswema	Irrigation Counterpart	Morogoro Zonal Irrig. Off.

Participants- Day 1 & Day 2

	Name	Occupation	Irrigation Group
1	Hamisi Funge	Farmer	
2	Amana Bonamali	Farmer	
3	Bertha John	Farmer	
4	Gasto Swai	Farmer	
5	Hamisi Abdallah	Farmer	
6	Selemani Mlisho	Farmer	
7	Karol Clemence	Farmer	
8	Omari Ramadhani	Farmer	
9	Tadai Fabian	Farmer	
10	Mashaka Mlisho	Farmer	
11	Saidi Sotery	Farmer	
12	Rajabu Mgamba	Farmer	
13	Eliza Simoni	Farmer	
14	Agnes John	Farmer	
15	Athumani Karumba	Farmer	
16	Shomari Msomi	Farmer	
17	Salum Kimosa	Farmer	
18	Hassani Shabani	Farmer	
19	Hadija Athumani	Farmer	
20	Maneno Shomari	Farmer	
21	Emma Alphonse	Farmer	
22	Issa Mfalme	Farmer	

23	Joseph Temba	Farmer
24	Abdallah Ibrahim	Farmer
25	Edda Angerine	Farmer
26	Amiza Said	Farmer
27	Kibaba Petro	Farmer
28	Asha Ally	Farmer
29	Salum Makopa	Farmer
30	Mohamed Sebaila	Farmer
31	Fatuma Mbanu	Farmer
32	Maximilian Ramford	Farmer
33	Siwazali Ally	Farmer
34	Oscar Gerald	Farmer
35	Musa Kibinamoto	Farmer
36	Athumani Nada	Farmer

Annex 2: Workshop Schedule

Day 1

Registration of participants
Begin workshop Introduction game Workshop rules
Group work
Presentation of group work & discussion
Lunch
Group work: Institution, Agriculture, Irrigation

Day 2

Group work: continued
Presentation of group work & discussion
VENN Diagram & Discussion
Evaluation
Closing
Group picture
Lunch

Annex 3: Workshop Evaluation

☺ good workshop facilitation (very lively) and the entire workshop
☺ openness & transparency
☺ somo ya kilimo: hasara na faida
☺ many thanks to the sponsors of this workshop
☺ happy to meet the Japanese (JICA representatives) who are funding this project
☺ would like to have more similar workshops
☺ importance of starting up a cooperative

☹ None

Annex 4: Mapping

Ramani ya rasilimali za mradi wa
umwagiliaji ionyeshe taarifa zifuatazo:

mipaka ya kijiji
kilimo cha umwagiliaji kinafanyika wapi?
Maji ya umwagiliaji ni yapi na yamegawanywa kivipi?
mifereji ya umwagiliaji
vitaro vya mashamba na mmilikaji (kikundi au mtu binafsi)
eneo la kilimo cha mvua
eneo la umwagiliaji
banio
mifereji ya umwagiliaji
mlango, vifaa na miundo-mbinu vya umwagiliaji
eneo lote kulimika
na mengineo yanayohusiana na kilimo cha umwagiliaji

Annex 5: Focus Group Discussion on Culture and Customs

Shughuli za kimila na utamaduni kuhusiana na kilimo cha umwagiliaji

Taja mila, desturi na utamaduni zote zinazohusiana na kilimo cha umwagiliaji:
wakati wa kusafisha mashamba
wakati wa kupanda
wakati wa kuvuna mazao
zinazohusika na kuhifadhi mazao

Elezea mila na desturi hizi sinavyoweza kusaidia au kuathiri shughuli za kilimo.

Taja njia zinazoweza kupunguza athari mlioelezea na kuboresha zile zinazosaidia kilimo (haswa cha umwagiliaji).

Je, kuna miiko au vikawazo vinavyohusiana na umwagiliaji kwa kutumia maji katika mila zenu?

Kama zipo, mnafanyaje ili kuepuka na majanga yanayoweza kutokana na mila hizo? Mnazidhibiti vipi?

Katika umwagiliaji, kuna mila na desturi yoyote zinazoathiri jinsia ya wanaume au ya wanawake?

Annex 6: Focus Group discussion on Women's Issues

Ushirikishwaji wa Wanawake Katika Kilimo cha Umwagiliaji

Je, mgao wa shughuli za kilimo kati ya wanaume na wanawake (ngazi ya kaya) unalingana?
Kama haulingani, umnafikiria mnaathirika vipi na mfumo huo? Tunaweza kuuboresha vipi?

Mnashirikishwaje katika
ujenzi na ukarabati wa miundo-mbinu ya mradi (shughuli zipi?)
uendeshaji na matunzo wa mradi (shughuli zipi?)

Kama hamshirikishwi katika kazi za ujenzi/ukarabati, ni shughuli gani nyingine mnazozifanya mbali ya zile za ujenzi/ukarabati? Km. kupiga chakula.

Kuna kazi ambazo hamruhusiwi kushiriki au kuzifanya?

Kuna adhabu zozote kuwaadhibu wasioshiriki kwenye kazi za ukarabati, matunzo na uendeshaji wa kilimo cha umwagiliaji? Je, wanawake mnalipa faini hizo?

Je, wanawake mnapewa nafasi sawa na wanaume kwenye masuala ya mafunzo ya kilimo cha umwagiliaji? Kama mmepewa, ni mafunzo yapi na wanawake wangapi walioshiriki katika mafunzo hayo?

Je, wanawake mnamiliki ardhi?
Kama ndiyo, wanawake wangapi wanamiliki ardhi katika skimu hii?

Je, katika skimu hii, mwanamke aliyeolewa anamiliki ardhi chini ya kivuli cha mumewe au yeye mwenyewe?

Wanawake walioachika, wanapataje ardhi ya kulima?

Mashamba yakiwa ya mtu na mke wake, je, mnashirikishwa katika mikutano ya vikundi vya umwagiliaji?
Kama mnashiriki, mnachaguliwa kama viongozi?
Kama mnachaguliwa, wanawake wanashika nafasi zipi na ni wangapi?

Annex 7: Farming Calendar

Activity	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Purchase of farm inputs																			✓	✓				
Clearing farms	✓	✓							✓	✓							✓	✓			✓	✓		
Tilling	✓	✓									✓	✓							✓	✓	✓	✓	✓	✓
Nursery	✓	✓																					✓	✓
Transplanting	✓	✓									✓	✓							✓	✓	✓	✓	✓	✓
Weeding			✓	✓	✓	✓					✓	✓									✓	✓	✓	✓
Application of fertilisers			✓	✓																				
Application of agro-chemicals			✓	✓																				
Herbicide			✓	✓																				
Irrigation																					✓	✓		
Protect crops from destructive animals							✓	✓																
Harvest crops									✓	✓			✓	✓	✓	✓	✓	✓						
Post harvest										✓														
Storage									✓	✓														
Sale of crops									✓	✓														

Annex 8: Seasonal Calendar

Variables	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Credit												
Farm inputs												
Availability of extension services												
Employment women												
Employment men												
Employment children												
Rainfall												
Diseases human												
Crop pests												
Crop diseases												
Adequate irrigation water												
Harvest												
Income												
Expenditure												
Food scarcity												

Annex 9: Land Use and Agriculture Questionnaire Results

Land Use and Agriculture

- Land Use in the Target Area (Mgongola development area within the villages of Mkindo, Dihombo and Hembeti)

Item	(Area in ha)
Total Number of Household	1.694 H/H (Total H/H of 3 villages = 3,314)
Total Farm Land	2,750
Total Cultivated Area and Fluctuation	2,100
Rainfed Area	1,900
Irrigated Area	200
Potentially Irrigable Area	2,750

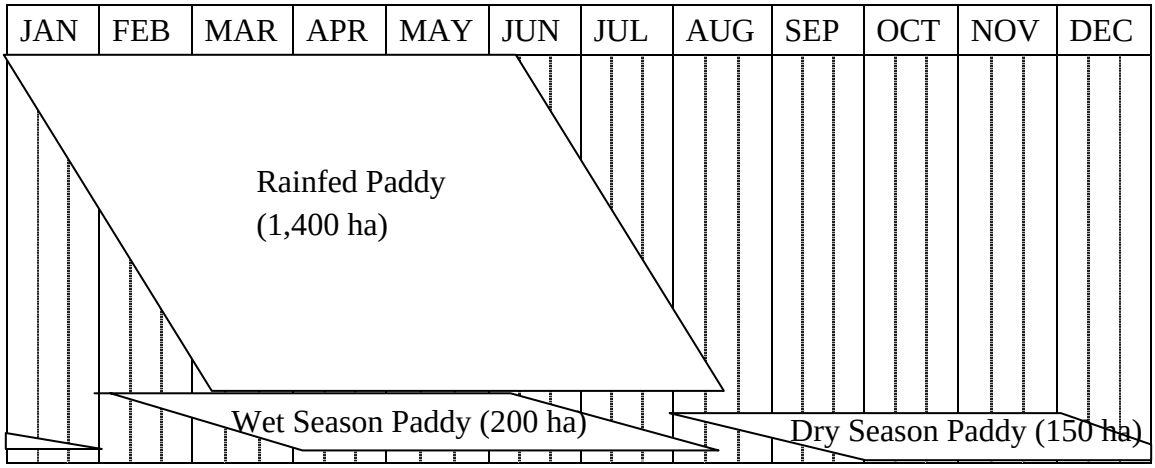
- Crop Production

Major crops cultivated	Rainfed		Irrigated (rainy season)		Irrigated (dry season)	
	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)
(1) Paddy	1,400	1.1	200	3.4	150	3.8
(2) Maize	20	1.5				
(3) Casava	Less than 5	-				
(4) Banana	Less than 5	-				
(5) Vegetables	Less than 5	-				

* Vegetables include onion, tomato, spinach and cabbage

- Farming Calendar and Cropping Pattern

Wet season Paddy (Saro)	from	Feb/Mar	to	Jun/Jul
Dry season Paddy (Saro)	from	Aug/Sep	to	Dec/Jan
Upland Crops				
1. Rainfed Paddy (Supa)	from	Jan/Feb	to	Jun/Jul
2. Maize (short rain)	from	Oct/Nov	to	Jan/Feb
3. Maize (long rtain)	from	Feb/Mar	to	May/Jun
4.	from		to	



- Land Ownership Situation and Problems

Farmland is usually inherited from parents under customary tenure system. Land fragmentation is one of the problem through such inheritance system. Under rainfed area, there are some disputes on land ownership due to undefined border. Under the irrigation scheme, on the other hand, border is very clear and less land ownership problems than rainfed area.

- Farm Size Distribution (Previous JICA study)

Land hold (ha)	Number of Farmer	Total area in ha
0-0.4	302	121
0.4-0.8	63	51
0.8-1.2	21	25
1.2-1.6	71	113
1.6-2.0	19	38
2.0-4.0	65	130
4.0-6.0	13	64
6.0-8.0	15	36
8.0-	9	72
Total	578	650

- Major Constraints in Crop Production, Input Supply and Marketing

Problems/Difficulties	Notes
Drought problem in rainfed area	Irrigation is strongly needed
Insect pests	Army worm (There is district campaign for control)
Bird pests	Querea (There is government aerial spray activities)
Other pests such as rodents	Traps, rice bran with poison, rice bran with cement
Diseases	Yellow mottle virus (No countermeasures)
Limited affordability for inputs such as fertilizer, pesticides and herbicides	Necessary inputs are usually available at the market
Farmers have no power to negotiate with middleman for the marketing of their products	Farmers have to sell their products at the low farm gate prices and there is no group selling system

- Major Significance for the Introduction of Irrigation System

Irrigation is needed to increase the production of paddy through stabilization of wet season paddy and introduction of dry season paddy.

Farmers Supporting System

- Post Harvest

Crop	Harvest Method	Storage Method	Storage Facility
Paddy	By hand	Bags in room	-
Maize	By hand	Bags in room	-

- Marketing and Prices

Crop	Market Channels	Farm Gate Price (low/high) in Tsh/kg	Season (low/high)
Irrigated Paddy	Middleman	140/210	-
Rainfed Paddy	Middleman	110/140	Jun-Jul/Dec
Maize	Middleman	60/120	May-Jun/Feb-Mar

- Input Supply

Kind of Input	Obtained from where	Purchasing Method	Availability and Source of Loan	Availability of Subsidy
Certified Seed (Saro)	Research Center (Dakawa)	Cash (every 2-4 seasons)	Available from SACCOS (village saving and credit society) but not effectively used due to strict condition and unsecured production	No
Fertilizer	Shops in neighbor villages	Cash		No
Chemical				No
Machinery	Hire from village group	Cash		No
Others ( )				

- Extension Service

1) Are you a member of any organizations or cooperatives?	-
2) Which organization provides you with technical assistance?	- Sokoine University; ICE and TARPII - Training Center for Irrigation - Ward; Ward extension officer - District; village extension officer and irrigation technicians for each village
3) How frequently do you have technical assistance?	Available at anytime
4) What kind of support do you get from them?	All types of technical support

- Indigenous Knowledge

Unique knowledge for effective use of limited natural resources, environmental conservation, unique technologies for crop production:
*Protection for flood and erosion by planting certain grass species (Nepia grass, Elephant grass, MATETE) along the canal
*Smoke the harvested grain for preservation
*Store harvested grains such as maize and beans mixed with ash of husk, straw and etc. for preservation
*Use plant liquid as pesticides; Tobacco, Tephlosia and Neem
*Apply azzola in the paddy field for soil fertility improvement and weed control

Farm Economics (for typical farm family)

- Farm Income

(1) 0.4 ha under irrigation scheme
Wet season paddy:((0.4 ha x 3.4 ton/ha x 1,000 kg/ton) – 500 kg for consumption) x 180 Tsh/kg = 154,800 Tsh
Dry season paddy: (0.4 ha x 3.8 ton/ha x 1,000 kg/ton) x 180 Tsh/kg = 273,600 Tsh
(2) 1.6 ha for Rainfed paddy
Rainfed pady: (1.6 ha x 1.1 ton/ha x 1,000 kg/ton) x 140 Tsh/kg = 246,400 Tsh

- Production Cost

(1) Irrigated paddy (Tsh/ha)	Tillage	30,000
	Paddling + Fertilization (TSP)	45,000
	Nursery operation	(12,500)
	Transplanting	35,000
	Weeding	(35,000)
	Fertilization (Urea)	33,750
	2nd weeding	25,000
	Fertilization (Urea)	33,750
	Scarring birds	(37,500)
	Harvesting	62,500
	Transportation from field to home	28,000
	Total	293,000

(2) Rainfed paddy (Tsh/ha)	Tillage	37,500
	Broadcasting	(2,500)
	Harrowing	(37,500)
	Weeding	50,000
	2nd weeding	(25,000)
	Scarring birds	(37,500)
	Harvesting/Threshing	(50,000)
	Transportation from field to home	15,000
	Total	102,500

- Expenditure

1,300 Tsh/day x 30 days/month x 12 months/year = 468,000 Tsh/year

- Farm economics for typical farm family of 6 members

(Unit: 1,000 Tsh.)

	Holding Size (ha)	Harvest Area (ha)	Farm Income	Off Farm Income	Gross Income	Product Cost	Net Income	Living Expense	Net Profit
Inside the scheme									
Wet paddy		0.4	155			117			
Dry paddy		0.4	274			117			
Sub-total		0.4	429			234	195		
Outside the scheme									
Raifed paddy		1.6	246			163			
Sub-total		1.6	246			163	83		
Total	2.0+α	2.0	675	190	865	397	468	468	0

RRA Report for the

Musa Mwinjanga Irrigation Scheme

4th & 5th February, 2003
KADP, Moshi

Table of Contents

INTRODUCTION ..... E-5 - 1

METHODOLOGY ..... E-5 - 1

OBSERVATIONS & PROBLEMS ..... E-5 - 2

SOCIO-ECONOMY ..... E-5 - 2

Land Tenure ..... E-5 - 2

Farmers' Economy & Life Style ..... E-5 - 2

Cultural Practices ..... E-5 - 2

Labour Force and Seasonal Demand For Labour ..... E-5 - 3

AGRICULTURE ..... E-5 - 3

Cultivation Area ..... E-5 - 3

Crop Production ..... E-5 - 3

Farming Calendar ..... E-5 - 3

Farmers' Supporting System ..... E-5 - 4

Constraints in Crop Production, Input Supply and Marketing ..... E-5 - 4

FARMERS' ORGANISATION ..... E-5 - 5

General Information ..... E-5 - 5

Institution ..... E-5 - 5

Activities ..... E-5 - 6

Organisational Analysis ..... E-5 - 6

O & M FOR IRRIGATION AND DRAINAGE FACILITIES ..... E-5 - 6

Regulation of O & M ..... E-5 - 6

Situation of O & M for Facilities ..... E-5 - 7

Conflict over Water Distribution ..... E-5 - 8

Improvement of the Irrigation Scheme ..... E-5 - 8

Possible Future Constraints Based on Past Experience ..... E-5 - 9

GENDER ISSUES ..... E-5 - 9

Advantage and Disadvantage to Gender by Development Activity ..... E-5 - 10

SUPPORT FROM THE GOVERNMENT OF TANZANIA ..... E-5 - 10

Communication ..... E-5 - 11

RECOMMENDATIONS ..... E-5 - 13

Annex 1: Registration ..... E-5 - 14

Annex 2: Workshop Schedule ..... E-5 - 16

Annex 3: Workshop Evaluation ..... E-5 - 16

Annex 4: Mapping ..... E-5 - 17

Annex 5: Focus Group Discussion on Culture and Customs ..... E-5 - 17

Annex 6: Focus Group discussion on Women's Issues ..... E-5 - 18

Annex 7: Farming Calendar ..... E-5 - 19

Annex 8: Seasonal Calendar ..... E-5 - 20

Annex 9: Land Use and Agriculture Questionnaire Results ..... E-5 - 21

INTRODUCTION

The governments of Japan and Tanzania are in the preparatory stages of drawing up the National Irrigation Master Plan (NIMP) of Tanzania. As part of the second study phase, seven irrigation schemes have been selected nationwide to serve as samples of 4 different types of irrigation scheme: traditional, modern, traditional improved and water harvesting. The data collected from these schemes will be used in the preparation of the Master Plan. Rapid Rural Appraisal (RRA) was selected as the most appropriate methodology to collect information about each scheme.

The Musa Mwinjanga scheme is named after the founder farmers of the scheme. In 1943, Mwinjanga[1] led the excavation of the main canal in a village called Mijongweni. Consequently, this scheme has been classified as traditional improved after it was rehabilitated in 1991. Mijongweni has a population of 3,070 and is located in Kilimajaro region, 12km away from Moshi town.

METHODOLOGY

In order to collect information, a 2-day RRA workshop was conducted in the 7 villages (refer to Annex 2 for the workshop schedule). The main objective of the RRA was to obtain a clear and broad picture of how the scheme is presently managed, the main constraints in operation, maintenance and organisation of the irrigation group, and the scheme members' ideas and for the improvement of the scheme's operation. More generally, the objectives were to comprehend all the factors that affect agricultural production and the dynamics involved in operation and maintenance of the scheme.

The methodologies administered during the workshop included structured questionnaire, VENN Diagram and various group work exercises. The 5 group work sessions were aimed at collecting data about the life of the farmers throughout the year. They included a Seasonality Calendar (see Annex 8), a Farming Calendar (see Annex 7), Village Mapping (see Annex 4), focus group discussion regarding Women's Issues (see Annex 6) and Cultural practices and Customs (see Annex 5) that pertained to agriculture and irrigation. Participants were divided into groups and given an hour for group work, which was followed by session for presentation and plenary discussion. The structured questionnaire was prepared by Nippon Koei and consisted of 3 parts: Agriculture (see Annex 9 for results), Irrigation and Institution. These questionnaires were administered by a representative of the JICA Study Team, a government official and a facilitator. All questionnaires were supplemented by unstructured questions. The VENN Diagram exercise focused on the relationship between the intended beneficiaries, the farmers and all other stakeholders related to the irrigation scheme up to the level of the district. The aim of this exercise was to determine the flow and intensity of communication between all stakeholders and to pinpoint any current and potential areas of conflict.

[1] Musa, now an elderly man and resident of Mijongweni, is Mwinjanga's son and until recently, was the successor to his father in heading the

OBSERVATIONS & PROBLEMS

The workshop was held at the Kilimanjaro Agricultural Training Centre (KATC) in Moshi on the 4th & 5th February. In attendance were 30 participants, including the chairperson, secretary and a committee member of the irrigation group, 3 water distributors. The majority of the participants were farmers from downstream farms (Mijongweni Chini). On Day 2, a member of the village government was also in attendance.

The ration between men and women was 1:1, and women's participation was very active, equal to that of men. Overall, participants complied with the rules established jointly at the beginning of the workshop to be open and to respect others' opinion. In all discussions the Mijongweni farmers demonstrated good analytical skills in determining the real cause of their problems in agriculture. This can probably be attributed to their level of education.
ASK: other observations?

SOCIO-ECONOMY

Land Tenure

Farmers at Mijonweni village either inherit or purchase land. There are no major land disputes but land fragmentation is occurring. On average, one household will own 1.5-2 acres of rain-fed land. The average household land-holding is 0.4 ha.

Farmers' Economy & Life Style

Irrigated paddy is the main source of income, followed by onions. Maize is also cultivated in large quantities but fetches a much lower price than onions, despite its negligible production cost. Indeed onions sell at an even better price than rainy season paddy and at the same price as dry season, but with a much lower production cost. It is the only crop whose price does not fluctuate, and which is cultivated almost exclusively for sale. In general, farmers are able to recover their production expenses and pay for living expenses with income from the sale of crops, after which the profit obtained is very little. Participants reported that off-farm income is necessary to complement far income and many farmers engage in casual labour outside of agriculture.

Cultural Practices

Most of the residents of Mijongweni village belong to the chaga tribe. Other tribes that have migrated to the village include the pare and the sambara. Before construction of the intake, Musa tossed some coins into the river near where the intake was to be built in order gain permission to use the river waters for irrigation. Furthermore, at the beginning of the rainy season, elders were required to sacrifice a black cow/sheep by the river, offer their prayers and toss a few coins into the river. After the death of Mwinjanga, Musa continued to conduct this ritual every year until ownership of the canal was passed onto the village. Participants reported that there are no cultural rituals practiced since 1990. The newly elected chairperson has been to see Musa and, with approval from the village government, they have agreed that when the new intake is built, Musa will be allowed to carry out the necessary tituals at the intake

Other practices related to agriculture deal with seeds and storage. Prime seeds are selected from the previous harvest and stored until the following year. After they are smoked in the kitchen, they are ready to be planted. The first seed can must be planted either by a very old man or by a child under the age of 5. Participants reported that this custom is no longer practiced because farmers use modern seed and they do not have time to manually remove the seeds from the corn-cob. Similarly, in place of placing smelling grass ('madumbasi') on the floor of the storage room to prevent pests, farmers now use sacks and drums for storage and insecticide to prevent pests from destroying crops. There are no prohibitions related to the use of water from the river.

Labour Force and Seasonal Demand For Labour

Given the double-cropping of paddy, maize and beans, the demand for labour is high for both gender all-year round. The more intensive periods occur when the planting/harvesting of more than two crops coincide. From Nov-Jan the planting of wet season paddy, and harvest of dry season paddy occur simultaneously. These 3 months require the labour of men, women and children. Children do not only contribute to farm work during the holidays, others may even miss out on school in order to help their parents. The other intensive period occurs between May-Jul when the wet season paddy and beans are harvested, and it is the planting season for onion, dry season bean and paddy. Children's participation at this time is also considerable. There is a high incidence of water related diseases[2] during the rainy season.

AGRICULTURE

Cultivation Area

The total farm-land available at Mijongweni village is 676 ha. Of these 480 ha are being irrigated with traditional system developed in 1943. The rain-fed area is comparatively minute (10-15 ha). All farm-land has been ear-marked as potentially irrigable. Paddy is cultivated on clay soil, sandy soil has been identified as being more suitable for the cultivation of maize.

Crop Production

Paddy is by far the main crop, with over 3800 kg sold every year (and cultivated on 0.6 ha), followed by maize (0.2 ha) and onions (0.1 ha). Maize and groundnuts are cultivated in the rain-fed area. During the rainy season, maize and beans are mixed on the same plot of 100 ha, but are cultivated separately during the dry season (on 50 ha each). The dry season yield of paddy is higher than the rainy season yield.

Farming Calendar

The year usually begins with planting of wet season paddy (Jan) and harvest of dry season beans (Feb-Mar) and maize (Mar). In April, farmers harvest the wet season paddy and beans, and begin to plant onions in May. In Jun/Jul, farmers plant another season of maize. The dry season paddy is harvested in November followed by the planting of wet season paddy in December. Insect pests and diseases occur all year. Rainfall seems to be regular with heavy rains from Mar-May and short rains from Oct-Dec. It is usually after paddy and maize harvest (Apr/May & Nov/Dec) when

[2] UTI, malaria, typhoid, amoeba, cholera

farmers loan each other money and purchase inputs in preparation for the following planting season.

Farmers' Supporting System

The irrigation group plans to register as a cooperative in the near future in order to sell crops with increased bargaining power to determine the selling price. The Mijongweni farmers have recently received training at the KATC on how to run a cooperative. For other support, they have access to an agricultural extension officer who office is located at the Mijongweni government office[3]. At the moment however, all crops are sold to middlemen. During the low season, the selling price of all crops, except for onion, can be reduced by more than one third.

Farmers can consult the agricultural extension officer in case of technical support or inquiry. The seasonal calendar shows that extension services are available all year. Furthermore, farmers have benefited from their proximity to Moshi town, and to-date have received seeds and training in establishing of a cooperative society, how to improve irrigation activities (O & M), paddy production and upland crop production. Fertiliser and agro-chemicals can be purchased from shops in Moshi.

Constraints in Crop Production, Input Supply and Marketing

The low prices at which farmers are forced to sell their crops emerged as a major source of frustration. Participants complained about the insecure market for their crops and the lack of negotiating power vis-à-vis middlemen. This affects most farmers, who are unable to store their crops and must sell them as soon as they are harvested. This is exacerbated by the poor condition of the roads, which make transportation very expensive and contribute to the middleman's power to reduce the price of sale. It is hoped that the establishment of a cooperative will facilitate the alleviation of this problem.

In order to cultivate a good yield, it is necessary to purchase seeds after every 2-4 seasons. Mijongweni farmers have been using a hybrid seed (54). However, its yield is becoming smaller as it is reused. Although good seed is available at the KATC, it is very expensive.

This situation is particularly demoralising in view of the high price of farm inputs. Pests (army worm) and crop diseases occur throughout the year. And these require modern agro-chemicals and insecticide. Not all farmers are able to afford fertiliser, and poorer farmers have resorted to more traditional forms of fertiliser such as boiled neem tree leaves. Furthermore, participants complained that they lacked expert advice on the use of fertiliser, compost preparation or how to maximise yield production. The main reason for this is because the agricultural extension officer does not have transportation, to be able to visit all farmers, and other working tools.

Another constraint for farmers is that all agricultural activities are done manually, using traditional farming tools. There is one private tractor available for lease in the village. Few farmers can afford to rent it, but others are not able to rent it because some fields are inaccessible by road. In most cases, tilling is done by hoe,

[3] He resides in the neighbouring village of Chekereni.

transplanting and weeding is done by hand, and agro-chemicals are done without protective clothing.
Participants also reported that water scarcity has been a problem in the village even before the intake was destroyed in 2002. The affected months are from September to December. Rainfall in the past decade has been erratic and irregular. Furthermore, water is loss through seepage in traditional canals, the improper preparation of fields, the lack of advice from the agricultural extension officer on how to irrigate fields efficiently and the fact that some types of soil require frequent irrigation.

FARMERS' ORGANISATION

General Information

In 1943, 68 farmers from Mijongweni village excavated a canal in order to divert water from the WeruWeru river. Their leader was a farmer called Mwinjanga, who was later to be succeeded by his son Musa. In 1991, control of the scheme was transferred to the village government. In 2002, the Mijongweni Irrigators Cooperative Society (Ushirika wa Umwagiliaji Mijongweni: UWAMI) was established on the directive of the Zonal office. The village government was instructed to transfer the responsibility of the operation and maintenance of the Mgongola Irrigation scheme to a recognised irrigation group in order to be able to secure a donor for the rehabilitation of the intake weir. The scheme is undergoing a transitional phase in which all responsibility is gradually handed over to the new irrigation group.

Institution

The group's leaders were elected on 15th May 2002 by 211 farmers in a general vote. The executive committee is comprised of a chairperson, vice-chairperson (♀), secretary, treasurer (♀) & 6 members (2 are women). Elections are scheduled to take place by secret ballot every 3 years. No sub-committees have been formed.

The exact number of active members is unknown, but is estimated between 200-300. At the first general meeting, planned for the 10th February, a formal registration of members will take place[4]. Membership prerequisites have already been set: to be a farmer, a resident of the area, aged 18 and over, be a landowner, agree to abide by the constitution and be mentally fit. Tenant farmers[5] and absentee landowners will not be allowed to join the group. The 10th February general meeting will also be used to present the draft constitution and by-laws for adoption.

The irrigation is not registered, but there are plans to register as a cooperative. The decision to register as a cooperative was influenced by the Cooperative officer's presentation on the advantages of registering as a cooperative and disadvantages of registering as an association. Indeed, the farmers' initial decision was to register the group as an association, in part because of bad experiences of cooperative in the past. Participants revealed that they did not know they difference between a cooperative and an association. An application for water rights is pending at the Pangani Basin Water Office.

[4] There are 2500 farmers (above the age of 18) at Mijongweni. These are all potential group members.
[5] There are approximately 50 farmers in the village.

Activities

The frequency of meetings has not been fixed as yet. Collection of fees has not happened either. However, the registration fee has been set at 2000/-, and 1000/- as the annual fee. Indeed, no money has been collected as yet because the village government has retained control of the money that is contributed towards maintenance costs. Participants reported that this was a source of tension and hostility between the group and the village government because they have handed over all responsibility of the scheme's infrastructure to the executive committee without the money contributed as maintenance charge by the village government. Once the group is registered a yearly/seasonal maintenance charge will be set.

Mijongweni farmers have received training on how to establish a cooperative society, how to improve irrigation activities, paddy production and upland crop production. Their future training requirements were prioritised as follows: leadership, financial management, operation & M, paddy production and marketing of the farm products.

Organisational Analysis

The group is still weak and lacks autonomy of irrigation activities because some of the activities are still performed by the village government. A seminar has already been conducted on how to run the group and all work/responsibilities of repairing the intake already been handed over to the group's leaders, except for the budget (money). Money collected is still handed over to village government. Transfer from village government to the irrigation group must be complete in order to foster sense of ownership and relieve the current tension between the village government and the irrigation group.

The organisation is still in its infant stages, having been formed in 2002. No general meetings or formal registration of members has occurred. The constitution is in draft form and no money has been collected for registration of the cooperative as yet. However, observation of the group leaders indicates that there is potential for a strong organisation although a lot of work is yet to be done. Communal village work already takes place on Tuesdays and Thursdays. Therefore, it will not be difficult to incorporate canal maintenance work into farmer's schedules.

O & M FOR IRRIGATION AND DRAINAGE FACILITIES

Regulation of O & M

The intake was built in the 1980s and rehabilitated in 1991 by the Food and Agriculture Organisation (FAO). Additionally, the main canal, road culverts and the diversion boxes (1 to 9) were also rehabilitated. The village government chose 9 people to act as water distributors to operate these 9 main canal regulators as well as other diversion boxes downstream and the intake. It is these water distributors who set the start and end date for irrigation. The 1991 rehabilitation activities were carried out without the involvement of farmers. All construction was done by hired masons and only the village leaders (government and elders) were consulted. No training on operation and maintenance of irrigation facilities was conducted.

The distribution rule is that doors 1 and 4 are opened every day (because they irrigate a larger area). Doors 2, 3, 5, 6, 7, 8, and 9 are opened based on need. Irrigation

continues for 24 hours and the 9 water distributors' shifts change every 12 hours. Every farm is allowed given water after 2-3 days. When there is a shortage of water, all farmers are obliged to reduce the farm size cultivated. The penalty for non-compliance is 10,000/-. Non-payers are prosecuted.

Maintenance work can take place on any given Tuesdays and Thursday, which are days set aside for village communal works. Although maintenance is regular (once or twice a month) there is no set schedule. Water distributors identify areas in need of repair/rehabilitation either from patrols or from farmers' reports. Maintenance of the intake is communal. Since the intake weir was destroyed in 2002, maintenance work takes place once a week and involves re-filling and replacing sandbags, and filling baskets with stones. Maintenance of the main canals is communal. Each farmer is given a portion of canal (10-20 paces) in which to plug leaks, weed, de-silt and form bunds. The penalty for not participating is 2000/-.

For maintenance of field canals, each distributor will organise his group of farmers (between 10-15) to carry out communal maintenance work. Farmers involved in clearing the intake, de-silting and clearing canals, plugging leaks, bank forming and repair of canal structures. The water distributor blocks water from entering the canal until they have been cleaned. The penalty for not participating is to not receive water.

Participants reported that when the village government was managing the scheme, there was no schedule for maintenance activities. This has contributed to the current state of disrepair and the eventual break down of irrigation infrastructure.

Situation of O & M for Facilities

In 2002 during the rainy season, heavy floods completely destroyed the intake weir. Participants stated that the main reason for this was poor workmanship as the intake had been leaking prior to the rains. At the moment water is diverted by placing sandbags at the intake. However, these require frequent stabilisation and farmers attend weekly maintenance work to plug leaks and re-fill/replace sandbags. These problems have been relayed to the District office, and forwarded to the Zonal office. The Zonal office has contacted the village government and an agreement has been made to construct a temporary weir (to be replaced later by a permanent one). However, there have been no meetings between the Zonal officers the farmers. The village government has instructed the farmers to begin collecting stones for when construction begins. Between intake and door 1, there is rise/rock which prevents the smooth flow of water and leads to the accumulation of mud.

Of the 9 diversion boxes, all but 2 no longer have gates. These are been replaced by traditional gates made with grass. However, this is recognised as not being an effective mechanism to control water. A lot of water is lost through leaking. At Nyanga the diversion box and culvert are broken. Also, beyond Nyanga, there is a an area that does not have a proper drainage system, and a lot of water remains stagnant.

Many canals are not lined and a lot of water is lost through seepage. After door nine, many of the traditional canals are being are being widened and consequently a lot of water is lost. Other canals are lower than the fields. Indeed many farmers have not levelled them in order to increase the efficient use of water. In order to divert water onto higher fields, farmers place a large obstruction in the canal so that the water level

rises, thereby preventing downstream users from receive any water. The most severe case is at Miembeni sub-village (Kwa Dismas) where the field level is very high and some farmers have destroyed bunds.

Participants also reported that the Mijongweni farm roads were unusable during the rainy season because many canals cross the road in the valley and flooding is common.

Conflict over Water Distribution

Dry season (Sep-Feb) water scarcity has become acute since the intake was damaged in the 2002 floods. The conflict is spread evenly between upstream and downstream water users and amongst users of the same canal. Within the same canal, farmers may block water from going into their neighbour's plot in order to increase their share of water. The rate of water theft is high and may occur at any time. It was stressed that this practice is usually perpetrated against the more vulnerable members of society, women and youth. The conflict between upstream and downstream users lies in the problem of un-levelled fields. By blocking the water in order for it to rise high enough high enough to allow irrigation, very little water reaches downstream users. This is a very common occurrence, and the penalty is a 10,000/- fine.

Participants stressed that water scarcity is not only caused by the above-mentioned practices. Rather what they considered is the real cause of the problem is that a) water distribution is done by guesswork; and b) many fields are not prepared properly and therefore require more irrigation time than was originally set for them. There are also some areas where the soil does not retain water in Kiyungi, Ofisini and Mijongweni chini sub-villages. A lot of water is also lost because the canal head regulators are broken.

Mediation of water disputes is done by the sub-village chairpersons in conjunction with the relevant water distributor. The agricultural extension officer does not get involved.

Improvement of the Irrigation Scheme

Although the farmers main objective is to re-construct the destroyed intake weir, they would also like to extend irrigation to the rain-fed areas (196 ha)[6]. In collaboration with the Zonal office, the farmers are in the process of looking for a donor to support the reconstruction of the intake weir. Apart from the intake, other areas that require improvement include the canal regulator gates. Gates 1 and 2 are in poor condition, while gates 3-9 need to be replaced. All canals require lining in order to prevent seepage and in waterlogged areas, drainage canals need to be constructed (especially downstream of Nyanga, Mnazini and downstream of Gate 1). Participants reported that a drainage system was designed 1990 but not constructed. Village and farm roads require rehabilitation and construction, and where a canal crosses the road, culverts need to be put in place to prevent future flooding. Where required, farms should be levelled.

In order to carry out the above-mentioned tasks, the Mijongweni farmers have requested the government's assistance to secure funding. Farmer's contribution will

[6] In accordance with current practice, paddy and maize will be cultivated on clay soil and sandy soil respectively.

consist of their labour to collect/carry stones (which is already ongoing), excavation of canals and minor construction tasks.

Possible Future Constraints Based on Past Experience

The fine set at 10,000/- is too high for farmers and is not likely to be collected. The chances of it being effective are low, and thus should be reduced to a more realistic figure.

A lot of water is lost causing conflict over water distribution. Rehabilitation of irrigation infrastructure should concentrate on how to maximise the use of water. Therefore, the levelling of fields is of utmost importance.

The conflict between the village government and the irrigation group can have negative consequences for the management of the facilities and the irrigation group. The current village government members have the ability to hamper the development of irrigation activities in Mijongweni.

It has emerged that the framework provided by cooperative and association is not the most appropriate for irrigation groups. Choosing one or the either is bound to bring disadvantages and advantages.

GENDER ISSUES

One of the (male) participants pointed out that that the patriarchal system of gender relations prevails at Mijongweni village. Therefore, the traditional division of labour is the dominant, in which men are the head of the household, the main decision-makers and more likely to manage money. Women are supposed to remain within 'their' domestic sphere. It is the patriarchal system that lies behind chaga land tenure where women do now own land. As widows they may do so on behalf of their children. As divorcees they are not entitled to a share of their husband's land. Only if it was jointly owned will it be divided. Therefore within the scheme, most female members will be either widows or divorcees. And it is these women who are most picked on when it comes to water theft and illicit diverting of water. Married women who own land of their own will have it registered under their husband's land.

In Mijongweni, it is evident that women partake in agricultural and maintenance activities to an equal, if not greater, extent than men. It was claimed that a lot of men leave some types of work to their wives, such as planting, transplanting, weeding, protecting crops from animals and weeding. This work is in addition to the domestic workload awaiting their return from the farm[7]. However, after sale of crops, women do not receive any of the income. Furthermore, there are also high levels of child labour. Although children are not forced to drop out of school, they do miss out on some school days.

The situation of women described here is belied by their very active participation in the workshop and in the scheme. In part, this can be explained by the enterprising spirit of the chaga people and their usually high levels of education for both men and women. There are four women in the executive committee, two of which hold the positions of vice-chairperson and treasurer. Women are active in meetings and are granted equal training opportunities with men.

[7] A woman can pay 100/- to avoid communal maintenance working, in order to stay at home and carry out the domestic work.

Advantage and Disadvantage to Gender by Development Activity

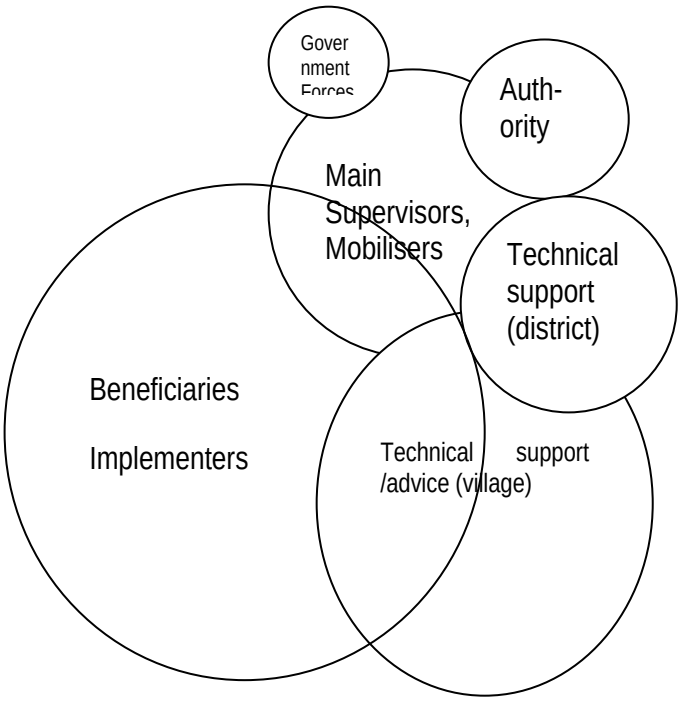
In Chaggaland, women do not have access to land. Therefore, women are bound to benefit less than men if production of crops and their price at sale is improved. Women are more likely to serve as labour, while men continue to pocket the income.

SUPPORT FROM THE GOVERNMENT OF TANZANIA

The VENN Diagram methodology was used to determine the importance of each of the actors in the farmers' supporting system (persons or institutions), the intensity and type of interaction with the farmers as well as a rough assessment of the communication between them and the irrigation group. Participants identified key persons or institutions up to the regional level whose action/inaction may impact on agricultural activities at Mijongweni. These were grouped under five main headings based on the nature of their relationship with the irrigation group.

Beneficiaries/Implementers	Farmers, Women's Groups, Irrigation group executive committee
Technical expertise (village):	Agricultural extension officer, Water distributors (9)
Main supervisors/Mobilisers:	Village Government, Councillor
Technical expertise (district):	Community development officer, Natural Resources office, Cooperatives & Marketing officer, Water and Livestock Office, Land Use Office, District Agricultural Officer, District Engineer (Works)
Authority:	District Commissioner, District Director, MP
Government forces:	Police, Court

The figure below indicates the level of interaction between the farmers and the persons/institutions in their support system, at different levels of government hierarchy. The technical support staff at village level are the most crucial individuals to the agricultural/irrigation activities at Mijongweni. In a role of supervisors is the village government, and councillor. These serve as a liaison between the farmers and actors at the level of Authority and Government Forces. There is no direct communication between the farmers and the technical support at district level. Rather it is channelled either through the technical support staff at village level, the agricultural extension officer, or the village government.



Communication

The agricultural extension officer is in charge of 3 villages, Mijongweni (headquarters), Kimashuku and Shirimgungani, through which he rotates, spending 1 day in each sub-village. Overall, the agricultural extension officer has the approval of the farmers and viewed as a hard-worker. Communication is frequent and open. Issues discussed centre on problems in agriculture and pest management. The agricultural extension officer reports to the district each week and relays back any news. He also attends the water distributors' meeting and gives seminars to farmers. The only draw-back is that he has not been provided with a means of transport to reach all the sub-villages under his charge.

The 9 water distributors who operate the irrigation canals are viewed as being even more important than the agricultural extension officer. Participants did not voice any complaints about their performance and the 3 water distributors present at the workshop were very active in pointing out problems related to the irrigation system.

The village government, on the other hand, did not receive a positive rating. Communication between the irrigation group and the village leadership is not smooth because of conflict over control of the maintenance money. The village government

has retained all money that was previously collected as maintenance fee, and it is currently being used to cover other, unknown costs. This problem has been reported to the District Commissioner and the MP in a bid to change the village leadership. The MP Mboe has agreed to visit on 18th February.

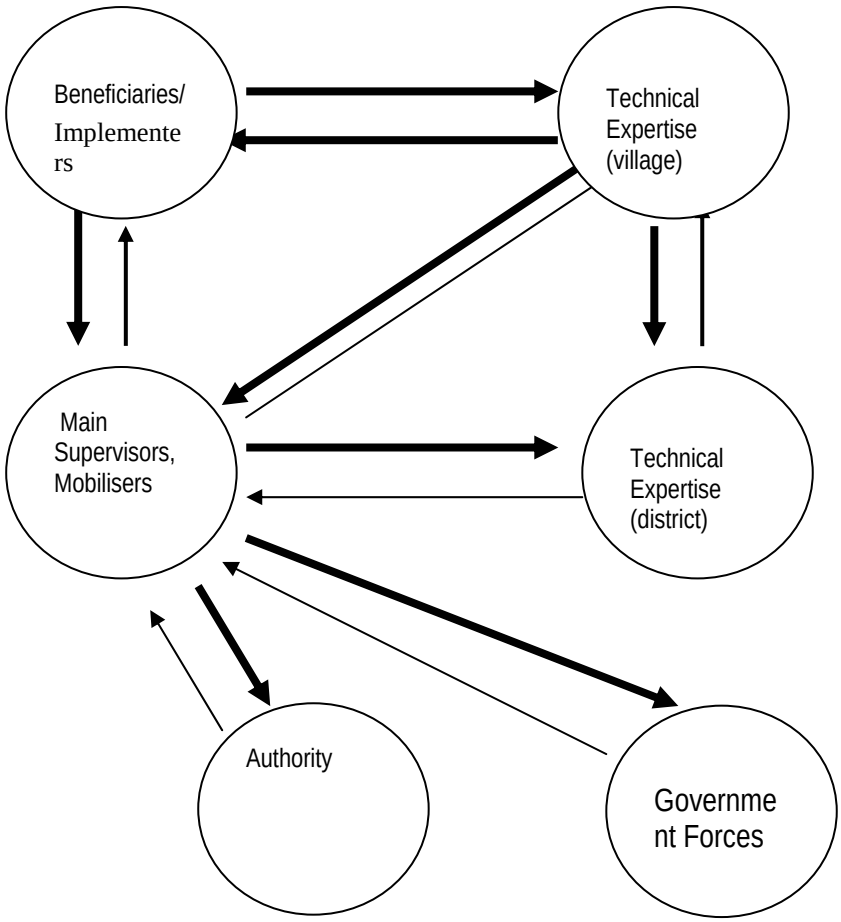
Participants also claimed that government leaders are weak and corrupt. There have been no public meetings in 3 years although the constitution states that there should be 2 public meetings a year, in addition to any emergency meetings. It was also claimed that whenever aid are delivered to the village and presented to the village government, only half of this is passed on to the intended beneficiaries. The last time that seeds were brought by the agricultural extension officer, they were distributed among the government members and their friends.

In view of this atmosphere of animosity, communication with the village government is occasional. Farmers will relay a complaint through the chairperson of the irrigation group, one of the water distributors or the agricultural extension officer. However, the chairperson of the irrigation group is more likely to communicate with the chairperson of the sub-village. These leaders have been most helpful to the farmers in matters of water distribution. The agricultural extension officer's office is in the village government office, which is where he reports every morning to state where he will be working on that day.

All communication with the district office takes place via the agricultural extension officer and usually relates to agricultural problems in the village, for e.g. pest management and how to improve farming techniques. It is also possible for the farmers to send a message directly to the district. However, the district agricultural officer will always liase with the agricultural extension officer and village government in dealing with the problem. Participants said they were satisfied with the method of communication, but complained that the district office does not always respond promptly to emergency situations such a pest infestation. The farmers relationship with the cooperative officer is good.

Frequent communication with the Zonal Office (irrigation engineer and agricultural officer) began only recently, after the intake weir was destroyed. Prior to that communication occurred only once or twice a year. However, since last year, zonal officers have visited Mijongweni frequently and have mobilised the community to participate in the rehabilitation of irrigation infrastructure. To-date Zonal officers communicate with the village government or the chairperson of the irrigation group. Participants were satisfied with the response of the Zonal officers, but would like there to more openness regarding the budget available for the project.

The figure below summarises in visual form the frequency and flow of communication within the farmers' support system.



RECOMMENDATIONS

The Government of Tanzania should develop a legal framework for irrigation groups. At the moment, neither of the organisations of cooperative or association cater exactly for the needs of irrigation groups. For now, the Ministry of Agriculture needs to decide on the best option to be promoted to all irrigation groups by the agricultural extension officer and community development officer.

During the construction of the irrigation facilities, all labour should be provided by the farmers voluntarily. The practice of paying farmers in order to speed up construction work is detrimental to future communal work, as this may be seen more as an income generating activity rather than for the good of all farmers. In future, farmers should be mobilised ahead of time to ensure that everyone participates equally in communal work and a timetable is prepared. In Musa Mwinjanga, there are already 2 days a week set aside for village communal work. This pre-established schedule should be taken advantage of by the Zonal office. District and Zonal officers should also train in participatory and empowerment approaches.

The agricultural extension officer does not have access to means of transportation to enable him to perform his duties efficiently. Therefore, a motorcycle should be made available to him.

Cooperation between the village government and the irrigation group is vital to ensure smooth running of all farming activities e.g. enforcement of defaulters. Measures have already been taken to attempt to remove the current leadership. It is vital that strong and accountable leaders are elected.

Annex 1: Registration

Observers

	Name	Position	Office
1	R. A. Kweka	Counterpart	MAFS Irrigation, DSM
2	R. R. Komanga	RRA Coordinator	MAFS Irrigation, DSM
3	M. Osada	JICA Study Team	
4	H. Ohnuma	JICA Study Team	
5	S. Matsushima	JICA Study Team	
6	T. Igawa	JICA Study Team	
7	T. Kuroda	JICA Study Team	
8	H. Shimazaki	JICA Study Team Leader	
9	H. Okada	JICA Expert	Morogoro Zonal Irrig. Office
10	Luswema		Morogoro Zonal Irrig. Office

Participants- Day 1

	Name	Occupation	Irrigation Group
1	Salome Daniel	Executive Committee, Member	Mijongweni
2	Kibibi Shabani	Farmer	Mijongweni
3	Fadhila Amani	Farmer	Mijongweni
4	Baby Ramadhani	Farmer	Mijongweni
5	Bertha Mushi	Farmer	Mijongweni
6	Brigita Raphael	Farmer	Mijongweni
7	Salvaga Emmanuel	Farmer	Mijongweni
8	Lucy Marceli	Farmer	Mijongweni
9	Ignas Munishi	Farmer	Mijongweni
10	Benedict Mwacha	Farmer	Mijongweni
11	Hussein Maguru	Farmer	Mijongweni
12	Iddy Tengu	Farmer	Mijongweni
13	Salum Mrema	Farmer	Mijongweni
14	Yusufu Husseini	Farmer	Mijongweni
15	Mwajabu Husseini	Farmer	Mijongweni
16	Hamisi Rajabu	Farmer	Mijongweni
17	Martini Agustino	Farmer	Mijongweni
18	Huseini Mwingira	Water Distributor	Mijongweni
19	Alphonce Msele	Farmer	Mijongweni
20	Robert Mselle	Executive Committee, Member	Mijongweni
21	Egajm Masiale	Executive Committee, Member	Mijongweni
22	Clemence Zuisso	Executive Committee, Member	Mijongweni
23	Mamura Ngerro	Farmer	Mijongweni
24	Omari Mohamedi	Executive Committee, Member	Mijongweni
25	A. S. Kibirti	Chairperson	Mijongweni
26	Amina Kibanda	Executive Committee, Member	Mijongweni

27	Lidia Erasmo	Farmer		Mijongweni
28	Serena Daniel	Farmer		Mijongweni
29	Rehema Mhando	Executive Member	Committee,	Mijongweni
30	Rose Zuberi	Farmer		Mijongweni

Participants- Day 2: unavailable

Annex 2: Workshop Schedule

Day 1

Registration of participants
Introduction Workshop rules
Group work
Presentation of group work & discussion
Lunch
Group work: Institution, Agriculture, Irrigation

Day 2

Group work: Institution, Agriculture, Irrigation (continued)
Presentation of group work & discussion
VENN Diagram & Discussion
Lunch
VENN Diagram & Discussion (continued)
Closing
Group picture

Annex 3: Workshop Evaluation

☺ workshop went well and rules set were followed
☺ have learnt things we did not know/clarified things we didn't understand
☺ exchanged ideas/opinions
☺ happy to be able to speak with Director of Irrigation
☺ mains of workshop included poverty alleviation
☺ promises (ahadi) regarding rehabilitation of irrigation infrastructure
☺ to be able to express our problems without fear
☺ to meet with Japanese representatives
☺ good workshop preparations
☺ lively facilitator
☺ hopeful that we will reach our objectives
☺ that Mr. Okada speaks Kiswahili
☺ openness/truthfulness of participants

☹ heat
☹ not being able to communicate with the Japanese
☹ don't know when another workshop will be held to evaluate the implementation of today's decisions

Annex 4: Mapping

Ramani ya rasilimali za mradi wa
umwagiliaji ionyeshe taarifa zifuatazo:

mipaka ya kijiji
kilimo cha umwagiliaji kinafanyika wapi?
Maji ya umwagiliaji ni yapi na yamegawanywa kivipi?
mifereji ya umwagiliaji
vitaro vya mashamba na mmilikaji (kikundi au mtu binafsi)
eneo la kilimo cha mvua
eneo la umwagiliaji
banio
mifereji ya umwagiliaji
mlango, vifaa na miundo-mbinu vya umwagiliaji
eneo lote kulimika
na mengineo yanayohusiana na kilimo cha umwagiliaji

Annex 5: Focus Group Discussion on Culture and Customs

Shughuli za kimila na utamaduni kuhusiana na kilimo cha umwagiliaji

Taja mila, desturi na utamaduni zote zinazohusiana na kilimo cha umwagiliaji:
wakati wa kusafisha mashamba
wakati wa kupanda
wakati wa kuvuna mazao
zinazohusika na kuhifadhi mazao

Elezea mila na desturi hizi sinavyoweza kusaidia au kuathiri shughuli za kilimo.

Taja njia zinazoweza kupunguza athari mlioelezea na kuboresha zile zinazosaidia kilimo (haswa cha umwagiliaji).

Je, kuna miiko au vikawazo vinavyohusiana na umwagiliaji kwa kutumia maji katika mila zenu?

Kama zipo, mnafanyaje ili kuepuka na majanga yanayoweza kutokana na mila hizo? Mnazidhibiti vipi?

Katika umwagiliaji, kuna mila na desturi yoyote zinazoathiri jinsia ya wanaume au ya wanawake?

Annex 6: Focus Group discussion on Women's Issues

Ushirikishwaji wa Wanawake Katika Kilimo cha Umwagiliaji

Je, mgao wa shughuli za kilimo kati ya wanaume na wanawake (ngazi ya kaya) unalingana?
Kama haulingani, umnafikiria mnaathirika vipi na mfumo huo? Tunaweza kuuboresha vipi?

Mnashirikishwaje katika
ujenzi na ukarabati wa miundo-mbinu ya mradi (shughuli zipi?)
uendeshaji na matunzo wa mradi (shughuli zipi?)

Kama hamshirikishwi katika kazi za ujenzi/ukarabati, ni shughuli gani nyingine mnazozifanya mbali ya zile za ujenzi/ukarabati? Km. kupiga chakula.

Kuna kazi ambazo hamruhusiwi kushiriki au kuzifanya?

Kuna adhabu zozote kuwaadhibu wasioshiriki kwenye kazi za ukarabati, matunzo na uendeshaji wa kilimo cha umwagiliaji? Je, wanawake mnalipa faini hizo?

Je, wanawake mnapewa nafasi sawa na wanaume kwenye masuala ya mafunzo ya kilimo cha umwagiliaji? Kama mmepewa, ni mafunzo yapi na wanawake wangapi walioshiriki katika mafunzo hayo?

Je, wanawake mnamiliki ardhi?
Kama ndiyo, wanawake wangapi wanamiliki ardhi katika skimu hii?

Je, katika skimu hii, mwanamke aliyeolewa anamiliki ardhi chini ya kivuli cha mumewe au yeye mwenyewe?

Wanawake walioachika, wanapataje ardhi ya kulima?

Mashamba yakiwa ya mtu na mke wake, je, mnashirikishwa katika mikutano ya vikundi vya umwagiliaji?
Kama mnashiriki, mnachaguliwa kama viongozi?
Kama mnachaguliwa, wanawake wanashika nafasi zipi na ni wangapi?

Annex 7: Farming Calendar

Activity	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Purchase of farm inputs			✓	✓									✓	✓							✓	✓		
Clearing farms	✓	✓									✓	✓							✓	✓				
Tilling		✓	✓								✓	✓							✓	✓			✓	✓
Nursery											✓	✓											✓	✓
Transplanting	✓	✓			✓	✓							✓	✓					✓	✓				
Weeding			✓	✓			✓	✓	✓	✓					✓	✓					✓	✓		
Application of fertilisers	✓	✓	✓	✓			✓	✓	✓	✓					✓	✓					✓	✓		
Application of agro-chemicals	✓	✓	✓	✓			✓	✓							✓	✓					✓	✓		
Herbicide													✓	✓									✓	✓
Irrigation	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Protect crops from destructive animals			✓	✓	✓	✓													✓	✓	✓	✓		
Harvest crops					✓	✓	✓	✓									✓	✓	✓	✓	✓	✓		
Post harvest					✓	✓	✓	✓									✓	✓			✓	✓	✓	✓
Storage																			✓	✓	✓	✓	✓	✓
Selling crops					✓	✓	✓	✓											✓	✓	✓	✓		

Annex 8: Seasonal Calendar

Variables	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Credit												
Farm inputs												
Availability of extension services												
Employment women												
Employment men												
Employment children												
Rainfall												
Diseases human												
Crop pests												
Crop diseases												
Adequate irrigation water												
Income												
Expenditure												
Food scarcity												
Destructive animals												
Harvest												

Annex 9: Land Use and Agriculture Questionnaire Results

Land Use and Agriculture

- Land Use in the Target Area (Mgongola development area within the villages of Mkindo, Dihombo and Hembeti)

Item	(Area in ha)
Total Number of Household	800 H/H
Total Farm Land	676
Total Cultivated Area and Fluctuation	500
Rainfed Area	10-15
Irrigated Area	480
Potentially Irrigable Area	676

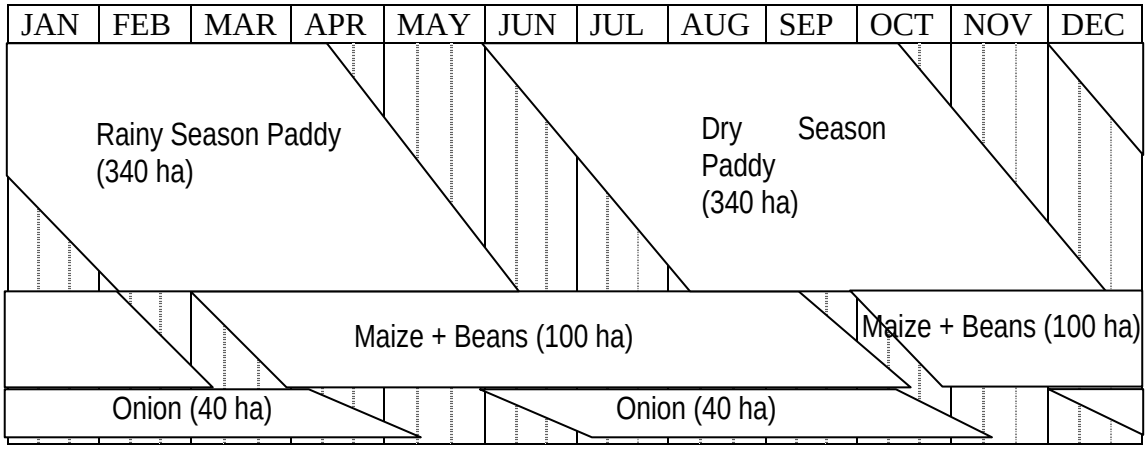
- Crop Production

Major crops cultivated	Rainfed		Irrigated (rainy season)		Irrigated (dry season)	
	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)	Cropped area (ha)	Average yield (ton/ha)
(1) Paddy			340	3.4	340	4.0
(2) Maize			100	1.8	Each 50 ha	1.8
(3) Beans				0.4	separately	1.1
(4) Maize + Groundnut	10 - 15	-				
(5) Vegetables (Onion)		-			40	10.0

* Vegetables include onion, tomato, spinach and cabbage

- Farming Calendar and Cropping Pattern

Wet season Paddy (IR54/IR56)	from	Dec/Jan	to	Apr/May
Dry season Paddy (IR54/IR56)	from	Jun/Jul	to	Nov/Dec
Upland Crops				
1. Maize (Rainy season)	from	Mar	to	Aug/Sep
2. Beans (Rainy season)	from	Mar	to	May
3. Maize (Dry season)	from	Oct	to	Feb/Mar
4. Beans (Dry season)	from	Jul	to	Sep/Oct
5. Onion	from	May (Sowing), Jul (T.P.)	to	Sep/Oct



- Land Ownership Situation and Problems

Most farmers own their land individually through inheritance and purchasing. There are no major land dispute but land fragmentation is going on. Average land area owned by one family is about 1.5 to 2.o acre distributed in 2 or 3 locations.

- Farm Size Distribution (No data)

- Major Constraints in Crop Production, Input Supply and Marketing

Problems/Difficulties	Notes
Water scarcity through improper function of irrigation system	Even before the breakage of weir
Limited affordability fore inputs such as seeds, fertilizer and pesticides	Inputs are available in the market
No negotiation power of farmers to middleman for the sale of their farm products	Future formation of cooperative may improve the situation through group selling
Low education of farmers in general	

- Major Significance for the Introduction of Irrigation System

Rehabilitation of weir and distribution points and improvement of seepage loss for the accomplishment of perfect double cropping.

Farmers Supporting System

- Post Harvest

Crop	Harvest Method	Storage Method	Storage Facility
Paddy	By hand	Bags in room	-
Maize	By hand	Bags or drums	-
Beans	By hand	Bags or drums	-
Onion	By hand	No storage just sell	-

- Marketing and Prices

Crop	Market Channels	Farm Gate Price (low/high) in Tsh/kg	Season (low/high)
Paddy (Rainy season)	Middleman	150/220	Jun-Jul/Oct-Dec
Paddy (Dry season)	Middleman	200/250	Nov/Jan
Maize	Middleman	95/120	Harvest/few month after
Beans	Middleman	175/300	Harvest/Dec-Feb
Onion	Middleman	250	Fluctuated

- Input Supply

Kind of Input	Obtained from where	Purchasing Method	Availability and Source of Loan	Availability of Subsidy
Certified Seed (IR)	KATC (so far using their own seeds from previous			No
Fertilizer	Shops in	Cash		No
Chemical	Moshi			No
Machinery	One tractor in village individually owned and leased			No
Others ( )				

Note: Tillage is being carried out 20% by machinery and 80% by hand

- Extension Service

1) Are you a member of any organizations or cooperatives?	Cooperative in near future
2) Which organization provides you with technical assistance?	- Extension agent from DALDO in village - KATC Training
3) How frequently do you have technical assistance?	Available at anytime
4) What kind of support do you get from them?	All types of technical support

- Indigenous Knowledge

Unique knowledge for effective use of limited natural resources, environmental conservation, unique technologies for crop production:
*Use Neem leaves extract as pesticide in case no agro-chemicals
*Application of ash from firewood to home garden
*Compost preparation is not common yet

Farm Economics (for typical farm family)

- Farm Income

(1) 0.6 ha irrigated paddy
Rainy season paddy:((0.6 ha x 3.4 ton/ha x 1,000 kg/ton) = 2,040 kg
Dry season paddy: (0.6 ha x 4.0 ton/ha x 1,000 kg/ton) = 2,400 kg
Total: 4,440 kg – 560 kg for consumption = 3,880 kg x 200 Tsh/kg = 776,000 Tsh
(2) 0.2 ha for Maize
(0.2 ha x 1.8 ton/ha x 1,000 kg/ton) x 2 seasons = 720 kg – 200 kg for consumption = 520 kg x 100 Tsh/kg = 52,000 Tsh
(3) 0.1 ha Onion
0.1 ha x 10 ton/ha x 1,000 kg/ton x 2 seasons = 2,000 kg x 175 Tsh/kg = 350,000 Tsh

- Production Cost

(1) Irrigated paddy (Tsh/ha)	Tillage	37,500
	Paddling	50,000
	Transplanting	42,500
	Weeding	37,500
	2nd weeding	25,000
	Fertilizer	86,250
	Scarring birds	62,500
	Pesticides	18,750
	Sub-Total	360,000
	x 0.6 ha x 2 seasons	432,000
	Harvesting + Threshing + Bagging	99,000
	Total	531,000
(2) Maize (Tsh/ha)	Negligible	
(3) Onion (Tsh/ha)	Total for 1 ha	250,000
	x 0.1 ha x 2 seasons	50,000

- Expenditure

1,500 Tsh/day x 30 days/month x 12 months/year = 547,000 Tsh/year

- Farm economics for typical farm family of 6 members

(Unit: 1,000 Tsh.)

	Holding Size (ha)	Harvest Area (ha)	Farm Income	Off Farm Income	Gross Income	Product Cost	Net Income	Living Expense	Net Profit
Inside the scheme									
Paddy		0.6	776						
Sub-total		0.6	776			531	245		
Outside the scheme									
Raifed Maize		0.2	52			-	52		
Home Garden		0.1	350			50	300		
Sub-total		0.3	402			50	352		
Total	0.9	0.9	1,178	α	1,178 +α	581	597	547	16+ α

Appendix F

Report on Preliminary Environmental Assessment

Appendix F
Report on Preliminary Environmental Assessment

Table of Contents

1.0 INTRODUCTION F-1
1.1 Objective of the study F-1
1.2 Relevant Regulations and Laws F-2
1.3 Methodology F-2
2.0 PRELIMINARY ENVIRONMENTAL ASSESSMENT F-4
2.1 Scheme – 1: PAWAGA IRRIGATION SCHEME F-4
2.1.1 Project Description F-4
2.1.2 Site Description F-5
2.1.3 Screening, Scoping and Examination on Potential Environmental Impacts F-7
2.1.4 Conclusion and recommendations F-10
2.2 Scheme – 2: KINYOPE TRADITIONAL IRRIGATION SCHEME F-12
2.2.1 Project Description F-12
2.2.2 Site Description F-13
2.2.3 Screening, Scoping and Examination on Potential Environmental Impacts F-15
2.2.4 Conclusion and recommendations F-17
2.3 Scheme – 3: MUSA MWINJANGA TRADITIONAL IRRIGATION SCHEME F-19
2.3.1 Project Description F-19
2.3.2 Site Description F-20
2.3.3 Screening, Scoping and Examination on Potential Environmental Impacts F-22
2.3.4 Conclusion and recommendations F-24
2.4 Scheme – 4: PAMILA WATER HARVESTING IRRIGATION SCHEME F-26
2.4.1 Project description F-26
2.4.2 Site Description F-27
2.4.3 Screening, Scoping and Examination on Potential Environmental Impacts F-29
2.4.4 Conclusion and recommendations F-31
2.5 Scheme – 5: MAGOMA TRADITIONAL IRRIGATION SCHEME F-33
2.5.1 Project Description F-33
2.5.2 Site Description F-34
2.5.3 Screening, Scoping and Examination on Potential Environmental Impacts F-36
2.5.4 Conclusion and recommendations F-38
2.6 Scheme – 6: NKENGE IRRIGATION SCHEME F-40
2.6.1 Project Description F-40
2.6.2 Site Description F-41
2.6.3 Screening, Scoping and Examination on Potential Environmental Impacts F-43
2.6.4 Conclusion and recommendations F-45
2.7 Scheme – 7: KISESE IRRIGATION SCHEME F-46
2.7.1 Project Description F-46
2.7.2 Site Description F-47
2.7.3 Screening, Scoping and Examination on Potential Environmental Impacts F-49
2.7.4 Conclusion and recommendations F-51
2.8 Scheme – 8: LOWER MOSHI IRRIGATION SCHEME F-53
2.8.1 Project Description F-53
2.8.2 Site Description F-54
2.8.3 Screening, Scoping and Examination on Potential Environmental Impacts F-56
2.8.4 Conclusion and recommendations F-59
2.9 Scheme – 1: LUCHILI IRRIGATION SCHEME F-60
2.9.1 Project Description F-60
2.9.2 Site Description F-61
2.9.3 Screening, Scoping and Examination on Potential Environmental Impacts F-63
2.9.4 Conclusion and recommendations F-65
2.10 Scheme – 10: MGONGOLA IRRIGATION SCHEME F-66
2.10.1 Project Description F-66
2.10.2 Site Description F-67
2.10.3 Screening, Scoping and Examination on Potential Environmental Impacts F-69
2.10.4 Conclusion and recommendations F-71
References F-73

1.0 INTRODUCTION

Environmental assessment is geared at ensuring that the development options under consideration are environmentally sound and sustainable. As economic, financial, institutional and technical analyses are part of the project preparation, so is environmental assessment. If potential environmental problems are identified at an early stage during project planning, economic losses that may result from poor project planning can be avoided.

In the course of carrying out preliminary environmental examination, the field team had to abide to both national and JICA guidelines related to environmental assessment procedures.

JICA guidelines (JICA, 1992) propose screening, scoping, Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) in the environmental consideration process. This process entails not only to predict and assess degrees of negative impacts and to study environmental protection measures, but also to assess the benefits of the project in the locality, harmony between development and environment, and the degree of environmental enhancement of affected areas; and to monitor environmental consequences.

Since this assignment was carried out in the preparatory phase of the intended irrigation improvement, it was decided and agreed to term the study "Preliminary Environmental Assessment", which includes screening, scoping and preparation of terms of reference for schemes which will require further environmental investigation.

At this level of assessment, it is decided whether the scheme will be subjected to further investigation through an EIA or if the scheme can be accomplished with specific environmental mitigation measures.

1.1 Objective of the study

The objective of the study was to get a preliminary understanding of the present environmental conditions within the scheme through screening and scoping in order to be able to identify environmental impacts that need further scrutiny in case full-fledged EIA is deemed necessary. In this regard, the study team has prepared a screening and scoping report.

More specifically, the study undertook the following:

- Preliminary identification of environmental and social impacts
- Screening and Scoping in order to comply with existing JICA and national environmental guidelines
- Stakeholder consultations

The preliminary environment assessment involved ecosystem, farming system and participatory approaches. In applying the ecosystem approach, the study team not only focused on the command area, but also on the ecosystem and associated factors,

which have cumulative effects on upstream and downstream environmental and socio-economic development.

On the irrigation scheme level, a farming system approach was used to describe the scheme, to identify impacts on environment and socio-economic setting, resulting from issues like land degradation, water pollution, pesticides and fertilizers use, human health and social setting.

A participatory approach was adopted in identification of environmental and social impacts. This included seeking information from stakeholders, i.e. farmers, village leaders, district and zonal irrigation officers, and other institutions who have been involved in one way or another in the study areas.

1.2 Relevant Regulations and Laws

In Tanzania, relevant regulations and laws pertaining to irrigation development include the Institutional and Legal Framework for Environmental Management, which is being finalized, and the draft Environmental Assessment Guidelines which were revised in March 2002. Other relevant regulations and laws are those under different sectors such as water, land, natural resources, and agriculture.

JICA guidelines related to development study for agricultural and rural development projects are those provided in the "Guideline for Environmental Consideration on Agricultural and Rural Development Projects".

Institutional arrangement:

The environmental management matters in mainland Tanzania lies with the Vice President's Office through which the Division of Environment (DoE) and National Environment Management Council (NEMC) have the authority to make sure that all stakeholders fulfil the requirements of Environmental Impact Assessment before implementing any development projects.

In sectoral ministries, environmental units are established to take care of environmental matters within the sectors. In the Ministry of Agriculture and Food Security (MAFS), the Environmental Cell Unit (ECU) is responsible for environmental planning and management of irrigation schemes. ECU works closely with DoE and NEMC to ensure proper procedures of environmental assessment are followed to ensure sustainable utilisation of land and water resources.

1.3 Methodology

Available literature for respective study areas was reviewed for the purpose of identifying issues of environmental and social concern. Meetings were held with few village communities in respective schemes and these helped to identify key environmental issues and obtain information from stakeholders with regard to their concerns about potential environmental and social impacts. The study team conducted further fieldwork to various areas in the irrigation scheme, upstream and down stream for the purpose of collecting additional information, worked with the

scheme management or Irrigators Associations/Groups where existing, and leased with zonal irrigation office and district officials.

Observation through site visit with few farmers was carried out from the upstream water sources, within the scheme area and downstream with interactive discussion all the way. Useful local information and opinions were utilized to facilitate screening and scoping.

Screening and scoping

Screening and scoping formats were used by the field team according to both national and JICA guidelines related to environmental assessment procedures. Since the national guidelines are still in draft form, JICA screening and scoping formats were used with modification to reflect relevant environmental information pertaining to each irrigation site. The degree of possible environmental impact items were then assigned the following applicable categories:

A: Significant environmental impacts identified or is expected, further scrutiny is required.

B: Significant environmental impacts not clarified, further study is required

C: Significant environmental impacts are recognized to be nil, no further study is required.

In preparing the preliminary environmental assessment report, both NEMC and JICA guidelines were used.

2.0 PRELIMINARY ENVIRONMENTAL ASSESSMENT

2.1 Scheme – 1*: PAWAGA IRRIGATION SCHEME*

2.1.1 Project Description

2.1.1.1 Background Information and Objectives of Scheme

Pawaga improved traditional irrigation scheme has the objective of raising crop production using irrigation and raising living standards of the people in the valley.

2.1.1.2 Brief Description of Scheme

Outline of scheme area	Pawaga improved traditional irrigation scheme is located in Pawaga division, Itinundu ward, Iringa Rural district in Iringa region at approximately $7^0$23'20"S and $35^0$28'08"E. It involves farmers from Iseke, Kinyika, Kisanga, Itunundu, Mboliboli, Mbuyuni, Kimande villages and Pawaga prison.
Beneficiaries and Benefited Area	: 9,000 people in about 1,600 farm families Command area is 2,000 ha
Relevant Scheme Components	: There exists a gabion weir, main canal, drainage system, farming system. No sand exclusion structures and river bank is unstable
Water source	: Water abstracted from Little Ruaha river
Executing Agencies	: Pawaga irrigation scheme will be rehabilitated by the Government of Tanzania (GOT) in cooperation with other donors/financiers.
Environmental Agencies Concerned	: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.1.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
There exists a gabion weir, main canal, drainage system, and farming system. No sand exclusion structures and river bank is unstable	2,000 ha	Unknown	NIL

2.1.2 Site Description

2.1.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights; Inheritance and Outright purchase. Rainfed farms, irrigation fields and village land (including settlements)
(2) Economic activities in and around study area	: Agriculture (irrigated and rainfed); Livestock keeping and Petty business. Crops grown include mainly paddy, maize sweet potatoes, banana and cassava.
(3) Customs (water right etc).	: Pawaga scheme has a water right under the custodian of the Iringa District Executive Director
(4) Host people or community	: Mainly Hehe and Gogo subsistence farmers engaged in irrigated agriculture for many years prior to GOT intervention some years back.
(5) Public health	: Villagers suffer from malaria (a prevailing disease), typhoid and diarrhoea diseases.
(6) Population	: In 1985, about 9,000 persons in about 1,600 families from 4 villages were cultivating Pawaga valley. Total surveyed area is 6,980 ha. However, command area is 2,000 ha.
(7) Others	: A health centre, one primary school, numerous shops and kiosks and a number of milling machines serve communities. Various development organizations exist including CONCERN, ASPS, Church organizations, Tanzania National Parks, MBOMIPA, JICA and DIFD.

2.1.2.2 Natural Conditions of Study Area

(1) Climate	: Rainfall is relatively very low, with an annual average rainfall average of 670 mm to Kimande with an annual average of 385 mm. Wet season is from November to April) and Dry season is from May to October.
(2) Topography	: More or less generally flat land adjacent to Little Ruaha river.
(3) Hydrology and drainage condition	: A number of small rivers contribute water into Pawaga valley before draining into the Great Ruaha river
(4) Soils	: Unknown
(5) Vegetation	: Mainly grassland with scattered trees on uplands
(6) Rare species or fragile ecology	: Unknown
(7) Others	: None

2.1.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**		**X**		
-Habitat of fauna and flora		**X**			**X**			**X**	
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**		**X**		
-Forest reserve		**X**			**X**			**X**	
b) *Areas prone to natural disasters*									
-Area susceptible to erosion	**X**					**X**			**X**
-Flood plains	**X**					**X**			**X**
-Geological hazards			**X**			**X**			**X**

Key: Appl. – applicable N.A. – Not applicable

2.1.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.1.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues		**Health and sanitary issues**	
Planned agricultural settlement	No	Increased use of agrochemicals	Unknown
Involuntary resettlement	No	Outbreak of endemic diseases	Unknown
Substantial change in way of life	No	Prevalence of water borne diseases	Unknown
Conflicts among communities or people	Yes	Residual toxic of agrochemicals	Unknown
Impacts on native people	No	Increase in domestic and other human wastes	Unknown
Impediment to movement of people and livestock	Yes	**Cultural Property Issues**	
Population increase	Unknown	Impairment of historical remains and cultural sites	No
Drastic change in population composition	Unknown	Damage to aesthetic sites	No
Relocation of bases of economic activities	No		
Occupational change and loss of labour opportunity	No		
Increase in income disparities	Unknown		
Adjustment and regulation of water or fishing rights	Unknown		
Changes in social and institutional structures	No		
Changes in existing institutions and customs	No		
II NATURAL ENVIRONMENT			
Biological and Ecological issues		**Soil and Land Resources**	
Deterioration or degradation of vegetation	No	Soil erosion	Yes
Negative impacts on important or indigenous fauna and flora	Unknown	Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	Unknown	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	Unknown	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	No	Devastation or desertification of land	No
Encroachment on tropical forests	No	Devastation of hinterland	No
Destruction or degradation of mangrove forests	No	Ground subsidence	No
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Unknown		
Changes in ground water hydrology	Unknown		
Inundation and flood	Unknown		
Soil sedimentation	Yes		
Riverbank degradation	Yes		
Water contamination and deterioration of water quality	Unknown		
Water eutrophication	Unknown		
Low water temperature	Unknown		
Atmospheric pollution	No		
Poor water management	No	Overall evaluation	**Yes = 7**
Landscape and Mineral Resources			**No = 20**
Damage to landscape	No		**Unknown = 20**

2.1.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	A	C	A
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	A	A	C	B
b) Demographic issues						
Population increase	C	C	C	B	C	B
Drastic change in population composition	C	B	B	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	B	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	B	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. **Health and sanitary issues**						
Increase use of agrochemicals	C	C	C	B	C	C
Prevalence of water borne diseases	C	C	C	A	C	A
Residual toxic of agrochemicals	C	C	C	B	C	C
3. **Cultural Property Issues**						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	A	A	C	A	A
Impacts on indigenous fauna and flora	C	C	C	C	C	C
Degradation of ecosystem	B	B	B	B	B	B
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	A	A	A	A	A	A
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	B	C	C
Soil contamination by agrochemicals	C	C	C	B	C	C
(b) Land Resources						
Soil sedimentation	C	A	C	C	A	C
Riverbank degradation	C	A	C	C	A	C
Inundation and flood	C	C	C	B	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	C	C	C	B	C	C
Change in ground water hydrology	C	C	C	B	C	C
Poor water management	C	C	C	B	C	C
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	C	B	C	B
Water eutrophication	C	C	C	C	C	C
(c) Water quantity						
Adequacy and reliability of water supply	C	B	C	B	B	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training
DS – Drainage System A - Identified or potential significant environmental impact
B – Environmental impact not clarified C – Issue having no environmental impact

2.1.3.3 Potential environmental impacts

In Pawaga scheme, the following potential environmental impacts are expected:

(i) Siltation of main canal from Little Ruaha river sediments. It seems the design did not consider sand-trapping structures to contain sediments and prevent sand from entering the main canal. Siltation greatly inhibits water flows by reducing water velocity and thus resulting in much lower flows with less water being conveyed to the irrigation fields. It is also very expensive for farmers to remove silt from the main canal.

(ii) Waterlogging in the Nyuli area due to poor drainage especially during the rainy season. Some fields are not properly levelled and lack drains as a result of water ponding over long periods with most fields being under field capacity.

(iii) River bank erosion, which has led to Little Ruaha River changing course and in so doing affecting some areas. Little Ruaha riverbanks are being destabilized partly by human activities along its banks and also due to the nature of the soils, which are relatively fragile. This may affect the existing intake site.

(iv) Water use conflicts among farmers especially in the dry season mainly due to poor water management as a result of uneven topography of the fields and farmers having low water management skills. These are likely to increase, as more land will be put into agricultural use using the available water resources.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vi) Land use conflicts between farmers and livestock keepers. These are mainly due to absence of demarcated areas for both agricultural fields and grazing. In addition, no cattle troughs exist for livestock, thus compelling livestock to search for water in irrigation canals and the Little Ruaha river. This problem becomes amplified during the dry season when herds of cattle have to travel great distances searching for pasture and water.

(vii) Presence of water borne diseases (Typhoid, malaria, diarrhoea diseases, bilharzias and sometimes cholera outbreaks). Mosquitoes transmit malaria whilst houseflies transmit typhoid and diarrhoea. During field visit it became apparent that there are numerous depressions, which allow for water ponding and thus act as breeding sites for disease vectors. In addition, villagers depend on pipe water supply system and in some localities directly from the Little Ruaha River. Most of the people do not boil water for drinking and thus increasing the risk of contracting water borne diseases.

(viii) Presence of *quelea quelea* destructive birds, which according to people interviewed greatly, reduces paddy yield. The irrigators resort to bird scaring, an activity mainly done by children who spend daytime in the fields. Birds likely to increase as more land is put under irrigated paddy.

(ix) Possible soil and water pollution as a result of increased use of industrial fertilizers and pesticides. At present, farmers do not use fertilizers in their farms on the pretext that soils are still relatively fertile. However, with agricultural intensification in the near future, there is likelihood of an increase in use of fertilizers and pesticides.

2.1.4 Conclusion and recommendations

2.1.4.1 Conclusion of PEA and Recommendations

The study team noted that no environmental assessment was done before implementation of Pawaga irrigation scheme. Also the preliminary environmental assessment indicates that there are some environmental and social impacts, which should be looked into more details. Thus, based on the findings from this study, the study team recommends EIA for Pawaga irrigation scheme be conducted. EIA should focus on the identified environmental and social problems.

2.1.4.2 Proposed Terms of Reference (TOR) for Environmental Impact Assessment (EIA)

The Environmental Impact Assessment of Pawaga irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT
1.Socio-economic Environment
- Conflicts among community and people
- Impediment to movement of people and livestock
- Population increase

2.Health and sanitation
- Increase use of agrochemicals
- Prevalence of water borne diseases
- Residue toxic of agrochemicals

NATURAL ENVIRONMENT
1. Biological and ecological issues
- Deterioration or degradation of vegetation
- Degradation of ecosystem

2.Soil and land resources
- Soil erosion
- Soil salinity
- Deterioration of soil fertility
- Soil contamination by agrochemicals
- Soil sedimentation

3. Land resources
- Soil sedimentation
- River degradation
- Inundation and floods

4. Hydrology
   - Change in surface water hydrology
   - Change in groundwater hydrology
   - Poor water management
   - Water deterioration and deterioration of water quality
   - Adequacy and reliability of water supply.

2.2 Scheme – 2*: KINYOPE TRADITIONAL IRRIGATION SCHEME*

2.2.1 Project Description

2.2.1.1 Background Information and Objectives of Scheme

A traditional gravity irrigation scheme located in a valley. The objective of the scheme is raising food production and income for farmers living in the valley.

2.2.1.2 Brief Description of Scheme

Outline of scheme area: Kinyope traditional irrigation scheme is located in Milola division, Milola ward, Lindi rural district in Lindi region at approximately $9^0$59'49"S and $39^0$24'49"E. It involves farmers from Kinyope and Milola villages. It is located 48 km west of Lindi town.

Beneficiaries and Benefited Area: About 2,500 people in Kinyope village in 903 households. Population for Kinyope and Milola villages is 6,622. Command area is 726 ha with 300 ha surveyed.

Relevant Scheme Components: There exists a small concrete weir, which is not operational; numerous local intake structures; unlined open canals; no distribution system; flood irrigation practised; surface drainage follow natural river course. No farm roads.

Water source: Water abstracted from Milola River (perennial) and Nihinu River (seasonal) using locally made intakes. Discharge for Milola River is estimated at 0.226 m^3/sec.

Executing Agencies: Kinyope traditional irrigation scheme will be rehabilitated by the Government of Tanzania (GOT) in cooperation with other donors/financiers.

Environmental Agencies Concerned: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.2.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
There exists a small concrete weir, which is not operational; unlined open canals; numerous local intake structures; no distribution system; flood irrigation practised; surface drainage follow natural river course.	726 ha	Unknown	NIL

2.2.2 Site Description

2.2.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights; Inheritance and Outright purchase. Rainfed farms, irrigation fields and village land (including settlements)
(2) Economic activities in and around study area	: Agriculture (irrigated and rainfed); Honey gathering; Petty business. Crops grown in the valley include mainly rainfed paddy with supplementary irrigation, maize and vegetables during dry season.
(3) Customs (water right etc).	: Kinyope irrigation scheme has no water right.
(4) Host people or community	: Mainly subsistence farmers engaged in irrigated agriculture for many years prior to external intervention in the 1970s.
(5) Public health	: Both dispensary and clinic do not exist in the study area; Nearby dispensary at Makangala village (3 km away). Villagers suffer from Malaria and Bilharzias; Medical services including laboratory services obtained at Rutamba village (8 km away).
(6) Population	: Total number of farmers is 1,434 in 186 households.
(7) Others	: One primary school; numerous shops and kiosks and mosques; no rice milling machines; dilapidated domestic water supply system; Various development organizations exist including the Rural Integrated Program Support (RIPS) and Tanzania Social Action Fund (TASAF).

2.2.2.2 Natural Conditions of Study Area

(1) Climate	: Two distinct climatic conditions – (i) dry season i.e. June to November (ii) rainy season i.e. December to May. Average annual rainfall ranges between 600 mm and 920 mm.
(2) Topography	: The study area falls under medium coastal lowland ecological zone characterised by sandy loam soils to clay.
(3) Hydrology and drainage condition	: Both Milola and Nihinu rivers drain into the study area. Water from agricultural fields and adjacent catchment area drain into Rutamba reservoir and ultimately into the Indian Ocean.
(4) Soils	: Mostly fine to medium textured alluvial clays and sandy clays. Most soils relatively fertile with sufficiently large moisture holding capacity suitable for agriculture.
(5) Vegetation	: Mainly grassland with scattered trees on uplands
(6) Rare species or fragile ecology	: Unknown
(7) Others	: None

2.2.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**x**			**x**			**x**	
-Wetlands of national importance		**x**			**x**			**x**	
-Wildlife corridor		**x**			**x**				**x**
-Habitat of fauna and flora		**x**			**x**		**x**		
-Heritage sites, social, cultural, history and archaeological		**x**			**x**			**x**	
-National parks		**x**			**x**			**x**	
-Forest reserve		**x**		**x**				**x**	
b) *Areas prone to natural disasters*									
-Area susceptible to erosion		**x**				**x**		**x**	
-Flood plains		**x**			**x**			**x**	
-Geological hazards		**x**			**x**			**x**	

Key: Appl. – applicable N.A. – Not applicable

2.2.3 Screening, Scoping and Examination on Potential Environmental Impacts				
2.2.3.1 Screening checklist				
Potential Significant Environmental Impact (SEI)	**Evaluation Bases**		**Potential Significant Environmental Impact (SEI)**	**Evaluation Bases**
I) SOCIAL ENVIRONMENT				
Social economic issues			**Health and sanitary issues**	
Planned agricultural settlement	No		Increased use of agrochemicals	Unknown
Involuntary resettlement	No		Outbreak of endemic diseases	No
Substantial change in way of life	No		Prevalence of water borne diseases	Yes
Conflicts among communities or people	No		Residual toxic of agrochemicals	Unknown
Impacts on native people	No		Increase in domestic and other human wastes	No
Impediment to movement of people and livestock	No		**Cultural Property Issues**	
Population increase	No		Impairment of historical remains and cultural sites	No
Drastic change in population composition	No		Damage to aesthetic sites	No
Relocation of bases of economic activities	No			
Occupational change and loss of labour opportunity	No			
Increase in income disparities	No			
Adjustment and regulation of water or fishing rights	No			
Changes in social and institutional structures	No			
Changes in existing institutions and customs	No			
II NATURAL ENVIRONMENT				
Biological and Ecological issues			**Soil and Land Resources**	
Deterioration or degradation of vegetation	No		Soil erosion	No
Negative impacts on important or indigenous fauna and flora	Unknown		Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	Unknown		Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	No		Soil contamination by agrochemicals	Yes
Encroachment on wetlands	No		Devastation or desertification of land	No
Encroachment on tropical forests	No		Devastation of hinterland	No
Destruction or degradation of mangrove forests	No		Ground subsidence	No
Degradation of coral reef	No			
Hydrology and Air and Water Quality issues				
Changes in surface water hydrology	Unknown			
Changes in ground water hydrology	Unknown			
Inundation and flood	No			
Soil sedimentation	No			
Riverbank degradation	No			
Water contamination and deterioration of water quality	No			
Water eutrophication	Yes			
Water logging	Yes			
Atmospheric pollution	No			
Poor water management	No		Overall evaluation	**Yes = 4**
Landscape and Mineral Resources				**No = 34**
Damage to landscape	Unknown			**Unknown = 9**

2.2.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	C	C	C
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	C	C	C	C	C
Drastic change in population composition	C	C	C	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	B	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	B	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. Health and sanitary issues						
Increase use of agrochemicals	C	C	C	B	C	C
Prevalence of water borne diseases	C	C	C	A	C	C
Residual toxic of agrochemicals	C	C	C	B	C	C
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	C	C	C	C	C	C
Impacts on indigenous fauna and flora	C	C	C	C	C	C
Degradation of ecosystem	C	C	C	C	C	C
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	C	C	C	C	C	C
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	A	C	C
Soil contamination by agrochemicals	C	C	C	C	C	C
(b) Land Resources						
Soil sedimentation	C	A	C	C	A	C
Riverbank degradation	C	A	C	C	A	C
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	B	B	B	B	B	B
Change in ground water hydrology	C	C	C	B	C	C
Poor water management	C	C	C	B	C	C
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	C	C	C	B
Water eutrophication	C	C	C	C	C	C
(c) Water quantity						
Adequacy and reliability of water supply	C	C	C	C	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.2.3.3 Potential environmental impacts

In Kinyope traditional irrigation scheme, the following potential environmental impacts are expected:

(i) Water logging in some areas due to lack of drains. At present excess water follow natural drain and ultimately enter Milola River downstream.

(ii) Destructive birds – this is not a serious problem. However, it entails irrigators spending a substantial time in the fields scaring birds. Vermin also pose a threat to crops in the valley. Extension of irrigable area for paddy and other crops might trigger increase of birds and vermin.

(iii) Possible increase in water use conflicts as a result of more farmers coming in for dry season irrigated agriculture. Most farmers cultivate in the valley during the rainy season with few farmers carrying out farming activities in the dry season. Water use conflicts are due to poor irrigation infrastructure and inadequate water management skills. Much water is wasted in the fields due to flooding irrigation system coupled with lack of sound field canals and drains. As a result irrigation water does not suffice the command area.

(iv) Possible increase in water borne diseases due to use of untreated water directly from the river and from existing domestic water supply, which taps water directly from the river. Malaria and bilharzias are present in the study area. This might be due to stagnant water, which acts as breeding sites for water borne disease vectors.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vi) Some areas in the valley have low fertility due to nature of soils which are sandy resulting into poor crop stands and yields. The use of these areas for crop production in the long run could render them virtually unfit for crop production.

(vii) Possible soil and water pollution as a result of increased use of industrial fertilizers and pesticides. At present, farmers use neither fertilizers nor pesticides in their farms on the pretext that soils are relatively still fertile and pests do not pose a great danger. However, with agricultural intensification in the near future, there is likelihood of an increase in use of fertilizers and pesticides.

2.2.4 Conclusion and recommendations

2.2.4.1 Conclusion of PEA and recommendations

The preliminary environmental assessment indicates that there are some environmental and social impacts, which should be looked into more details. Thus, based on the findings from this study, the study team recommends EIA for Kinyope traditional irrigation scheme be conducted. EIA should focus on the identified environmental and social problems.

2.2.4.2 Proposed Terms of Reference (TOR) for Environmental Impact Assessment (EIA)

The Environmental Impact Assessment of Kinyope irrigation scheme should focus on the following issues

SOCIAL ENVIRONMENT

1.Socio-economic Environment

- Possible increase in water use conflicts
- Presence of birds and vermin

2.Health and sanitation

- Safe use and handling of agrochemicals
- Prevalence of water borne diseases

NATURAL ENVIRONMENT

1. Biological and ecological issues

- Impacts on indigenous flora and fauna

2.Soil and land resources

- Soil contamination by agrochemicals
- Soil fertility loss

4. Hydrology

- Water logging
- Possible water pollution

2.3 Scheme – 3*: MUSA MWINJANGA TRADITIONAL IRRIGATION SCHEME*

2.3.1 Project Description

2.3.1.1 Background Information and Objectives of Scheme

A traditional improved gravity irrigation scheme located in the low land agro-ecological zone of Kilimanjaro region with a greater part on a volcanic outwash plain of very low relief. The objective of the scheme is raising food production and income for farmers living in the study area.

2.3.1.2 Brief Description of Scheme

Outline of scheme area: Musa Mwinjanga traditional improved gravity irrigation scheme is located in Mijongweni village, Machame southward in Hai district, Kilimanjaro region at approximately $3^{o}24'00''S$ and $37^{o}17'46''E$. It involves farmers mainly from Mijongweni village. Few farmers come from Kikafu village, Weruweru village and Moshi township.

Beneficiaries and Benefited Area: : Approximately 600 farmers. Potential command area is 676 ha with 480 ha under irrigation.

Relevant Scheme Components: : There exists a damaged concrete weir, farmers are using sand bags to divert water from river to intake structure; water abstracted by gravity through the unlined main canal and distributed to numerous secondary/tertiary canals in traditional manner. Irrigation water also used for domestic and livestock purposes. No farm access roads.

Water source: : Water abstracted from Weruweru river, which is perennial.

Executing Agencies: : Musa Mwinjanga traditional irrigation scheme will be rehabilitated by the Government of Tanzania (GOT) in cooperation with other donors/financiers.

Environmental Agencies Concerned: : Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.3.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
Damaged concrete weir, unlined main canal; division structures and unlined secondary and tertiary canals. No farm access roads.	676 ha	Unknown	NIL

2.3.2 Site Description

2.3.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights and inheritance land tenure system. Average land holding size per family is 0.4 ha. Rainfed farms, irrigation fields and village land (including settlements within the irrigated command area).
(2) Economic activities in and around study area	: Agriculture (irrigated and rainfed); Livestock keeping (zero grazing); Petty business. Crops grown in the study area include irrigated paddy and rainfed agriculture (maize and beans).
(3) Customs (water right etc).	: Recently formed Mijongweni Irrigators Association (UWAMI) has applied for a water right from the Pangani Basin Water Office (PBWO) to abstract 600 l/s from Weruweru River.
(4) Host people or community	: Mainly subsistence farmers engaged in irrigated agriculture since 1940s.
(5) Public health	: A dispensary exists in the village, however, laboratory services available at Kikafu village and Moshi township. Villagers suffer from Malaria, Amoeba, Typhoid and HIV/AIDS.
(6) Population	: According to 2003 estimates, Mijongweni village had a population of 3,741 people.
(7) Others	: One primary school; numerous shops and kiosks; unreliable domestic water supply system; Scheme was improved by UNDP/FAO in 1991 through "Rehabilitation of Traditional Irrigation Project"

2.3.2.2 Natural Conditions of Study Area

(1) Climate	: Bi-modal rainfall pattern – moderate rains from March to May; light rains from September through November. Average rainfall ranging from 400 to 570 mm per annum. Rains erratic and inadequate.
(2) Topography	: The study area falls under low land agro-ecological zone.
(3) Hydrology and drainage condition	: Weruweru and Kikafu Rivers, which converge downstream, bound study area. Poor drainage condition in the scheme area.
(4) Soils	: Soils moderately deep, well drained, moderately fine textured soils ranging from clay to loamy textures developed on alluvial deposits with slopes ranging from 0-2%. Non-saline and non-sodic.
(5) Vegetation	: Crops in the study area with planted trees around homesteads
(6) Rare species or fragile ecology	: Unknown
(7) Others	: None

2.3.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**			**X**	
-Habitat of fauna and flora									
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**			**X**	
-Forest reserve		**X**			**X**			**X**	
b) *Areas prone to natural disasters*									
-Area susceptible to erosion		**X**			**X**				**X**
-Flood plains		**X**			**X**			**X**	
-Geological hazards		**X**			**X**				**X**

Key: Appl. – applicable N.A. – Not applicable

2.3.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.3.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues	NO	Health and sanitary issues	
Planned agricultural settlement	NO	Increased use of agrochemicals	Yes
Involuntary resettlement	NO	Outbreak of endemic diseases	No
Substantial change in way of life	NO	Prevalence of water borne diseases	Yes
Conflicts among communities or people	NO	Residual toxic of agrochemicals	Yes
Impacts on native people	NO	Increase in domestic and other human wastes	NO
Impediment to movement of people and livestock	NO	Cultural Property Issues	NO
Population increase	NO	Impairment of historical remains and cultural sites	NO
Drastic change in population composition	NO	Damage to aesthetic sites	NO
Relocation of bases of economic activities	NO		
Occupational change and loss of labour opportunity	NO		
Increase in income disparities	Unknown		
Adjustment and regulation of water or fishing rights	NO		
Changes in social and institutional structures	NO		
Changes in existing institutions and customs	NO		
II NATURAL ENVIRONMENT			
Biological and Ecological issues	NO	Soil and Land Resources	
Deterioration or degradation of vegetation	NO	Soil erosion	NO
Negative impacts on important or indigenous fauna and flora	NO	Soil Salinization	NO
Degradation of ecosystem with biological diversity	NO	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	NO	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	NO	Devastation or desertification of land	NO
Encroachment on tropical forests	NO	Devastation of hinterland	NO
Destruction or degradation of mangrove forests	NO	Ground subsidence	NO
Degradation of coral reef	NO		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	NO		
Changes in ground water hydrology	NO		
Inundation and flood	NO		
Soil sedimentation	NO		
Riverbank degradation	NO		
Water contamination and deterioration of water quality	Unknown		
Water eutrophication	Unknown		
Low water temperature	NO		
Atmospheric pollution	NO		
Poor water management	NO	Overall evaluation	**Yes = 3**
Landscape and Mineral Resources	NO		**No = 43**
Damage to landscape	NO		**Unknown = 5**

2.3.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	C	C	C
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	C	C	B	C	B
Drastic change in population composition	C	B	B	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	B	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	B	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. Health and sanitary issues						
Increase use of agrochemicals	C	C	C	A	C	A
Prevalence of water borne diseases	C	C	C	A	C	C
Residual toxic of agrochemicals	C	C	C	A	C	A
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	C	C	C	C	C	C
Impacts on indigenous fauna and flora	C	C	C	C	C	C
Degradation of ecosystem	B	B	B	B	B	B
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	C	C	C	C	C	C
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	B	C	C
Soil contamination by agrochemicals	C	C	C	B	C	C
(b) Land Resources						
Soil sedimentation	C	C	C	C	C	C
Riverbank degradation	C	C	C	C	C	C
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	C	C	C	B	C	C
Change in ground water hydrology	C	C	C	B	C	C
Poor water management	C	C	C	B	C	C
(b) Water quality						
Water contamination and deterioration of water quality	C	C	C	B	C	B
Water eutrophication	C	C	C	B	C	B
(c) Water quantity						
Adequacy and reliability of water supply	C	A	C	A	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.3.3.3 Potential environmental impacts

In Musa Mwinjanga traditional irrigation scheme, the following potential environmental impacts are expected:

(i) High seepage losses in unlined irrigation canals leading to inadequate supply of irrigation water. With improvement of the scheme, not all canals will be lined and thus seepage problem is likely to stay.

(ii) Lack of adequate drainage system resulting into some areas having high water tables and waterlogging. Some permanent swampy areas especially in the central part do exist inhibiting crop production in these parts. Most of the individual farms are not well leveled resulting into uneven farm water distribution in the farms.

(iii) Possible vandalism after rehabilitation/improvement. During the study period it was noted that villagers lack adequate operation and maintenance skills and sense of ownership in particular leading to vandalism of structures. Irresponsible farmers have vandalized some of control gates installed during the UNDP/FAO rehabilitation.

(iv) Loss of soil fertility in some farms might increase due to prolonged cultivation of farms without replenishing soil nutrients by organic fertilizers.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vi) Destructive animals including monkeys and baboons. Birds pose a relatively small threat. The Tanganyika Planting Company – a sugar company, regularly sprays and kills birds harbouring in the nearby sugar cane farms. More irrigation water to the farms will mean more crop production and consequently more destructive animals attracted.

(vii) Water borne diseases including malaria, typhoid and amoeba. The increase use of river water for domestic use may trigger increase of water borne diseases.

(viii) Possible soil and water pollution as a result of increased use of industrial fertilizers and pesticides. At present, farmers use *Sulphate of Ammonia*, *UREA* and *NPK* and apply *Faradan*, *Round up*, *Gramaxon* and *Mamba* to get rid of pests. However, with agricultural intensification in the near future, there is likelihood of an increase in use of fertilizers and pesticides.

2.3.4 Conclusion and recommendations

2.3.4.1 Conclusion of PEA and Recommendations

The preliminary environmental assessment indicates that there are some environmental and social impacts, which should be looked into more details. Thus, based on the findings from this study, the study team recommends EIA for Musa Mwinjanga traditional irrigation scheme be conducted prior to scheme improvement. EIA should focus on the identified environmental and social problems.

2.3.4.2 Proposed Terms of Reference (TOR) for Environmental Impact Assessment (EIA)

The Environmental Impact Assessment of Musa Mwinjanga irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1.Socio-economic Environment

- Increase in income disparities

2.Health and sanitation

- Safe handling and use of agrochemicals
- Prevalence of water borne diseases

NATURAL ENVIRONMENT

1. Soil and land resources
   - Deterioration of soil fertility
   - Soil contamination by agrochemicals
   - Water logging
   - Soil pollution
2. Hydrology
   - Water contamination and deterioration of water quality
   - Water eutrophication
   - Water pollution

2.4 Scheme – 4*: PAMILA WATER HARVESTING IRRIGATION SCHEME*

2.4.1 Project description

2.4.1.1 Background Information and Objectives of Scheme

Traditional water harvesting irrigation scheme located in Pamila valley, which covers the south part of the village and extending eastwards to part of Nyanganga and Kwaga villages. The main objective is to increase crop production through sustainable utilisation of water resources.

2.4.1.2 Brief Description of Scheme

Outline of scheme area	Pamila water harvesting irrigation scheme is located in Pamila village about 45 km east of Kigoma town in Kigoma region at approximately 4°53'33''S and 29°56'11''E. It involves farmers from Pamila village.
Beneficiaries and Benefited Area	: Total population – 3,469 people with 671 households. Potential command area is estimated at 1,000 ha. At present 30 ha under flood irrigation.
Relevant Scheme Components	: Local intake structures made up of trees, debris and grass. Water is diverted to the fields using traditional methods i.e. simple unlined open canals. No drainage system.
Water source	: Irrigators abstract water from a seasonal Nyankara stream to irrigate their paddy fields. Nyankara stream originates from springs and joins Mkuti River downstream the valley.
Executing Agencies	: Pamila water harvesting irrigation scheme will be rehabilitated by the Government of Tanzania (GOT) in cooperation with other donors/financiers.
Environmental Agencies Concerned	: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.4.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
No improved irrigation structures exist in the study area. Water is diverted to the fields using simple open canals. No adequate drains.	Estimated at 1,000 ha	Unknown	NIL

2.4.2 Site Description

2.4.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights; inheritance land tenure system and outright purchase. Rainfed farms, irrigation fields and village land (including settlements).
(2) Economic activities in and around study area	: Agriculture (supplementary irrigation and rainfed); Petty business. Crops grown in the study area include irrigated paddy, horticultural crops and off-season crops which include maize, beans and horticultural crops.
(3) Customs (water right etc).	: Pamila water harvesting scheme has no water right.
(4) Host people or community	: Mainly subsistence farmers engaged in cultivating paddy in the valley since 1985.
(5) Public health	: One dispensary – laboratory facilities at Rusesa village about 15 km away; domestic water supply system exists in the village, however, water supply not reliable. Villagers suffer mainly from Malaria and Bilharzias.
(6) Population	: Total population is 3,469 people with 671 households.
(7) Others	: One primary school; numerous shops and kiosks; milling machines; daily evening local market; mosques and churches. Development organisation in the study area include Africare, Kigoma Development Project (KIDEP), *Mpango wa Maendeleo wa Elimu ya Msingi* (MMEM) and District Based Support for Primary Education (DBSPE)

2.4.2.2 Natural Conditions of Study Area

(1) Climate	: Two rainfall seasons i.e. October to December and February to May.
(2) Topography	: The study area falls under lake shore agro-ecological zone.
(3) Hydrology and drainage condition	: Nyankara seasonal stream joins Mkuti River, which ultimately enters Luiche River draining into Lake Tanganyika. Rubirizi river also drains the Pamila valley.
(4) Soils	: Soils fairly fertile, well drained with fine to moderate textured clay loams to sand clay loams.
(5) Vegetation	: Scattered trees on upland and grass in the valley.
(6) Rare species or fragile ecology	: Unknown
(7) Others	: None

2.4.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**			**X**	
-Habitat of fauna and flora			**X**			**X**		**X**	
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**			**X**	
-Forest reserve		**X**			**X**		**X**		
b) *Areas prone to natural disasters*									
-Area susceptible to erosion		**X**			**X**			**X**	
-Flood plains		**X**		**X**				**X**	
-Geological hazards		**X**			**X**				**X**

Key: Appl. – applicable N.A. – Not applicable

2.4.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.4.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues	NO	Health and sanitary issues	
Planned agricultural settlement	NO	Increased use of agrochemicals	Unknown
Involuntary resettlement	NO	Outbreak of endemic diseases	Unknown
Substantial change in way of life	NO	Prevalence of water borne diseases	Yes
Conflicts among communities or people	NO	Residual toxic of agrochemicals	Unknown
Impacts on native people	NO	Increase in domestic and other human wastes	No
Impediment to movement of people and livestock	NO	Cultural Property Issues	
Population increase	NO	Impairment of historical remains and cultural sites	No
Drastic change in population composition	NO	Damage to aesthetic sites	No
Relocation of bases of economic activities	NO		
Occupational change and loss of labour opportunity	NO		
Increase in income disparities	Unknown		
Adjustment and regulation of water or fishing rights	NO		
Changes in social and institutional structures	NO		
Changes in existing institutions and customs	NO		
II NATURAL ENVIRONMENT			
Biological and Ecological issues		Soil and Land Resources	
Deterioration or degradation of vegetation	Yes	Soil erosion	No
Negative impacts on important or indigenous fauna and flora	Unknown	Soil Salinization	No
Degradation of ecosystem with biological diversity	Unknown	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	No	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	No	Devastation or desertification of land	No
Encroachment on tropical forests	No	Devastation of hinterland	No
Destruction or degradation of mangrove forests	No	Ground subsidence	No
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Unknown		
Changes in ground water hydrology	Unknown		
Inundation and flood	Unknown		
Soil sedimentation	Unknown		
Riverbank degradation	No		
Water contamination and deterioration of water quality	No		
Water eutrophication	No		
Low water temperature	No		
Atmospheric pollution	No		
Poor water management	Yes	Overall evaluation	**Yes = 3**
Landscape and Mineral Resources			**No = 33**
Damage to landscape	No		**Unknown = 12**

2.4.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	C	C	C
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	C	C	C	C	C
Drastic change in population composition	C	C	C	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	B	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	C	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. Health and sanitary issues						
Increase use of agrochemicals	C	C	C	B	C	C
Prevalence of water borne diseases	C	C	C	A	C	C
Residual toxic of agrochemicals	C	C	C	B	C	C
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. **Biological and Ecological Issues**						
Deterioration or degradation of vegetation	A	A	A	A	A	A
Impacts on indigenous fauna and flora	B	B	B	B	B	B
Degradation of ecosystem	B	B	B	B	B	B
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	C	C	C	C	C	C
Soil salinization	C	C	C	C	C	C
Deterioration of soil fertility	C	C	C	B	C	C
Soil contamination by agrochemicals	C	C	C	B	C	C
(b) Land Resources						
Soil sedimentation	C	C	C	C	C	C
Riverbank degradation	C	C	C	C	C	C
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	C	C	C	B	C	C
Change in ground water hydrology	C	C	C	B	C	C
Poor water management	C	C	C	C	C	C
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	C	B	C	B
Water eutrophication	C	C	C	C	C	C
(c) Water quantity						
Adequacy and reliability of water supply	C	C	C	C	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.4.3.3 Potential environmental impacts

In Pamila water harvesting irrigation scheme, the following potential environmental impacts are expected:

(i) Water logging in fields due to lack of drainage system. This situation is aggravated in the rainy season due to backwater from Mkuti River, which inundate part of the valley for a short period. Floods are not experienced in the study area. Farms are not well leveled resulting into uneven farm water distribution in the farms.

(ii) Water shortage particularly during the dry spell (January/February). It became apparent during study period that there is a substantial decrease in water flow from Nyankara stream due to increased population in the valley against available water. Increase in irrigation could worsen the present water situation.

(iii) Destructive animals including vermins, tortoise and birds. Birds pose a threat to paddy crop and with an increase in paddy acreage this problem is likely to rise. No cropping calendar observed in the valley, which further aggravates the bird-scaring problem.

(iv) Water borne diseases including malaria and bilharzias. Water for domestic use is untreated posing threat to villagers. In the event of unreliable domestic water supply, villagers rely on water from Kwiga River, Rukaranga stream and Pamila springs.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vi) Possible soil and water pollution as a result of increased use of industrial fertilizers and pesticides. At present, farmers do not use fertilizers, herbicides and pesticides for paddy. For horticultural crops, fertilizers used include *Sulphate of Ammonia and UREA* with *Blue/Red Copper* and *Bravo* pesticides applied to combat pests. However, with agricultural intensification in the future, there is likelihood of an increase in use of fertilizers and pesticides.

2.4.4 Conclusion and recommendations

2.4.4.1 Conclusion of PEA and Recommendations

The preliminary environmental assessment indicates that there are some environmental and social impacts, which should be looked into more details. Thus, based on the findings from this study, the study team recommends EIA for Pamila water harvesting irrigation scheme be conducted prior to scheme improvement. EIA should focus on the identified environmental and social problems.

2.4.4.2 Proposed Terms of Reference (TOR) for Environmental Impact Assessment (EIA)

The Environmental Impact Assessment of Pamila water harvesting irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1.Socio-economic issues

- Income disparities
- Destructive animals

2.Health and sanitation

- Water borne diseases
- Safe use and handling of agrochemicals

NATURAL ENVIRONMENT

1. Biological and ecological issues

- Siltation

2.Soil and land resources

- Soil contamination
- Deterioration of soil fertility

4. Hydrology

- Water logging
- Water pollution due to agrochemicals

2.5 Scheme – 5*: MAGOMA TRADITIONAL IRRIGATION SCHEME*

2.5.1 Project Description

2.5.1.1 Background Information and Objectives of Scheme

A flood plain, which is extensive and currently utilised for paddy, maize and vegetable irrigation. Rainfed farming is practised in valley fringes. The main objective of the scheme is to improve the water conveyance, distribution and drainage condition to allow for efficient water use.

2.5.1.2 Brief Description of Scheme

Outline of scheme area	Magoma flood plain is located in Magoma ward, Magoma division in Korogwe district, Tanga region at approximately latitude 4°54'00''S and longitude 38°34'46" E. It involves farmers from Makangara and Mkwajuni villages.
Beneficiaries and Benefited Area	: Would be beneficiaries are farmers from 2 villages living near and around Magoma valley – a total of 5,100 people from 914 families. Potential area is estimated to be 300 ha.
Relevant Scheme Components	: Traditional irrigation is practised by abstracting water from Lwengera river using traditional temporary diversion structures which are frequently washed away during floods. Some farmers (mainly youths) use treadle pumps to irrigate vegetables during off-season period.
Water source	: Water is abstracted from Lwengera river, which is perennial.
Executing Agencies	: Magoma irrigation scheme will be improved by GOT in collaboration with other donors/financiers
Environmental Agencies Concerned	: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.5.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
There exist numerous local water diversion structures; unlined open canals; no proper distribution system; flood irrigation is practised with no drainage system.	Potential area 300 ha	Unknown	NIL

2.5.2 Site Description

2.5.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights, inheritance and outright purchase are common. Majority own 1-2 acres of land; few villagers own 3-5 acres plots. Rainfed farms, irrigation fields and village land (including settlements).
(2) Economic activities in and around study area	: Farming is the main activity; both irrigation and rainfed agriculture practised; Crops grown in the valley include irrigated paddy, maize and vegetables. Bananas and coconuts also cultivated. Other activities include livestock keeping; Petty business; and fishing to a lesser extent.
(3) Customs (water right etc).	: Water right not yet applied for. Farmers' organization exists (Umoja wa Umwagiliaji Magoma – UMAMA) but not yet registered.
(4) Host people or community	: Mainly subsistence farmers engaged in cultivating irrigated paddy and other crops in the valley.
(5) Public health	: A health center is available. Villagers depend on Lwengera River water for domestic purposes. Villagers suffer mainly from Malaria, Typhoid, Cholera outbreaks; bilharzia and Tuberculosis.
(6) Population	: Would be beneficiaries about 5,100 people.
(7) Others	: 3 primary schools; 1 secondary school; milling machines; shops and kiosks; all weather murram road; electricity; telephone facilities. The only development organisation supporting the study area is World Vision International, which is involved in the fields of education, health and agriculture.

2.5.2.2 Natural Conditions of Study Area

(1) Climate	: Two distinct rainy seasons namely *Masika* (March-June) and *Vuli* (September-November). Annual rainfall in Korogwe district ranges between 600 mm in the dry lowlands to over 1,600 mm in the highlands. The study area experiences annual rainfall between 800 mm to 1,000 mm.
(2) Topography	: Valley land lies in between eastern Usambara and western Usambara mountain ranges.
(3) Hydrology and drainage condition	: Lwengera river originates from west Usambara mountain ranges in Bumbuli area (Lushoto district) and eventually joins Pangani river draining into the Indian ocean.
(4) Soils	: Moderately fine textured alluvial deposits from the surrounding catchment area. In some areas of the valley, soils have enough moisture capacity to support crops for the entire growing season.
(5) Vegetation	: Fairly dense vegetation on mountain ranges; coconuts trees and sparse grass in the valley.
(6) Rare species or fragile ecology	: Unknown
(7) Others	: None

2.5.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**			**X**	
-Habitat of fauna and flora	**X**			**X**					**X**
-Heritage sites, social, cultural, history and archaeological		**X**			**X**				**X**
-National parks		**X**			**X**			**X**	
-Forest reserve		**X**		**X**			**X**		
b) *Areas prone to natural disasters*									
-Area susceptible to erosion	**X**				**X**				**X**
-Flood plains		**X**				**X**		**X**	
-Geological hazards			**X**			**X**			**X**

Key: Appl. – applicable N.A. – Not applicable

2.5.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.5.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	**Evaluation Bases**	**Potential Significant Environmental Impact (SEI)**	Evaluation **Bases**
I) SOCIAL ENVIRONMENT			
Social economic issues		Health and sanitary issues	
Planned agricultural settlement	No	Increased use of agrochemicals	Yes
Involuntary resettlement	No	Outbreak of endemic diseases	Yes
Substantial change in way of life	Unknown	Prevalence of water borne diseases	Yes
Conflicts among communities or people	Unknown	Residual toxic of agrochemicals	Yes
Impacts on native people	No	Increase in domestic and other human wastes	Unknown
Impediment to movement of people and livestock	No	Cultural Property Issues	
Population increase	Yes	Impairment of historical remains and cultural sites	No
Drastic change in population composition	Unknown	Damage to aesthetic sites	No
Relocation of bases of economic activities	No		
Occupational change and loss of labour opportunity	No		
Increase in income disparities	Yes		
Adjustment and regulation of water or fishing rights	No		
Changes in social and institutional structures	Unknown		
Changes in existing institutions and customs	Unknown		
II NATURAL ENVIRONMENT			
Biological and Ecological issues		Soil and Land Resources	
Deterioration or degradation of vegetation	Yes	Soil erosion	Yes
Negative impacts on important or indigenous fauna and flora	Unknown	Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	Unknown	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	No	Soil contamination by agrochemicals	Yes
Encroachment on wetlands	No	Devastation or desertification of land	No
Encroachment on tropical forests	No	Devastation of hinterland	No
Destruction or degradation of mangrove forests	No	Ground subsidence	No
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Unknown		
Changes in ground water hydrology	Unknown		
Inundation and flood	Yes		
Soil sedimentation	Yes		
Riverbank degradation	Yes		
Water contamination and deterioration of water quality	Yes		
Water eutrophication	Yes		
Low water temperature	Unknown		
Atmospheric pollution	No		
Poor water management	Yes	Overall evaluation	**Yes = 15**
Landscape and Mineral Resources			**No = 18**
Damage to landscape	Unknown		**Unknown = 14**

2.5.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 ***Social economic issues***						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	B	C	C
Conflicts among community and people	C	C	C	B	B	C
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	A	C	A	C	C
Drastic change in population composition	C	B	C	B	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	A	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	B	C	C
Changes in existing institution and customs	C	C	C	B	C	C
2. ***Health and sanitary issues***						
Increase use of agrochemicals	C	C	C	A	C	C
Prevalence of water borne diseases	C	C	C	A	C	A
Residual toxic of agrochemicals	C	C	C	C	C	A
3. ***Cultural Property Issues***						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. *Biological and Ecological Issues*						
Deterioration or degradation of vegetation	A	A	A	C	A	A
Impacts on indigenous fauna and flora	C	C	C	C	B	C
Degradation of ecosystem	C	C	C	C	B	C
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. ***Soil and Land Resources issues***						
(a) Soil Resources	C	C	C	C	C	C
Soil erosion	A	A	A	C	A	C
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	B	C	C
Soil contamination by agrochemicals	C	C	C	A	C	A
(b) Land Resources						
Soil sedimentation	C	C	C	A	C	C
Riverbank degradation	C	C	C	C	A	C
Inundation and floods						
6. ***Hydrology, water quality and quantity issues***						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	C	C	C	B	C	C
Change in ground water hydrology	C	C	C	B	C	C
Poor water management	C	C	C	A	C	A
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	A	A	C	C
Water eutrophication	C	C	C	A	C	C
(c) Water quantity						
Adequacy and reliability of water supply	C	C	C	C	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.5.3.3 Potential environmental impacts

In Magoma flood plain, the following environmental impacts were identified:

(i) Possible decrease in soil fertility after introduction of irrigation activities under which floods will be controlled and thereby denying valley soils of periodic soil nutrients from alluvial soils as a result of floods. Most of the valley is inundated due to floods during the rainy season inhibiting crop production during this period.

(ii) With crop intensification, there is possible increase in *quelea quelea* birds, which destroy paddy crop. More areas will be put into cultivation and thus attract more birds.

(iii) Water borne diseases including malaria, Typhoid, Cholera and Bilhazia are rampant in the study area. Villagers rely on Lwengera River for domestic use. With no relatively safer domestic water supply system in the area in the near future, there is likelihood of more people contracting water borne diseases.

(iv) Possible increase in soil and water pollution as a result of increased use of industrial fertilizers and pesticides if the irrigation infrastructure is improved. At present, few farmers do apply fertilizers, and pesticides. However, with agricultural improvement in the future, there is likelihood of an increase in use of fertilizers and pesticides. Furthermore, this problem is amplified by farmers upstream the study area, who intensively cultivate vegetables and apply agrochemicals which ultimately enters Lwengera river.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vi) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vii) Possible change of river course due to continued cultivation up to the riverbanks. It was noted that during *El-nino* rains, river changed course and riverbanks are destabilized and lack protective cover due to riverbank cultivation.

(viii) Possible canal erosion even after improvement due to the nature of soils, which are alluvial and fragile.

2.5.4 Conclusion and recommendations

2.5.4.1 Conclusion of PEA and Recommendations

The preliminary environmental assessment indicates that there are some environmental impacts, which should be looked into more details. Thus, based on the findings from this study, the study team recommends EIA for Magoma valley be conducted prior to agricultural improvement. EIA should focus on the identified environmental problems.

2.5.4.2 Proposed Terms of Reference (TOR) for Environmental Impact Assessment (EIA)

The Environmental Impact Assessment for Magoma valley should focus on the following issues:

SOCIAL ENVIRONMENT

1. Soil and land resources
   - Soil fertility loss

2. Health and sanitation
   - Water borne diseases
   - Safe use and handling of agrochemicals

NATURAL ENVIRONMENT

1. Biological and ecological issues
   - Degradation of vegetation
   - Riverbank degradation

2. Hydrology
   - Inundation and floods

2.6 Scheme – 6*: NKENGE IRRIGATION SCHEME*

2.6.1 Project Description

2.6.1.1 Background Information and Objectives of Scheme

A pump scheme located in the Ngono valley, which used to be operational for irrigating paddy and maize crops. Rainfed farming for maize is currently practised in some few localities with a bigger part of the Nkenge farm not under cultivation. The main objective of the scheme is to raise crop production through sustainable utilisation of Ngono River water.

2.6.1.2 Brief Description of Scheme

Outline of scheme area	Nkenge pump scheme is located in Ngono valley, west of Lake Victoria in Bukoba Rural district, Kagera region at approximately $1^{o}13'03"$ S and $31^{o}36'44"$E. The valley has an area of 1,161 km^2 south of Kalebe bridge. It involves farmers from Mbale village.
Beneficiaries and Benefited Area	: In early 1980s, 80 farmers were involved in paddy cultivation each having 0.4 ha plot. By 1983/84, about 32 ha were already developed for irrigation.
Relevant Scheme Components	: Main and secondary canals exist. Division boxes and pump house still at site, however, without pumps. No irrigation activities being carried out in the valley; only rainfed agriculture occasionally practised.
Water source	: Water abstracted from Ngono River which is about 90 km long flowing to the north and main contributor to Kagera river.
Executing Agencies	: Nkenge pump irrigation scheme will be improved by GOT in collaboration with other donors/financiers.
Environmental Agencies Concerned	: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.6.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
Main and secondary canals exist. Division boxes and pump house still at site however, without pumps	32 ha developed in 1983/84	Unknown	NIL

2.6.2 Site Description

2.6.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Farm belongs to the former Ngono Multipurpose Project.
(2) Economic activities in and around study area	: Rainfed agriculture; Crops grown in the study area include maize, banana and cassava.
(3) Customs (water right etc).	: No information readily available on water right.
(4) Host people or community	: Mainly subsistence farmers engaged in cultivating rainfed maize, banana and other crops in the study area.
(5) Public health	: A nearby private dispensary available at Kashasha. Piped water supply available in the village. Villagers suffer mainly from Malaria, colds and flu, skin diseases and HIV/AIDS.
(6) Population	: Number of would be beneficiaries not readily available.
(7) Others	: Primary school; secondary school; shops, kiosks, milling machine. Development organisation in the study area include Health, Sanitation and Water (HESAWA) project; WIWAYA and WAMATA (assistance to orphans); PARTAGE WEST (assistance to AIDS orphans); Kagera Agricultural and Environment Project (KAEMP).

2.6.2.2 Natural Conditions of Study Area

(1) Climate	: Information not readily available
(2) Topography	: Generally flat gently sloping topography towards Ngono River.
(3) Hydrology and drainage condition	: Ngono River drains the area.
(4) Soils	: No information readily available on soils.
(5) Vegetation	: Valley characterised by grass and shrubs.
(6) Rare species or fragile ecology	: Unknown.
(7) Others	: None.

2.6.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention									
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**			**X**	
-Habitat of fauna and flora			**X**			**X**			**X**
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**			**X**	
-Forest reserve		**X**			**X**		**X**		
b) *Areas prone to natural disasters*									
-Area susceptible to erosion		**X**			**X**			**X**	
-Flood plains		**X**			**X**			**X**	
-Geological hazards		**X**			**X**				**X**

Key: Appl. – applicable N.A. – Not applicable

2.6.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.6.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues	NO	Health and sanitary issues	
Planned agricultural settlement	NO	Increased use of agrochemicals	Unknown
Involuntary resettlement	NO	Outbreak of endemic diseases	No
Substantial change in way of life	NO	Prevalence of water borne diseases	Unknown
Conflicts among communities or people	NO	Residual toxic of agrochemicals	Unknown
Impacts on native people	NO	Increase in domestic and other human wastes	NO
Impediment to movement of people and livestock	NO	Cultural Property Issues	
Population increase	NO	Impairment of historical remains and cultural sites	NO
Drastic change in population composition	NO	Damage to aesthetic sites	NO
Relocation of bases of economic activities	NO		
Occupational change and loss of labour opportunity	NO		
Increase in income disparities	NO		
Adjustment and regulation of water or fishing rights			
Changes in social and institutional structures			
Changes in existing institutions and customs			
II NATURAL ENVIRONMENT			
Biological and Ecological issues		Soil and Land Resources	
Deterioration or degradation of vegetation	Yes	Soil erosion	NO
Negative impacts on important or indigenous fauna and flora	NO	Soil Salinization	NO
Degradation of ecosystem with biological diversity	NO	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	NO	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	NO	Devastation or desertification of land	NO
Encroachment on tropical forests	NO	Devastation of hinterland	NO
Destruction or degradation of mangrove forests	NO	Ground subsidence	NO
Degradation of coral reef	NO		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	NO		
Changes in ground water hydrology	NO		
Inundation and flood	NO		
Soil sedimentation	NO		
Riverbank degradation	NO		
Water contamination and deterioration of water quality	NO		
Water eutrophication	NO		
Low water temperature	NO		
Atmospheric pollution	NO		
Poor water management	NO	Overall evaluation	**Yes = 1**
Landscape and Mineral Resources	NO		**No = 36**
Damage to landscape	NO		**Unknown = 7**

2.6.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	C	C	C
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	C	C	C	C	C
Drastic change in population composition	C	C	C	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	B	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	C	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. Health and sanitary issues						
Increase use of agrochemicals	C	C	C	B	C	B
Prevalence of water borne diseases	C	C	C	B	C	B
Residual toxic of agrochemicals	C	C	C	B	C	B
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	A	A	C	A	A
Impacts on indigenous fauna and flora	C	C	C	C	C	C
Degradation of ecosystem		B	B	B	B	B
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	C	C	C	C	C	C
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	B	C	C
Soil contamination by agrochemicals	C	C	C	B	C	C
(b) Land Resources						
Soil sedimentation	C	C	C	C	C	C
Riverbank degradation	C	C	C	C	C	C
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	C	C	C	C	C	C
Change in ground water hydrology	C	C	C	C	C	C
Poor water management	C	C	C	C	C	C
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	C	C	C	C
Water eutrophication	C	C	C	C	C	C
(c) Water quantity						
Adequacy and reliability of water supply	C	C	C	C	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.6.3.3 Potential environmental impacts

In Nkenge scheme, the following potential environmental impacts are expected:

(i) Destructive animals including pigs. Also, birds posed a threat to paddy fields. With rehabilitation of the scheme, more land will be put into irrigated agriculture and thus attract destructive animals and birds.
(ii) Water borne diseases including malaria and skin diseases. These are likely to increase due to possible population growth and continued use of untreated domestic water.
(iii) Possible soil and water pollution as a result of increased use of industrial fertilizers and pesticides in the study area. At present, use of fertilizers and pesticides is at very low levels. However, with agricultural development in the future, there is likelihood of an increase in use of fertilizers and pesticides.
(iv) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

2.6.4 Conclusion and recommendations

2.6.4.1 Conclusion of PEA and Recommendations

The preliminary environmental assessment indicates that there are minor environmental and social impacts in the study area. Thus, based on the findings from this study, the study team does not recommend EIA for Nkenge irrigation scheme prior to improvement. What is recommended is preparation of environmental and social management plan to implement mitigation measures for the above potential impacts.

2.7 Scheme – 7*: KISESE IRRIGATION SCHEME*

2.7.1 Project Description

2.7.1.1 Background Information and Objectives of Scheme

Kisese traditional water harvesting irrigation scheme uses traditional canals to irrigate maize, paddy, beans, onions, vegetables and bananas in an area totalling 20 ha. Objective of the scheme is to improve the current traditional irrigation system and raise crop production in the valley by sustainably utilising water from Kisese River and Salanka, Mlava and Ikangai springs.

2.7.1.2 Brief Description of Scheme

Outline of scheme area	Kisese water harvesting scheme is located in Kisese-Sauna village, Kisese ward, Bereko division, Kondoa district, in Dodoma region at approximately 4°26'30"S and 35°48'05"E. It involves farmers from Mapinduzi, Kisese-Sauna, Kisese-Disa and Madisa villages.
Beneficiaries and Benefited Area	: 1,300 able people. Potential command area is 2,000 ha. About 20 ha under irrigation.
Relevant Scheme Components	: Local intake structures; earth canals; no proper drainage system. Irrigated agriculture carried out in small area with the bigger area under rainfed agriculture.
Water source	: Water abstracted from Kisese River and other spring source streams of Salanka, Mlava and Ikangai
Executing Agencies	: Improvement of Kisese irrigation scheme will be done by GOT in collaboration with other donors/financiers.
Environmental Agencies Concerned	: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.7.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
Local intake structures; earth canals; no proper drainage system.	Potential command area is 2,000 ha.	Unknown	NIL

2.7.2 Site Description

2.7.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary land holding, hire and outright purchase in some instances
(2) Economic activities in and around study area	: Agriculture and livestock production. Crops grown in the valley include maize, paddy, sunflower, beans, onions, vegetables and bananas.
(3) Customs (water right etc).	: Irrigators have no water right.
(4) Host people or community	: Mainly subsistence farmers who are also engaged in livestock keeping.
(5) Public health	: Dispensary at Atta village; Health centre at Disa. Laboratory services obtained at Galapo (8 hours walk distance). Piped water supply available in all villages (water not treated). Villagers suffer mainly from malaria, typhoid and diarrhoea diseases.
(6) Population	: 1,300 able people.
(7) Others	: Each village has one primary school; there are a number of shops and kiosks, milling machines. Development organisation in the study area include Tanzania Social Action Fund (TASAF); *Mpango wa Maendeleo wa Elimu ya Msingi (MMEM)*; Heifer Project Tanzania (HPI) and Agricultural Sector Program Support (ASPS) – Seed Component.

2.7.2.2 Natural Conditions of Study Area

(1) Climate	: Semi arid area with unimodal rains ranging from 500 to 800 mm per annum in December – March period.
(2) Topography	: Valley land with flat to gentle slopes. Surrounded by mountainous lands of Irumawi and Kwapina, which act as catchment area in the rainy season.
(3) Hydrology and drainage condition	: Kisese River drains the area.
(4) Soils	: No information on soils.
(5) Vegetation	: Valley characterised by farm fields.
(6) Rare species or fragile ecology	: Salanka forest reserve surrounds the scheme.
(7) Others	: None.

2.7.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**			**X**	
-Habitat of fauna and flora		**X**				**X**			**X**
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**			**X**	
-Forest reserve		**X**		**X**					**X**
b) *Areas prone to natural disasters*									
-Area susceptible to erosion	**X**			**X**			**X**		
-Flood plains		**X**			**X**		**X**		
-Geological hazards		**X**			**X**				**X**

Key: Appl. – applicable N.A. – Not applicable

2.7.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.7.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues	NO	Health and sanitary issues	
Planned agricultural settlement	NO	Increased use of agrochemicals	Unknown
Involuntary resettlement	NO	Outbreak of endemic diseases	Unknown
Substantial change in way of life	NO	Prevalence of water borne diseases	Yes
Conflicts among communities or people	Yes	Residual toxic of agrochemicals	Unknown
Impacts on native people	NO	Increase in domestic and other human wastes	No
Impediment to movement of people and livestock	NO	Cultural Property Issues	No
Population increase	NO	Impairment of historical remains and cultural sites	No
Drastic change in population composition	NO	Damage to aesthetic sites	NO
Relocation of bases of economic activities	NO		
Occupational change and loss of labour opportunity	NO		
Increase in income disparities	Unknown		
Adjustment and regulation of water or fishing rights	NO		
Changes in social and institutional structures	NO		
Changes in existing institutions and customs	NO		
II NATURAL ENVIRONMENT			
Biological and Ecological issues		Soil and Land Resources	
Deterioration or degradation of vegetation	NO	Soil erosion	Yes
Negative impacts on important or indigenous fauna and flora	NO	Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	NO	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	UNKNOWN	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	NO	Devastation or desertification of land	No
Encroachment on tropical forests	NO	Devastation of hinterland	No
Destruction or degradation of mangrove forests	NO	Ground subsidence	No
Degradation of coral reef	NO		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	NO		
Changes in ground water hydrology	NO		
Inundation and flood	NO		
Soil sedimentation	Yes		
Riverbank degradation	Yes		
Water contamination and deterioration of water quality	Unknown		
Water eutrophication	Unknown		
Low water temperature	NO		
Atmospheric pollution	NO		
Poor water management	NO	Overall evaluation	**Yes = 5**
Landscape and Mineral Resources	NO		**No = 36**
Damage to landscape	NO		**Unknown = 10**

2.7.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	A	C	B
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	C	C	B	C	B
Drastic change in population composition	C	B	B	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	B	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	B	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. Health and sanitary issues						
Increase use of agrochemicals	C	C	C	B	C	C
Prevalence of water borne diseases	C	C	C	A	C	A
Residual toxic of agrochemicals	C	C	C	B	C	B
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	C	A	A	C	A	A
Impacts on indigenous fauna and flora	C	C	C	C	C	C
Degradation of ecosystem	C	C	C	C	C	C
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	A	A	A	A	A	A
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	B	C	C
Soil contamination by agrochemicals	C	C	C	B	C	C
(b) Land Resources						
Soil sedimentation	C	A	C	C	A	C
Riverbank degradation	C	A	C	C	A	C
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	B	B	B	B	C	B
Change in ground water hydrology	B	B	B	B	B	C
Poor water management	C	C	C	B	C	C
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	C	B	C	B
Water eutrophication	C	C	C	C	C	C
(c) Water quantity						
Adequacy and reliability of water supply	A	A	A	A	B	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.7.3.3 Potential environmental impacts

In Kisese scheme, the following potential environmental impacts are expected:

(i) Siltation in Kisese River – sediments are carried all the way from Bereko area which is a highly erosion susceptible area. Water flow is greatly reduced due to silt loads. Before *El-nino*, river was free from sediments.

(ii) Soil erosion in the valley due to uncontrolled water flows and fragile soils. The absence of water control structures compounds this problem. Gullies are common features in the valley and river depth has increased a great deal making it virtually impossible in many parts to divert water to the fields.

(iii) Water seepage due to earth traditional canals. Water losses are high due to seepage making it difficult for irrigators downstream to obtain enough water. During irrigation improvement, not all canals will be lined and taking into consideration the nature of the soils -fragile - water seepage is likely to persist.

(iv) Conflicts between farmers and livestock keepers. It was noted that some farmers cultivate in livestock tracks/corridors. In the study area, no land use plan exists and this essentially means that no areas have been demarcated for various uses.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vi) Water borne diseases including malaria, typhoid and diarrhoea diseases. Use of untreated water and use of unboiled water contributes to the increase of typhoid and diarrhoea diseases. Malaria prevalence might be due to presence of stagnant waters especially during the rainy season. Since no measures are anticipated in the very near future in treating domestic water and improving health and sanitation, water borne diseases are likely to increase.

(vii) Possible soil and water pollution as a result of increased use of industrial fertilizers and pesticides in the study area. At present, use of fertilizers and pesticides is at very low levels. However, with agricultural development in the future, there is likelihood of an increase in use of fertilizers and pesticides.

(viii) Wild animals including pigs, monkeys and baboons. These pose a threat to crops and farmers have to guard farms in the night. With crop intensification, this problem might rise.

2.7.4 Conclusion and recommendations

2.7.4.1 Conclusion of PEA and Recommendations

The preliminary environmental assessment indicates that there are some environmental and social impacts, which should be looked into more details. Thus, based on the findings from this study, the study team recommends EIA for Kisese irrigation scheme be conducted prior to scheme improvement. EIA should focus on the identified environmental and social problems.

2.7.4.2 Proposed Terms of Reference (TOR) for Environmental Impact Assessment (EIA)

The Environmental Impact Assessment of Kisese irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1.Socio-economic Environment

- Conflicts between farmers and livestock keepers

2.Health and sanitation

- Water borne diseases
- Safe use and handling of agrochemicals

NATURAL ENVIRONMENT

1. Soil and land resources

- Soil erosion
- soil and water pollution

2. Hydrology

- Siltation in river and canals
- Riverbank erosion
- Water seepage

2.8 Scheme – 8*: LOWER MOSHI IRRIGATION SCHEME*

2.8.1 Project Description

2.8.1.1 Background Information and Objectives of Scheme
(Refer to Lower Moshi Feasibility study report)

2.8.1.2 Brief Description of Scheme

Outline of scheme area: Lower Moshi irrigation scheme is a modern scheme located in Moshi Rural District Kilimanjaro Region. The scheme is operating using two in takes of Rau and Njoro. It is at approximately 3°23'03"S and 37°21'33"E

Beneficiaries and Benefited Area: : Beneficiaries are from Mabogini, Rau ya Kati , Chekereni, Oria, Mandaka Mnono and Kaloni with a total population of 21,110 people. The area under cultivation is 1,560 consisting of 1,100 ha presently irrigated and 460 ha expanded area outside the project area.

Relevant Scheme Components: : Rehabilitation of existing intake structures, lined canals and construction of intake, farm roads, and canals for expanded area of 560 ha. Organization and registration of farmers in the expanded area.

: Farmers in the expanded area adopted the cultivation practices and technology from the modern Lower Moshi irrigation scheme.

Water source: : Water sources are from Njoro and Rau ya Kati rivers.

Executing Agencies: : Lower Moshi irrigation scheme will be rehabilitated by the Government of Tanzania (GOT) in cooperation with other donors/financiers.

Environmental Agencies Concerned: : Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.8.1.3 Major Components and Development Scale of Project

(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
a. Rehabilitation of existing irrigation structures, main canal, farm roads and in takes to cover the expanded area outside the scheme area, farmer organization in an expanded area, and strengthening of the existing farmer organization in modern Lower Moshi irrigation scheme.	1,100 ha 560 ha	Intake facilities 8 Improve existing canals 26 km Construction of drains 21 km Rehabilitation of roads 30 km Construction flood dyke 16 km.	Farmers outside modern Lower Moshi irrigation scheme to be mobilized and supported by improving the infrastructures.

2.8.2 Site Description

2.8.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights; irrigation fields and village land (including settlements)
(2) Economic activities in and around study area	: Irrigated Agriculture, Livestock keeping (zero grazing), Small business enterprises and employment in Moshi Town. Crops grown include mainly paddy.
(3) Water right.	: The water right for modern scheme is 804 l/s at Mabogini intake and weir and 1,135 l/s at the Rau ya Kati intake.
(4) Host people or community	: Mainly Wachaga and Kahe communities from Mabogini, Rau ya Kati , Chekereni, Oria, Mandaka Mnono and Kaloni engaged in irrigated agriculture in the area.
(5) Public health	: Villagers suffer from malaria, (a prevailing disease), bilharzias, typhoid and diarrhoea diseases.
(6) Population	: About 21,110 people will benefit from villages of Chekereni, Oria, Mandaka Mnono and Kaloni
(7) Others	: A health centre, one primary school, numerous shops and kiosks and a number of milling machines serve communities.

2.8.2.2 Natural Conditions of Study Area

(1) Climate	: Rainfall is relatively high, with an annual average rainfall average of 1310 mm. Wet season is from November to April and Dry spell in September.
(2) Topography	: More or less generally flat land adjacent to Mkindo and Mgongola river.
(3) Hydrology and drainage condition	: A number of springs contribute water into Njoro and Rau ya Kati Rivers. These spring recharge from mount Kilimanjaro.
(4) Soils	: Unknown (refer to feasibility study of Lower Moshi)
(5) Vegetation	: Mainly grassland with scattered baobab trees on the scheme area and forest in the upstream of the intake (Spring Sources).
(6) Rare species or fragile ecology	: Unknown
(7) Others	: None

2.8.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**		**X**		
-Habitat of fauna and flora		**X**			**X**			**X**	
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**		**X**		
-Forest reserve		**X**			**X**			**X**	
b) *Areas prone to natural disasters*									
-Area susceptible to erosion	**X**					**X**			**X**
-Flood plains		**X**				**X**			**X**
-Geological hazards			**X**			**X**			**X**

Key: Appl. – applicable N.A. – Not applicable

2.8.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.8.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues		Health and sanitary issues	
Planned agricultural settlement	No	Increased use of agrochemicals	Yes
Involuntary resettlement	No	Outbreak of endemic diseases	Unknown
Substantial change in way of life	No	Prevalence of water borne diseases	Yes
Conflicts among communities or people	Yes	Residual toxic of agrochemicals	Yes
Impacts on native people	No	Increase in domestic and other human wastes	No
Impediment to movement of people and livestock	No	Cultural Property Issues	
Population increase	No	Impairment of historical remains and cultural sites	No
Drastic change in population composition	No	Damage to aesthetic sites	No
Relocation of bases of economic activities	No		
Occupational change and loss of labour opportunity	No		
Increase in income disparities	Yes		
Adjustment and regulation of water or fishing rights	No		
Changes in social and institutional structures	No		
Changes in existing institutions and customs	No		
II NATURAL ENVIRONMENT			
Biological and Ecological issues		Soil and Land Resources	
Deterioration or degradation of vegetation	No	Soil erosion	NO
Negative impacts on important or indigenous fauna and flora	No	Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	No	Deterioration of soil fertility	Yes
Proliferation of exotic and/or hazardous species	No	Soil contamination by agrochemicals	Yes
Encroachment on wetlands	No	Devastation or desertification of land	No
Encroachment on tropical forests	No	Devastation of hinterland	No
Destruction or degradation of mangrove forests	No	Ground subsidence	No
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Unknown		
Changes in ground water hydrology	Unknown		
Inundation and flood	No		
Soil sedimentation	Yes		
Riverbank degradation	No		
Water contamination and deterioration of water quality	Yes		
Water eutrophication	Yes		
Low water temperature	No		
Atmospheric pollution	No		
Poor water management	No	Overall evaluation	**Yes = 10**
Landscape and Mineral Resources			**No = 33**
Damage to landscape	No		**Unknown = 4**

2.8.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	A	C	A
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	C	C	C	C	C
Drastic change in population composition	C	C	C	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	A	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	B	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. Health and sanitary issues						
Increase use of agrochemicals	C	C	C	A	C	C
Prevalence of water borne diseases	C	C	C	A	C	A
Residual toxic of agrochemicals	C	C	C	A	C	A
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	A	A	C	A	A
Impacts on indigenous fauna and flora	C	C	C	C	C	C
Degradation of ecosystem	B	B	B	B	B	B
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	C	C	C	C	C	C
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	A	C	C
Soil contamination by agrochemicals	C	C	C	A	C	C
(b) Land Resources						
Soil sedimentation	C	A	C	C	C	C
Riverbank degradation	C	C	C	C	C	C
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	C	C	C	B	C	C
Change in ground water hydrology	C	C	C	B	C	C
Poor water management	C	C	C	C	C	C
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	C	A	C	A
Water eutrophication	C	C	C	A	C	A
(c) Water quantity						
Adequacy and reliability of water supply	C	C	C	A	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact
B – Environmental impact not clarified C – Issue having no environmental impact

2.8.3.3 Potential environmental impacts

In Lower Moshi Irrigation scheme, the following potential environmental impacts are expected:

(i) Pressure on the water resources due to steady rise in population and expansion of paddy fields. Water scarcity in the scheme area especially in the Lower Mabogini area is due to a number of factors including (1) improper water scheduling (2) cultivation activities in the vicinity of some of the water sources and (3) water abstractions by out-growers upstream the intake.

(ii) Conflict of interests between KADP and CHAWAMPU on the ownership of the project. This acts as a stumbling block to the operation of the scheme.

(iii) Siltation at both Mabogini and Rau intakes resulting into reduced flows with consequences to water availability to the farms. Silt loads are high necessitating for heavy equipment to de-silt it.

(iv) Vandalism is rampant with irrigation structures falling prey to irresponsible people. Some lined canals and other structures have been destroyed. This is a great setback in developing irrigation in the study area since it results into unnecessary water loss. Rehabilitation of the scheme is likely to attract more vandalism.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

(vi) Presence of water borne diseases (Malaria, Typhoid, diarrhoea diseases and bilharzias. The Tropical Pesticide Institute (TPRI) had a research station at Mabogini to monitor water borne diseases but it is no longer functioning.

(vii) Possible soil and water pollution – it became apparent that farmers in the study area apply fertilizers and pesticides in substantial amounts. Fertilizers include UREA and Sulphate of Ammonia. Pesticides include Thiodan and Diazban. Production cost per unit area has increased a great deal due to use of agrochemicals.

(viii) Possible increase in water borne diseases due to the fact that villagers utilize irrigation water for domestic use including drinking, washing and bathing. It was noted that Malaria, Typhoid and Bilharzia are common diseases in the area. The Tropical Pesticide Institute (TPRI) had a research station at Mabogini to monitor water borne diseases but it is no longer functioning.

(ix) Lack of water troughs for livestock necessitating livestock to share irrigation water with other users and in so doing destroying canals and other related structures.

(x) Reduced water flow in irrigation canals due to irrigators not cleaning canals on a regular basis. During site visit it became apparent that some canals are clogged with weeds, which slow down water and may provide good habitat for breeding of water related disease vectors.

(xi) Destructive birds pose a threat to the scheme area especially to the paddy crop. With crop intensification, the problem is likely to rise.

2.8.4 Conclusion and recommendations

2.8.4.1 Conclusion of PEA and recommendations

The study team noted that no environmental assessment was done before implementation of Modern Lower Moshi irrigation scheme. However the environmental impact assessment was done for Lower Moshi Integrated Agricultural and Rural development project, which have some information regarding lower Moshi. Therefore we recommend undertaking Environmental Audit of the Modern Lower Moshi irrigation scheme.

2.8.4.2 Proposed Terms of Reference (TOR) for Environmental Audit

The Environmental Audit of Lower Moshi irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1.Socio-economic issues

- Conflicts among community and irrigators association management
- Management systems of the modern Lower Moshi irrigation scheme.

2. Health and sanitation

- Safe use and handling of agrochemicals
- Prevalence of water borne diseases
- Residue toxic of agrochemicals

NATURAL ENVIRONMENT

1. Soil and land resources

- Deterioration of soil fertility
- Soil contamination by agrochemicals
- Sedimentation at the intakes

2. Hydrology

- Adequacy and reliability of irrigation water supply.
- Water contamination and deterioration of water quality
- Water eutrophication

2.9 Scheme – 1*: LUCHILI IRRIGATION SCHEME*

2.9.1 Project Description

2.9.1.1 Background Information and Objectives of Scheme

Luchili irrigation scheme was developed as a pumping scheme by the District government l with support from Indian engineers in 1979. the scheme becomes in operational in 1992 due to high running cost of the diesel engines and inefficient farmers organization. In view of the Mwanza zonal irrigation Unit and the District have proposed to rehabilitate the scheme focusing on feasible operation of pumps, farmers organization and rehabilitate infrastructures.

2.9.1.2 Brief Description of Scheme

Outline of scheme area	Luchili irrigation scheme is a pumping irrigation scheme, which is located in Sengerema district, about 40 km south of Mwanza at approximately $2^{o}32'13"S$ and $32^{o}29'53"E$ The scheme is currently not operational. It used to draw water from lake Victoria using two pump units.
Beneficiaries and Benefited Area	: 62 households are involved 43 ha were surveyed
Relevant Scheme Components	: Pump house, pressure delivery line, main canal and diversion box.
	: Scheme performance was below expectations due to High operation cost, farmers poor financial capacity and weak farmers organization, inadequate agronomic package on part of the farms
Water source	: Water pumped from Lake Victoria
Executing Agencies	: Luchili irrigation scheme will be rehabilitated by the Government of Tanzania (GOT) in cooperation with other donors/financiers.
Environmental Agencies Concerned	: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.9.1.3 Major Components and Development Scale of Project

	(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
a.	Pumping house, suction line, pressure delivery line, main canal, secondary canals and two pump units:	43 ha	Unknown	NIL
b.	Feasibility study and survey was done for 43 ha			
c.	Leveling done and completed to a limit of 18.5 ha			

2.9.2 Site Description

2.9.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights; Inheritance and Outright purchase. Rainfed farms, irrigation fields and village land (including settlements)
(2) Economic activities in and around study area	: Agriculture (irrigated and rainfed); Fishing and livestock keeping. Crops grown include mainly paddy and maize.
(3) Water right.	: No water right is available.
(4) Host people or community	: Mainly Sukuma from Nyakasungwa village.
(5) Public health	: Villagers suffer from malaria (a prevailing disease), typhoid and diarrhoea diseases.
(6) Population	: 62 families from Nyakasungawa and Luchili villages
(7) Others	: NIL

2.9.2.2 Natural Conditions of Study Area

(1) Climate	: Rainfall is relatively high from February to may, an annual average rainfall average of 800 mm –900 mm peer year. Dry season is from June to September.
(2) Topography	: Generally flat with gentle slope to the lake. The scheme lies about 700m from the lake shore.
(3) Hydrology and drainage condition	: One seasonal stream passes adjacent to the scheme. It drains the scheme on one side and discharge water into lake Victoria.
(4) Soils	: Unknown
(5) Vegetation	: Mainly grassland
(6) Rare species or fragile ecology	: Lake Victoria ecology
(7) Others	: None

2.9.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance Designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**		**X**		
-Habitat of fauna and flora		**X**			**X**				**X**
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**			**X**	
-Forest reserve		**X**			**X**			**X**	
b) *Areas prone to natural disasters*									
-Area susceptible to erosion		**X**				**X**			**X**
-Flood plains		**X**				**X**			**X**
-Geological hazards		**X**			**X**				**X**

Key: Appl. – applicable N.A. – Not applicable

2.9.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.9.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues		Health and sanitary issues	
Planned agricultural settlement	NO	Increased use of agrochemicals	Unknown
Involuntary resettlement	NO	Outbreak of endemic diseases	Unknown
Substantial change in way of life	NO	Prevalence of water borne diseases	Unknown
Conflicts among communities or people	NO	Residual toxic of agrochemicals	Unknown
Impacts on native people	NO	Increase in domestic and other human wastes	NO
Impediment to movement of people and livestock	NO	Cultural Property Issues	
Population increase	NO	Impairment of historical remains and cultural sites	NO
Drastic change in population composition	NO	Damage to aesthetic sites	NO
Relocation of bases of economic activities	NO		
Occupational change and loss of labour opportunity	NO		
Increase in income disparities	Unknown		
Adjustment and regulation of water or fishing rights			
Changes in social and institutional structures			
Changes in existing institutions and customs			
II NATURAL ENVIRONMENT			
Biological and Ecological issues		Soil and Land Resources	
Deterioration or degradation of vegetation	Yes	Soil erosion	NO
Negative impacts on important or indigenous fauna and flora	NO	Soil Salinization	NO
Degradation of ecosystem with biological diversity	NO	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	NO	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	NO	Devastation or desertification of land	NO
Encroachment on tropical forests	NO	Devastation of hinterland	NO
Destruction or degradation of mangrove forests	NO	Ground subsidence	NO
Degradation of coral reef	NO		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	NO		
Changes in ground water hydrology	NO		
Inundation and flood	NO		
Soil sedimentation	NO		
Riverbank degradation	NO		
Water contamination and deterioration of water quality	NO		
Water eutrophication	NO		
Low water temperature	NO		
Atmospheric pollution	NO		
Poor water management	NO	Overall evaluation	**Yes = 1**
Landscape and Mineral Resources	NO		**No = 36**
Damage to landscape			**Unknown = 7**

2.9.3.2 Scoping checklist	PROJECT ACTIVITIES					
	LC	WC	CC	FS	RT	DS
I) Social Environment						
1 **Social economic issues**						
a) Social issues						
Planned agricultural settlement	C	C	C	C	C	C
Involuntary resettlement	C	C	C	C	C	C
Substantial change in way of life	C	C	C	C	C	C
Conflicts among community and people	C	C	C	C	C	C
Impacts on native people	C	C	C	C	C	C
Impediment to movement of people and livestock	C	C	C	C	C	C
b) Demographic issues						
Population increase	C	C	C	C	C	C
Drastic change in population composition	C	C	C	C	C	C
c) Economic activities						
Relocation of bases of economic activities	C	C	C	C	C	C
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	C	C	C	B	C	C
d) Institutional and Custom related Issues						
Adjustment and regulation of water for fishing right	C	C	C	C	C	C
Changes in social and institutional structure	C	C	C	C	C	C
Changes in existing institution and customs	C	C	C	C	C	C
2. Health and sanitary issues						
Increase use of agrochemicals	C	C	C	B	C	B
Prevalence of water borne diseases	C	C	C	B	C	B
Residual toxic of agrochemicals	C	C	C	B	C	B
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	A	A	C	A	A
Impacts on indigenous fauna and flora	C	C	C	C	C	C
Degradation of ecosystem		B	B	B	B	B
Encroachment on wetlands	C	C	C	C	C	C
Encroachment on tropical forest	C	C	C	C	C	C
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	C	C	C	C	C
5. Soil and Land Resources						
(a) Soil Resources						
Soil erosion	C	C	C	C	C	C
Soil salinization	C	C	C	B	C	C
Deterioration of soil fertility	C	C	C	B	C	C
Soil contamination by agrochemicals	C	C	C	B	C	C
(b) Land Resources						
Soil sedimentation	C	C	C	C	C	C
Riverbank degradation	C	C	C	C	C	C
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
(a) Hydrology						
Ground subsidence	C	C	C	C	C	C
Devastation of hinterland	C	C	C	C	C	C
Change in surface water hydrology	C	C	C	C	C	C
Change in ground water hydrology	C	C	C	C	C	C
Poor water management	C	C	C	C	C	C
(b) Water quality						
Water deterioration and deterioration of water quality	C	C	C	C	C	C
Water eutrophication	C	C	C	C	C	C
(c) Water quantity						
Adequacy and reliability of water supply	C	C	C	C	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.9.3.3 Potential environmental impacts

In Luchili irrigation scheme, the following potential environmental impacts are expected:

(i) Water hyacinth problem at the suction line. Water hyacinths block the suction line and sometime in the past, it destroyed the suction line. With the problem of water hyacinth still rampant in Lake Victoria, safety of suction line will remain at stake.

(ii) Vandalism of the pressure pipeline. Rehabilitation of the irrigation infrastructure might attract more vandalism.

(iii) Land use conflicts between farmers in Luchili village and Nyakasungwa village. Although the name of the scheme is called Luchili, the beneficially are those form Nyakasungwa village. It was reported that there was a conflict of interest between these villages.

(iv) Livestock form neighbouring village graze into the scheme area and destroys lined canal system. Since the study area has many cattle, conflicts between farmers and livestock keepers will remain.

(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.

2.9.4 Conclusion and recommendations

The preliminary environmental assessment indicates that there are minor environmental and social impacts in the study area. Thus, based on the findings from this study, the study team does not recommend EIA for Luchili irrigation scheme prior to improvement but rather the preparation of environmental and social management plan to implement mitigation measures.

2.10 Scheme – 10*: MGONGOLA IRRIGATION SCHEME*

2.10.1 Project Description

2.10.1.1 Background Information and Objectives of Scheme

The JICA Team conducted a feasibility study of Mgongola irrigation scheme in 1997 with the aim of developing the rainfed area under the implementation of master plan in Central Wami River Basin. The project concept of the scheme was to extend the advanced irrigated agriculture already examined by the pilot scheme to the possible limit.

2.10.1.2 Brief Description of Scheme

Outline of scheme area	Mgongola irrigation scheme is proposed to be a gravity irrigation scheme, which is located in the New Mvomelo district, about 40 km North of Morogoro. It is located at approximately 6°15'51"S and 37°35'14"E. The scheme is operating using rainfed and floods from the rivers.
Beneficiaries and Benefited Area	: Beneficiaries are from Mkindo, Dihombo and Hembeti. approximately 1,700 people in 620 ha will be involved
Relevant Scheme Components	: Remodeling of existing intake structure, development of main canal, farm roads and other infrastructures to the proposed 620 ha which is currently under rainfed and Improvement of domestic water supply pipes : In the farm land of Mkindo pilot scheme, modern paddy cultivation is practiced and is being adopted by outside farmers.
Water source	: Water sources is from Mkindo River
Executing Agencies	: Mgongola irrigation scheme will be rehabilitated by the Government of Tanzania (GOT) in cooperation with other donors/financiers.
Environmental Agencies Concerned	: Division of Environment; NEMC and Environmental Cell Unit of MAFS

2.10.1.3 Major Components and Development Scale of Project

	(1) Main Project Components	(2) Area	(3) Dimensions of major facilities	(4) Remarks
a.	Remodeling of existing irrigation structures, main canal, farm roads to cover new area, improve domestic water supply pipe	620 ha	Unknown	Consolidation of Mkindo pilot area and new area.

2.10.2 Site Description

2.10.2.1 Present socio-economic status of the study area

(1) Land ownership and land use	: Customary rights of rainfed farms, irrigation fields and village land (including settlements)
(2) Economic activities in and around study area	: Agriculture (irrigated and rainfed), Fishing and livestock keeping. Crops grown include mainly paddy and maize.
(3) Water right.	: Water right is under process. No water right is available.
(4) Host people or community	: Mainly community from Mkindo, Dihombo and Hembeti farmers engaged in irrigated agriculture in the area.
(5) Public health	: Villagers suffer from malaria (a prevailing disease), bilharzias, typhoid and diarrhoea diseases.
(6) Population	: About 620 ha will be cultivated in Mngongola irrigation scheme where villages from Mkindo, Dihombo and Hembeti will be involved. A total of 1,700 families will be supported.
(7) Others	: A health centre, one primary school, numerous shops and kiosks and a number of milling machines serve communities. The villages have electricity. Various development organizations exist including Special Program For Food Security, and ASPS.

2.10.2.2 Natural Conditions of Study Area

(1) Climate	: Rainfall is relatively high, with an annual average rainfall average of 1310 mm. Wet season is from November to April and Dry spell in September.
(2) Topography	: More or less generally flat land adjacent to Mkindo and Mgongola river.
(3) Hydrology and drainage condition	: A number of rivers contribute water into Mkindo. These are dizingwa and Mgongola rivers
(4) Soils	: Unknown (refer to Mgongola feasibility study)
(5) Vegetation	: Mainly grassland with scattered trees on the scheme area and forest in the upstream of Mkindo river.
(6) Rare species or fragile ecology	: Unknown
(7) Others	: None

2.10.2.3 Environmentally Sensitive Areas in Study Area or Vicinity

ENVIRONMENTALLY SENSITIVE AREAS	In scheme area			Vicinity of scheme area			Outside		
	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown	Appl.	N.A.	Unknown
a) *Areas under specific designation*									
-Wetlands of International importance designated in Ramsar Convention		**X**			**X**			**X**	
-Wetlands of national importance		**X**			**X**			**X**	
-Wildlife corridor		**X**			**X**			**X**	
-Habitat of fauna and flora		**X**			**X**				**X**
-Heritage sites, social, cultural, history and archaeological		**X**			**X**			**X**	
-National parks		**X**			**X**			**X**	
-Forest reserve		**X**		**X**					**X**
b) *Areas prone to natural disasters*									
-Area susceptible to erosion			**X**			**X**			**X**
-Flood plains	**X**			**X**					**X**
-Geological hazards		**X**				**X**			**X**

Key: Appl. – applicable N.A. – Not applicable

2.10.3 Screening, Scoping and Examination on Potential Environmental Impacts

2.10.3.1 Screening checklist

Potential Significant Environmental Impact (SEI)	Evaluation Bases	Potential Significant Environmental Impact (SEI)	Evaluation Bases
I) SOCIAL ENVIRONMENT			
Social economic issues		**Health and sanitary issues**	
Planned agricultural settlement	No	Increased use of agrochemicals	Yes
Involuntary resettlement	No	Outbreak of endemic diseases	No
Substantial change in way of life	No	Prevalence of water borne diseases	Yes
Conflicts among communities or people	Yes	Residual toxic of agrochemicals	Yes
Impacts on native people	No	Increase in domestic and other human wastes	No
Impediment to movement of people and livestock	Yes	Cultural Property Issues	
Population increase	No	Impairment of historical remains and cultural sites	No
Drastic change in population composition	No	Damage to aesthetic sites	No
Relocation of bases of economic activities	Unknown		
Occupational change and loss of labour opportunity	No		
Increase in income disparities	No		
Adjustment and regulation of water or fishing rights	No		
Changes in social and institutional structures	No		
Changes in existing institutions and customs	No		
II NATURAL ENVIRONMENT			
Biological and Ecological issues		Soil and Land Resources	
Deterioration or degradation of vegetation	Yes	Soil erosion	No
Negative impacts on important or indigenous fauna and flora	Unknown	Soil Salinization	No
Degradation of ecosystem with biological diversity	No	Deterioration of soil fertility	Unknown
Proliferation of exotic and/or hazardous species	No	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	No	Devastation or desertification of land	No
Encroachment on tropical forests	No	Devastation of hinterland	No
Destruction or degradation of mangrove forests	No	Ground subsidence	No
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Unknown		
Changes in ground water hydrology	Unknown		
Inundation and flood	Yes		
Soil sedimentation	No		
Riverbank degradation	No		
Water contamination and deterioration of water quality	Unknown		
Water eutrophication	Unknown		
Low water temperature	No		
Atmospheric pollution	No		
Poor water management	Yes	Overall evaluation	Yes = 8
Landscape and Mineral Resources			No = 31
Damage to landscape	No		Unknown = 8

2.10.3.2 Scoping checklist		PROJECT ACTIVITIES					
		LC	WC	CC	FS	RT	DS
I) Social Environment							
1	**Social economic issues**						
	a) Social issues						
	Planned agricultural settlement	C	C	C	C	C	C
	Involuntary resettlement	C	C	C	C	C	C
	Substantial change in way of life	C	C	C	C	C	C
	Conflicts among community and people	C	C	C	A	C	C
	Impacts on native people	C	C	C	C	C	C
	Impediment to movement of people and livestock	C	C	A	A	C	A
	b) Demographic issues						
	Population increase	C	C	C	B	C	B
	Drastic change in population composition	C	B	B	C	C	C
	c) Economic activities						
	Relocation of bases of economic activities	C	C	C	C	C	C
	Occupational change and loss of labour opportunities	C	C	C	C	C	C
	Increase in income disparities	C	C	C	C	C	C
	d) Institutional and Custom related Issues						
	Adjustment and regulation of water for fishing right	C	C	C	C	C	C
	Changes in social and institutional structure	C	C	C	C	C	C
	Changes in existing institution and customs	C	C	C	C	C	C
2.	Health and sanitary issues						
	Increase use of agrochemicals	C	C	C	A	C	A
	Prevalence of water borne diseases	C	C	C	A	C	C
	Residual toxic of agrochemicals	C	C	C	A	C	A
3.	Cultural Property Issues						
	Impairment of historical remains and cultural sites	C	C	C	C	C	C
	Damage to aesthetic sites	C	C	C	C	C	C
II. Natural Environment							
4.	Biological and Ecological Issues						
	Deterioration or degradation of vegetation	A	A	A	C	A	A
	Impacts on indigenous fauna and flora	B	B	B	B	B	B
	Degradation of ecosystem	B	B	B	B	B	B
	Encroachment on wetlands	C	C	C	C	C	C
	Encroachment on tropical forest	C	C	C	C	C	C
	Destruction or degradation of mangrove forest	C	C	C	C	C	C
	Degradation of coral reef	C	C	C	C	C	C
5.	Soil and Land Resources						
	(a) Soil Resources						
	Soil erosion	A	A	A	A	A	A
	Soil salinization	C	C	C	B	C	C
	Deterioration of soil fertility	C	C	C	B	C	C
	Soil contamination by agrochemicals	C	C	C	B	C	C
	(b) Land Resources						
	Soil sedimentation	C	A	C	C	A	C
	Riverbank degradation	C	A	C	C	A	C
	Inundation and flood	C	C	C	B	C	C
6.	Hydrology, water quality and quantity issues						
	(a) Hydrology						
	Ground subsidence	C	C	C	C	C	C
	Devastation of hinterland	C	C	C	C	C	C
	Change in surface water hydrology	C	C	C	B	C	C
	Change in ground water hydrology	C	C	C	B	C	C
	Poor water management	C	C	C	C	C	C
	Inundation and floods	C	C	C	A	C	A
	(b) Water quality						
	Water deterioration and deterioration of water quality	C	C	C	B	C	B
	Water eutrophication	C	C	C	C	C	C
	(c) Water quantity						
	Adequacy and reliability of water supply	C	C	C	C	C	C

LC – Land Clearing WC – Weir Construction CC – Canal Construction FS – Farming System RT – River Training DS – Drainage System A - Identified or potential significant environmental impact

B – Environmental impact not clarified C – Issue having no environmental impact

2.10.3.3 Potential environmental impacts

In Mgongola scheme, the following potential environmental impacts are expected:

(i) Possible increase in pressure on the natural resources due to steady rising of population and fuel wood collection.
(ii) Pollution problem. Dizingwa River collects drainage water from Mkindo phase 1 fields. The river is used down stream to irrigate phase II of the pilot scheme.
(iii) Land use conflicts between farmers and livestock keepers. These are mainly due to absence of demarcated areas for both agricultural fields and grazing. This problem becomes amplified during the dry season when herds of cattle have to travel great distances searching for pasture and water.
(iv) Presence of water borne diseases (Malaria, Typhoid, diarrhoea diseases, Bilharzia and sometimes cholera outbreaks). Mosquitoes transmit malaria whilst houseflies transmit typhoid and diarrhoea.
(v) During construction activities, soils will be scooped paving way for engineering structures and thereby causing degradation of vegetation.
(vi) Presence of *quelea quelea* destructive birds, which according to people interviewed greatly reduces paddy yield. The irrigators resort to bird scaring, an activity mainly done by children who spend daytime in the fields.
(vii) Possible increase in use of industrial fertilizers and pesticides. At present, farmers use fertilizers in Mkindo pilot scheme. are relatively still fertile. However, with agricultural intensification in the new area, there is likelihood of an increase in use of fertilizers and pesticides.

2.10.4 Conclusion and recommendations

2.10.4.1 Conclusion of PEA and Recommendations

The study team noted that environmental assessment was done during the feasibility study of Mgongola irrigation scheme. Also the preliminary environmental assessment indicated that there are some environmental and social impacts, for which environmental mitigation measures were proposed. Thus, based on the findings from this study, the study team recommends a review of the Environmental Assessment report and preparation of an environmental and Social Management plan.

2.10.4.2 Proposed Terms of Reference (TOR) for Review of Environmental Assessment and Mitigation measures

The Review of Environmental Assessment of Mgongola irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT
1.Socio-economic issues
- Land use conflicts between farmers and livestock keepers.
- Quelea quelea problem

2. Health and sanitation
- Safe use and handling of agrochemicals
- Water borne diseases trend and sanitation

NATURAL ENVIRONMENT

1. Land resources
- Poor drainage and flash floods during rainy season
- Pressure on grazing land through conversion to irrigated land and expansion of settlement.

2. Hydrology
- Water deterioration and deterioration of water quality

3. Others
- Pressure on natural resources due to population increase against supply.

References

SLD (2003) *Appraisal Report for Liyuni Valley – Irrigation Project.* Songea Rural District (SLD)

HDC (2003) *Brief Description of Musa Mwinjanga Traditional Irrigation Scheme.* Hai District Council (HDC).

KGC (2003) *General Outline of Pamila Traditional Irrigation Scheme.* Kigoma District Council (KDC).

JICA (1992) *Guideline for environmental consideration on Agricultural and Rural Development Projects*. Japan International Cooperation Agency (JICA). December 1992.

LDC (2001) *Improvement of Kinyope Traditional Irrigation Scheme*. Project Document. Lindi District Council (LDC). January 2001(Unpublished Internal document).

MAFS (2001) *Report on Additional Reconnaisance Survey of Liyuni/Likonde Flood Plains.* Songea District, Ruvuma Region. September 2001

NEMC (2002a) *Tanzania Environmental Impact Assessment Procedure and Guidelines.* Volume 2: Screening and Scoping Guidelines. National Environment Management Council (NEMC). Revised March 2002.

NEMC (2002b) *Tanzania Environmental Impact Assessment Procedure and Guidelines.* Volume 5: General Checklist of Environmental Characteristics. National Environment Management Council (NEMC). Revised March 2002.

RALG (2002) *Project Proposal for Development of Kisese Irrigation Scheme.* Regional Administration and Local Government (RALG). February 2002.

URT (1985) Lower Moshi Integrated Agriculture and Rural Development Pro*ject Feasibility Study*. United Republic of Tanzania (URT). July 1998.

URT (1985) *Pawaga Irrigation Project Feasibility Study*. Volume II. Annexes 1-8. United Republic of Tanzania (URT). March 1985.

URT (1997) Feasibility Study on Central Wami River Basin. United Republic of Tanzania (URT)