

Appendix D
Economic and Financial Evaluation
For Model Irrigation Schemes

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

Action Plan Report

Appendix D

Economic and Financial Evaluation for Model Irrigation Schemes

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1. Mlemele Irrigation Scheme

Site Description

The project area comprises most of Chake Chake District on the southern part of the South Pemba Region in Pemba Island. It includes 7 villages, namely, Matele, Tondooni, Mitamani, Dodo, Kumvini, Kitokame and Pogwa. Access to the project area in the Matele village is by an unmetaled feeder road from the town of Chake Chake, about 10 km distant.

Annual rainfall of the project area is relatively abundant and observed at approximately 1,700 mm with a single maximum peak in April. In the project area, fertile cultivated lands extends along two tributaries (provisionally named Right Mlemele river and Left Mlemele river). Both tributaries are ephemeral rivers, flash water during flood occurs, would be a valuable water source for irrigation to such presently rainfed area.

Scheme Description

Development Purpose

To ensure irrigation water for the scheme through initiating water harvesting development.

Basic Approach

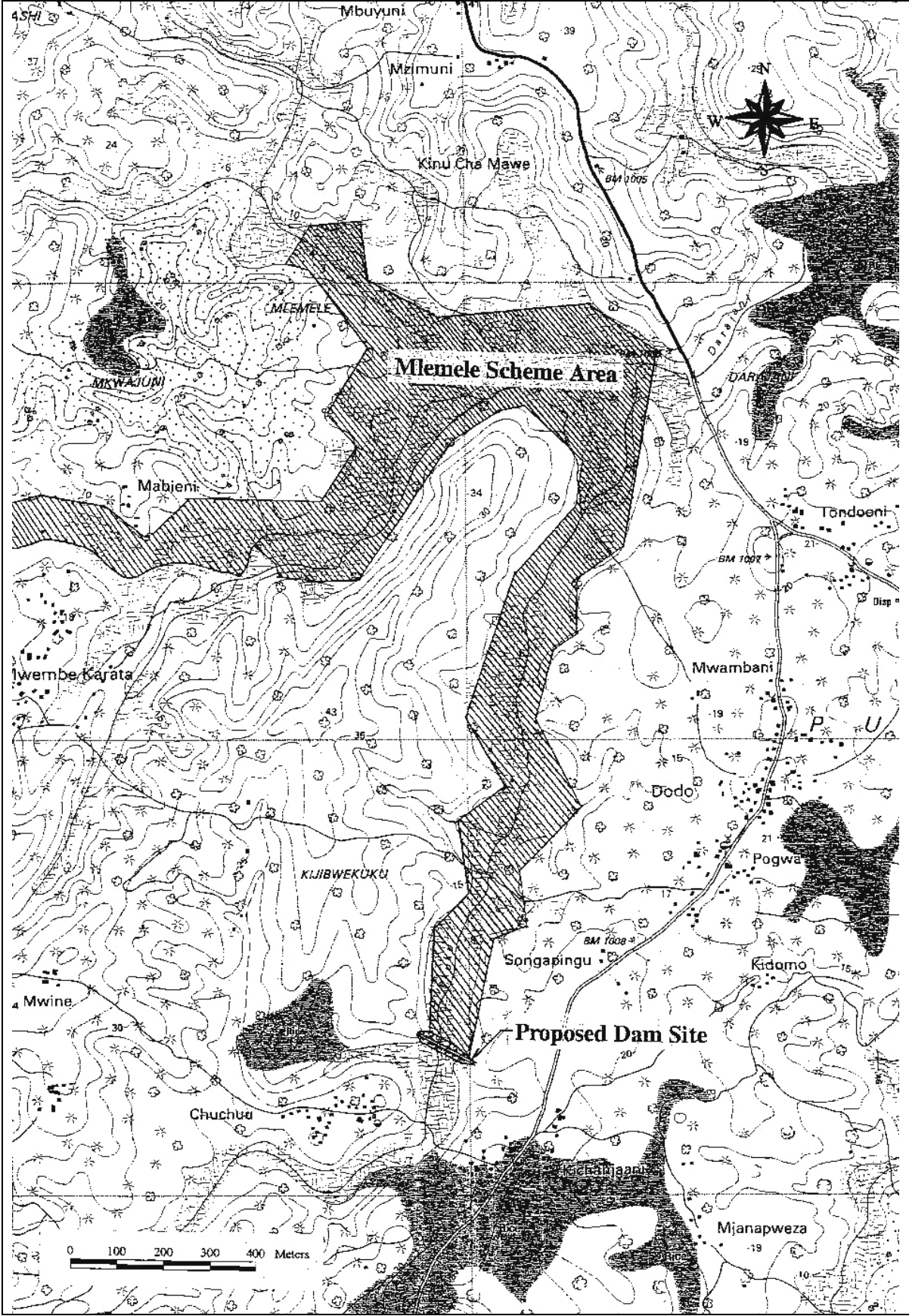
To exploit additional water source by providing small dam at low cost.

Development Plan

The proposed scheme area is 65 ha in net. A small dam with a reservoir capacity of about 100,000 m³ is proposed at upstream of the Right Mlemele River to supply irrigation water to the command area of 65 ha. Impounding water is delivered to farm lands through irrigation canal system. Main irrigation canal will run along foot-range of hills to reach the opposite side of the river. Minor irrigation canals are not needed because the farm plots can be irrigated from the main irrigation canal directly, or farmers will put ditch from the main irrigation canal to their plots. Drainage canal and farm road are provided along parts of main irrigation canal for operation and maintenance of irrigation facilities. The proposed construction works for the scheme are as follows:

- (a) Small earthfill dam (height 3m x length 120 m)
- (b) Main irrigation canal (unlined canal with length 7,220 m)
- (c) Drainage canal (unlined channel with length 4,620 m)
- (d) Farm road (length 2,500 m)
- (e) Related structures (Lump Sum)

Scheme Map



Photographs



Ephemeral River



Proposed pond site



Burning of plant residue



Seeding



Interview with farmers



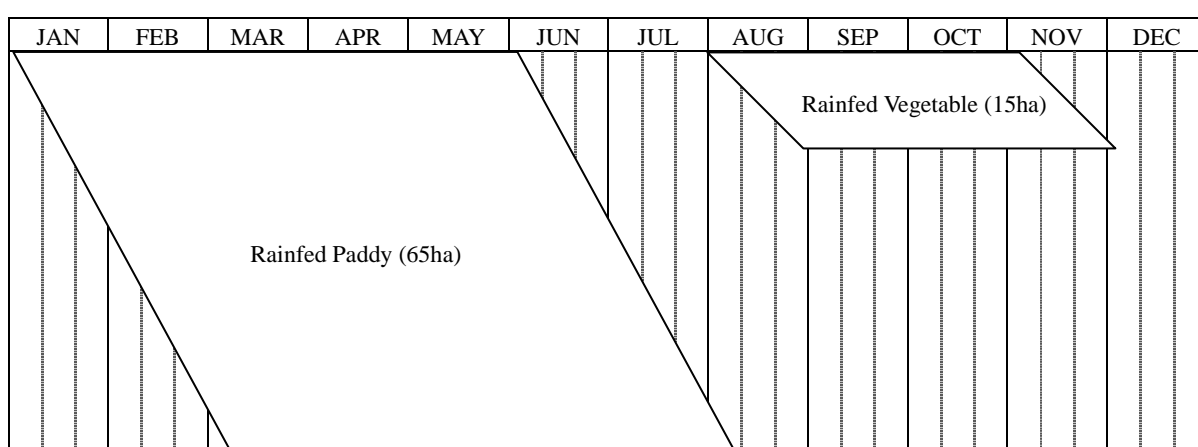
Washing beside small pond

Cultivated Area, Cropping Intensity and Average Yield

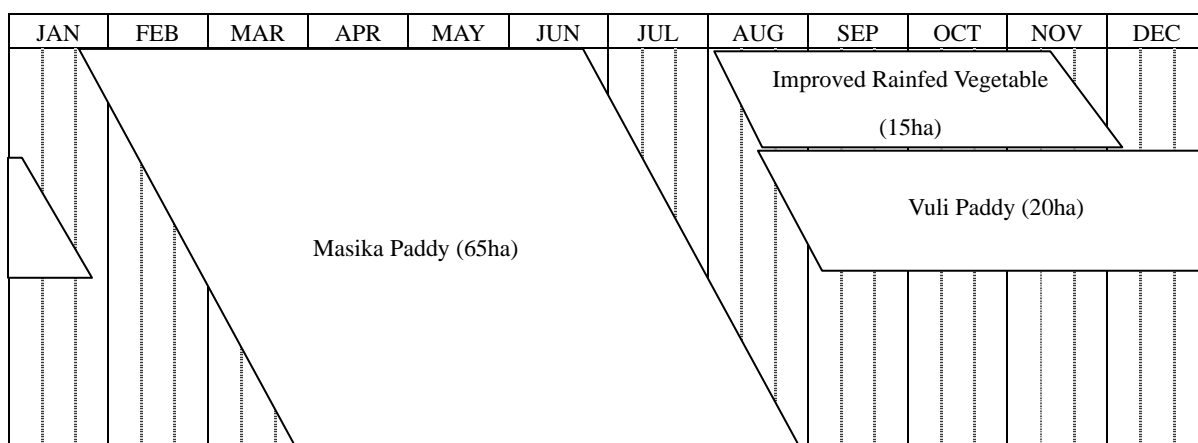
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy		65		1.0						
	Upland Crops			15				15			
Irrigated	Paddy						65	20		4.5	
	Upland Crops										
Total		65	65	15	123	65	65	35	154		

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.2ha (Rainfed Paddy + Rainfed Vegetables)	0.2ha (Irrigated Paddy + Improved Rainfed Vegetable)
Outside the Scheme	0.4ha (Upland crops such as Cassava, Banana, Groundnut)	0.4ha (Upland crops such as Cassava, Banana, Groundnut)

Financial Crop Budget

Financial Crop Budget in Mlemele	Unit	Present Condition						Proposed Condition									
		Rainfed Paddy			Rainfed Cucumber			Irrigated Paddy			Improved Rainfed Cucumber						
		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		1,000			6,000			4,500				10,000				
Farmgate Price	Tsh/kg	145			350			175			350						
Gross Return	Tsh/ha			145,000			2,100,000			787,500				3,500,000			
II Production Cost																	
1. Farm Inputs																	
1.1 Seed	kg/ha	300	50	15,000	35,000	0.5	17,500	500	80	40,000	35,000	0.5	17,500				
1.2 Fertilizer																	
Urea (46% N)	kg/ha	180	80	14,400	180	150	27,000	180	175	31,500	180	150	27,000				
SA (21% N)	kg/ha	200	0	0	200	0	0	200	0	0	200	0	0	0			
TSP (46% P2O5)	kg/ha	180	0	0	180	0	0	180	90	16,200	180	0	0	0			
NPK	kg/ha	180	0	0	180	0	0	180	70	12,600	180	0	0	0			
Manure	ton/ha	8,000	0	0	8,000	3	24,000	8,000	0	0	8,000	3	24,000				
1.3 Agro-chemical																	
Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	3	30,000	10,000	2	20,000				
Herbicide	lit/ha	6,000	0.5	3,000	6,000	0	0	6,000	3	18,000	6,000	0	0				
Fungicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0	5,000	2	10,000				
1.4 Packing Material																	
Bags (100 kg)	nos/ha	200	10	2,000	200	60	12,000	200	45	9,000	200	60	12,000				
Sub-total				34,400			95,500			157,300			110,500				
2. Labour Requirement																	
			Total	Hired		Total	Hired		Total	Hired		Total	Hired				
Land prep., Puddle and Bund	man/day		10	5	7,000		30	15	21,000		10	10	14,000	30	15	21,000	
Nursery	man/day		0	0	0		10	0	0		5	0	0	10	0	0	
Plant/Transplanting	man/day		4	0	0		30	15	21,000		15	5	7,000	30	20	28,000	
Weeding and Fertilizer	man/day		15	0	0		35	10	14,000		15	5	7,000	35	15	21,000	
Bird Scaring	man/day		15	0	0		15	0	0		15	0	0	15	0	0	
Harvesting	man/day		20	0	0		30	20	28,000		40	15	21,000	40	20	28,000	
Transport Marketing	man/day		4	2	2,800		5	5	7,000		10	5	7,000	10	10	14,000	
Irrigation, etc	man/day		0	0	0		0	0	0		10	0	0	10	0	0	
Threshing/Winning	man/day		2	0	0		25	15	21,000		10	5	7,000	30	15	21,000	
Sub-total			1,400	70	9,800	1,400	180	80	112,000	1,400	130	45	63,000	1,400	210	95	133,000
3. Machinery or Draught Animal																	
Tractor	LS	650	26	16,900	650	26	16,900	650	0	0	650	26	16,900				
Hand Tractor	LS	650	0	0	650	0	0	650	8	5,200	650	0	0				
Draught Animal	LS		0	0		0	0		0	0		0	0				
Sub-total				16,900			16,900			5,200			16,900				
4. Miscellaneous Cost																	
5% of Cost				3,055			11,220			11,275			13,020				
Total Cost				64,155			235,620			236,775			273,420				
III Net Return																	
Value				80,845			1,864,380			550,725			3,226,580				

Financial Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	65	81	5,255	0	0	0	-5,255
Rainfed Cucumber	15	1,864	27,966	0	0	0	-27,966
Irrigated Paddy	0	0	0	85	551	46,812	46,812
Improved Rainfed C.	0	0	0	15	3,227	48,399	48,399
Total	80	1,945	33,221	100	3,777	95,210	61,990

Economic Crop Budget

Economic Crop Budget in Mlemele	Unit	Present Condition						Proposed Condition									
		Rainfed Paddy			Rainfed Cucumber			Irrigated Paddy			Improved Rainfed Cucumber						
		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		1,000			6,000			4,500			10,000					
Farmgate Price	Tsh/kg	154			280			185			280						
Gross Return	Tsh/ha			154,450			1,680,000			834,030			2,800,000				
II Production Cost																	
1. Farm Inputs																	
1.1 Seed	kg/ha	300	50	15,000	35,000	0.5	17,500	500	80	40,000	35,000	0.5	17,500				
1.2 Fertilizer																	
Urea (46% N)	kg/ha	188	100	18,818	188	150	28,227	188	175	32,932	188	150	28,227				
SA (21% N)	kg/ha	101	0	0	101	0	0	101	0	0	101	0	0				
TSP (46% P2O5)	kg/ha	193	0	0	193	0	0	193	90	17,345	193	0	0				
NPK	kg/ha	180	0	0	180	0	0	180	70	12,600	180	0	0				
Manure	ton/ha	8,000	0	0	8,000	3	24,000	8,000	0	0	8,000	3	24,000				
1.3 Agro-chemical																	
Pesticide	lit/ha	10,000	0	0	10,000	1	10,000	10,000	3	30,000	10,000	2	20,000				
Herbicide	lit/ha	6,000	1	6,000	6,000	0	0	6,000	3	18,000	6,000	0	0				
Fungicide	lit/ha	5,000	0	0	5,000	1	5,000	5,000	0	0	5,000	2	10,000				
1.4 Packing Material																	
Bags (100 kg)	nos/ha	200	10	2,000	200	60	12,000	200	45	9,000	200	60	12,000				
Sub-total				41,818			96,727			159,876			111,727				
2. Labour Requirement																	
			Total	Hired		Total	Hired		Total	Hired		Total	Hired				
Land prep., Puddle and Bund	man/day		10	5	11,200	30	15	33,600	10	10	11,200	30	15	33,600			
Nursery	man/day		0	0	0	10	0	11,200	5	0	5,600	10	0	11,200			
Plant/Transplanting	man/day		4	0	4,480	30	15	33,600	15	5	16,800	30	20	33,600			
Weeding and Fertilizer	man/day		15	0	16,800	35	10	39,200	15	5	16,800	35	15	39,200			
Bird Scaring	man/day		15	0	16,800	15	0	16,800	15	0	16,800	15	0	16,800			
Harvesting	man/day		20	0	22,400	30	20	33,600	40	15	44,800	40	20	44,800			
Transport Marketing	man/day		4	2	4,480	5	5	5,600	10	5	11,200	10	10	11,200			
Irrigation, etc	man/day		0	0	0	0	0	0	10	0	11,200	10	0	11,200			
Threshing/Winnowing	man/day		2	0	2,240	25	15	28,000	10	5	11,200	30	15	33,600			
Sub-total		1,120	70	7	7,840	1,120	180	80	89,600	1,120	130	45	50,400	1,120	210	95	106,400
3. Machinery or Draught Animal																	
Tractor	LS	650	26	16,900	650	26	16,900	650	0	0	650	26	16,900				
Hand Tractor	LS	650	0	0	650	0	0	650	8	5,200	650	0	0				
Draught Animal	LS		0			0			0	0		0					
Sub-total				16,900			16,900			5,200			16,900				
4. Miscellaneous Cost																	
5% of Cost				3,328			10,161			10,774			11,751				
Total Cost				69,886			213,388			226,250			246,778				
III Net Return																	
Value				84,564			1,466,612			607,780			2,553,222				

Economic Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	65	85	5,497	0	0	0	-5,497
Rainfed Cucumber	15	1,467	21,999	0	0	0	-21,999
Irrigated Paddy	0	0	0	85	608	51,661	51,661
Improved Rainfed C.	0	0	0	15	2,553	38,298	38,298
Total	80	1,551	27,496	100	3,161	89,960	62,464

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost						Project Benefit		Balance
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	Total Cost	Incremental Benefit	
2004		17,307	8,654			28,846	54,806		-54,806
2005	259,610	17,307	8,654			21,634	307,205		-307,205
2006		17,307	8,654	466		21,634	48,061	6,246	-41,815
2007				933			933	18,739	17,806
2008				933			933	43,725	42,792
2009				933			933	56,217	55,285
2010				933			933	62,464	61,531
2011				933			933	62,464	61,531
2012				933			933	62,464	61,531
2013				933			933	62,464	61,531
2014				933			933	62,464	61,531
2015				933	2,596		3,529	62,464	58,935
2016				933			933	62,464	61,531
2017				933			933	62,464	61,531
2018				933			933	62,464	61,531
2019				933			933	62,464	61,531
2020				933			933	62,464	61,531
2021				933			933	62,464	61,531
2022				933			933	62,464	61,531
2023				933			933	62,464	61,531
2024				933			933	62,464	61,531
2025				933	2,596		3,529	62,464	58,935
2026				933			933	62,464	61,531
2027				933			933	62,464	61,531
2028				933			933	62,464	61,531
2029				933			933	62,464	61,531
2030				933			933	62,464	61,531
2031				933			933	62,464	61,531
2032				933			933	62,464	61,531
2033				933			933	62,464	61,531
2034				933			933	62,464	61,531
								NPV (12%) =	-16,375
								EIRR =	11%

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	0.6	0.6
- Within the Scheme Area (ha)	0.2	0.2
- Outside the Scheme Area (ha)	0.4	0.4
Gross Farm Income	413	660
Production Cost	98	149
Net Farm Income	315	512
Off-farm Income	103	103
Living Expenditure	380	380
Tax and Duties	8	8
Balance	30	227

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.2 ha
b) Gross Income	381
c) Production Cost	76
d) Net Farm Income	306
e) Tax and Duties	8
f) O/M Cost	3
g) Net Profit (d-e-f)	294

2. Makwararani Irrigation Scheme

Site Description

The project area occupies most of Micheweni District lying on the eastern part of the North Pemba Region in Pemba Island. It administratively covers 6 villages, namely, Mtakao, Kivugo, Kichangani, Michungani, Njuguni and Mapofu. Access to the project area in the Mtakao village is good because of availability of an asphalt-paved road from the town of Chake Chake, about 30 km distant.

Annual rainfall of the project area is recorded at about 1,800 mm having a single peak in April. Makwararani river has perennial flow though that in the dry season becomes low. Along the river course, fertile cultivated lands extend over both sides due to affluent moisture gushing out from the river.

Scheme Description

Development Purpose

To ensure irrigation water for the scheme through construction of small dam and rehabilitation of existing irrigation canal system.

Basic Approach

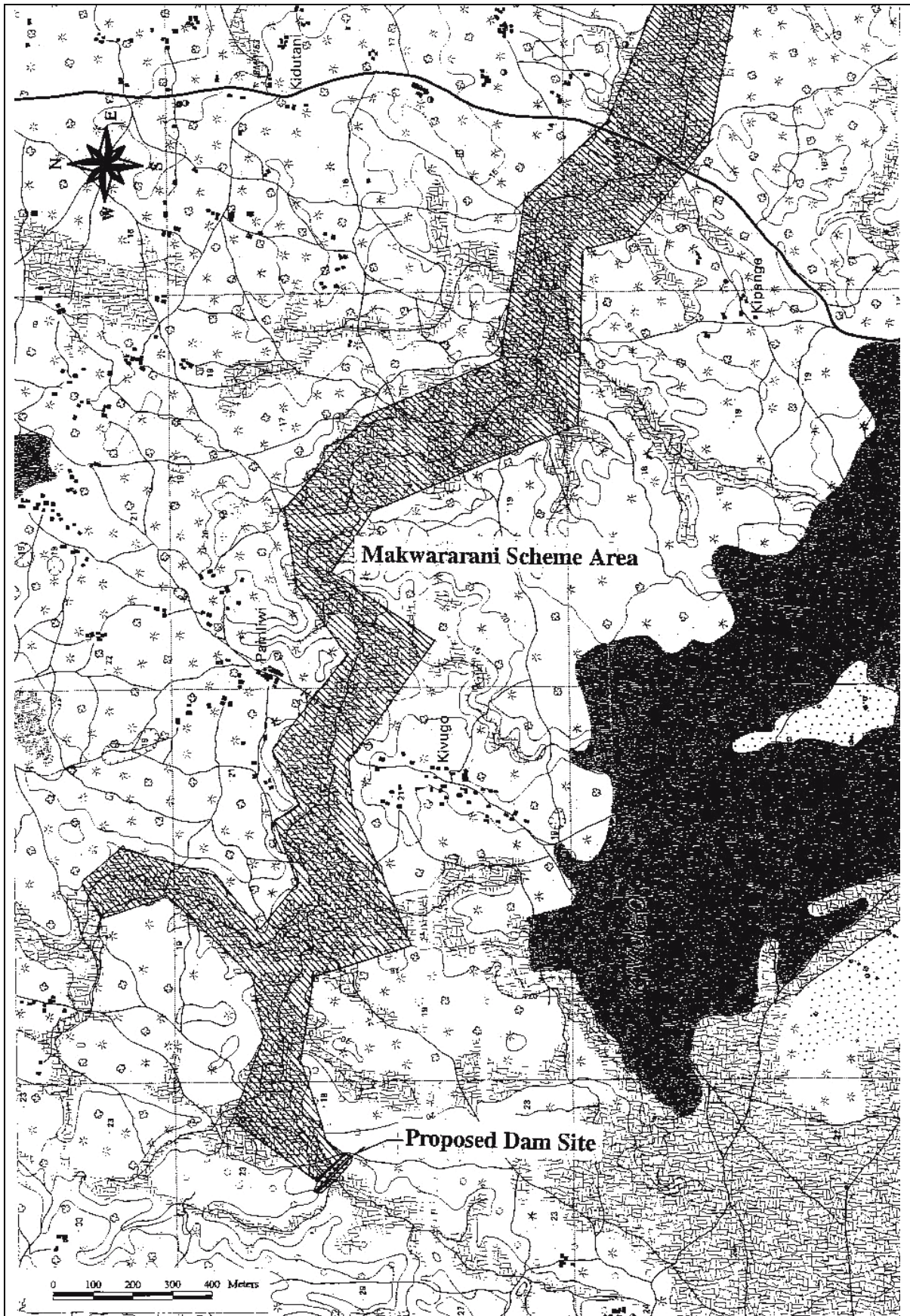
To exploit the limited water source by re-constructing small dam.

Development Plan

The proposed scheme area is 72 ha in net. The scheme exploits new water source for irrigation development by re-constructing a small dam. A small dam with a reservoir capacity of about 200,000 m³ is proposed at same dam axis with the collapsed dam although proper foundation treatment is essential. The proposed main irrigation canals will run along foot-range of both side hills toward downstream. No minor irrigation canals are required because of direct supply to fields from main irrigation canal through field ditches to be constructed by farmers. In addition, the scheme includes construction of drainage canal and farm road. The proposed construction works for the scheme are as follows:

- (a) Small earthfill dam (height 2m x length 150 m)
- (b) Main irrigation canal (unlined canal with length 8,950 m)
- (c) Drainage canal (unlined channel with length 14,000 m)
- (d) Farm road (length 1,700 m)
- (e) Related structures (Lump Sum)

Scheme Map



Photographs



Original water course



Reservoir area



Constructed spillway



Command area



Land preparation before rainy season



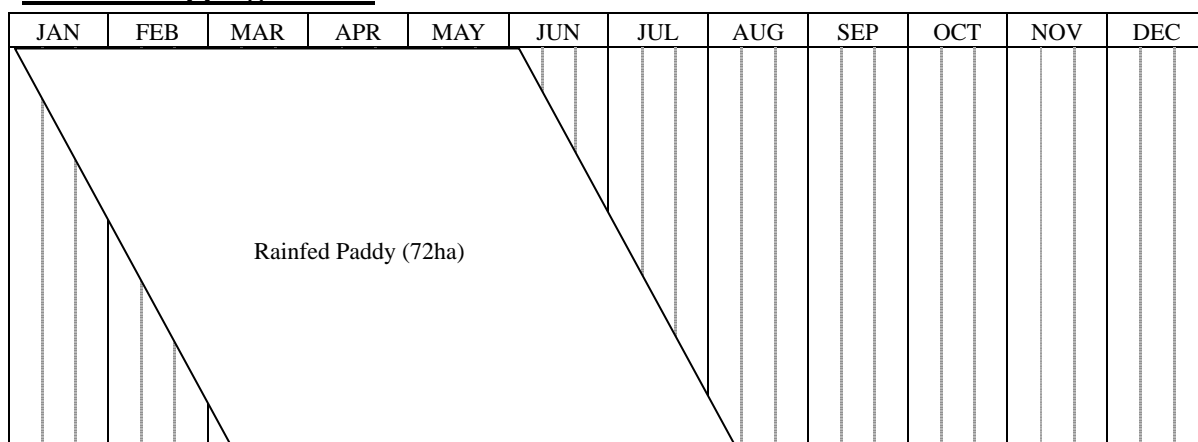
Interview with farmers

Cultivated Area, Cropping Intensity and Average Yield

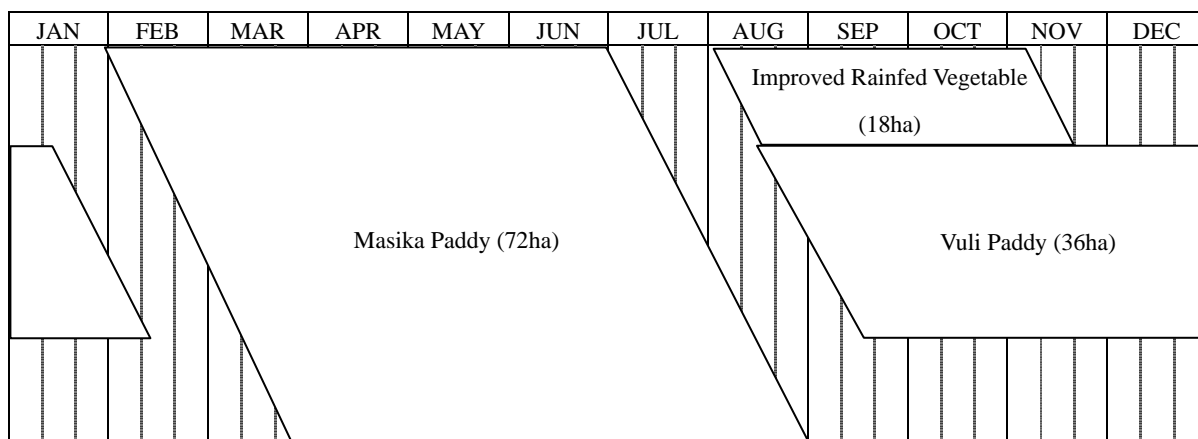
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy		72		2.0						
	Upland Crops							18			
Irrigated	Paddy						72	36			4.5
	Upland Crops										
Total		72	72	0	100	72	72	54	175		

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.1ha (Rainfed Paddy)	0.1ha (Irrigated Paddy + Improved Rainfed Vegetable)
Outside the Scheme	1.2ha (Coconut, Mango, Cassava and Spice crops)	1.2ha (Coconut, Mango, Cassava and Spice crops)

Financial Crop Budget

Financial Crop Budget in Makwararani		Unit	Present Condition			Proposed Condition									
			Rainfed Paddy			Irrigated Paddy			Improved Rainfed Cucumber						
			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			10,000					
	Farmgate Price	Tsh/kg	100			175			350						
	Gross Return	Tsh/ha			200,000			787,500			3,500,000				
II Production Cost															
1. Farm Inputs															
	1.1 Seed	kg/ha	300	80	24,000	500	80	40,000	35,000	0.5	17,500				
	1.2 Fertilizer														
	Urea (46% N)	kg/ha	180	125	22,500	180	175	31,500	180	150	27,000				
	SA (21% N)	kg/ha	200	0	0	200	0	0	200	0	0				
	TSP (46% P2O5)	kg/ha	180	0	0	180	90	16,200	180	0	0				
	NPK	kg/ha	180	0	0	180	70	12,600	180	0	0				
	Manure	ton/ha	8,000	0	0	8,000	0	0	8,000	3	24,000				
	1.3 Agro-chemical														
	Pesticide	lit/ha	10,000	0	0	10,000	3	30,000	10,000	2	20,000				
	Herbicide	lit/ha	6,000	2	12,000	6,000	3	18,000	6,000	0	0				
	Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	2	10,000				
	1.4 Packing Material														
	Bags (100 kg)	nos/ha	200	20	4,000	200	45	9,000	200	60	12,000				
	Sub-total				62,500			157,300			110,500				
	2. Labour Requirement			Total	Hired		Total	Hired		Total	Hired				
	Land prep., Puddle and Bund	man/day		10	10	14,000		10	10	14,000		30	15	21,000	
	Nursery	man/day		0	0	0		5	0	0		10	0	0	
	Plant/Transplanting	man/day		4	0	0		15	5	7,000		30	20	28,000	
	Weeding and Fertilizer	man/day		15	5	7,000		15	5	7,000		35	15	21,000	
	Bird Scaring	man/day		15	0	0		15	0	0		15	0	0	
	Harvesting	man/day		25	5	7,000		40	15	21,000		40	20	28,000	
	Transport Marketing	man/day		4	2	2,800		10	5	7,000		10	10	14,000	
	Irrigation, etc	man/day		0	0	0		10	0	0		10	0	0	
	Threshing/Winning	man/day		3	0	0		10	5	7,000		30	15	21,000	
	Sub-total			1,400	76	22	30,800	1,400	130	45	63,000	1,400	210	95	133,000
	3. Machinery or Draught Animal														
	Tractor	liter/ha	650	26	16,900	650	0	0	650	26	16,900				
	Hand Tractor	liter/ha	650	0	0	650	8	5,200	650	0	0				
	Draught Animal	LS		0	0			0					0		
	Sub-total				16,900			5,200						16,900	
	4. Miscellaneous Cost														
	5% of Cost				5,510			11,275						13,020	
	Total Cost				115,710			236,775						273,420	
III Net Return															
	Value				84,290			550,725						3,226,580	

Financial Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	72	84	6,069	0	0	0	-6,069
Irrigated Paddy	0	0	0	108	551	59,478	59,478
Improved Rainfed Cucumber	0	0	0	18	3,227	58,078	58,078
Total	72	84	6,069	126	3,777	117,557	111,488

Economic Crop Budget

Economic Crop Budget in Makwararani		Unit	Present Condition			Proposed Condition								
			Rainfed Paddy			Irrigated Paddy			Improved Rainfed Cucumber					
			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			10,000				
	Farmgate Price	Tsh/kg	154			185			280					
	Gross Return	Tsh/ha		308,900			834,030			2,800,000				
II Production Cost														
1. Farm Inputs														
	1.1 Seed	kg/ha	300	80	24,000	500	80	40,000	35,000	0.5	17,500			
	1.2 Fertilizer													
	Urea (46% N)	kg/ha	188	125	23,523	188	175	32,932	188	150	28,227			
	SA (21% N)	kg/ha	101	0	0	101	0	0	101	0	0			
	TSP (46% P2O5)	kg/ha	193	0	0	193	90	17,345	193	0	0			
	NPK	kg/ha	180	0	0	180	70	12,600	180	0	0			
	Manure	ton/ha	8,000	0	0	8,000	0	0	8,000	3	24,000			
	1.3 Agro-chemical													
	Pesticide	lit/ha	10,000	0	0	10,000	3	30,000	10,000	2	20,000			
	Herbicide	lit/ha	6,000	2	12,000	6,000	3	18,000	6,000	0	0			
	Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	2	10,000			
	1.4 Packing Material													
	Bags (100 kg)	nos/ha	200	20	4,000	200	45	9,000	200	60	12,000			
	Sub-total				63,523			159,876			111,727			
2. Labour Requirement														
				Total	Hired		Total	Hired		Total	Hired			
	Land prep., Puddle and Bund	man/day		10	10	11,200	10	10	11,200	30	15	33,600		
	Nursery	man/day		0	0	0	5	0	5,600	10	0	11,200		
	Plant/Transplanting	man/day		4	0	4,480	15	5	16,800	30	20	33,600		
	Weeding and Fertilizer	man/day		15	5	16,800	20	5	22,400	35	15	39,200		
	Bird Scaring	man/day		15	0	16,800	15	0	16,800	15	0	16,800		
	Harvesting	man/day		25	5	28,000	40	15	44,800	40	20	44,800		
	Transport Marketing	man/day		4	2	4,480	10	5	11,200	10	10	11,200		
	Irrigation, etc	man/day		0	0	0	10	0	11,200	10	0	11,200		
	Threshing/Winning	man/day		3	0	3,360	4	2	4,480	30	15	33,600		
	Sub-total		1,120	76	22	24,640	1,120	129	42	47,040	1,120	210	95	106,400
3. Machinery or Draught Animal														
	Tractor	liter/ha	650	26	16,900	650	0	0	650	26	16,900			
	Hand Tractor	liter/ha	650	0	0	650	8	5,200	650	0	0			
	Draught Animal	LS		0	0		0			0				
	Sub-total				16,900			5,200			16,900			
4. Miscellaneous Cost														
	5% of Cost				5,253			10,606			11,751			
	Total Cost				110,316			222,722			246,778			
III Net Return														
	Value				198,584			611,308			2,553,222			

Economic Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	72	199	14,298	0	0	0	-14,298
Irrigated Paddy	0	0	0	108	611	66,021	66,021
Improved Rainfed Cucumber	0	0	0	18	2,553	45,958	45,958
Total	72	199	14,298	126	3,165	111,979	97,681

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		22,451	11,226			37,419	71,096		-71,096
2005	336,770	22,451	11,226			28,064	398,512		-398,512
2006		22,451	11,226	517		28,064	62,258	9,768	-52,490
2007				1,033			1,033	29,304	28,271
2008				1,033			1,033	68,377	67,344
2009				1,033			1,033	87,913	86,880
2010				1,033			1,033	97,681	96,648
2011				1,033			1,033	97,681	96,648
2012				1,033			1,033	97,681	96,648
2013				1,033			1,033	97,681	96,648
2014				1,033			1,033	97,681	96,648
2015				1,033	3,368		4,401	97,681	93,280
2016				1,033			1,033	97,681	96,648
2017				1,033			1,033	97,681	96,648
2018				1,033			1,033	97,681	96,648
2019				1,033			1,033	97,681	96,648
2020				1,033			1,033	97,681	96,648
2021				1,033			1,033	97,681	96,648
2022				1,033			1,033	97,681	96,648
2023				1,033			1,033	97,681	96,648
2024				1,033			1,033	97,681	96,648
2025				1,033	3,368		4,401	97,681	93,280
2026				1,033			1,033	97,681	96,648
2027				1,033			1,033	97,681	96,648
2028				1,033			1,033	97,681	96,648
2029				1,033			1,033	97,681	96,648
2030				1,033			1,033	97,681	96,648
2031				1,033			1,033	97,681	96,648
2032				1,033			1,033	97,681	96,648
2033				1,033			1,033	97,681	96,648
2034				1,033			1,033	97,681	96,648
								NPV (12%) =	64,560
								EIRR =	14%

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	1.3	1.3
- Within the Scheme Area (ha)	0.1	0.1
- Outside the Scheme Area (ha)	1.2	1.2
Gross Farm Income	857	990
Production Cost	348	374
Net Farm Income	509	616
Off-farm Income	214	214
Living Expenditure	440	440
Tax and Duties	17	17
Balance	267	373

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.1 ha
b) Gross Income	153
c) Production Cost	38
d) Net Farm Income	115
e) Tax and Duties	17
f) O/M Cost	2
g) Net Profit (d-e-f)	96

3. Bumbwi Sudi Irrigation Scheme

Site Description

The Bumbwi Sudi Scheme is characterized as a pump irrigation scheme. The project area occupies most area of West District located at the northern part of Urban West Region in Unguja Island. Administratively, it includes 11 villages such as Mwache-Alale, Dole, Bumbwi-Sudi, Mguzuni, Kitundu, Ndagaa, Mwakaje, Kiboje, Mfenesini, Kizimbani and Miwani. Access to the project area in the Bumbwi Sudi village is all weather road connecting it with the centre of Zanzibar about 20 km distant.

The project site forms expansive flat lands being used as paddy fields among the range of hills. As there exists rather plentiful aquifer underground, groundwater has been extracted for various purposes including irrigation since old times. Flush water flows into the project area from surrounded hilly areas during flood, however no stable watercourses exist because of irregularity of flowing period and flowing direction.

Annual rainfall of the project area is relatively abundant and ranges from 1,600 mm to 1,800 mm with a single maximum peak in May. While having rather abundant precipitation in quantity in a year, irrigation is definitely essential for crop cultivation in the dry season and also in the rainy season as supplemental purpose.

Scheme Description

Development Purpose

To ensure irrigation water for the scheme through rehabilitation of pump system and construction of pond to store surface water.

Basic Approach

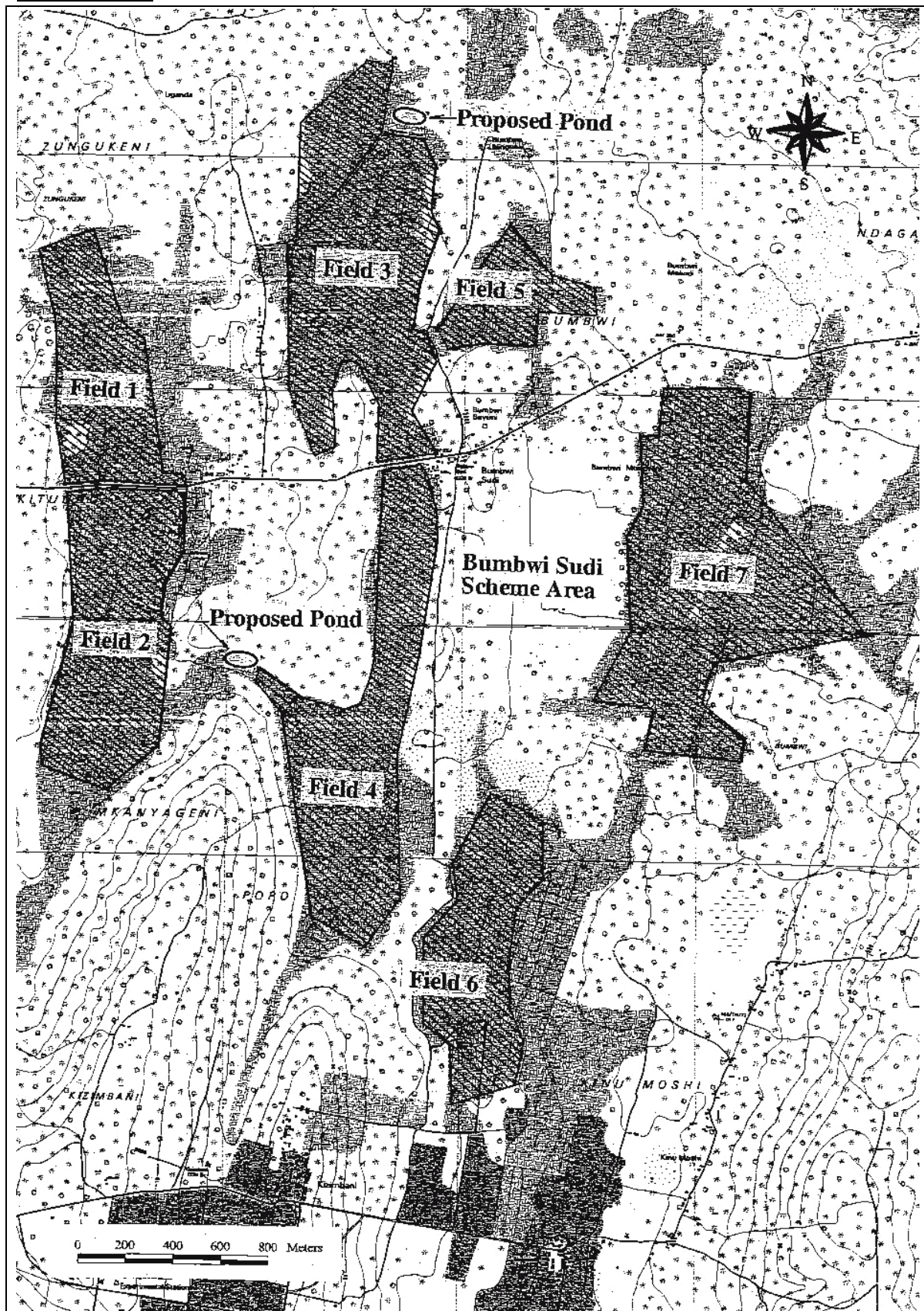
To apply conjunctive use of groundwater and surface water to minimize operation cost for pump.

Development Plan

The proposed scheme area is 560 ha in net. Major works in pump irrigation system consist of installation of submergible pump, bore-hole drilling and rehabilitation of irrigation canal with lining. Since the cost of irrigation water by pump is high, canal lining is important to minimize conveyance loss. In addition, a measuring device should be installed at beginning of main canal and division points, to make strict water management. A pond which is regarded as an additional water source for conjunctive use of surface water, is constructed. Drainage canal is constructed to eliminate excess water from fields. Farm road is also constructed for easy transportation of agricultural products. The proposed construction works for the scheme are as follows:

- (a) Submergible pump installation (rehabilitation of 4 nos. and new installation of 6 nos.)
- (b) Bore-hole drilling (new holes of 2 nos.)
- (c) Pond (new construction of 2 nos.)
- (d) Main irrigation canal with lining (rehabilitation of 2,900 m and new construction of 12,740 m)
- (e) Secondary irrigation canal with lining (new construction of 7,300 m)
- (f) Drainage canal (new construction of 8,900 m)
- (g) Farm road (rehabilitation of 8,900 m and new construction of 5,900 m)
- (h) Related structures (Lump Sum)

Scheme Map



Photographs



Active pump station



Damaged pump station



Proposed pond site



Transplanting of rainy season paddy



RRA meeting with farmers



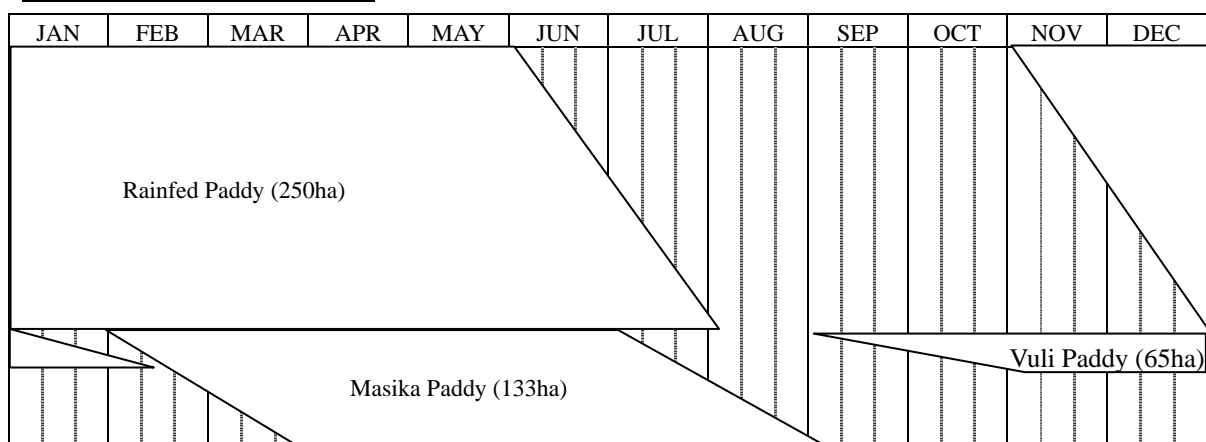
Farmers and JICA Study Team

Cultivated Area, Cropping Intensity and Average Yield

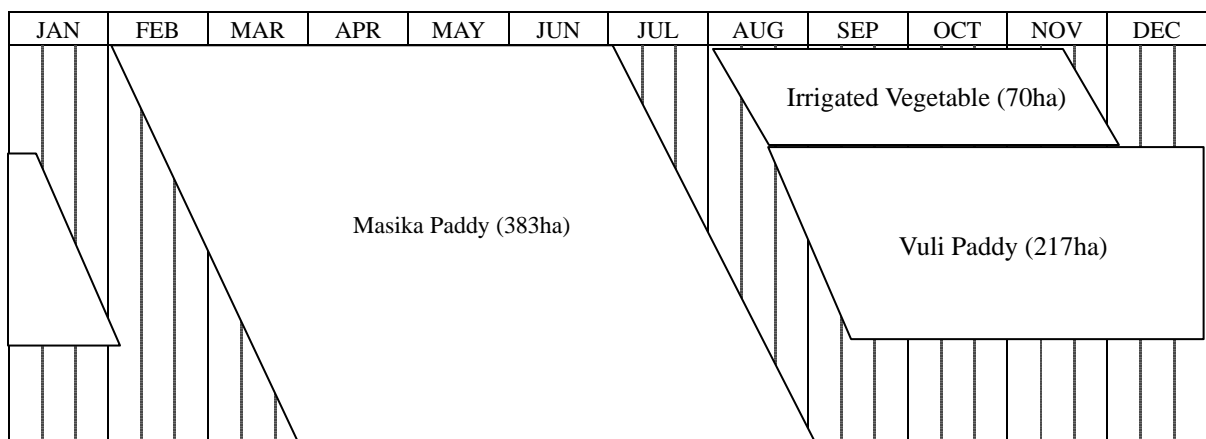
Rainfed/ Irrigated	Paddy/Upland Crops	Present				Proposed					
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy		250		2.0						
	Upland Crops										
Irrigated	Paddy		133	65	3.2		383	217			4.5
	Upland Crops							70			
	Total	383	383	65	117	383	383	287	175		

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.4ha (0.3ha Rainfed Paddy and 0.1ha Irrigated Paddy)	0.4ha (Irrigated Paddy + Irrigated Vegetable)
Outside the Scheme	0.4ha (Cassava, Sweet potato and Banana)	0.4ha (Cassava, Sweet potato and Banana)

Financial Crop Budget

Financial Crop Budget in Bumbwi Sudi	Unit	Present Condition						Proposed Condition									
		Rainfed Paddy			Irrigated Paddy			Irrigated Paddy			Irrigated Tomato						
		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		2,000			3,200			4,500			12,000					
Farmgate Price	Tsh/kg	145			120			175			300						
Gross Return	Tsh/ha			290,000			384,000			787,500			3,600,000				
II Production Cost																	
1. Farm Inputs																	
1.1 Seed	kg/ha	300	50	15,000	300	80	24,000	500	80	40,000	70,000	0.5	35,000				
1.2 Fertilizer																	
Urea (46% N)	kg/ha	180	80	14,400	180	250	45,000	180	175	31,500	180	150	27,000				
SA (21% N)	kg/ha	200	0	0	200	0	0	200	0	0	200	0	0				
TSP (46% P2O5)	kg/ha	180	0	0	180	120	21,600	180	90	16,200	180	0	0				
Potash	kg/ha	180	0	0	180	70	12,600	180	70	12,600	180	0	0				
Manure	ton/ha	8,000	0	0	8,000	0	0	8,000	0	0	8,000	3	24,000				
1.3 Agro-chemical																	
Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	3	30,000	10,000	3	30,000				
Herbicide	lit/ha	6,000	0.5	3,000	6,000	0	0	6,000	3	18,000	6,000	0	0				
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	3	15,000				
1.4 Packing Material																	
Bags (100 kg)	nos/ha	200	13	2,600	200	32	6,400	200	45	9,000	200	120	24,000				
Sub-total				35,000			109,600			157,300			155,000				
2. Labour Requirement																	
			Total	Hired		Total	Hired		Total	Hired		Total	Hired				
Land prep., Puddle and Bund	man/day		10	5	7,000		10	10	14,000		10	10	14,000	30	20	28,000	
Nursery	man/day		0	0	0		2	0	0		5	0	0	10	0	0	
Plant/Transplanting	man/day		4	0	0		15	0	0		15	5	7,000	50	25	35,000	
Weeding and Fertilizer	man/day		15	0	0		15	0	0		15	5	7,000	50	25	35,000	
Bird Scaring	man/day		15	0	0		15	0	0		15	0	0	15	0	0	
Harvesting	man/day		20	0	0		25	5	7,000		40	15	21,000	50	25	35,000	
Transport Marketing	man/day		4	2	2,800		9	9	12,600		10	5	7,000	40	35	49,000	
Irrigation, etc	man/day		0	0	0		5	0	0		10	0	0	5	0	0	
Threshing/Winning	man/day		2	0	0		4	0	0		10	5	7,000	40	20	28,000	
Sub-total			1,400	70	9,800	1,400	100	24	33,600	1,400	130	45	63,000	1,400	290	150	210,000
3. Machinery or Draught Animal																	
Tractor	lit/ha	650	26	16,900	650	0	0	650	0	0	650	26	16,900				
Hand Tractor	lit/ha	650	0	0	650	8	5,200	650	8	5,200	650	0	0				
Draught Animal	LS		0			0			0	0		0	0				
Sub-total				16,900			5,200			5,200			16,900				
4. Miscellaneous Cost																	
5% of Cost				3,085			7,420			11,275			19,095				
Total Cost				64,785			155,820			236,775			400,995				
III Net Return																	
Value				225,215			228,180			550,725			3,199,005				

Financial Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	250	225	56,304	0	0	0	-56,304
Irrigated Paddy	198	228	45,180	600	551	330,435	285,255
Irrigated Tomato	0	0	0	70	3,199	223,930	223,930
Total	448	453	101,483	670	3,750	554,365	452,882

Economic Crop Budget

Economic Crop Budget in Bumbwi Sudi	Unit	Present Condition						Proposed Condition									
		Rainfed Paddy			Irrigated Paddy			Irrigated Paddy			Irrigated Tomato						
		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		2,000			3,200			4,500				12,000				
Farmgate Price	Tsh/kg	154			154			185				240					
Gross Return	Tsh/ha			308,900			494,240			834,030				2,880,000			
II Production Cost																	
1. Farm Inputs																	
1.1 Seed	kg/ha	300	50	15,000	300	80	24,000	500	80	40,000	70,000	0.5	35,000				
1.2 Fertilizer																	
Urea (46% N)	kg/ha	188	80	15,054	188	250	47,045	188	175	32,932	188	150	28,227				
SA (21% N)	kg/ha	101	0	0	101	0	0	101	0	0	101	0	0				
TSP (46% P2O5)	kg/ha	193	0	0	193	120	23,126	193	90	17,345	193	0	0				
Potash	kg/ha	180	0	0	180	70	12,600	180	70	12,600	180	0	0				
Manure	ton/ha	8,000	0	0	8,000	0	0	8,000	0	0	8,000	3	24,000				
1.3 Agro-chemical																	
Pesticide	lit/ha	10,000	0	0	10,000	0	0	10,000	3	30,000	10,000	3	30,000				
Herbicide	lit/ha	6,000	0.5	3,000	6,000	0	0	6,000	3	18,000	6,000	0	0				
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	3	15,000				
1.4 Packing Material																	
Bags (100 kg)	nos/ha	200	13	2,600	200	32	6,400	200	45	9,000	200	120	24,000				
Sub-total				35,654			113,171			159,876			156,227				
2. Labour Requirement																	
			Total	Hired		Total	Hired		Total	Hired		Total	Hired				
Land prep., Puddle and Bund	man/day		10	5	11,200		10	10	11,200		10	10	11,200	30	20	33,600	
Nursery	man/day		0	0	0		2	0	2,240		5	0	5,600	10	0	11,200	
Plant/Transplanting	man/day		4	0	4,480		15	15	16,800		15	5	16,800	50	25	56,000	
Weeding and Fertilizer	man/day		15	0	16,800		15	0	16,800		15	5	16,800	50	25	56,000	
Bird Scaring	man/day		15	0	16,800		35	0	39,200		15	0	16,800	15	0	16,800	
Harvesting	man/day		20	0	22,400		25	20	28,000		40	15	44,800	50	25	56,000	
Transport Marketing	man/day		4	2	4,480		9	9	10,080		10	5	11,200	40	35	44,800	
Irrigation, etc	man/day		0	0	0		5	0	5,600		10	0	11,200	5	0	5,600	
Threshing/Winning	man/day		2	0	2,240		4	4	4,480		10	5	11,200	40	20	44,800	
Sub-total		1,120	70	7	7,840	1,120	120	58	64,960	1,120	130	45	50,400	1,120	290	150	168,000
3. Machinery or Draught Animal																	
Tractor	lit/ha	650	26	16,900	650	0	0	650	0	0	650	26	16,900				
Hand Tractor	lit/ha	650	0	0	650	8	5,200	650	8	5,200	650	0	0				
Draught Animal	LS		0			0			0			0	0				
Sub-total				16,900			5,200			5,200			16,900				
4. Miscellaneous Cost																	
5% of Cost				3,020			9,167			10,774			17,056				
Total Cost				63,414			192,498			226,250			358,183				
III Net Return																	
Value				245,486			301,742			607,780			2,521,817				

Economic Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	250	245	61,371	0	0	0	-61,371
Irrigated Paddy	198	302	59,745	600	608	364,668	304,923
Irrigated Tomato	0	0	0	70	2,522	176,527	176,527
Total	448	547	121,116	670	3,130	541,195	420,079

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost						Project Benefit		Balance
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	Total Cost	Incremental Benefit	
2004		76,066	38,033			126,777	240,877		-240,877
2005	1,140,996	76,066	38,033			95,083	1,350,179		-1,350,179
2006		76,066	38,033	9,885		95,083	219,068	42,008	-177,060
2007				19,770			19,770	126,024	106,253
2008				19,770			19,770	294,055	274,285
2009				19,770			19,770	378,071	358,301
2010				19,770			19,770	420,079	400,309
2011				19,770			19,770	420,079	400,309
2012				19,770			19,770	420,079	400,309
2013				19,770			19,770	420,079	400,309
2014				19,770			19,770	420,079	400,309
2015				19,770	57,050		76,820	420,079	343,259
2016				19,770			19,770	420,079	400,309
2017				19,770			19,770	420,079	400,309
2018				19,770			19,770	420,079	400,309
2019				19,770			19,770	420,079	400,309
2020				19,770			19,770	420,079	400,309
2021				19,770			19,770	420,079	400,309
2022				19,770			19,770	420,079	400,309
2023				19,770			19,770	420,079	400,309
2024				19,770			19,770	420,079	400,309
2025				19,770	57,050		76,820	420,079	343,259
2026				19,770			19,770	420,079	400,309
2027				19,770			19,770	420,079	400,309
2028				19,770			19,770	420,079	400,309
2029				19,770			19,770	420,079	400,309
2030				19,770			19,770	420,079	400,309
2031				19,770			19,770	420,079	400,309
2032				19,770			19,770	420,079	400,309
2033				19,770			19,770	420,079	400,309
2034				19,770			19,770	420,079	400,309
NPV (12%) = 558,538									
EIRR = 16%									

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	0.8	0.8
- Within the Scheme Area (ha)	0.4	0.4
- Outside the Scheme Area (ha)	0.4	0.4
Gross Farm Income	257	777
Production Cost	88	208
Net Farm Income	169	569
Off-farm Income	129	129
Living Expenditure	280	280
Tax and Duties	5	5
Balance	12	412

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.4 ha
b) Gross Income	675
c) Production Cost	169
d) Net Farm Income	506
e) Tax and Duties	5
f) O/M Cost	23
g) Net Profit (d-e-f)	478

4. Chaani Irrigation Scheme

Site Description

The project area covers most of North-A District situated at the southern part of the North-Unguja Region in Unguja Island. It administratively includes 7 villages: Chaani, Kentwa, Mbuzini, Gamba, Kandwi, Kivunge and Mkwajuni. Access to the project area in the Chaani village is asphalt-paved road from the town of Zanzibar, about 35 km distant.

Annual rainfall of the project area is observed at about 1,200 mm having distinctively peaked with a maximum in April. The Bwabwaja river which is one of the rivers of Unguja North originating in Kilombero of the Donge ridge, is a water source of irrigation for the project area. Though the Bwabwaja river has undersized catchment area of 3.6 km², it has relative long spell of flowing period due to gushing out of sub-surface water flow.

Low plane suitable for rice cultivation extends the mouth of gouge of the Bwabwaja river. The river runs into the fertile cultivable land from west to east. The river course tends to disappear into the peripheral coral rags and Miocene limestone called "Pokezi". The project area is bounded on the south by the command area of Kibukwa irrigation scheme.

Scheme Description

Development Purpose

To ensure irrigation water for the scheme through initiating water harvesting development.

Basic Approach

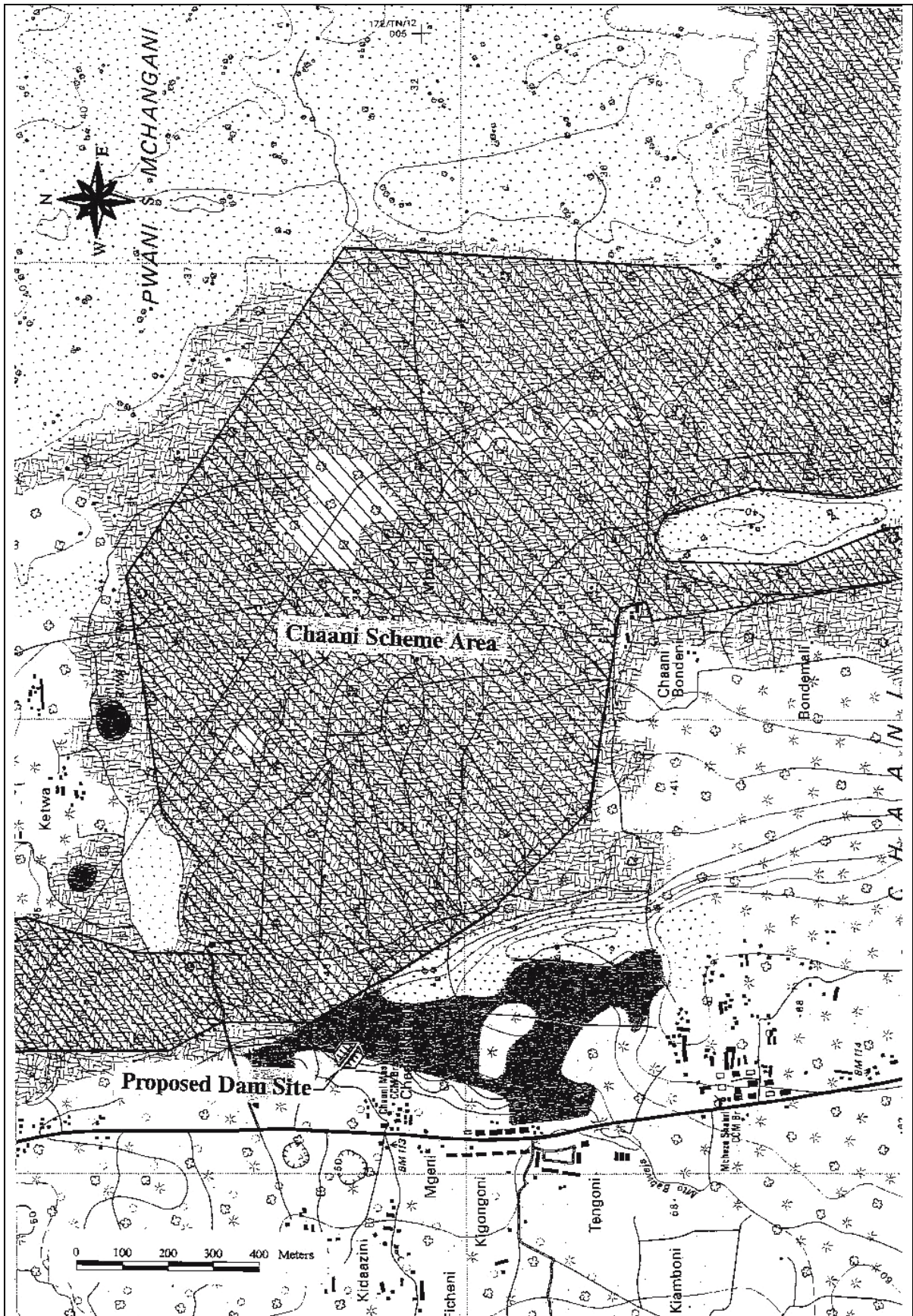
To exploit additional water source by providing small dam at low cost.

Development Plan

The proposed scheme area is 250 ha in net. A small dam with a reservoir capacity of about 80,000 m³ is proposed at new axis crossing the Bwabwaja river, to supply irrigation water to the command area. Impounded water is delivered through canal system. Main irrigation canals will run along higher edge of the command area toward downstream. Secondary irrigation canals are also constructed up to the points where farmers can supply water to their farm plots through small ditch. Drainage canal is required to eliminate excess water from fields. Farm roads will be constructed for O & M of irrigation facilities and conveyance of agricultural products. The proposed construction works for the scheme are as follows:

- (a) Small earthfill dam (height 4m x length 38 m)
- (b) Main irrigation canal (lining canal with length 6,600 m)
- (c) Secondary irrigation canal (unlined canal with length 11,100 m)
- (d) Drainage canal (unlined canal with length 1,600 m)
- (e) Farm road (length 6,600 m)
- (f) Related structures (Lump Sum)

Scheme Map



Photographs



Proposed dam site



Original river



Command Area



Command Area



RRA meeting with farmers



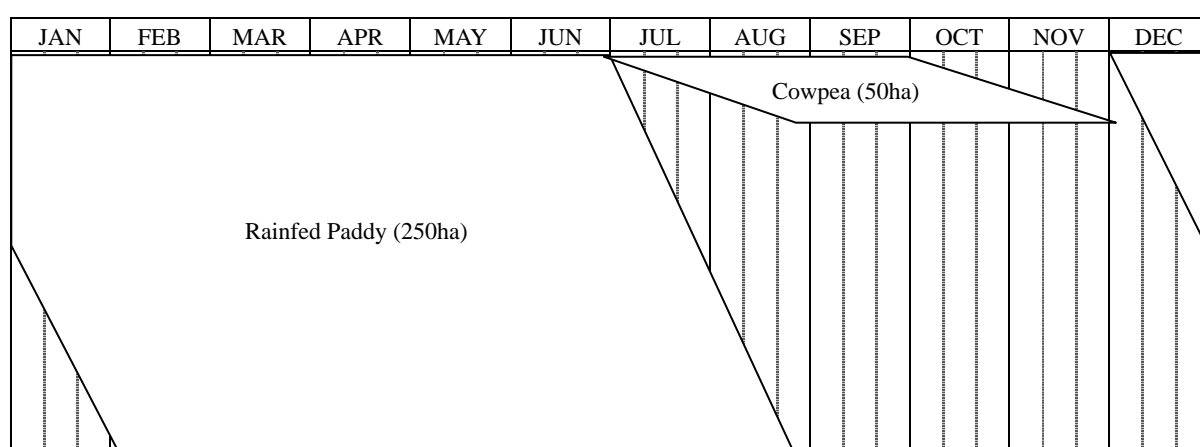
A shot of RRA meeting

Cultivated Area, Cropping Intensity and Average Yield

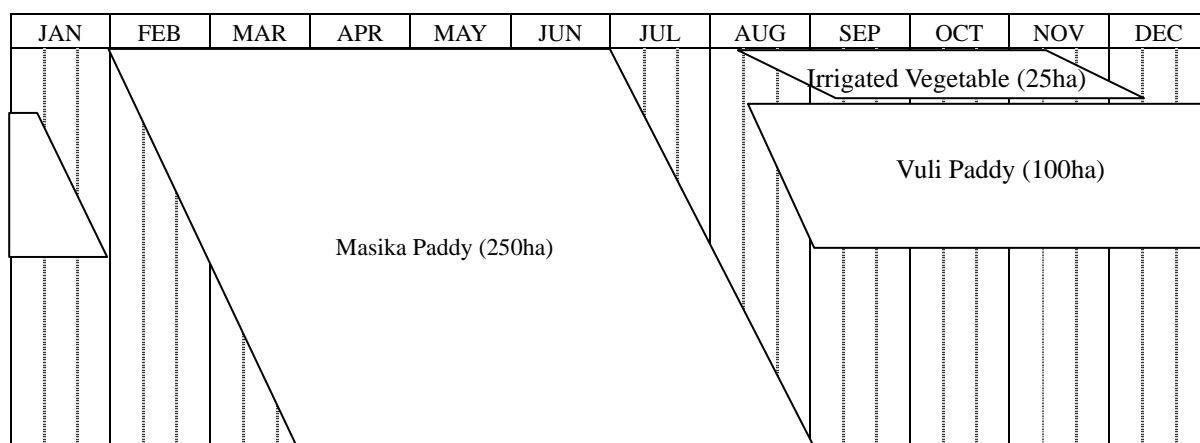
Rainfed/ Irrigated	Paddy/Upland Crops	Present					Proposed				
		Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)	Project Area (ha)	Cultivated Area (ha)		Cropping Intensity (%)	Average Yield (ton/ha)
			RS	DS				RS	DS		
Rainfed	Paddy		250		1.7						
	Upland Crops			50							
Irrigated	Paddy						250	100			4.5
	Upland Crops							25			
Total		250	250	50	120	250	250	125	150		

RS: Rainy Season, DS: Dry Season

Present Cropping Pattern



Proposed Cropping Pattern



Cultivation by Farm Household

	Present	Proposed
Inside the Scheme	0.4ha (Rainfed Paddy and Rainfed Cowpea)	0.4ha (Irrigated Paddy + Irrigated Vegetable)
Outside the Scheme	0.8ha (Cassava, Sweet potato, Cocoyam and Banana)	0.8ha (Cassava, Sweet potato, Cocoyam and Banana)

Financial Crop Budget

Financial Crop Budget in Chaani	Unit	Present Condition						Proposed Condition										
		Rainfed Paddy			Rainfed Cowpea			Irrigated Paddy			Irrigated Tomato							
		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		1,700			1,000				4,500			12,000					
Farmgate Price	Tsh/kg	145			400				175			300						
Gross Return	Tsh/ha			246,500					400,000			787,500		3,600,000				
II Production Cost																		
1. Farm Inputs																		
1.1 Seed	kg/ha	300	80	24,000	500	40	20,000	500	80	40,000	70,000	1	35,000					
1.2 Fertilizer																		
Urea (46% N)	kg/ha	180	125	22,500	180	0	0	180	175	31,500	180	150	27,000					
SA (21% N)	kg/ha	200	0	0	200	0	0	200	0	0	200	0	0					
TSP (46% P2O5)	kg/ha	180	0	0	180	0	0	180	90	16,200	180	0	0					
NPK	kg/ha	180	0	0	180	0	0	180	70	12,600	180	0	0					
Manure	ton/ha	8,000	0	0	8,000	0	0	8,000	0	0	8,000	3	24,000					
1.3 Agro-chemical																		
Pesticide	lit/ha	10,000	0	0	10,000	3	30,000	10,000	3	30,000	10,000	3	30,000					
Herbicide	lit/ha	6,000	2	12,000	6,000	0	0	6,000	3	18,000	6,000	0	0					
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	3	15,000					
1.4 Packing Material																		
Bags (100 kg)	nos/ha	200	17	3,400	200	10	2,000	200	45	9,000	200	120	24,000					
Sub-total				61,900			52,000			157,300			155,000					
2. Labour Requirement																		
			Total	Hired		Total	Hired		Total	Hired		Total	Hired					
Land prep., Puddle and Bund	man/day		10	10	14,000	0	0	0	10	10	14,000	30	20	28,000				
Nursery	man/day		0	0	0	0	0	0	5	0	0	10	0	0				
Plant/Transplanting	man/day		4	0	0	25	10	14,000	15	5	7,000	50	25	35,000				
Weeding and Fertilizer	man/day		15	5	7,000	15	0	0	15	5	7,000	50	25	35,000				
Bird Scaring	man/day		15	0	0	0	0	0	15	0	0	15	0	0				
Harvesting	man/day		25	5	7,000	20	5	7,000	40	15	21,000	50	25	35,000				
Transport Marketing	man/day		4	2	2,800	0	0	0	10	5	7,000	40	35	49,000				
Irrigation, etc	man/day		0	0	0	0	0	0	10	0	0	5	0	0				
Threshing/Winnowing	man/day		3	0	0	20	5	7,000	10	5	7,000	40	20	28,000				
Sub-total			1,400	76	22	30,800	1,400	80	20	28,000	1,400	130	45	63,000	1,400	290	150	210,000
3. Machinery or Draught Animal																		
Tractor	LS	650	26	16,900	650	26	16,900	650	0	0	650	26	16,900					
Hand Tractor	LS	650	0	0	650	0	0	650	8	5,200	650	0	0					
Draught Animal	LS		0			0			0			0	0					
Sub-total				16,900			16,900			5,200			16,900					
4. Miscellaneous Cost																		
5% of Cost				5,480			4,845			11,275			19,095					
Total Cost				115,080			101,745			236,775			400,995					
III Net Return																		
Value				131,420			298,255			550,725			3,199,005					

Financial Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	250	131	32,855	0	0	0	-32,855
Rainfed Cowpea	50	298	14,913	0	0	0	-14,913
Irrigated Paddy	0	0	0	350	551	192,754	192,754
Irrigated Tomato	0	0	0	25	3,199	79,975	79,975
Total	300	430	47,768	375	3,750	272,729	224,961

Economic Crop Budget

Economic Crop Budget in Chaani	Unit	Present Condition						Proposed Condition									
		Rainfed Paddy			Rainfed Cowpea			Irrigated Paddy			Irrigated Tomato						
		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		1,700			1,000			4,500			12,000					
Farmgate Price	Tsh/kg	154			320			185			240						
Gross Return	Tsh/ha			262,565			320,000			834,030			2,880,000				
II Production Cost																	
1. Farm Inputs																	
1.1 Seed	kg/ha	300	80	24,000	500	40	20,000	500	80	40,000	70,000	1	35,000				
1.2 Fertilizer																	
Urea (46% N)	kg/ha	188	125	23,523	188	0	0	188	175	32,932	188	150	28,227				
SA (21% N)	kg/ha	101	0	0	101	0	0	101	0	0	101	0	0				
TSP (46% P2O5)	kg/ha	193	0	0	193	0	0	193	90	17,345	193	0	0				
NPK	kg/ha	180	0	0	180	0	0	180	70	12,600	180	0	0				
Manure	ton/ha	8,000	0	0	8,000	0	0	8,000	0	0	8,000	3	24,000				
1.3 Agro-chemical																	
Pesticide	lit/ha	10,000	0	0	10,000	3	30,000	10,000	3	30,000	10,000	3	30,000				
Herbicide	lit/ha	6,000	2	12,000	6,000	0	0	6,000	3	18,000	6,000	0	0				
Fungicide	lit/ha	5,000	0	0	5,000	0	0	5,000	0	0	5,000	3	15,000				
1.4 Packing Material																	
Bags (100 kg)	nos/ha	200	17	3,400	200	10	2,000	200	45	9,000	200	120	24,000				
Sub-total				62,923			52,000			159,876			156,227				
2. Labour Requirement																	
			Total	Hired		Total	Hired		Total	Hired		Total	Hired				
Land prep., Puddle and Bund	man/day		10	10	11,200	0	0	0	10	10	11,200	30	20	33,600			
Nursery	man/day		0	0	0	0	0	0	5	0	5,600	10	0	11,200			
Plant/Transplanting	man/day		4	0	4,480	25	10	28,000	15	5	16,800	50	25	56,000			
Weeding and Fertilizer	man/day		15	5	16,800	15	0	16,800	15	5	16,800	50	25	56,000			
Bird Scaring	man/day		15	0	16,800	0	0	0	15	0	16,800	15	0	16,800			
Harvesting	man/day		25	5	28,000	20	5	22,400	40	15	44,800	50	25	56,000			
Transport Marketing	man/day		4	2	4,480	0	0	0	10	5	11,200	40	35	44,800			
Irrigation, etc	man/day		0	0	0	0	0	0	10	0	11,200	5	0	5,600			
Threshing/Winnowing	man/day		3	0	3,360	20	5	22,400	10	5	11,200	40	20	44,800			
Sub-total		1,120	76	22	24,640	1,120	80	20	22,400	1,120	130	45	50,400	1,120	290	150	168,000
3. Machinery or Draught Animal																	
Tractor	LS	650	26	16,900	650	26	16,900	650	0	0	650	26	16,900				
Hand Tractor	LS	650	0	0	650	0	0	650	8	5,200	650	0	0				
Draught Animal	LS		0			0			0			0	0				
Sub-total				16,900			16,900			5,200			16,900				
4. Miscellaneous Cost																	
5% of Cost				5,223			4,565			10,774			17,056				
Total Cost				109,686			95,865			226,250			358,183				
III Net Return																	
Value				152,879			224,135			607,780			2,521,817				

Economic Net Benefit

	Without-Project			With-Project			Net Benefit (1,000 Tsh)
	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)	
Rainfed Paddy	250	153	38,220	0	0	0	-38,220
Rainfed Cowpea	50	224	11,207	0	0	0	-11,207
Irrigated Paddy	0	0	0	350	608	212,723	212,723
Irrigated Tomato	0	0	0	25	2,522	63,045	63,045
Total	300	377	49,427	375	3,130	275,768	226,342

Estimation of Economic Internal Rate of Return (EIRR)

(1,000Tsh)

Year	Project Cost						Project Benefit		Balance
	Construction Cost	Soft Component Cost	Administration Cost	O&M Cost	Replacement Cost	Engineering Services	Total Cost	Incremental Benefit	
2004		57,180	28,590			95,300	181,070		-181,070
2005	857,699	57,180	28,590			71,475	1,014,944		-1,014,944
2006		57,180	28,590	1,794		71,475	159,039	22,634	-136,404
2007				3,588			3,588	67,903	64,315
2008				3,588			3,588	158,439	154,852
2009				3,588			3,588	203,708	200,120
2010				3,588			3,588	226,342	222,754
2011				3,588			3,588	226,342	222,754
2012				3,588			3,588	226,342	222,754
2013				3,588			3,588	226,342	222,754
2014				3,588			3,588	226,342	222,754
2015				3,588	8,577		12,165	226,342	214,177
2016				3,588			3,588	226,342	222,754
2017				3,588			3,588	226,342	222,754
2018				3,588			3,588	226,342	222,754
2019				3,588			3,588	226,342	222,754
2020				3,588			3,588	226,342	222,754
2021				3,588			3,588	226,342	222,754
2022				3,588			3,588	226,342	222,754
2023				3,588			3,588	226,342	222,754
2024				3,588			3,588	226,342	222,754
2025				3,588	8,577		12,165	226,342	214,177
2026				3,588			3,588	226,342	222,754
2027				3,588			3,588	226,342	222,754
2028				3,588			3,588	226,342	222,754
2029				3,588			3,588	226,342	222,754
2030				3,588			3,588	226,342	222,754
2031				3,588			3,588	226,342	222,754
2032				3,588			3,588	226,342	222,754
2033				3,588			3,588	226,342	222,754
2034				3,588			3,588	226,342	222,754
NPV (12%) = 44,482									
EIRR = 12%									

Farm Budget Analysis

(Unit: 1,000 Tsh.)

	Without Project	With Project
Average Holding Size (ha)	1.2	1.2
- Within the Scheme Area (ha)	0.4	0.4
- Outside the Scheme Area (ha)	0.8	0.8
Gross Farm Income	676	1,178
Production Cost	224	326
Net Farm Income	451	852
Off-farm Income	169	169
Living Expenditure	440	440
Tax and Duties	14	14
Balance	167	568

Capacity to Pay Analysis

(Unit: 1,000 Tsh.)

a) Holding Size	0.4 ha
b) Gross Income	621
c) Production Cost	153
d) Net Farm Income	468
e) Tax and Duties	14
f) O/M Cost	6
g) Net Profit (d-e-f)	448

Appendix E
Project Cycle Management

APPENDIX E

PCM WORKSHOP FOR STRENGTHENING THE IRRIGATION SUPPORT SERVICES IN THE MINISTRY OF AGRICULTURE, NATURAL RESOURCES, ENVIRONMENT AND COOPERATIVES (MANREC) AND THE IRRIGATORS ASSOCIATIONS IN ZANZIBAR

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List of Abbreviations

ASP	-	Agriculture Sector Policy
IA	-	Irrigators Associations
MANREC	-	Ministry of Agriculture, Natural Resources, Environment and Cooperatives
PCM	-	Project Cycle Management
NIMP	-	National Irrigation Master Plan
ZIDP	-	Zanzibar Irrigation Development Plan
ZIMP	-	Zanzibar Irrigation Master Plan
ZPRS	-	Zanzibar Poverty Reduction Strategy

1. INTRODUCTION

The Ministry of Agriculture, Natural Resources, Environment and Cooperatives (MANREC) in Zanzibar has the role and responsibility to support the irrigation farming development in the Island.

The irrigation services within MANREC have no institutional status but are rather embedded in the Division of Agriculture, Rice Cultivation and Inputs.

In order to foster irrigation farming and sustain the development of irrigation infrastructure the Zanzibar Revolutionary Government has commissioned the JICA study team to develop a Zanzibar Irrigation Master Plan (ZIMP).

Since the key implementers of the ZIMP are the farmers themselves and the irrigation services of MANREC, they have to be involved in the development of ZIMP right from the start. It is for this reason that two separate workshops have been organised, one for the irrigation staff of MANREC and another for the selected farmers and representatives of the Irrigators Associations (IAs) from both Pemba and Unguja Islands.

2. OBJECTIVES OF THE WORKSHOPS

As mentioned earlier a feasible and implementable ZIMP would require inputs from the key implementers (farmers and irrigation staff of MANREC). The two workshops have been organised to solicit those inputs.

Both workshops have two similar objectives:

- (i) To obtain the details of the current problem situation with regard to irrigation farming in terms of irrigation support, infrastructure and farming practices.
- (ii) To develop strategies which are feasible to alleviate the problem situation in order to foster and sustain the development of irrigation farming.

3. WORKSHOPS METHODOLOGY:

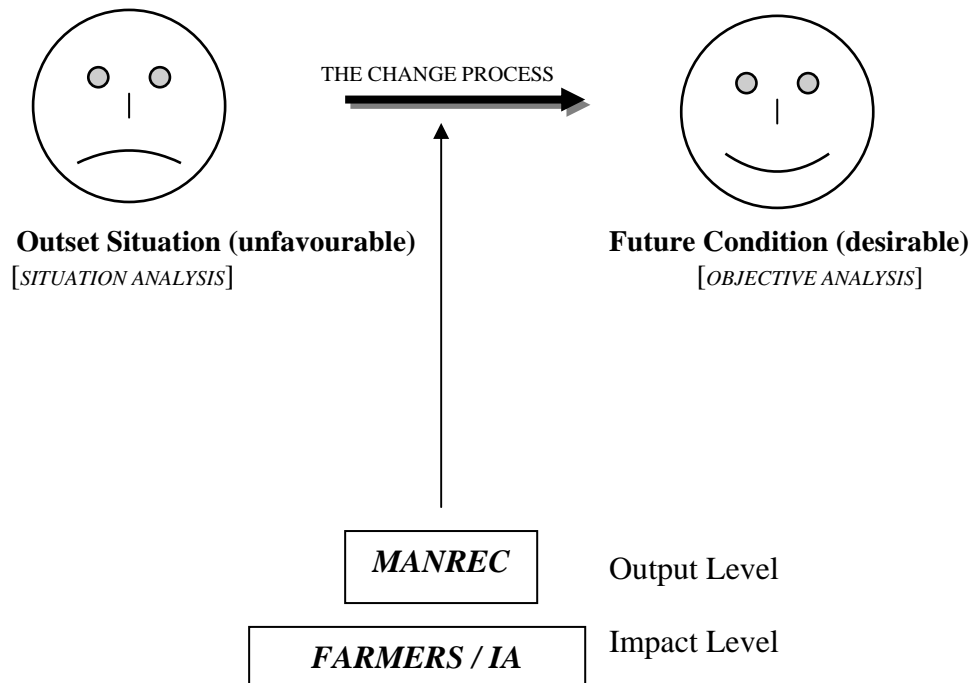
3.1 The Approach

The methodology adopted in both workshops was of a participatory approach. In each case the participants to the workshops were accorded equal opportunities to write their inputs on cards, which were then displayed on softboards to allow for meaningful discussions until a consensus is reached.

In order to allow for inputs which are focused, the discussions were conducted in groups for specified topics and the results presented in the plenary for endorsement. The workshop result presented herein is a replication of the consensus reached in the plenary.

3.2 The PCM concept:

The workshop methodology was guided by the Project Cycle Management (PCM) concept of a developmental intervention from one outset situation (Unfavourable) to a future condition (desirable) as illustrated hereunder:



The change process as reflected above is effected by two key implementers:

(i) **MANREC**

In order that irrigation farming receives adequate support from the Zanzibar Revolutionary Government, the irrigation support services under MANREC have to be strengthened from its current problem situation.

(ii) ***Irrigators Associations/Farmers***

The Irrigators Associations and farmers are the key implementers at the impact level because they are the target groups of the change process.

They are the ones to sustain the management and operations of the irrigation infrastructure and undertake appropriate farming practices with the ultimate goal of increasing the agricultural yield. However, this will only happen if the IA/Farmers implement a change process from their current outset situation (unfavourable) to desirable condition (favourable).

3.3 Implementation of the change process:

The PCM – based concept of a change process does not create miracles but rather enables the implementation of feasible strategies which can be realistically accomplished by the key implementers themselves. Responses to the following questions constitute a guiding orientation:

MANREC:

- (a) What is the problem situation in the delivery of irrigation support services from MANREC on basis of its mandatory roles?
- (b) What are the feasible strategies to be implemented by the irrigation staff within MANREC to ease/alleviate the problems?

IRRIGATORS ASSOCIATIONS/FARMERS:

- (a) What is the current problem situation facing the Irrigators Associations and farmers on basis of their responsibilities?
- (b) What are the realistically achievable strategies by the IA/farmers themselves towards elevations of the problems?

4. RESULTS OF THE PCM WORKSHOP FOR THE IRRIGATION STAFF OF MANREC



Irrigation Staff of MANREC attending the PCM Workshop at Zanzibar

4.1 The Opening:

The workshop was officially opened by the Deputy Commissioner of Agriculture Research and Extension Mr. Kassim M. Biwi .

In his opening address he acknowledged the good attendance of the participants and advised the workshop to accord special attention to the followings critical issues of irrigation development:

1. *Whether the agricultural policy conforms to the irrigation master plan being developed*
2. *Whether the Legal Framework is conducive to facilitate smooth implementation of the ZIMP*
3. *What is the capacity building requirement within MANREC to enable effective implementation of the ZIMP*
4. *The need for coordination amongst the MANREC irrigation staff in Pemba and Unguja as well as amongst cooperating institutions*
5. *The need for institutionalisation of the irrigation services within MANREC.*

He then wished the participants good deliberations in the workshop and pledge for his optimum support towards implementation of their recommendations.

4.2 Outset Situations (unfavourable):

The workshop participants (irrigation staff), were guided to discuss the current problem situation in rendering the irrigation support services.

The starting pint was the identification of a core problem, and this was identified to be *“the poor performance on irrigation support by MANREC”*

The discussion in the plenary further identified six direct causes of the core problem as follows:

1. *Inadequate information system on irrigation*
2. *The status of irrigation support services is not well defined within MANREC*
3. *Inadequacy of competent specialists in irrigation*
4. *Lack of motivation to irrigation support staff*
5. *Lack of adequate policies in support of irrigation*
6. *Low-level cooperation with other key actors in support of irrigation*

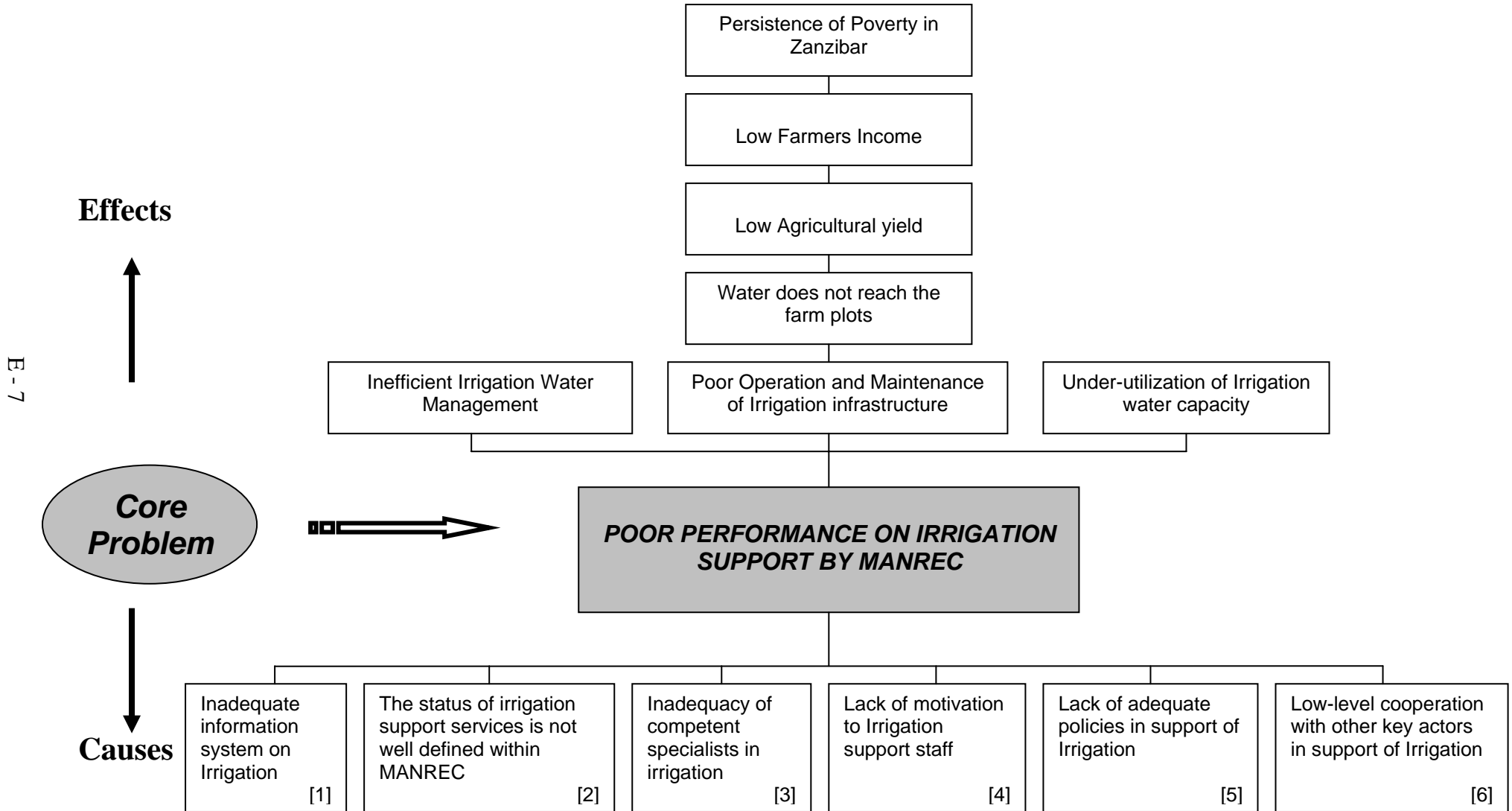
Three direct effects of the core problem were also identified, and these are:

1. *Inefficient Irrigation Water Management*
2. *Poor Operation and Maintenance of Irrigation Infrastructure*
3. *Under-utilization of Irrigation Support Capacity*

The ultimate effect of the three problems is the low agriculture yield.

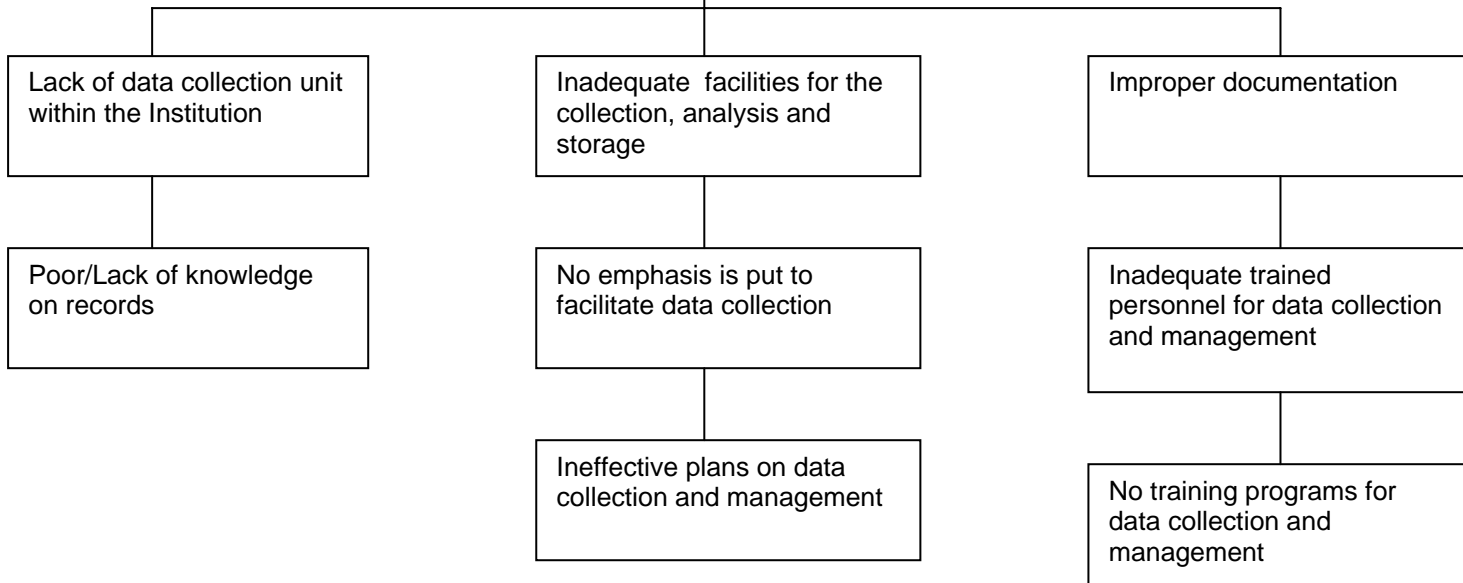
Further discussions were conducted in groups to identify further causes for each of the six problems and the results are presented in form of problem tree:

4.3 The Current Problem Situation (MANREC)

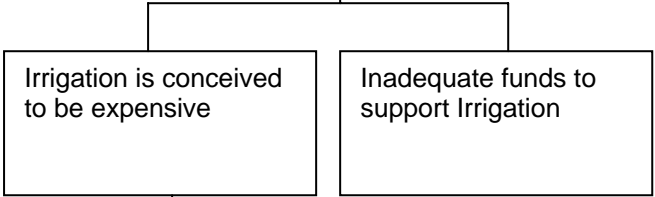
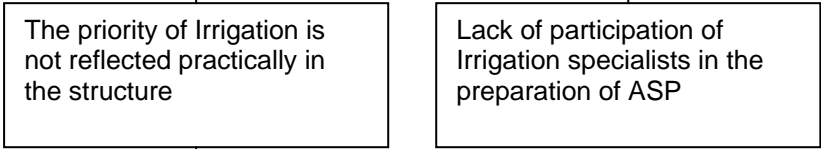
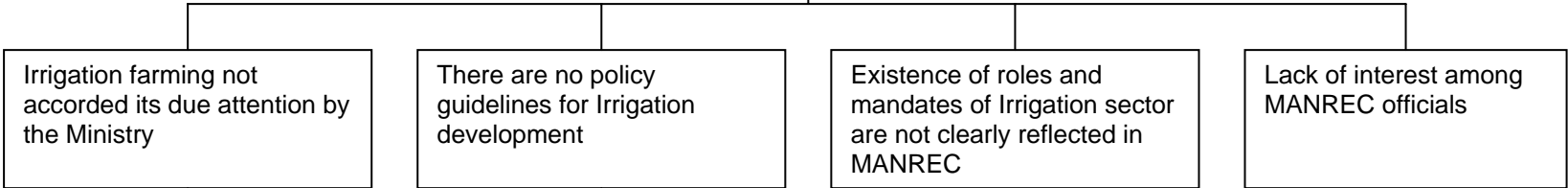


Inadequate information system on Irrigation

[1]

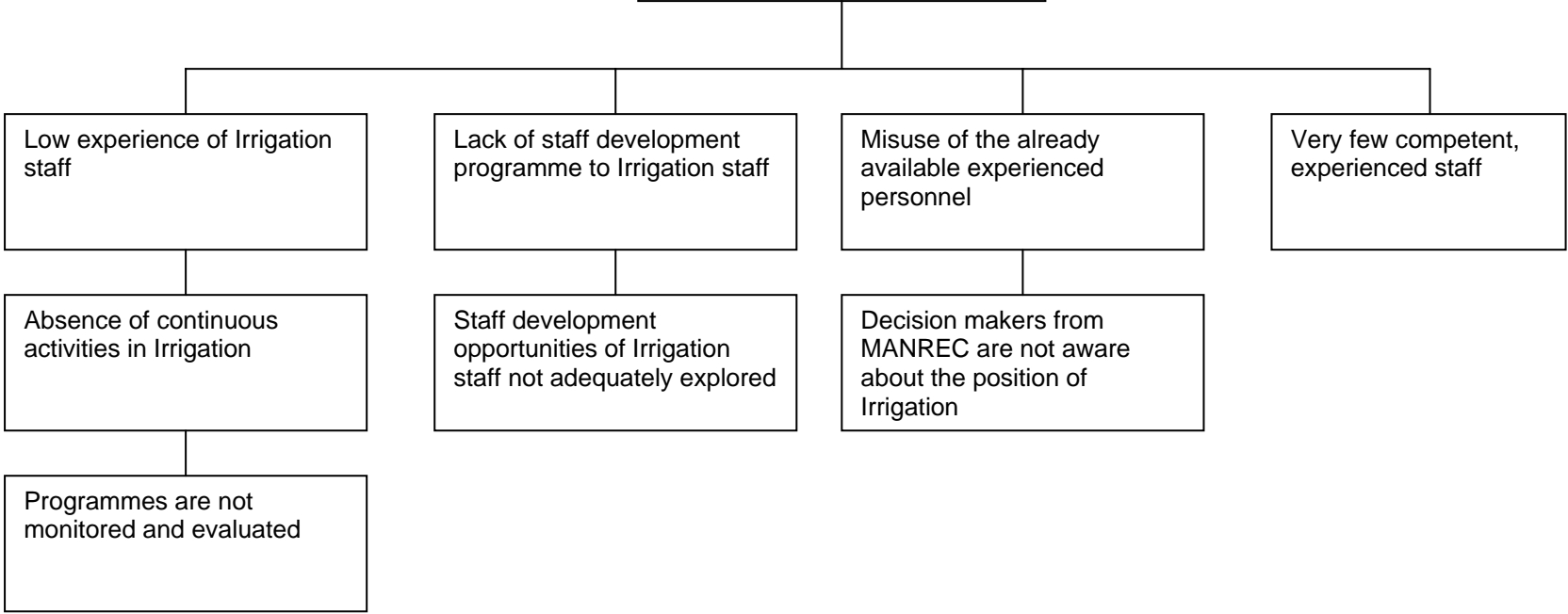


The status of irrigation support services is not well defined within MANREC
[2]



Lack of cost-benefit analysis for irrigation

Inadequacy of competent specialists in irrigation
[3]



**Lack of motivation to
Irrigation support staff**
[4]

Inadequate support services
from MANREC

There is inadequate special
budget for Irrigation
development

Very few or no training
opportunities to the irrigation
staff

Low salaries compared to
other Civil Sectors, who are
working under similar risk
condition

No scheme of service for
Irrigation staff

Lack of performance based
incentive

Inadequate policies and poor implementation in support of Irrigation
[5]

Stagnated implementation of ZIDP

Poor follow-up of ZIDP

No Institutional mandate

There is no priority given to Irrigation development in agricultural sector policy

Lack of planned strategies for Irrigation in the policy i.e. ASP

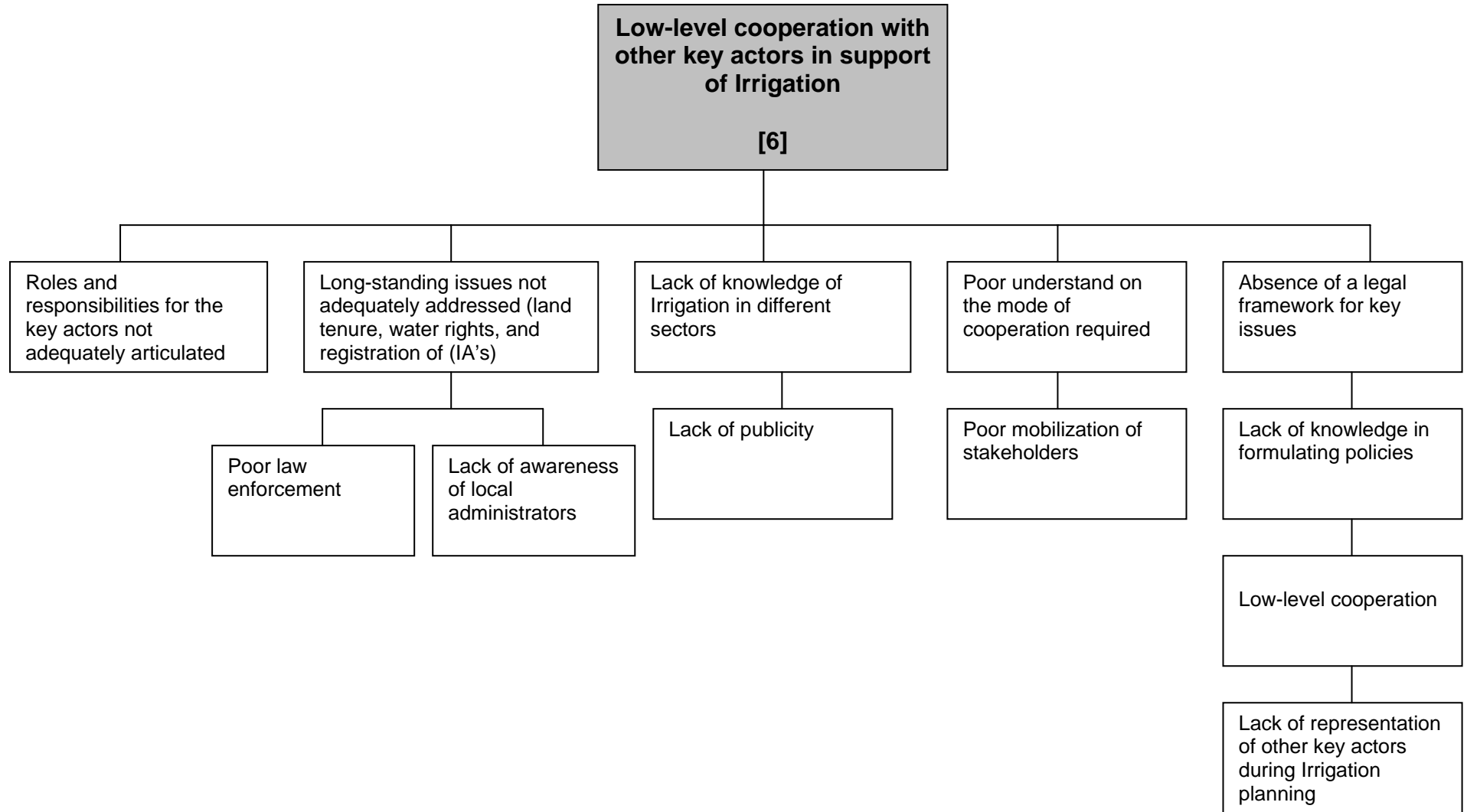
Lack of competent planners

Slow implementation of ASP

Policy may stay for a long time without revision in accordance with time and prevailing condition

Policy makers are not aware on the knowledge of Irrigation and its performance

Poor mobilization on the knowledge of Irrigation within the policy makers and administrators



4.4 Feasible strategies/Activities(MANREC):

The conclusion of a problem situation in form of a problem tree oriented the participants to work out strategies/activities to be implemented in order to alleviate the problems. Methodologically each of the direct causes to the core problem was reformulated in a desirable objective to be reached.

The strategies/activities to be implemented were sought from the problem below by stating the measures to be undertaking in order to solve those problems. Guidance was provided to the participants to formulated those strategies/activities, which they themselves can undertake. The results are replicated in the following table:

OBJECTIVE: Performance On Irrigation Support By MANREC Significantly Improved

OUTPUTS	FEASIBLE STRATEGIES/ACTIVITIES
<p>1. An efficient information system on Irrigation put in place and operationalized.</p>	<ul style="list-style-type: none"> - Conduct training on data collection and management. - Formulate a data base information system for Irrigation. - Establish a data collection system from National to District level. - Make deliberate efforts to plan and facilitate establishment of a sustainable Irrigation information system. - Recruit data collection personnel at District levels. - Create programs to make decision makers, planners and administrators, aware on the importance of information system. - Formulate effective plans of action on data collection and management. - Lobby for allocation of adequate budget for Irrigation development.
<p>2. Institutional set-up of Irrigation fostered within the MANREC</p>	<ul style="list-style-type: none"> - Formulate the requirement for a department of Irrigation to reflect the due priority of the Irrigation sector. - Reflect practically the priority of Irrigation in the structure. - Create awareness to decision makers on the benefit of Irrigation farming. - Formulate a proposal for the establishment of an Irrigation development policy. - Defining clearly the roles and responsibilities of the Irrigation sector. - Formulate a monitoring and evaluation unit within the Irrigation institution. - Involve Irrigation specialists in the formulation of agricultural development policies. - Lobby for allocation adequate funds for Irrigation development.

OUTPUTS	FEASIBLE STRATEGIES/ACTIVITIES
<p>3. <i>Competent specialists in Irrigation adequately availed</i></p>	<ul style="list-style-type: none"> - Identify training needs of irrigation staffs - Establish and implement training program for irrigation staff - Explore for successfully established irrigation support mechanisms in countries with related topographical and water conditions (e.g. Madagascar) - Organise field visits for key irrigation staff to those countries. - Lobby for proper allocation of available irrigation personnel. - Utilize efficiently the available irrigation manpower. - Organise the implementation of one scheme supervised by qualified personnel with full involvement of local technicians. - Expose the impact of irrigation farming. - Conduct sensitization workshops to policy makers on irrigation aspects. - Lobby for establishment of a department of irrigation. - Propose a requirement for the position of irrigation in the MANREC. - MANREC to observed the priority of irrigation as the principal factor for efficient food production and food security. - Conduct a regular monitoring and evaluation of irrigation development activities to ensure sustainability. - Lobby for engagement of retired irrigation specialists on contractual terms.
<p>4. <i>Irrigation support staff adequately motivated</i></p>	<ul style="list-style-type: none"> - Establish a well-organised training programme for the irrigation staff. - Solicit for provision of adequate support services from MANREC. - Lobby for adequate budget for irrigation development. - Identify priority activities for provision of additional incentives. - Develop a performance based incentive scheme proposal. - Present the incentive scheme proposal to the MANREC management Committee. - Prepare proper scheme of service based on experience and performance. - Advise MANREC to involve subordinate workers in the decision making process.

OUTPUTS	FEASIBLE STRATEGIES/ACTIVITIES
<p>5. <i>Irrigation supportive policies developed and implemented</i></p>	<ul style="list-style-type: none"> - Investigate on the stalemate of ASP implementation. - Develop an implementation guideline of ASP taking on board the ZIDP and ZIMP perspectives. - Develop an implementation schedule of the projects documents (ZIDP & ZIMP) - Prepare an implementation budget and present to MANREC authorities for approval. - Facilitate ASP review to accommodate the fostered priority of irrigation. - Prepare a presentation of the management committee of MANREC to justify the need for an irrigation section/department. - Develop an irrigation development programme for Zanzibar. - Lobby for inclusion of irrigation programme into Zanzibar Poverty Reduction Strategy (ZPRS).
<p>6. <i>Cooperation with other key actors in support of irrigation improved</i></p>	<ul style="list-style-type: none"> - Establish the existence of conflicting roles and responsibilities of key actors of irrigation support. - Prepare proposal on functional responsibilities based on the mandatory roles of key actors of irrigation support. - Organize a meeting for all respective stakeholders, discussing the need of our cooperating for irrigation development. - Present the proposal to the stakeholders' meeting.

4(i) List of Participants

	<i>NAME</i>	<i>POSITION</i>	<i>INSTITUTION</i>
1	Moh'd Omar Moh'd	Head Mechanization	Division of Agric. & Input
2	Kombo A. Rashid	TUTOR	Kizimbani Agric. T. Institute
3	Rubea Moh'd Ali	Irrigation Technician	MANREC -Pemba
4	Ali Hassan Haji	Irrigation Agronomist	SPFS Zanzibar
5	Ramadhan Asseid	Planning Officer	Commission of Agriculture
6	Mahmoud V. Pandu	Land Resources Eng.	Division of Agric. & Input
7	Shaib Juma Khalfan	Irrigation Technician	MANREC - Pemba
8	Ali Moh'd Ali	Irrigation Technician	MANREC -Pemba
9	Juma A. Foum	Irrigation Technician	Division of Agric & Input
10	Talib B. Shariff	Irrigation Technician	MANREC - Pemba
11	Mchenga A. Mchenga	Deputy Head of Division	Division of Agric. & Input
12	Abdulla K. Hamad	Irrigation Technician	MANREC - Pemba
13	Nassor O. Khamis	Irrigation Technician	MANREC – Pemba
14	Ali M. Omar	Agronomy Counterpart	MANREC - Pemba
15	Ame Khamis Ame	Incharge of Kibokwa	Division of Agric. & Input
16	Kadir Ali Kadir	Irrigation Tech. B/Sudi	Division of Agric. & Input
17	Shaame M. Shaame	Irrigation Engineer	MANREC -Pemba
18	Shaaban A. Shaaban	Head Rice Cultivation	Division of Agric. & Input
19	Andrea S. Mbinga	Irr. Infrastructure Engineer	Division of Agric. & Input
20	Aisha Iddi Amani	Agric. Field Officer Mwera	Division of Agric. & Input
21	Amour Uzzi Vuai	Irrigation Technician	Division of Agric. & Input
22	Juma Ali Juma	ZIMP Counterpart	Commission of Agric.
23	Chum H. Yussuf	Research Coordinator	MANREC - Pemba
24	Nuru R. Mbarouk	Chief Extension Officer	Commission of Agriculture
25	Dr. Lwambuka L.	Facilitator	UDSM, Dar es Salaam
26	Joyce Lyimo	Co-Facilitator	Dar es Salaam

4 (ii) Programme

1.	Registration	08:30 – 09:00.	All participants
2.	Welcoming Remarks	09:00 – 09:03.	Chief Counterpart -ZIMP
3.	Self Introduction	09:03 – 09:10.	All participants.
4.	Opening Address	09:10 – 09:15	Deputy Commissioner
5.	Introduction to PCM and methodology	09:15 – 09:35.	Dr. Lwambuka L.
6.	Problem Situation - plenary - group work	09:35 – 10:30.	All participants
7.	Tea break	10:30 – 11:00.	All participants
8.	Problems situation - groups works	11:00 – 12:00.	All participants.
9.	Plenary presentation	12.00 – 13:00.	Group Representative.
10.	Lunch break	13:00 – 14:00.	All participants.
11.	Setting of strategies - groups works	14:00 – 15:30.	All participants.
12.	Tea break	15:30 – 16:00	All participants.
13.	Presentation of strategies - plenary	16:00 – 18:00	Groups Representative
13	Closing remarks	18:00 – 18:15	NIMP Study Team Leader

5. RESULTS OF THE PCM WORKSHOP FOR THE FARMERS AND WATER USERS ASSOCIATIONS REPRESENTATIVES



Farmers and Irrigators Associations Representatives Attending the PCM Workshop at Zanzibar

5.1 Preamble:

Involvement of beneficiaries (Irrigators Associations/Farmers) is considered in the PCM-based approach as prerequisite for the implementation of the ZIMP and sustenance of the irrigation farming development. In order to facilitate detailed discussions and gain maximum inputs from the participants, this workshop was conducted in Swahili language. For the purpose of this report, the results of the workshop have been translated in English, but the original Swahili version has been retained and is appended to this report.

5.2 Outset Situation (Unfavourable):

The farmers were guided to discuss the problem situation, which they are facing in pursuance of the irrigation farming.

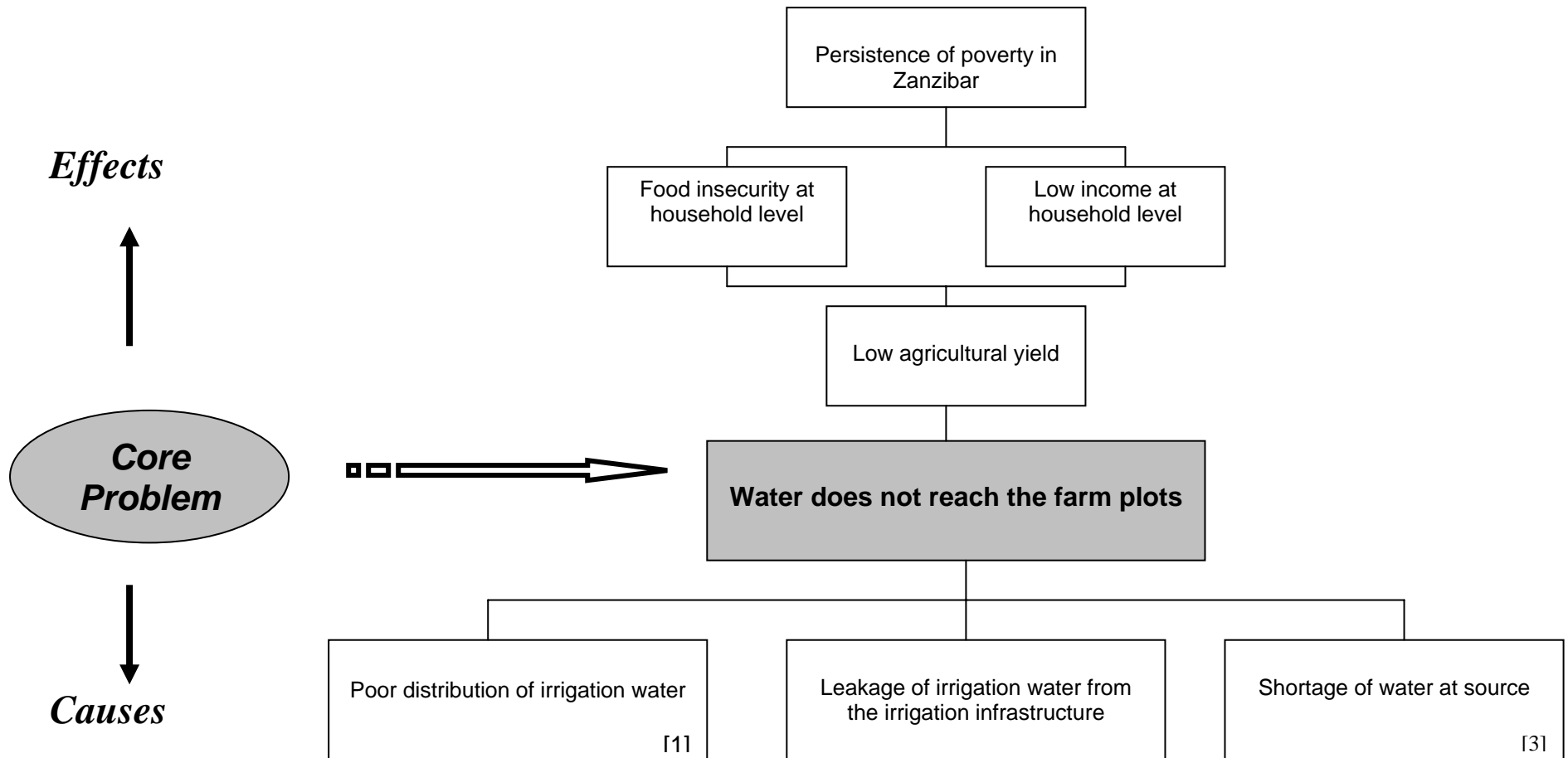
They identified the core problem as “*Water does not reach the farm plots*”. Three direct causes to the core problem were further identified as follows:

- (1) *Poor distribution of irrigation water.*
- (2) *Leakage of irrigation water from the irrigation infrastructure.*
- (3) *Shortage of water at source.*

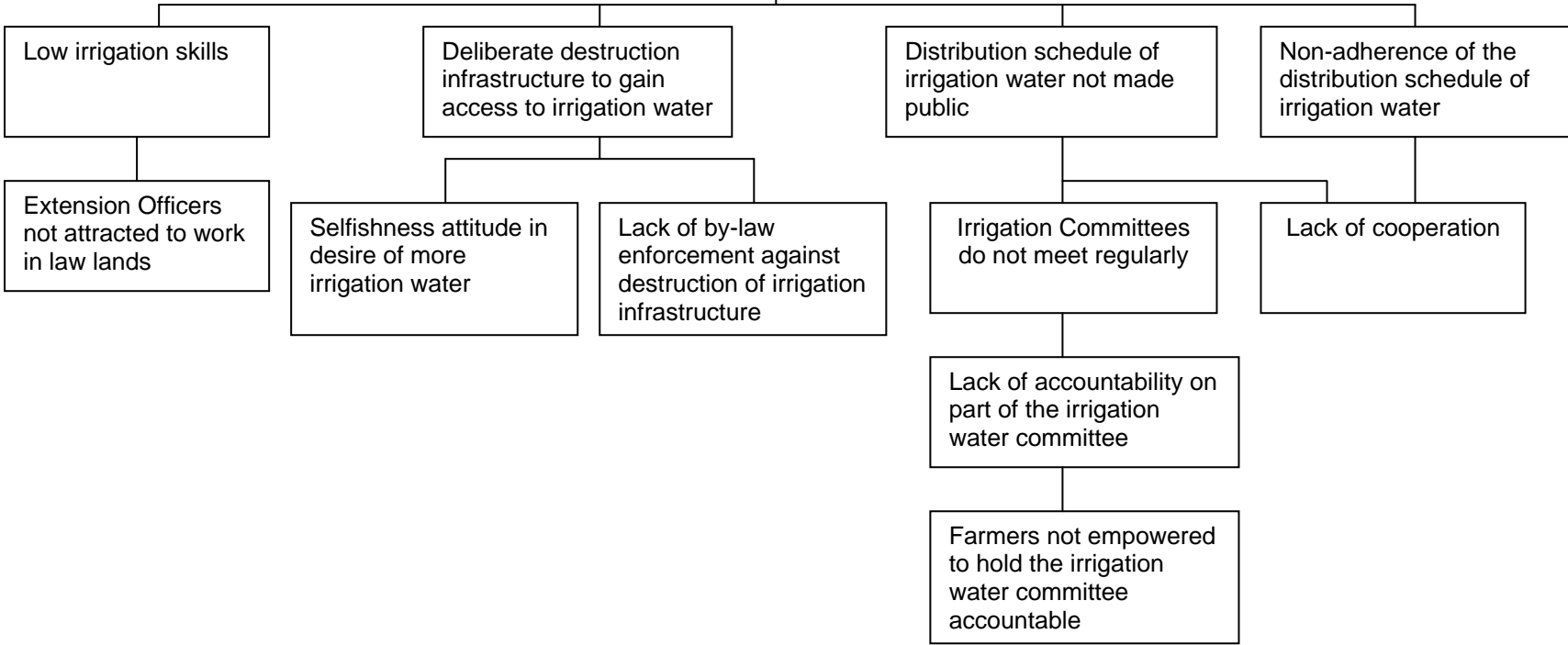
The immediate effect to the core problem was identified as “*the Low Agricultural Yield*”.

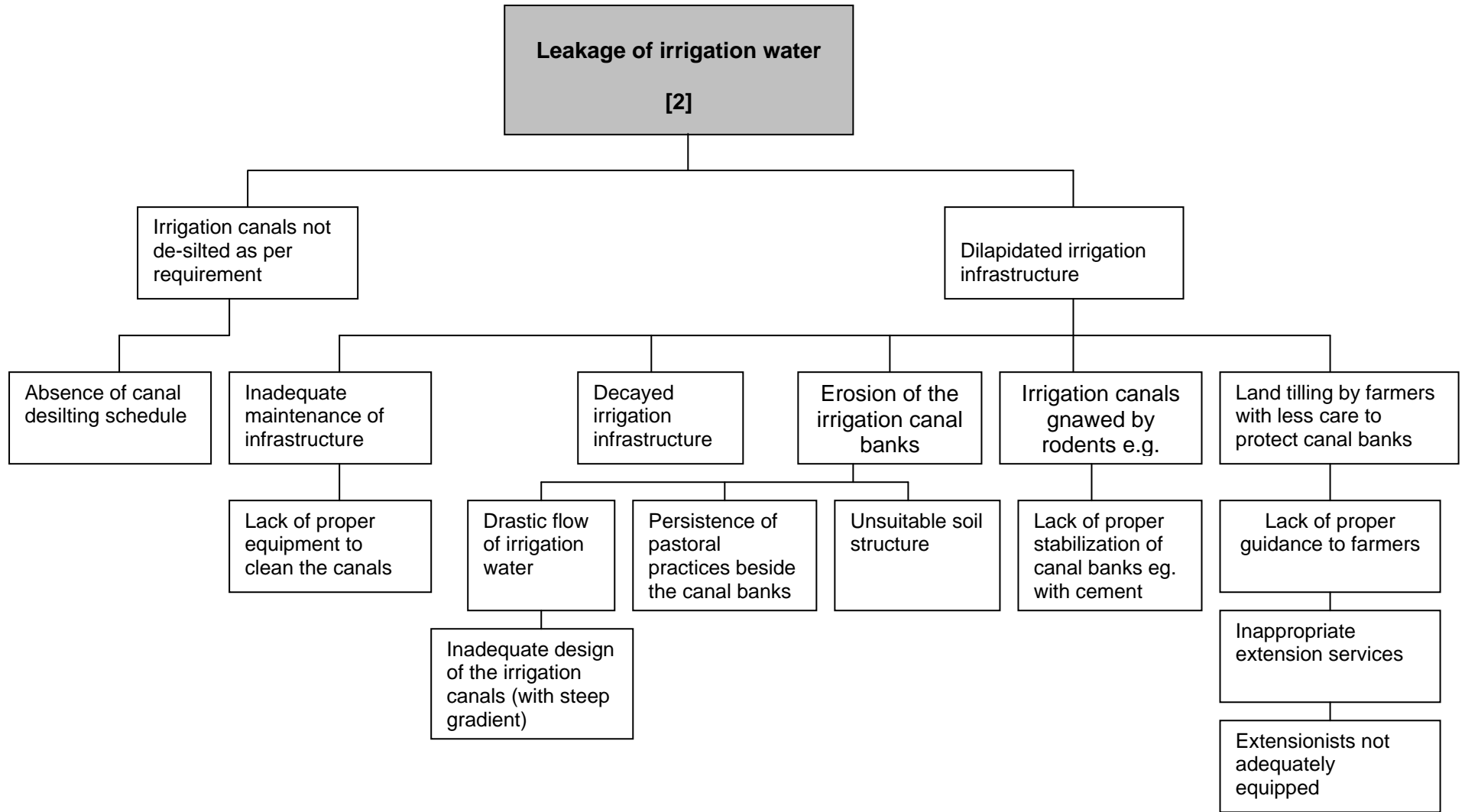
The participants were thereafter split into three groups to discuss in details the causes of the three problems identified above. The results of the discussion is the problem situation presented in form of a problem tree:

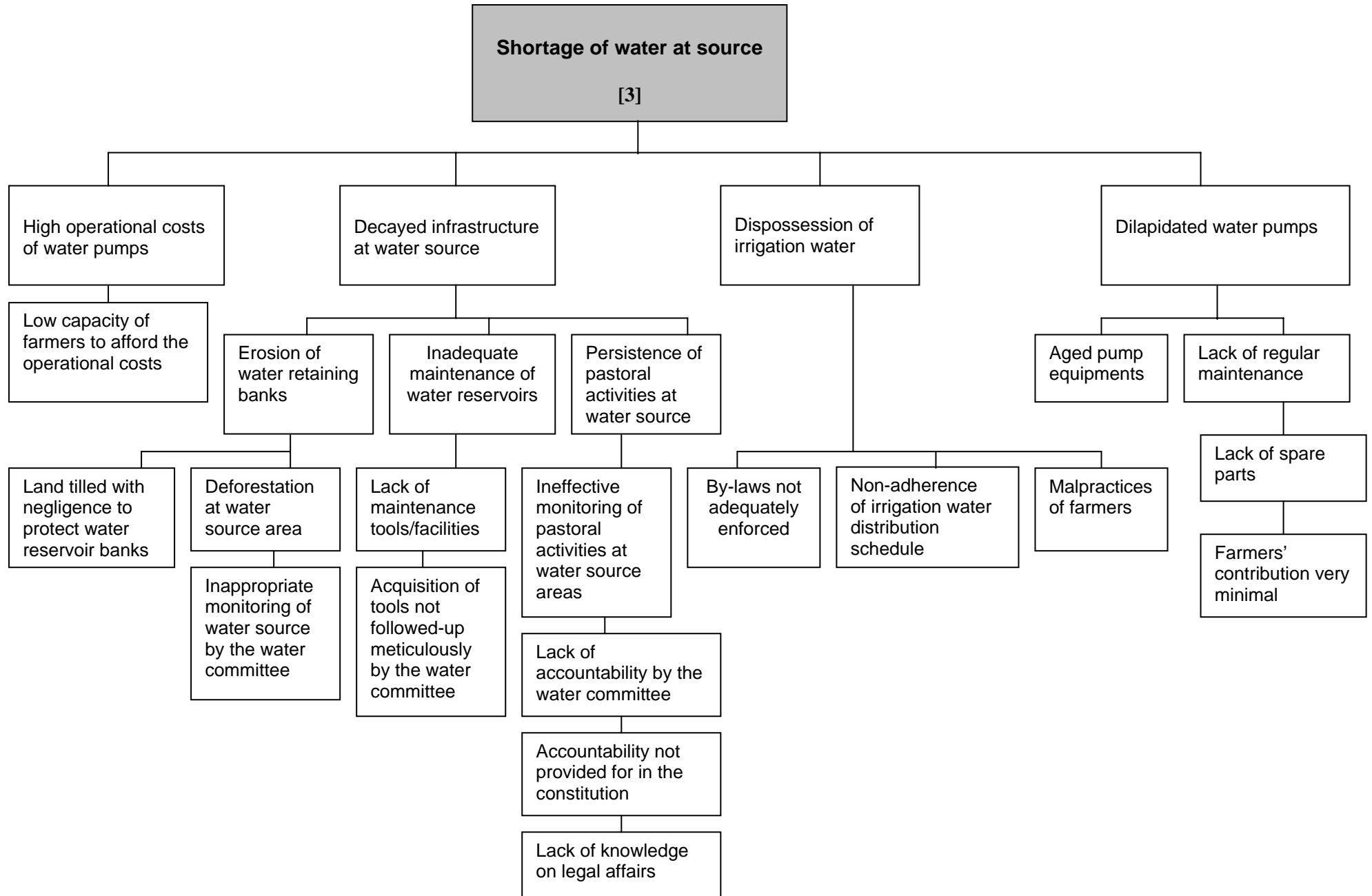
5.3 The Current Problem Situation (Farmers/IA)



Poor distribution of irrigation water
[1]







5.4 Feasible Strategies/Activities (Farmers/IA):

The three direct causes to the core problem were re-formulated into desirable conditions as follows:

- (1) Distribution of irrigation water improved.
- (2) Water leakages from the irrigation infrastructure effectively contained.
- (3) Irrigation water sufficiently availed.

It is worth noting that the first objective is focused on the management and irrigation water, the second objective concerns the operation and maintenance of irrigation infrastructure while the third objective deals with the protection of water sources.

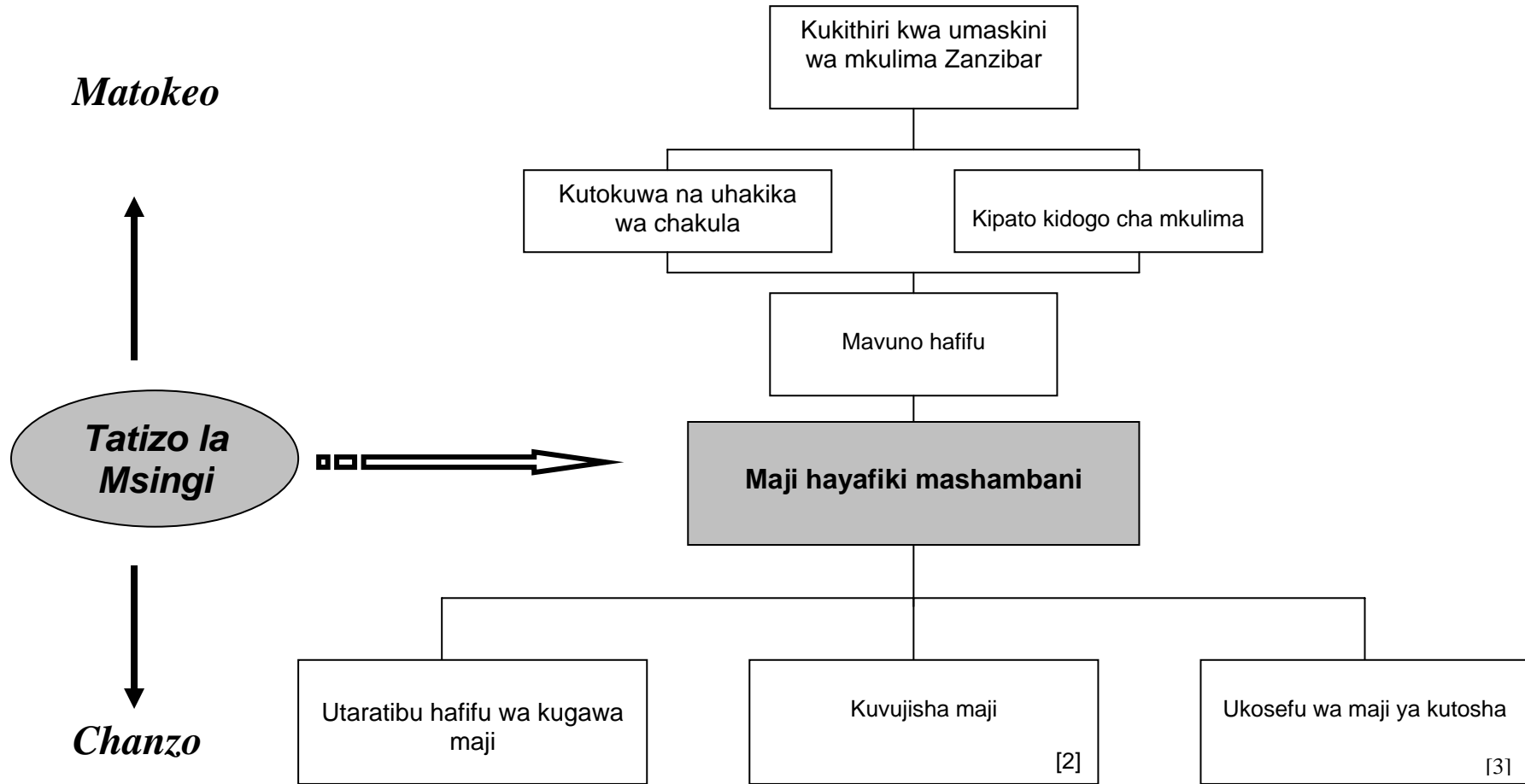
OBJECTIVES: Water Reaches All The Farm Plots

OUTPUTS	FEASIBLE STRATEGIES/ACTIVITIES
<p>1. <i>Distribution of irrigation water improved</i></p>	<ul style="list-style-type: none"> - Introduce by-laws to safeguard irrigation canals against malpractices. - Solicit for training opportunities on water distribution skills for the committee members. - Organise fresh elections (if necessary) to institute a new water committee leadership. - Write to the Ministry to seek its intervention on extensionists not ready to service the low lands. - Introduce regular consultations with the Ministry to monitor the performance of extensionists. - Facilitate acquisition/donation of working tools for extensionists and provision of their training by relevant institutions. - Involve farmers in preparation of irrigation water distribution schedule. - Organise a general meeting to discuss the introduction of by-laws which will put a curb on malpractices by farmers. - Organise meetings on regular basis to discuss irrigation farming problems and remedial measures. - Establish leadership qualities for candidates aspiring for leadership position in the irrigation water committee. - Introduce by-laws and enforcement measures to promote accountability of committee leadership. - Introduce information dissemination to a wider public on various irrigation activities. - Publicize the irrigation water distribution calendar to all farmers. - Introduce an opinion box to obtain information from farmers on the violation of the water distribution calendar and present the opinions to the water user committees.
<p>2. <i>Water leakages from the irrigation infrastructure effectively contained</i></p>	<ul style="list-style-type: none"> - Prepare canal de-silting schedule and assign responsibilities. - The committee should select a supervisor to monitor adherence of the de-silting schedule. - The irrigation committee should administer clearance of grass surrounding the irrigation canals to curb attraction of pastoral activities. - The committee should undertake a condition survey of the irrigation canals on regular basis. - The committee should inform relevant higher authorities on deterrent measures introduced to curb the persisted pastoral activities around the canal banks. - The committee in consultation with farmers should prepare a procedure to upgrade the canal banks with cement mortar. - The farmers should be made aware of leadership qualities prior to committee elections. - Organise free elections to institute scrupulous committee leadership. - The committee should monitor the provision of training to farmers and advise accordingly. - The committee should forward to the concerned Ministry a proposal for the betterment of extension services particularly in the low lands.

OUTPUTS	FEASIBLE STRATEGIES/ACTIVITIES
<p>3. <i>Irrigation water sufficiently availed</i></p>	<ul style="list-style-type: none"> - Committee should solicit for the provision of training on cooperatives and marketing. - Introduce by-laws to enhance the conservation water of sources. - Create awareness to all farmers on the effects of deforestation at water source areas. - Develop by-laws enforcement measures for the protection of water sources. - Introduce deterrent penalties for farmers who violate the recommended farming practices for the protection of water sources. - The water committee should provide a worked out procedure to monitor adherence of the maintenance schedule for irrigation infrastructure. - The water committee should work out a procedure of inspecting the maintenance on regular basis. - The water committee should re-organise its membership to include people with irrigation expertise. - The committee should consult relevant institutions for the provision basic knowledge in legal affairs. - The committee should organise a training programme for the farmers. - The committee should monitor the adequacy of the training offered to the farmers. - The committee should take the responsibility to oversee the enforcement of community by-laws. - Develop a procedure to promote accountability of the committee. - Propose to the Ministry of Water to introduce a fair tariff of water. - Propose to the Ministry of Water to allow the communities retain some of the water bill collections. - The committee should advise on the appropriate size and quality of water pumps. - The committee should regularly monitor the maintenance of water pumps. - Present to the Government the local contribution towards rehabilitation of irrigation canals.

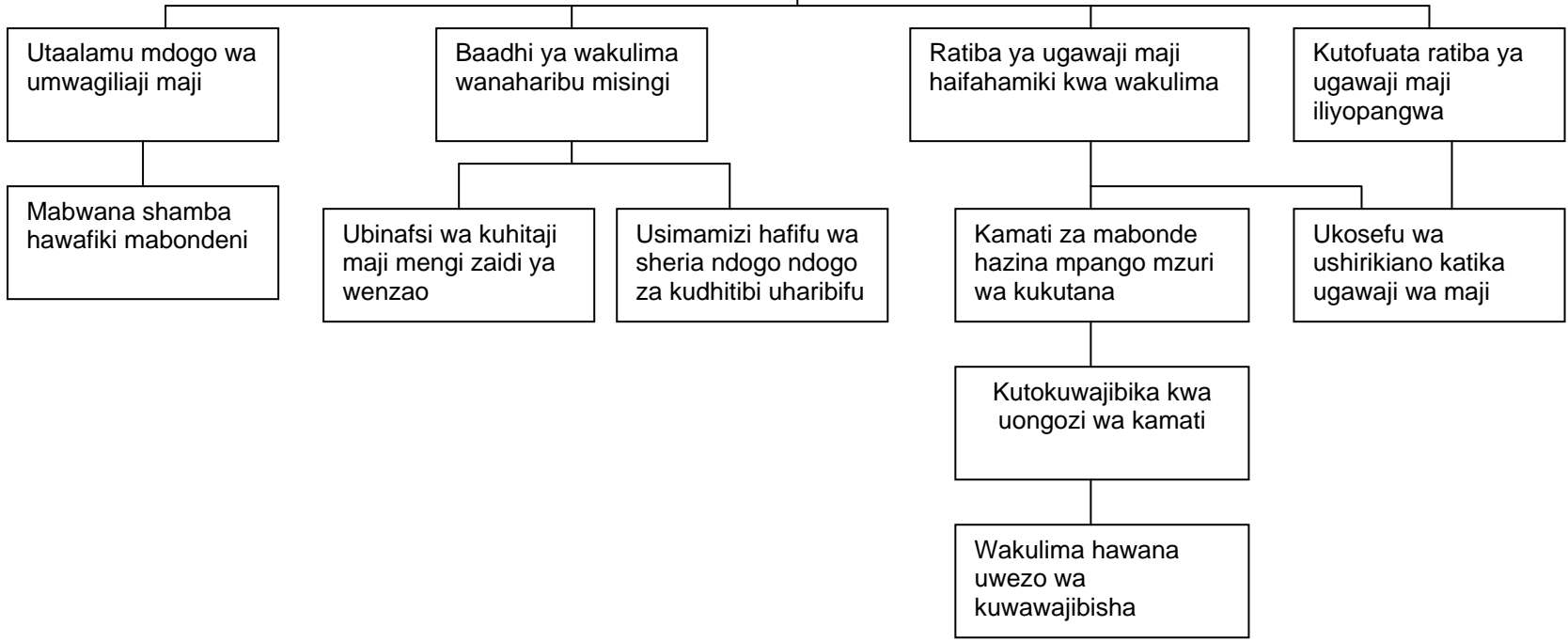
5.5 The Current Problem Situation (Farmers/IA) [Original Swahili Version]

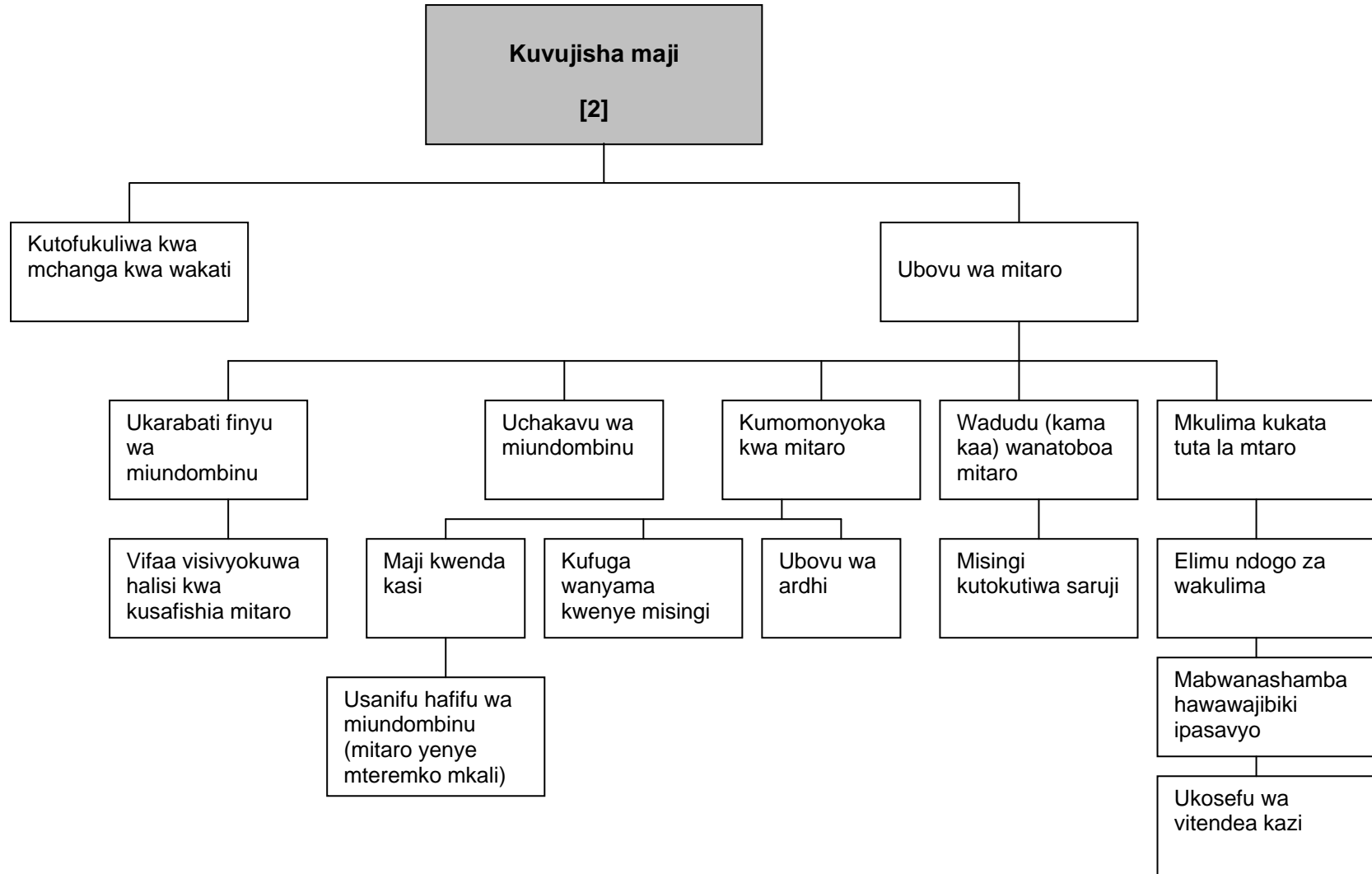
E - 29



Utaratibu hafifu wa kugawa maji

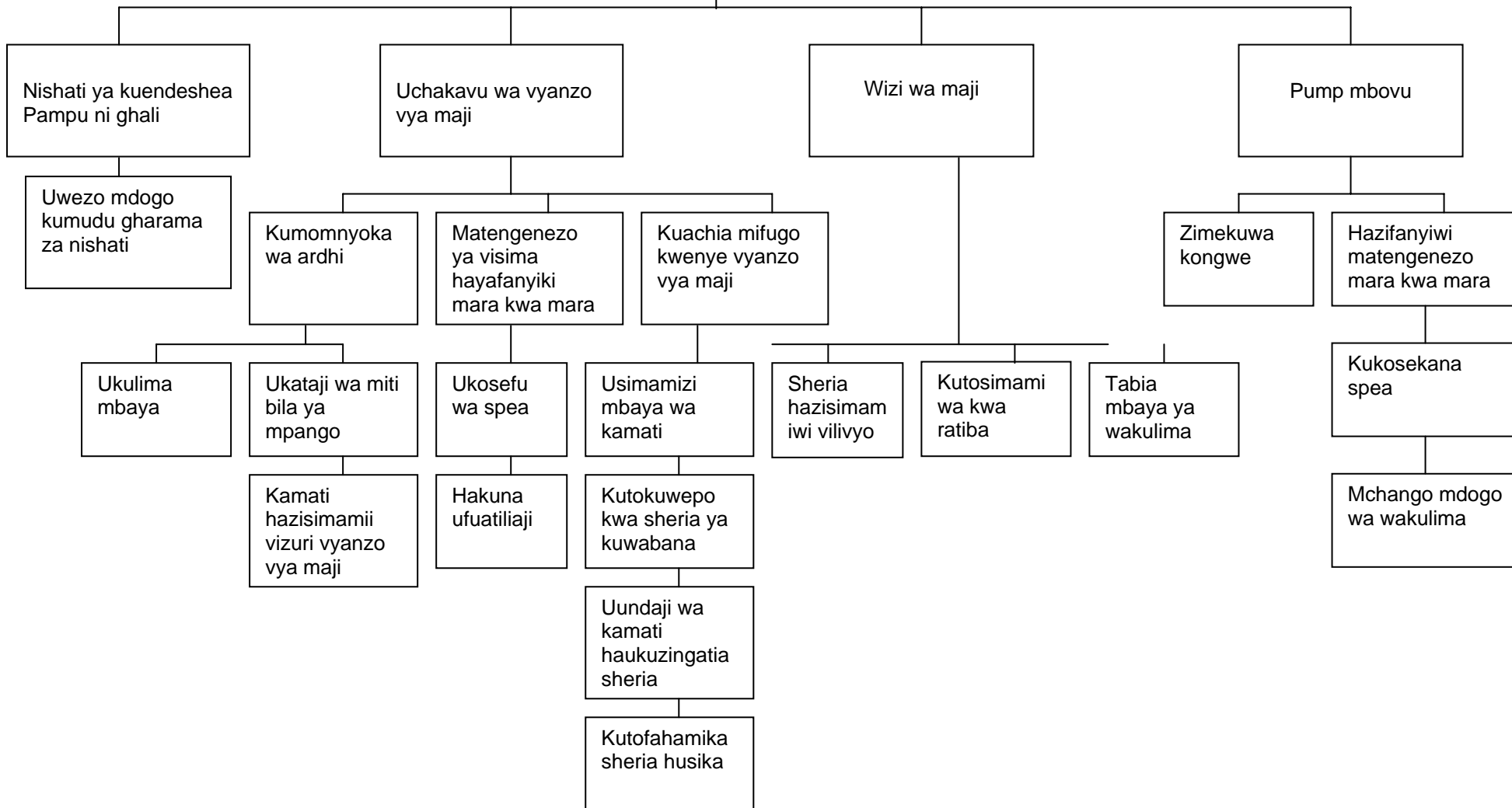
[1]





Ukosefu wa maji ya kutosha

[3]



	MIKAKATI
<p>1. Utarabibu wa kugawa maji umeboreshwa</p>	<ul style="list-style-type: none"> - Kuandaa sheria ndogo ndogo itakayo ondoa muhali. - Kuwaombea mafunzo wanakamati kutoka taasisi zinazohusika - Kuuandaa uchaguzi mpya ili kuondokana na kamati zenye utendaji mbovu. - Tupeleke malalamiko wizarani kuhusu mabwanashamba kutofika mabondeni - Kuandaa utaratibu wa mawasiliano ya mara kwa mara na wizara. - Kuwaombea mabwanashamba vifaa vya kutendea kazi na mafunzo kutoka taasisi mbalimbali - Wakulima washirikishwe katika uandaaji wa ratiba ya maji - Tuweke kikao kwa pamoja tupange sheria zinazo mdhibiti mkulima - Kuandaa mikutano ya mara kwa mara kuelezana matatizo na ufumbuzi. - Kuweka vigezo vya sifa kwa wakulima wanaoomba uongozi. - Kuweka sheria ndogo ndogo ya kuwabana viongozi wasiwajibika katika kazi zao - Kuweka wazi kumbukumbu zinazohusu kazi mbali mbali na matukio. - Utaratibu wa kumwagilia uandaliwe na kuwekwa wazi kwa wakulima wote. - Maoni ya wakulima kuhusu ukiukwaji wa utaratibu wa umwagiliaji yakusanywe na kuwakilishwa kwenye vikao vya kamati.
<p>2. Uvujaji wa maji umepungua kwa kiasi kikubwa</p>	<ul style="list-style-type: none"> - - Iandaliwe ratiba ya kufukua mchanga yenye majina ya wahusika - Kamati iteuwe msimamizi wa utekelezaji wa hiyo ratiba. - Kamati na wakulima wazingatie uwezekano wa kupanua maeneo ya usafi ili kuepuka kuvutia wenye mifugo. - Kamati iandae utaratibu madhubuti wa ukaguzi wa mara kwa mara wa mitaro ili kugundua maeneo yeye ubovu. - kushirikiana na serikali kutengeza mitaro mibovu. - Kamati ipendekeze kwa mamlaka za juu mabadiliko ya kanuni zitakazowabana zaidi wanao haribu miundombinu ya umwagiliaji kwa kufuga wanyama. - Kamati kwa kushirikiana na wakulima waandae mpango utakowawezesha kujenga mitaro kwa saruji. - Wakulima waelimishwe kuhusu sifa za uongozi bora kabla ya uchaguzi wa kamati. - Kuandaa uchaguzi mpya ili kuondokana na kamati zenye utendaji mbovu. - Kamati ifuatilie mwenendo wa utoaji elimu kwa wakulima na iwasilishe mapendekezo kwa wahusika. - Kamati za wakulima zipendekeze kwa wizara inayohusika njia za kuwasaidia mabwanashamba waweze kufika mabondeni.

	MIKAKATI
<p>3. <i>Maji yanapatikana kwa kutosheleza Kilimo cha umwagiliaji</i></p>	<ul style="list-style-type: none"> - Tutazishawishi taasisi za fedha zitupe mikopo nafuu. - Kamati zitashauri kupatiwa elimu ya ushirika na masoko. - Tutaunda sheria ndogo ndogo za kuhifadhi vyanzo vya maji. - Tutawaelimisha wakulima juu ya athari ya ukataji miti ovyo. - Tutasimamia sheria ndogo ndogo za kuhifadhi vyanzo vya maji. - Tutaunda sheria ndogo ndogo za kuwajibisha wakulima wanaokiuka kanuni za kilimo bora. - Kamati itaweka utaratibu wa ufuatiliaji matengenezo . - Kamati zitaanzisha mfuko wa kugharamia matengenezo. - Tutaanzisha utaratibu wa ukaguzi wa mara kwa mara. - Tutawashirkisha wataalamu kwenye kamati zetu. - Tutashauri tasisi husika kutoa taaluma ya sheria. - Tutazishauri taasisi husika kufanya mapitio ya sheria za kuanzisha jumuiya. - Kamati zitaratibu upatikanaji wa mafunzo ya kutosha kwa wakulima. - Kamati zitasimamia mpango wa elimu kwa wakulima. - Kamati itasimamia sheria ndogo ndogo za jumuiya. - Tutaunda sheria ndogo ndogo za kuiwajibisha kamati. - Tutashauri wizara ifanye mapitio ya sheria ya ada ya maji kulingana na huduma. - Tutaishauri wizara kuziachia jumuiya fedha zinazotokana na ada ya maji. - Kamati zitashauri matumizi ya mitambo ambayo ni rahisi kupatiwa vipuri. - Tutasimamia kwa karibu matengenezo ya mara kwa mara. - Tutapeleka serikalini mapendekezo yetu ya kuchangia ufufuaji wa mabonde ya umwagiliaji.

5 (i) List of Participants

	NAME	POSITION	INSTITUTION
1	Kadiria Mnyeji	Farmer	Bumbwisudi
2	Kiduwa Vuai	Farmer	Kibokwa
3	Shani Hassan	Farmer	Kibokwa
4	Hawa Othman	Farmer	Mwera
5	Ali Sharif	Farmer	Mtambile – Pemba
6	Nassor Shehe	Farmer	Makwararani - Pemba
7	Asya Ame Ali	Farmer	Cheju
8	Kidawa Mselem	Farmer	Pujini – Pemba
9	Massoud Khamis Ali	Farmer	Makwararani – Pemba
10	Alfons Peter	Farmer	Mtwango
11	Biyamu Nassor	Farmer	Mtwango
12	Khamis Faraji	Farmer	Cheju
13	Makame Hamdu	Farmer	Mwera
14	Yusta Claus	Farmer	Bumbwisudi
15	Muhidin Kombo	Farmer	Wete – Pemba
16	Mussa Ali	Farmer	Pujini – Pemba
17	Said Omar	Bwanashamba	Pujini – Pemba
18	Mbwana Dadi	Bwanashamba	Makwararani – Pemba
19.	Shaaban A. Shaaban	Head Rice Cultivation	Division of Agric. & Input
20.	Andrea S. Mbinga	Irr. Infrastructure Engineer	Division of Agric. & Input
21.	Juma Ali Juma	ZIMP Counterpart	Commission of Agric.
22.	Mahmoud V. Pandu	Land Resource Engineer	Division of Agric. & Input
23.	Mchenga A. Mchenga	Deputy Head of Division	Division of agric. & Input
24.	Ali M. Omar	Irr. Agriculture Counterpart	Pemba
25.	Shaame M. Shaame	Irrigation Engineer	Pemba
26.	Abdalla K. Hamad	Irrigation Technician	Pemba
27.	Ali Hassan Haji	Irrigation Agronomist	SPFS Zanzibar
28.	Dr. Lwambuka L.	Facilitator	UDSM, Dar es Salaam
29.	Joyce Lyimo	Co-Facilitator	Dar es Salaam

5 (ii) Programme

1.	Registration	08:30 – 09:00	All participants
2.	Welcoming Remarks	09:00 – 09:03	Chief Counterpart
3.	Self Introduction	09:03 – 09:10	All participants
1.	Introduction to PCM and methodology	09:10 – 09:30	Dr. Lwambuka L.
5.	Problem Situation - plenary - group work	09:30 – 10:30	All participants
6.	Tea break	10:30 – 11:00	All participants
7.	Problems situation - groups works	11:00 – 12:00	All participants
8.	Plenary presentation	12.00 – 13:00	Group Representative
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10.	Setting of strategies - groups works	14:00 – 15:30	All participants
11.	Tea break	15:30 – 16:00	All participants
12.	.Presentation of strategies - plenary	16:00 – 18:00.	Groups Representative
13	Closing remarks	18:00 – 18:10.	NIMP Study Team Leader

6. CONCLUSION ON THE PCM WORKSHOP IN ZANZIBAR

6.1 Observations

The irrigation support services in MANREC has identified a core problem as ***“The poor performance on irrigation support by MANREC”***. This core problem has three direct effects, namely;

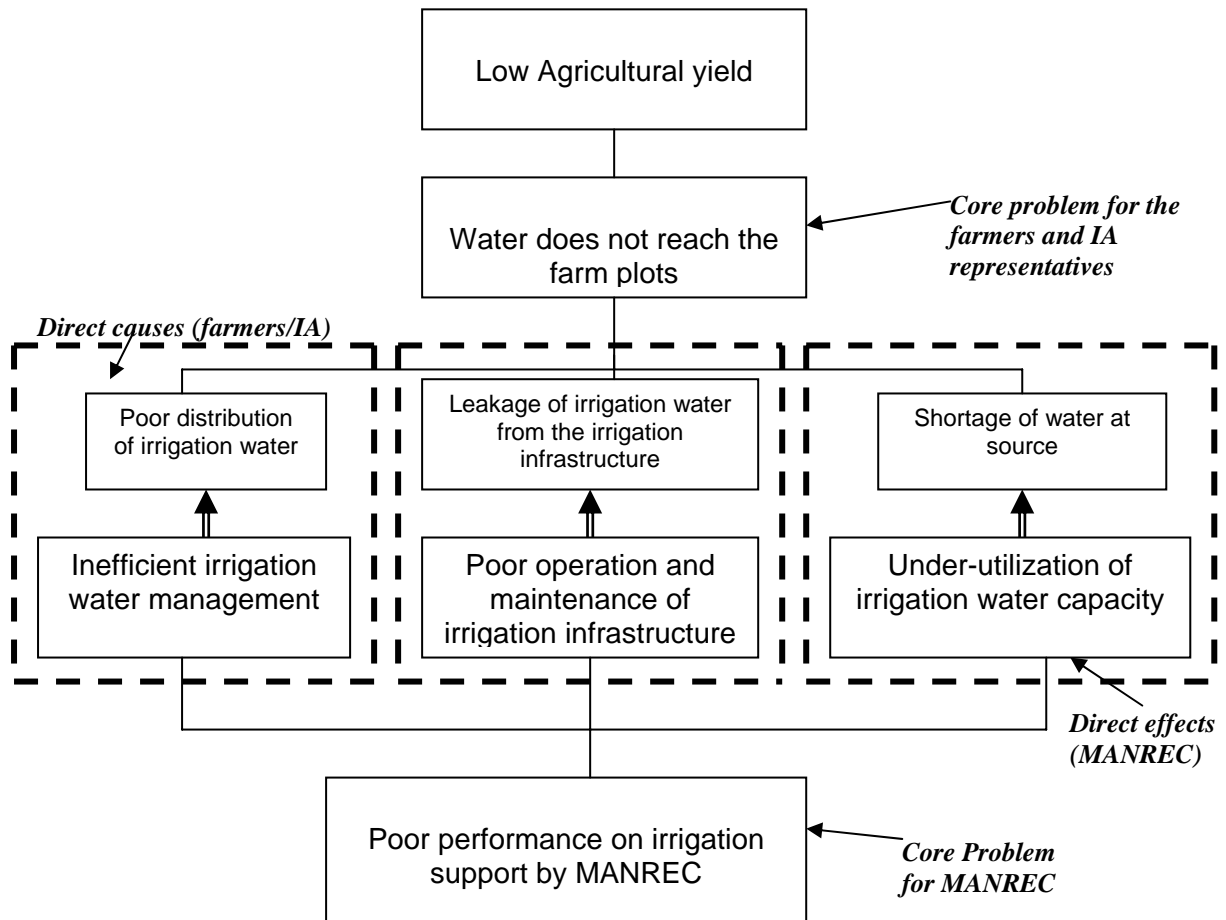
1. *Inefficient irrigation water management.*
2. *Poor operation and maintenance of irrigation infrastructure.*
3. *Under-utilization of irrigation water capacity.*

On other hand the farmers and representatives of the Irrigators Associations have identified the core problem as ***“Water does not reach the farm plots”***. This core problem has three direct causes, namely;

1. *Poor distribution of irrigation waters.*
2. *Leakage of irrigation water from the irrigation infrastructure.*
3. *Shortage of water at source.*

A scrupulous observation of the two results shows that the three effects of the core problem by MANREC is reflected in the three direct causes by the farmers and IA representatives.

6.2 Interlocking the PCMs



6.3 Perspectives

It is also worth noting that the direct effects of the core problem for MANREC fall under the roles and responsibilities of IA.

It is for this reason that all the strategies/activities formulated in the workshop are implementable by the farmers/IA. This is a reflection of sustainability.

Appendix F
Rapid Rural Appraisal Reports
For the Selected Model Irrigation Schemes

Appendix F
List of Reports

- F1 RRA Report for the Bumbwi Sudi Irrigation Scheme
- F2 RRA Report for the Chaani Irrigation Scheme

RRA Report for the

Bumbwi Sudi Irrigation Scheme

10th & 11th February, 2003
Mwenge Primary School, Zanzibar

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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 Bumbwi Sudi Irrigation Scheme is located in central Zanzibar. The irrigation scheme was developed in the Bumbwi Sudi valley in 1979 as a state farm. Plots in this valley were later distributed to the 7 neighbouring villages: Mwachaalela, Bumbwi Sudi, Kitundu, Mwakaje, Mfenensini, Miwani, Dole Mbuzini, Ndagaa, Kiboje and Kizimbani. This scheme is categorised as a pump irrigation scheme.

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 (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 RRA workshop was held over two days at the Mwenge primary school. In attendance were 20 farmers, 8 of whom were women (refer to Annex 2 for

participants list). The irrigation group was represented by the chairperson and member of the executive committee; a chairperson, vice-chairperson and 2 secretaries of the sub-associations; and farmers from 7 of the 11 irrigation sub-associations (A, B, C, D, G, H, K).

Before the workshop proceedings began, a few workshop rules were drawn up: the importance of time-keeping, attendance on Day 2, to be open and truthful and to disseminate what has been learnt/discussed at the workshop.

The participants were quite willing to discuss problems related to operation and maintenance and agriculture in general. All participants exhibited a high understanding of how the irrigation scheme works, pointing out areas that require rehabilitation and conflict areas. Despite the presence of 8 women, their participation was minimal. At times, women were observed talking amongst themselves, but due to lack of confidence, they were reluctant to contribute to the discussion.

SOCIO-ECONOMY

Land Tenure

The present Bumbwi Sudi irrigation scheme was developed during the 1970s as a state farm. Ownership of lowland individual 1-acre plots were distributed to each family in 1984. Upland 1-acre plots were also distributed to farmers. The prevailing land tenure to-date is that of inheritance, as dictated by Islamic law. All other land is owned by the central government, and farmers may apply for land directly to the central government. This is the most common method used by women to acquire land. On average, every family have applied for and owns land in more than one valley. Therefore, most families own more than 2 acres of land. There are no tenant farmers in the area, but there is an established practice of lending land e.g. to a single woman to cultivate for one season.

Farmers' Economy & Life Style

The economy of Bumbwi Sudi farmers is based on both rain-fed and irrigated crops. Rain-fed crops include cassava, sweet potato, peas and bananas. Irrigated crops are mostly paddy, cultivated in 2 seasons. Calculations on cost and income reveal that paddy rice and cassava are the main source of monetary income for the scheme farmers. The main income months are July and December/January, right after paddy harvest in both rain-fed and irrigated areas. However, it is not very profitable and rain-fed paddy is cultivated at a loss. Upland crops are less profitable than paddy but sold with profit. By the end of the year, the average farmer will only manage to recoup his/her production cost and repay all loans acquired from relatives, friends and neighbours at the beginning of the season. Most men carry out other income generating activities during non-harvest months to supplement the family's income. Indeed, the seasonality diagram indicates that farmers receive an income all year round, and as such, agriculture cannot be the main source of income.

Cultural Practices

The Bumbwi Sudi area has been a meeting point for different tribes. Members of the pemba and nyamwezi tribe are now resident in area and are members of the scheme. Participants reported that there are no customs or specific rituals related to agriculture that are conducted for the betterment of agriculture. However, in other parts of Zanzibar, there are traditional customs related to agriculture exist and continue to be practiced.

Labour Force and Seasonal Demand for Labour

Men, women and children participate in agricultural activities. Children's participation is highest during the busiest months of the year: Mar-May and Oct-Dec. Their contribution is mostly to protect crops from destructive animals/birds and during harvest. Women's labour is required throughout the year. They are assisted by children and men during the most demanding activities: planting and harvesting. Since men's involvement in agriculture is interspersed with other income generating activities, it is acknowledged that women bear the brunt of the agricultural workload. For example, they are solely responsible for harvesting upland crops such as sweet potato. Men are responsible for the application of fertiliser and agro-chemicals, for fear that if women did it, it would affect food preparation and child care. Men also manage all money, and therefore all carry out activities that involve monetary exchange, purchasing all farm inputs and selling the harvested crops. Productivity of the labour force is hampered by the incidence of water-related disease¹ during and after the rainy season from Mar-May and Oct/Nov.

AGRICULTURE

Cultivation area

Bumbwi Sudi valley has up to 560 ha available for lowland farming, with potential for irrigation. Of this, only 27% (150 ha) of it is currently cultivated. This is the area that was developed as part of the state farm. At present, only 30 ha are irrigated, the areas irrigated by Popo A, Kitundu, Mwachalale Mwanzini and H pumps. The other 120 ha is cultivated as rain-fed due to pump failure or borehole collapse. The plots in the scheme measure 0.1 ha each. This is usually divided into ¼ acre of irrigated paddy and ¾ acre for rain-fed paddy. Upland plots are slightly bigger and measure 0.3 ha on average.

Crop production

The main crops cultivated in Bumbwi Sudi valley are paddy, maize, cassava and sweet potato. To a lesser extent, cowpeas and bananas are also cultivated. There are two paddy seasons: wet season paddy (Feb/Mar-Jul/Aug) and dry season paddy (Sept/Oct-Jan/Feb). Dry season paddy is only cultivated in the irrigated areas where pump is functioning. Maize is also double cropped: Mar-Jul and Oct-Jan/Feb. Although a larger area is cultivated for rain-fed paddy (120ha), the irrigated paddy

¹ malaria, cholera, typhoid, fungi and urinary tract infection

fields, in both rainy and dry season, produce a better average yield. Cassava, sweet potato and banana are usually mixed together on the same plot.

Farming calendar

The year usually begins with the harvest of maize and dry season paddy (Jan-Feb). This is immediately followed by preparations for planting the wet season paddy, maize and cassava (Mar). At this time, farm inputs are purchased. In Jun/July is the harvest of wet season paddy, rainfed paddy and maize. Ongoing at the same time are planting preparations for cowpeas and sweet potato. Their harvest in Sep-Oct coincides with the planting of dry season paddy and maize. The dry season (Dec-Feb; Jul-Sep) brings with it most of the drop disease and insects (mafunza). The busiest time of the year at Bumbwi Sudi is between March-May and Oct-November. These also coincide with the months when food scarcity occurs. When the rice stock is running out, farmers turn to other upland crops, such as cowpea and sweet potato.

Farmers' Supporting System

Farmers purchase farm inputs before the planting season in Feb/Mar and Sept/Oct. There are not credit facilities available, so money is borrowed from relatives or neighbours. The central government subsidises fertiliser (sold at 9,000/- but purchased at 15,000/-) and machinery. There is no warehouse for Bumbwi Sudi farmers, so harvested paddy is usually stored in bags in individual houses. Other crops are sold immediately. All crops are harvested using manual tools such as hand hoe or sickle. Upland crops (cassava, sweet potato & banana) are usually sold to middlemen, whilst paddy is sold directly to the consumer or to a retailer. Extension services are available mostly before the planting season, in the form of farming inputs and technical knowledge, and up the harvest period.

Land Capability for Irrigation

The commanding area proposed for extension of the irrigation scheme is the 410 ha of lowland that have not been developed as yet. This area is currently rain-fed. 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.

Constraints in Crop Production, Input Supply and Marketing

The key constraints cited are grouped under the following headings:

Tractor: There are 2 tractors available for rent; one is private and the other is government-owned. The tractor is used to plough the land used for rain-fed paddy. However, the rent for these is considered too expensive. Participants noted that it would be more affordable if a tractor was rented to plough all the land of one sub-association. The tractor is also in high demand. Some farmers plant their fields late, resulting in poor yield.

Water Scarcity: In the 4 pumps that are still operational, participants reported that there is not enough water in the boreholes. Water shortage is particularly acute while

tending nursery and transplanting seedlings. Some farmers collect water from dug wells and irrigate manually, while others wait for the rainy season to begin. The purchase of a hand pump for the dug well is under discussion.

Certified seed is difficult to obtain. Seeds have been re-used many times and are no longer producing good quality rice. There is no proper system of certified seed multiplication and distribution.

Farm inputs are considered to be beyond the financial capacity of the average farmer, particularly as there are no credit facilities where farmers could apply for loans. More often, farmers collect or purchase manure from livestock keepers. In addition, there is a shortage of technical advice on how to use fertiliser, agro-chemicals and herbicide². Participants have identified compost production as a cheaper future solution to fertiliser requirements.

Farming implements are not available. As mentioned earlier, the tractor is in high demand. Farmers use traditional tools for preparing fields, harvesting and post-harvest processes. Clearing upland fields for maize and cassava is particularly difficult due to the dense vegetation. During the dry season, weeding with small hoes is made time-consuming because the soil is very hard and weeds are proliferous. There are plans to organise into small groups that will jointly weed each other's fields.

Storage. At the moment, farmers store their paddy in baskets and polythene bags at home, as there is no warehouse. Participants requested training on how to use elevated storage huts ('vihenge').

Destructive animals include the water fowls and other birds. These attack the seedlings and crops (before harvest) respectively. Monkeys and wild pigs are also a menace to crops. Farmers lack the proper tools to scare these animals away from their farms.

Marketing of paddy is made difficult due to the absence of a market provided by either a company or the government. Participants blamed the large amount of rice that is being imported and the lack of a farmers' cooperative.

FARMERS' ORGANISATION

General information

The present-day irrigation scheme at Bumbwi Sudi was developed in as a state farm in 1979. In 1984, the plots within the scheme were distributed by the central government to farmers in the villages neighbouring Bumbwi Sudi. The Bumbwi Sudi Irrigation Group was established in 1999 as an informal group. It is comprised of eleven sub-groups, each of which corresponds to a to a particular pump. Association 'A' manages the two pumps in Mwachalale

² Participants complained about the fertiliser 'azora', a fertiliser that will destroy rice in plots that do not have a drainage system. Many farmers have used it in the past without prior information about this side-effect.

Association	Pump	Association	Pump
A →	Mwachalale, Mwachalale Mwanzini	F →	Langoni B
B →	Ya kati	G →	Kisima Mlevi
C →	Popo A (Mambo Sasa)	H →	Ya Serikali
D →	Popo B	I →	Mwenge
E →	Langoni A	J →	Kwagoa
		K →	Kitundu

Institution

The Bumbwi Sudi scheme has 469 registered members (204 male, 265 female) and it is managed by an executive committee and eleven sub-group committees. The executive committee is made up of a chairperson, vice-chairperson, secretary, treasurer and 18 members. All the members of the executive committee are leaders (chairperson & secretary) of the sub-groups. Each sub-group committee is made up a chairperson, secretary, treasurer and 2 members. There are no sub-committees. Elections are not held regularly, and are dependent on the current leaders' performance. All leaders are selected by secret ballot. By-laws and regulations have been adopted³, and most farmers know them.

The exact number of members in each sub-group is unknown. A sub-group may have up to 80 members. There is no established membership criteria. A farmer who owns land, pays the 400/- water fee and follows the group's regulations will gain entry.

The Bumbwi Sudi Valley irrigation group is not registered. However, the group's intentions are to register as an association. There is no specific reason for selecting to register as an association, aside from the previous bad experience with a cooperative. The participants were unable to state the main differences between a cooperative and an association.

Activities

There have been no general meetings so far. The executive committee meet twice a year, before the start of the season, while the sub-group committees meet quarterly. All executive committee meetings are documented. Sub-group committees do not keep minutes, but individuals may write down minutes for their own record. The attendance to sub-group committees (80%) exceeds that of the executive committee (55%). The main issues discussed in these meetings include: water shortage, the status of the pump (working or not working), drainage problems, broken/damaged structures, incidences of illicit tapping, poor participation in operation and

³ The penalty for livestock grazing on crops is 10,000/-. If a farmer does not want to cultivate his/her farm, s/he is obliged to lend it to someone else to cultivate for that season.

management, pests & diseases, any amendments to by-laws and regulations, farm input supplies for the following season. Demoralised by water shortages, it has been difficult to encourage a more active participation of farmers in meetings. Farmers pay less attention on issues discussed, and some issues remain unsolved even after several discussions.

There is neither a registration fee nor an annual/monthly membership fee. However, each farmer is obliged to pay a 400/- water fee every season⁴. This fee is collected by a revenue collector of the central government. There is a high rate of default on payment of this fee. Only 150 (32%) farmers paid the water fee in 2002. The penalty for those who do not pay this fee is that a farmer is not allowed to irrigate their farm, and they may not even be allowed to cultivate it. In other sub-groups, contributions are collected only when the need arises and never exceeds 500/- per farmer. The money collected is usually spent during for maintenance activities. Neither the executive committee or the sub-groups have opened a bank account. Each sub-group has established its own book-keeping procedures.

The Bumbwi Sudi Irrigation Group have been recipients of training in paddy production, pest management and manure preparation:

- In 2003, (January, for 2 weeks) 2 men and 2 women attended a training course on the subject of Manure Preparation at the Mkindo Agricultural Institute (Morogoro).
- In 2002 (December) 1 man and 2 women attended a training course at the Mkindo Agricultural Institute (Morogoro).
- In 1998, 1 person was sent to Indonesia for a course on how to improve agricultural production.
- In 1997, 1 man and 2 women attended a course on paddy production at the KATC (Moshi). A follow-up to this training was conducted in Bumbwi Sudi in 2002 (March-June).
- The Irrigation Dept carries out training on paddy production at Bumbwi Sudi. Three groups are receiving this training, with a total of 28 women and 28 men.
- FAO has conducted training on pest management in paddy production

The participants identified and prioritised future training requirements as: management of groups & leadership, paddy production, pest management, operation and maintenance, financial management, uplands crops production.

Organisational Analysis

Bumbwi Sudi water source for irrigation is expensive one, requiring the use of electricity to operate the 12 pumps. The expenses and maintenance requirement of pumps put the scheme at a comparative disadvantage from other schemes which use river-water for irrigation. The already high cost of electricity in Tanzania recently experienced a massive increase. Farmers were insistent that they could not bear the cost of electricity bill for all the pumps⁵, requesting a continuation of the present

⁴ Those farmers with plots on areas where the pump does not work, do not pay the water fee. Only farmers belonging to associations A, D and H are required to pay the water fee and collect extra expenses each season (e.g. 500/- for engine oil).

⁵ One participant stated that most farmers could not afford to pay their home's electricity bill. Based on this experience, he maintained that it would not be possible for the irrigation group to pay for the pump electricity bill.

arrangement in which the government provides electricity free of charge. This is bound to exacerbate the dependency of farmers on the government, and may eventually affect the sustainability of the scheme.

The sustainability of the scheme is also at risk 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 itself and the irrigation infrastructure. No fees are collected, except for the water fee paid to the government. The workshop participants indicated that they plan to register as an association. On the other hand, they indicated that the difference between the organization and the cooperative is not known. These two statements are examples of the farmers lack of vision of their future organisation. Despite the fact that Bumbwi Sudi scheme has been in existence for almost 20 years, its members have not made arrangements for its registration, to open a bank account, neither have they drafted a constitution or established effective by-laws⁶. This indicates the weaknesses in the organisation and leadership of the group. However, there is potential in Bumbwi Sudi for improved organisation. Farmers have vast experience in organising communal as well as group ventures, such as the Women's Agriculture Cooperative Society and the Cooperative Society for Milling Machine, both of which are registered.

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

Regulation of O & M

All the pumps, except for Kwagoa pump, are no longer run by diesel⁷. The government has since connected the pumps to electricity, and is paying the electricity bill. The 'J' sub-group members purchase fuel communally for their pump. Each sub-group holds a meeting in which the start and finish dates for irrigation are decided. Two pump operators have been assigned to each pump (government employees). The pumps are operated over 11 hours every day. The first pump operator works from 6am to 12pm. The pump is switched off for an hour, and then the second pump turns it on again from 1pm until 6pm. Each block is irrigated approximately 2-3 days. A representative of each block operates the field canals.

Farmers are involved in regular maintenance: cleaning the pumps, de-silting and clearing the canals, bank forming, repair of canal structures and cleaning the drainage canals. All maintenance work is communal and takes every cultivation and whenever the need arise during the season. There are always a few farmers who don't participate in the set maintenance work, but there are no persistent offenders. The penalty is a fine of 500/- and no water. The main problems of canal maintenance include: livestock keepers contribute to damage of canals; floods during heavy rains destroy bunds (Popo B, Kitundu, H); drainage system is poor (Langoni, Kisima Mlevi). Pump maintenance is the responsibility of the pump technician (a government employee, resident in the village) and is conducted after a specific number of running hours. The main problems faced by the pump technician is the

⁶ The penalty for those who default on their membership fee is to not be allowed to cultivate. This is not a realistic penalty and has never been implemented.

⁷ Previously, fuel for the pumps was purchased communally.

lack of spare parts⁸. There is no budget for maintenance work, but farmers contribute to maintenance costs when the need arises. This contribution does not exceed 500/- per farmer. In 2002, 2 such contributions were collected.

Regulations have been drawn up specifically for times when water is in absolute shortage. Farmers are obliged to reduce the area cultivated and the distribution schedule is revised⁹. Other farmers are encouraged to farm other crops so that those left farming paddy can receive enough water. It should be noted that during the dry season, in those farms where the pump is not working, no one cultivates.

Situation of O & M for Facilities

Eight out of the eleven pumps are at present not functioning. The first pump to break down was Popo A in 1995. Then followed Langoni A, Langoni B, Kisi ma Mlevi, Mwenge, Kwagoa and lastly Mwachalale in 2002. In some cases, it is the borehole which collapsed first, and the pump which subsequently breaks down due to non-use or no maintenance.

Pump	H	Pop o A	Pop o B	Kitu ndu	Mw achalale	M/ Mw anzi ni	Ya kati	Lan goni A	Lan goni B	Kisi ma Mlevi	Kwa goa	Mw enge
Not Functioning		✓			✓		✓	✓	✓	✓	✓	✓
Borehole collapsed		✓		✓				✓		✓		✓

Reasons cited for the break down of these pumps include the scarcity of spare parts (due primarily to the age of the machinery). This is the explanation given to the farmers by government-employed pump technician. The borehole collapse is blamed on poor workmanship and inappropriate design.

Participants also identified further problems with the irrigation facilities. Some of the boreholes (where the pump is functioning) do not have enough water to satisfy demand. Participants suggested that a survey be conducted to assess where there is more water in order to drill more boreholes. Many of the canals that were previously lined have been worn out and cement has been washed away. In these canals, as well as in traditional canals, there is a very high rate of seepage. Water is also lost through leakage where canals have developed¹⁰.

Pump	H	Pop o A	Pop o B	Kitu ndu	Mw achalale	M/ Mw anzi ni	Ya kati	Lan goni A	Lan goni B	Kisi ma Mlevi	Kwa goa	Mw enge

⁸ These were manufactured in the 1970s, and these models are no longer being produced.

⁹ Those who haven't paid their water fee are the first to be denied water.

¹⁰ In Popo B, tree roots have spread under the canal and are creating cracks in the canal. Two of the gates are broken, so the water level does not rise.

Floods	✓	✓	✓	✓				✓	✓	✓		
Canals cracked or worn out		✓	✓	✓					✓			✓
Canals not lined	✓					✓						

Conflict over Water

Participants expressed their dissatisfaction with the present water distribution. Water scarcity is experienced even during the short rains (Sep/Oct) and regulations have been established for times of water shortage. Downstream farmers are usually warned in advance that they may not receive water and are encouraged to farm crops other than paddy¹¹ or not to farm at all. If a sub-group feels unable to solve the problem internally, the executive committee is called on to mediate. To-date, government assistance with the matter has not been sought. Emergency meetings are convened to discuss an alternative irrigation timetable and the procedure on how to deal with those farmers who destroy canals in order to divert water to their crops. In 1997-1998, approximately 15 farmers were fined 500/- and the temporary confiscation of their farm.

The Bumbwi Sudi farmers are in conflict with the local livestock keepers. The crux of the issue is that when cattle are watered and/or grazed near or on the farms, the cattle trample on and damage the canals. This problem is more common during the dry season, and some livestock owners wait until nightfall in order before taking their cattle out to graze. At present, the situation has reached such level of gravity that the police have been contacted and the farmers are considering organising a security rota within the affected irrigation group(s). Participants insisted that they did not require government mediation as yet, preferring to handle the matter locally. Any fines (10,000/-) that are collected are used towards operation and maintenance expenses.

Proposed Rehabilitation of Irrigation Scheme

The participants insisted that they require the government's support in order to rehabilitate the irrigation scheme. Their request includes a detailed survey to find where there is a lot of water where new boreholes can be dug, canal lining for those that have been worn out, construction of drainage canals (and provision of equipment), the purchase & installation of new pumps, repair of collapsed boreholes; the development of a rainwater-harvesting system to collect water which can be used during the dry season; rehabilitation of roads. The farmers on their part will organise themselves and participate voluntarily in the construction activities, assisting technicians. Whenever possible, they are prepared to contribute towards the purchase of materials.

¹¹ Particularly in Popo and Mwenge, where there is a high evaporation rate. Alternative crops include maize and legumes.

Possible Future Constraints based on Past Experience

There is currently a high dependence on the Central Government. The government's involvement in the running the scheme is very high compared to the other schemes on mainland Tanzania. The Government is, to-date, been paying the electricity bill for the irrigation pumps and the salaries of 24 pump operators, 11 agricultural extension officers and a site supervisor. Additionally the Government also used to supply seeds to farmers free of charge. It is only recently that farmers are obliged to purchase them, and this is a sour point. Furthermore, all fertilizers are subsidized by the Government (purchased at 15,000, and sold at 9,000 by the government). It is quite possible for the farmers to select one or two members from the farmers group to be trained on pump operation.

The farmers were very reluctant to take over the responsibility of paying for electricity (which would require a contribution of 1,000/- as opposed to the 400/- currently paid as the water fee. Farmers feel unable to cover this cost due to their low living standard and income. However, this reluctance seems to go beyond their financial capacity and lies more in the past government policy, which seems to have inculcated in farmers a sense of inferiority and willingness to be led (by the government, by donors etc). For future sustainability the Government has to reduce its degree of involvement and take on a more supervisory role with regards to the scheme, providing technical support and advice when required. One may be tempted to say that villagers are not yet empowered to take some of the scheme operation responsibilities and become self-reliant. In order to achieve that, empowerment approaches such as PRA are necessary. Farmers' current lack of ownership of the scheme can be traced back to the design/construction stage of the scheme in 1979. At the time some farmers were employed in construction activities, but farmers did not participate in the planning or design. Before any expansion of the scheme, it is vital to hold consultation with all stakeholders, so that the end product is considered to be.

GENDER ISSUES

Zanzibari society is akin to that of African Muslim societies. The head of the household is the man the main decision-maker in the family. Women are placed under the protection of their men-folk (father, brother or husband). Women are not supposed to frequent public places, and as such it is usually men who go to market to purchase food. Therefore, it is men who manage all the money in the family, by purchasing household items and selling crops after harvest. The interaction between men and women at the workshop revealed women's lack of confidence to speak up in public, particularly in front of other men. Additionally, conflict over income is also especially high at Bumbwi Sudi.

In agricultural work, men and women participate equally in those activities undertaken jointly. Men are more likely to clear the fields themselves. The most probable reason for this is that this activity requires physical force due to the dense vegetation. As stated earlier, women are normally not allowed to apply fertiliser or agro-chemicals. Many men are formally employed or undertake income-generating activities outside of farming. They may participate at several stages (such as those as stated above) of the farming cycle. However, it is the women who are continuously involved in and primarily responsible for agriculture throughout the year. Activities

that are more likely done exclusively by women are irrigation, post-harvest tasks and farming of sweet potato. Children help out during the school holidays and weekends during busy periods of transplanting, weeding and harvesting. In the domestic sphere, traditional division of labour remains, and women are responsible for a large workload in their homes.

Under Islamic law, women inherit land from their parents or their husband, but usually they are allotted the smallest parcel. In Bumbwi Sudi, few women own land by inheritance. Within the scheme, women are given a ¼-acre plot. Women may apply to the central government¹² for land, but many of the female participants seemed to be unaware of this procedure. More commonly, women will borrow land from another farmer who does not want to cultivate it

There are 265 female members of the scheme, constituting 56% of the scheme membership. The focus group discussion revealed that women are more likely to attend meetings, stating that they are their household's representative in the scheme. However, based on their participation at the workshop, it can be argued that these meetings are probably run a few dominant (male) personalities. Another indicator is the scarcity of women in leadership positions, only the secretary of sub-groups J, B and F is a woman. However, women are involved in training when the opportunity arises. In 2002, 8 women and 12 men took part in a study visit to Chejuu and Kiboko village.

Advantage and Disadvantage to Gender by Development Activity

Bumbwi Sudi women are involved in the decision-making and some women in the irrigation group are leaders. The involvement of women in the decision-making has had a positive impact on the agricultural development activities as it increases participation. Unlike Chaani where women's participation is marginal, Bumbwi Sudi women are at the forefront in all meetings of the group, in most cases representing their husbands. However women lamented that they do not have access to the farm income, which men keep on the basis that women are not careful or responsible enough to handle money. The inaccessibility of women to money can have consequences on the health and development of the family, is a source of tension and mistrust. The conflict over income is almost always a manifestation of conflict over labour, in this case the labour of women. The dominance of men over farm income (which is earned by both) demoralises their wives to participate heartily in the farming activities.

SUPPORT FROM THE GOVERNMENT OF TANZANIA

The VENN Diagram methodology was used to determine the importance of each of the elements 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 will impact on

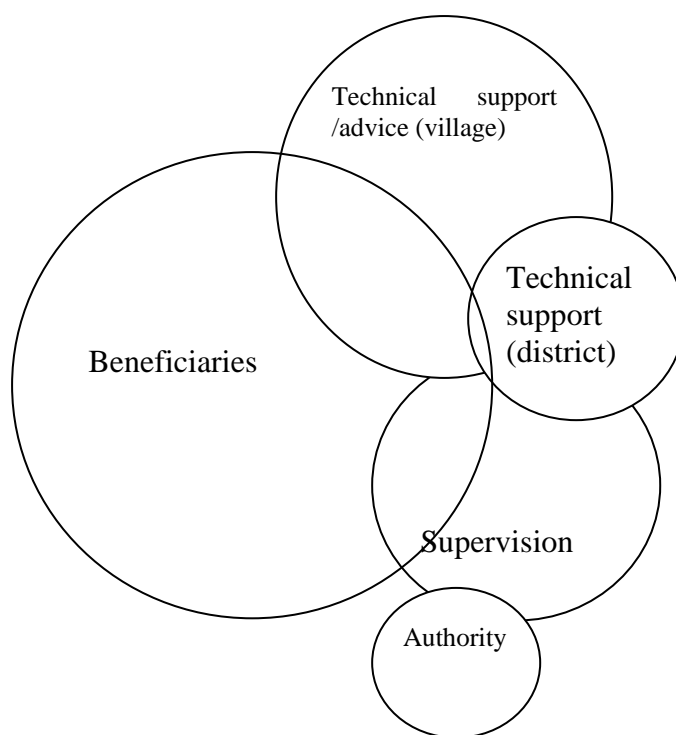
¹² By application to the Sheha.

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

Beneficiaries (/Implementers):	Farmers
Technical expertise/advice (village):	Agricultural Extension Officers (11), Site Supervisor (1), Pump Technician (1), Pump Operators (24)
Supervision:	Sheha ¹³ , Councillor
Technical expertise (district):	District agricultural officer, Regional agricultural officer, Natural Resources office (district), Livestock office (district), Water office (for drilling wells), Dept of Agriculture and seed research, Head of Irrigation
Authority/nguvu ya dola	Regional commissioner, District commissioner, District Administrative Secretary, Councillor, MP, Sheha, Member of the Zanzibar House of Representatives

The figure below indicates the interaction between the farmers and the persons/institutions in their support system, at different levels of government hierarchy. The technical support staff resident in the village are the most crucial individuals to the agricultural/irrigation activities in Bumbwi Sudi. These, and more specifically the site supervisor, form the channel of communication between the farmers and the district level. Direct interaction between the farmers and the district technical support is occasional. The Sheha and Councillor perform the function of supervisors and mobilisers. The Sheha emerged as playing the more active role in this group, mainly as a mediator in village matters and channel of communication between the District Council and the farmers.

¹³ A Sheha (in Zanzibar) occupies a similar position to the Chairperson (in mainland Tanzania). The main difference is that a Sheha is usually an elder of the village appointed by the District Commissioner to be a liaison between the villagers and the district office and to mediate on problems in the village. The village chairperson on mainland Tanzania is elected by the community. A Sheha is assisted in his work by the Sheha's committee, which is the equivalent of the village government in mainland Tanzania.



Communication

The agricultural extension officer (of which there are 11 in Bumbwi Sudi) and the site supervisor¹⁴ are the main points of reference for the farmers. The agricultural extension officer is a source of advice and technical support and a liaison between the district agricultural office and farmers. Farmers approach the agricultural extension officer on matters relating to seed quality and preparation for cultivation. If a matter is beyond the capacity of the agricultural extension officer e.g. a severe pest problem, s/he will contact the district office. Communication is frequent and satisfactory and can be initiated by either party. In matters that concern rain-fed areas, the communication chain will normally involve the Sheha. The site supervisor occupies a similar position vis-à-vis the farmers. S/he is in charge of all irrigation facilities and serves as a direct communication link between the Department of Irrigation (ministry level) and the irrigation group. All government employees (pump operation, pump technician) report to the site supervisor. Farmers and the site supervisor communicate frequently either in the village, at his/her office or in the field¹⁵. Subjects discussed with the site supervisor relate in one way or the other to irrigated agriculture: the status of the pump, hire of the tractor and use of farm inputs. Farmers are very satisfied with the performance of the site supervisor.

As explained above, the Sheha is the government's representative in the Shehia¹⁶. The Sheha is usually an elder man who is respected by the community. His key role is to convey the village's problems to the district and to convey back the district's response or announcements. The Sheha also plays a crucial role of mediation in

¹⁴ A new system is in effect in Zanzibar since 2002. A Subject Matter Specialist (SMS) in Irrigation has been appointed to each district. S/he will be responsible for irrigation and agriculture and will liaise with the site supervisor, the Sheha and the district agricultural officer.

¹⁵ The site supervisor is also a farmer and member of associations H and D.

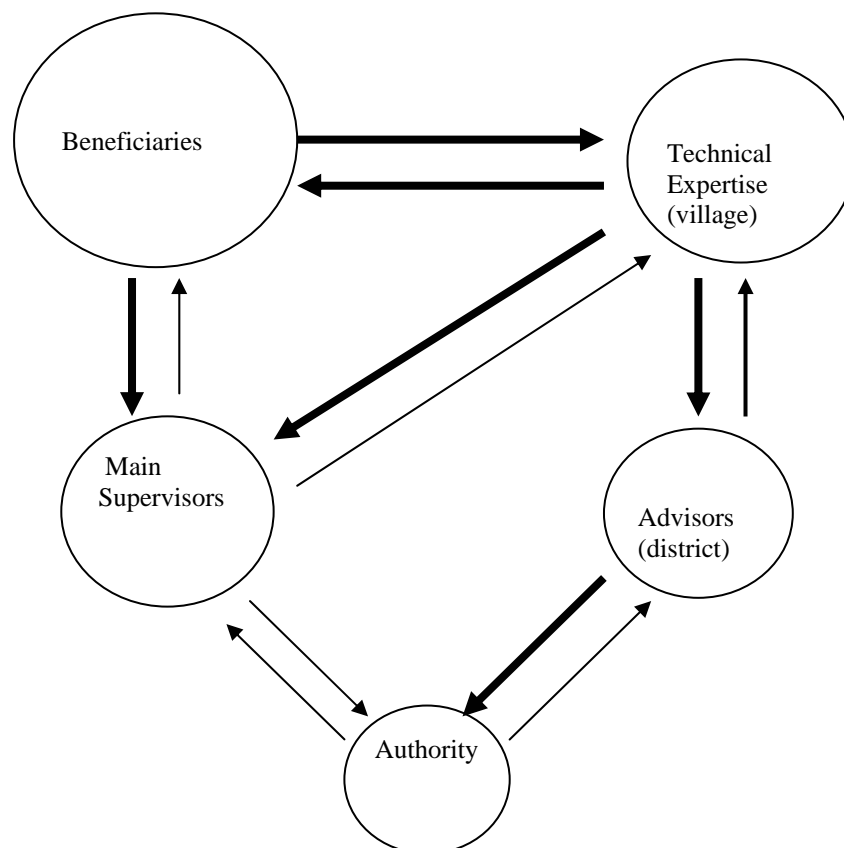
¹⁶ A group of 3-5 neighbouring villages.

conflicts that occur in the village and is invited to attend group meetings¹⁷ when any conflicts arise or if there is a guest. At present, the Sheha is particularly involved in the farmers' dispute with livestock keepers. Participants stressed the efforts of the Sheha to assist them and follow-up their requests in the past.

There is very little direct communication with the district agricultural development officer (DADO). Usually, communication is channelled through the Sheha, councillor or site supervisors. Frequency of communication is based on need, usually when the agricultural extension officer or site supervisor are not able to solve a problem. Issues that require support from the DADO include tractor hire, crop diseases, pests and destructive animals/birds. The DADO's performance is deemed satisfactory by the participants. She/he responds promptly to farmers' requests and inquiries. However, it was felt that the DADO did not visit the village often enough. It is difficult to make an appointment at his/her office, and transport is expensive.

Other actors in at the district level received a less favourable ranking. Participants were not happy with the Department of Agriculture and Seed Research for failing to provide them with good seeds. The Natural Resources officer and Regional agricultural officer have never visited the village. The same verdict was given for the actors listed under the heading 'Authority'. Their communication link with the farmers is the Sheha and the Councillor.

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



¹⁷ The Sheha in Bumbwi Sudi is also a farmer and a member of the irrigation group. He may also attend meetings in his capacity as a group member.

RECOMMENDATIONS

It seems the farmers cannot afford to purchase diesel for operating the pumps. Bumbwi Sudi and Nyakasungwa pump schemes have both experienced this problem. The cost involved exceeds the income or affordability of the target group. It is wise to look into alternative sources of energy, for e.g. solar energy and windmills, to replace the use of diesel. The technology used does not match with the financial capacity of the users. The Bumbwi Sudi case will be repeated where the Government pays for the electricity.

The communication between farmers and the authorities is done through the site supervisor residing in the village. The farmers are satisfied with this arrangement but would like to see more of their leaders from the District and Region. It is recommended that the authorities should include several visits a year to their constituencies. During the workshop the participants showed high expectation and dependence on Government assistance. The farmers cited a shopping list of requests from the Government with little contribution from the farmers, aside from their labour. The farmers should be encouraged to take a lead and help themselves. This can be achieved by adopting the use of empowerment approaches and training in leadership and management.

Land use planning should be executed by the District office to allocate a specific area for livestock grazing. This will minimize the existing conflict between farmers and livestock keepers. The extension officer/field Supervisor in collaboration with farmers should develop a farming calendar to be strictly followed by farmers. This is particularly important for the planting period. By doing so the conflict over water uses will be minimized.

Farmers should open a bank account, where they will deposit money, which will be used to operate and maintain the irrigation infrastructure. The 400/ water fee paid to the District should be kept by farmers group and deposited in their bank account. This will help the farmers to have adequate cash-flow with which to run the facility. The average farmers' income is so low, and does not allow for the accumulation of enough funds necessary for operating the irrigation system.

As in other irrigation schemes, Bumbwi Sudi farmers do not know the difference between association and co-operative. It is recommended that the expert of both association and cooperative should be invited to talk to the farmers on the advantages and disadvantages and of both types of organisation. It is also necessary for the Dept. of Irrigation of Zanzibar to adopt a stance on which type of organisation it will recommend that farmers follow.

Storage facilities are one among many factors which force farmers to sell crops at gate farm consequently low prices. It is recommended that a warehouse is constructed by the farmers with some support from the Government to store the crops so that the farmers can sell their crops when the market price is high. The government should also look into the possibilities of securing a market for the farmers agriculture outputs.

Farmers should organise themselves, with the assistance of the agricultural extension officer, and communal rehabilitate the farm roads.

In order to disseminate information and educate the farmers on the group's by-laws, deliberate efforts should be made by the group leaders in collaboration with the extension staff, to organise farmers' meeting to discuss the by laws.

To reduce high water seepage in the canal, it is recommended that the drainage canal should be constructed.

The paddy cultivated is of low quality because of the poor quality of the seeds used. Due to this problem the paddy produced does not fetch a good market price. It is recommended that the government should intervene to help the farmers to obtain better seeds.

In order to mitigate any negative effects on women, it is recommended that a study be conducted to produce a Gender Profile of Zanzibar. Findings from this study should be considered during any instances of assistance to the schemes. Furthermore, all government staff should attend a gender-awareness training course.

Annex 1: Registration

Observers

	Name	Position	Office
1	Mchenga Mchenga	A. Msaidizi Mkuu wa Kitengo (Mwambata wa Mtaalam wa Umwagiliaji na Matumizi bora ya Maji)	Division of Rice and Inputs of Zanzibar
2	Kadir Ali Kalir	Bumbwi Sudi Site Supervisor & Technician	Bumbwi Sudi Irrigation Site under Division of Rice and Inputs of Zanzibar
3	Shaaban A. Shaaban	Head of Rice Cultivation and Input	MANREC
4	H. Ohnuma	ZIMP JICA Study Team	JICA
5	T. Kuroda	ZIMP JICA Study Team	JICA
6	M. Osada	ZIMP JICA Study Team	JICA
7	S. Matsushima	ZIMP JICA Study Team	JICA
8	R. R. Komanga	Sociologist	MAFS Irrigation

Participants- Day 1

	Name	Occupation	Irrigation Group
1	Jacob John	Farmer	Field 7 (G)
2	Emil Kunambi	Farmer	Field 7 (G)
3	Ramadhani Jaribu Nyanza	Farmer	Field 1 (K)
4	Hamid Said Chorogwe	Farmer	Field H
5	Paulo Mogi	Farmer	Field B
6	Adam Khamis Othman	Farmer	Field K
7	Wahida Hassan	Farmer	Field C, H
8	Yusta Claus	Farmer	Field 7 (G)
9	Kadiria Mnyeji	Farmer	Field 3 (A)
10	Iddi Khalfan	Farmer	Field 7 (G)
11	Subira Kamola	Farmer	Field B
12	Asha Maridadi	Farmer	Field D
13	Asha Rudosa	Farmer	Field A
14	Suna Msafiri	Farmer	Field A
15	Omar Hussen	Farmer	Field D
16	Shaaban Manyanda Mlobeji	Farmer	Field A
17	Abdul Aziz Nahoda	Farmer	Field 2 (D)
18	Malik Juma	Farmer	Field A

19	Catalina Maiko	Farmer	Field A
20	Asha Omar	Farmer	Field C

Participants- Day 2

	Name	Occupation	Irrigation Group
1	Suna Msafiri	Farmer	Field B
2	Wahida Hassan	Farmer	Field C
3	Asha Omari	Farmer	Field K
4	Catalina Maiko	Farmer	Field H
5	Omar Hussien	Farmer	Field I
6	Iddi Khalfan	Farmer	Field J
7	Kadiria Mnyaji	Farmer	Field A
8	Shaaban Manyanda Mlobeji	Farmer	Field A
9	Asha Rudosa	Farmer	Field A
10	Jacob John	Farmer	Field J
11	Emili Kunambi	Farmer	Field J
12	Hamid Said	Farmer	Field H
13	Asha Maridadi	Farmer	Field D
14	Abdul Aziz Nahoda	Farmer	Field D
15	Adam Khamis Othman	Farmer, Treasurer	Field K
16	Ramadhani Jaribu Nyanza	Farmer, Chairperson of IG	Field K
17	Subira Kamola	Farmer, Secretary	Field B
18	Paulo Mogi	Farmer, Chairperson	Field B
19	Yusta Claus	Farmer, Secretary	Field J
20	Malik Juma	Farmer	Field A

Annex 2: Workshop Schedule

Day 1

Registration of participants
Introduction game 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
Closing
Group picture
Lunch

Annex 3: Workshop Evaluation

- ☺ to get time to sit together and share experiences/ideas
- ☺ to know problems that farmers experience
- ☺ hope that we will receive assistance in improving agricultural activities
- ☺ methodologies used in the workshop were easy to understand
- ☺ pleased that donors were present at the workshop
- ☺ happy with workshop proceedings

- ☹ despite efforts of farmers and agricultural extension officers, crop production has not increased
- ☹ not given transport allowance on day 1

Annex 4: Mapping

Ramani ya rasilimali za mradi wa umwagiliaji ionyeshe taarifa zifuatazo:

- a. mipaka ya kijiji
- b. kilimo cha umwagiliaji kinafanyika wapi?
- c. Maji ya umwagiliaji ni yapi na yamegawanywa kivipi?
- d. mifereji ya umwagiliaji
- e. vitaro vya mashamba na mmilikaji (kikundi au mtu binafsi)
- f. eneo la kilimo cha mvua
- g. eneo la umwagiliaji
- h. banio
- i. mifereji ya umwagiliaji
- j. mlango, vifaa na miundo-mbinu vya umwagiliaji
- k. eneo lote kulimika
- l. 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 mlielezea 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
Clearing farms	✓	✓			✓	✓					✓	✓					✓	✓						
Purchase of farm inputs			✓						✓		✓								✓					
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												
Destructive animals/birds												
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

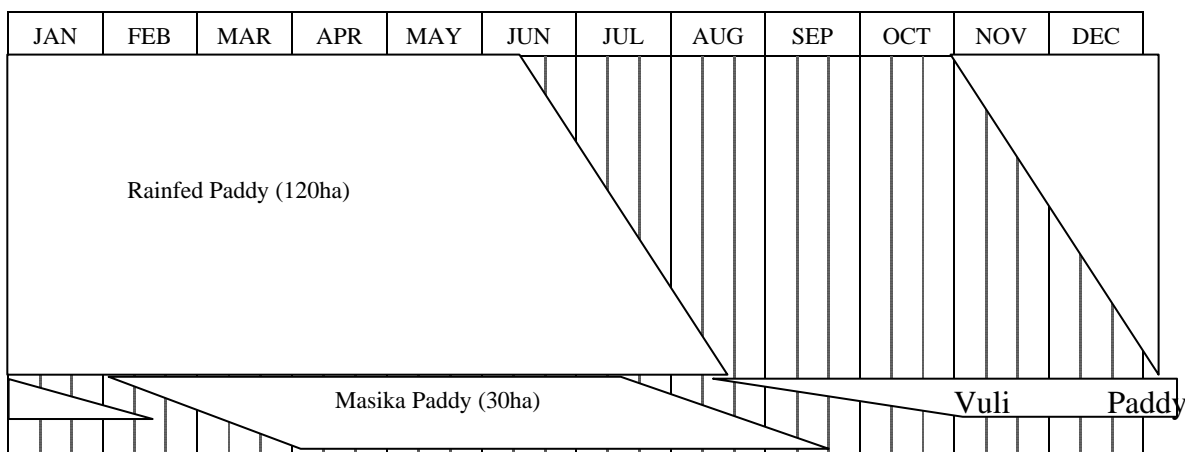
Item	(Area in ha)
Total Number of Household	469 Household
Total Farm Land (only low land)	560
Total Cultivated Area and Fluctuation (only low land)	150
Rainfed Area	120
Irrigated Area	30
Potentially Irrigable Area	560

- 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	120	2.4	30	3.7	15	2.7
(2) Cowpea	3	1.0				
(3) Maize	1.5	2.0				
(4) Cassava	↑	2.5				
(5) Sweet Potato	↓0.4ha/family	2.5				
(6) Banana		200 bunch				

- Farming Calendar and Cropping Pattern

Wet season Paddy (Masika)	from	Feb-Mar	to	Jul-Aug
Dry season Paddy (Vuli)	from	Sep-Oct	to	Jan-Feb
Upland Crops				
1. Rainfed Paddy	from	Nov-Dec	to	Jun-Jul
2. Cowpea	from	Jun-Jul	to	Sep-Oct
3. Maize	from	Mar/Oct	to	Jul/Jan-Feb
4. Sweet Potato	from	Jun-Jul	to	Sep-Oct



- Land Ownership Situation and Problems

Low land for paddy was distributed by the government at the rate of one acre/family. Upland was originally distributed by the government and inherited since then.

Usually one family owns one acre of low land field and one acre of upland field and one acre of low land is divided into 1/4 acre of irrigated land and 3/4 acre of rainfed paddy.

- Farm Size Distribution (No data)

- Major Constraints in Crop Production, Input Supply and Marketing

Problems/Difficulties	Notes
Tractor cannot be obtained at appropriate time specially for rainfed field.	Tractors are available from government or private owners through association.
Late sowing/transplanting due to unavailability of tractors on time.	Poor yield according to late sowing/transplanting and also to the climate condition.
Water shortage in the irrigation field due to poor pump operation and canal maintenance.	
Weeding for rainfed paddy field.	Weeding is usually carried out by hand
Fertilizer is used for both irrigated and rainfed paddy but is very expensive in spite of government subsidy.	
Seed purity problem.	Most farmers are using their seeds from their previous crop. There is no proper system of certified seed multiplication and distribution.
No facilities are available for the storage of farm products.	
No sufficient market for the sale of paddy due to high amount of imported rice.	

- Major Significance for the Introduction of Irrigation System

To perform perfect double cropping for their food security rather than to improve their cash income.

Farmers Supporting System

- Post Harvest

Crop	Harvest Method	Storage Method	Storage Facility
Paddy	By hand	Bags in room	No
Other crops	By hand	Just sell	No

- Marketing and Prices

Crop	Market Channels	Farm Gate Price (low/high) in Tsh/kg	Season (low/high)
Rainfed Paddy	Retailer/Consumer	120/160	Jul-Aug/Dec-Jan
Irrigated Paddy	Retailer/Consumer	100	-
Cassava	Middleman	60	-
Sweet potato	Middleman	10	-
Banana	Middleman	1,500/bunch	-

- Input Supply

Kind of Input	Obtained from where	Purchasing Method	Availability and Source of Loan	Availability of Subsidy
Certified Seed	↑	Cash	No	-
Fertilizer	Agriculture	Cash	No	5%
Chemical	Section	Cash	No	-
Machinery	↓	Cash	No	50%
Others ()				

- Extension Service

1) Are you a member of any organizations or cooperatives?	Yes
2) Which organization provides you with technical assistance?	MANREC
3) How frequently do you have technical assistance?	Anytime
4) What kind of support do you get from them?	Farming inputs/Technical knowledge

- 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 members)

- Farm Income

(1) 0.1 ha Irrigated Paddy:

Masika 0.1ha x 3.7 t/ha x 1,000 kg/t = 370kg → consumption

Vuli 0.1ha x 2.7 t/ha x 1,000kg/t = 270 kg x 100Tsh/kg = 27,000Tsh

(2) 0.3 ha Rainfed Paddy

0.3ha x 2.4t/ha x 1,000kg/t = 720kg – 360kg for consumption = 360kg x 120Tsh/kg = 43.200Tsh

(3) 0.4 ha Upland Crops

0.3ha Cassava: 0.3ha x 2.5t/ha x 1,000kg/t = 750kg – 180kg for consumption = 570kg x 60Tsh/kg = 34,200Tsh

0.1ha Sweet potato: 0.1ha x 2.5t/ha x 1,000kg/t = 250kg – 125kg for consumption = 125kg x 10Tsh/kg = 1,250Tsh

- Production Cost

(1) Irrigated Paddy (0.1ha)	Land clearing	3,000
	Plowing and harrowing	8,500
	Transplanting	()
	Weeding	()
	Fertilization	6,500
	Bags	800
	Harvesting and Threshing	()
	<u>Transportation from field to home</u>	<u>1,600</u>
	Total	20,400
(2) Rainfed Paddy (0.4ha)	Plowing and harrowing	18,000
	Broadcasting	()
	Herbicides	34,000
	Fertilization	18,000
	Bird Scaring	()
	Bags	2,000
	Harvesting	(Ujima)
	<u>Transportation from field to home</u>	<u>4,000</u>
	Total	76,000
	For 0.3 ha	57,000
(3) Upland (0.4ha)	Ridging	(50,000)
	Planting	()
	Weeding	(20,000)
	Harvesting	()
	Transportation from field to home	4,000
	Transportation from home to market	4,000
	Unloading	6,000
	<u>Permission for sale in market</u>	<u>150</u>
	Total	14,150

- Expenditure

1,500 Tsh/day x 30 days/month x 12 months/year = 540,000

- 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									
Irrigated Paddy		0.1	27			40			
Raifed Paddy		0.3	43			57			
Sub-total		0.4	70			97	-27		
Outside the scheme									
Cassava		0.3	34			14			
Sweet potato		0.1	1			0			
Sub-total		0.4	35			14	21		
Total	0.8	0.8	105		105+		-6	540	-546

RRA Report for the

Chaani Irrigation Scheme

13th February, 2003

Kibokwa Farming Station, Zanzibar

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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 Chaani Irrigation Scheme is a proposed water-harvesting scheme and involves 7 villages in north-eastern Zanzibar: Gamba, Ketwa, Kivunge, Chaani, Mibzini, Kandwi and Mkwajuni. The area that is cultivated is known as the Kibokwa valley. This area is divided into smaller valleys, of which nine are included in the commanding area which is north of Mawe river: Tanki la Maji, Kibokwa B, Mbuzini A, Mbuzini, B, Mbuzini C, Kisima Fedha, Kijambani 2, Mkelegeni and Machekechuni A.

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 focus group discussion on Women's Issues (see Annex 6 for probe questions) and Cultural practices and Customs (see Annex 5 for probe questions) 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 probe 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

Unlike the other RRA workshops, the workshop at Chaani was conducted over one day (see Annex 2 for workshop timetable). A religious holiday coincided with what would have been Day 1 of the workshop. In total, 21 farmers participated in the workshop. Of these, 6 were women. (see Annex 1 for registration list). Almost all the

participants were elders, as most farmers in the Chaani area are either older men or women. The few younger farmers present occupied a position of leadership within the group. The majority of the participants were also leaders in one of the 24 sub-associations at Chaani, including 7 chairpersons, 2 secretaries and 2 personnel of the Kibokwa Farming Station. Before the workshop proceedings began, a few workshop rules were drawn up: to be open and truthful and to be aware of the time constraint.

A major constraint in the group work was the high level of illiteracy among the participants. Many were unable to write up their presentations and required the assistance of the facilitators. The government officials of the Zanzibar Department of Irrigation were most helpful during the facilitation of the workshop. Except for the occasional contribution of a female chairperson, the six women present barely participated in the discussions.

SOCIO-ECONOMY

Land Tenure

The prevailing land tenure in the area is through inheritance in accordance with Islamic law. No land disputes were reported. On average a household will own 0.6 ha of lowland and 0.8 ha of upland. It is also possible to purchase or borrow land. The practice of borrowing land from an owner who does not want to cultivate it seems a common practice, which is unique to Zanzibar.

Farmers' Economy & Life-Style

All paddy and Cowpea are intended mainly for consumption. Therefore, farmers expect to receive income from the sale of cassava, sweet potato, banana and coco yam. However, a calculation of profit from these crops revealed that all four are cultivated at a loss to the farmer. There are no credit facilities available to farmers, making it difficult for them to obtain loans for investment in agriculture. Therefore, many farmers supplement their farming activities with other income generating businesses or employment. In Chaani, it seems to be the case that men and women pursue different income generating activities, women being responsible for agriculture. The seasonality diagram (refer to Annex 8) reveals that during the farming period for rain-fed paddy (Dec-Jun), there is no income and food scarcity reaches its peak in Apr/May. During these months, most farmers sell and consume their upland crops.

Cultural Practices

Participants reported that there are no customs or specific rituals related to agriculture that are conducted for the to improve agricultural production. The only practice that may precipitate food scarcity is the consumption of large quantities of food at feast and celebrations. There are no customary prohibitions that may impinge on the development of the commanding area.

Labour Force and Seasonal Demand for Labour

Agricultural activities are ongoing throughout the year. At times, the tasks of planting and harvesting coincide, and these tend to be the most demanding months of the year. All activities related to agriculture are undertaken by both genders. Female heads of household and married women who are exclusively responsible for farming undertake

activities that might otherwise be within the domain of men e.g. purchase of inputs. Children's involvement is concentrated between Apr-Sep. This period involves the planting of sweet potato, planting and harvest of cocoyam, banana and cassava (April), and the harvest of paddy and sweet potato, planting of cowpea and cassava (Jul-Sep). However, focus group discussion revealed that children's help is minimal, as they have to attend school during the week and religious instruction on the weekend.

AGRICULTURE

Cultivation Area

The total lowland area cultivated measures 250 ha. Of this, 200 ha are reserved for paddy, and cowpea is cultivated on the remaining 50 ha. Each household also cultivates cassava, sweet potato, coco yam and banana on approximately 2 acres of upland.

Crop Production

Farmers in the Chaani area cultivate paddy and cowpea in lowland areas and cassava, sweet potato, coco yam and banana in upland farms. There is only one paddy cropping during the rainy season. Crops such as cassava, coco yam and banana are harvested after 12 months. Participants stressed that an irrigation scheme will allow them to increase their income through double cropping of paddy and cultivating vegetables such as onion, tomato, potato and eggplant. Farmers are reluctant to continue producing spice crops because of the fluctuating farm gate price.

Farming Calendar

As stated earlier, the busiest times of the year range between Mar-May and Jul-Sep. However, agricultural activities are undertaken throughout the year. In March begins the planting preparations for sweet potato, coco yam and banana together with the harvest of cassava, coco yam and banana. Destructive animals start invading the farms in February, up until harvest in July. In July begins the harvest of the rain-fed paddy and sweet potato together with planting season for cowpea and cassava. Cowpea is harvested in November and paddy is planted in Dec/Jan, but as this is the only agricultural activity at this time of year. Extension services are available throughout the year, except during the months of Jun/Jul (refer to the attached farming calendar in Annex 7)

Farmers's Supporting System

Farmers purchase and use of farm inputs is continuous throughout the year. The practice common to other schemes of borrowing and lending money amongst each other does not occur here, and could explain why farm inputs are purchase/used 11 months of the year as they are purchased as the need arises. The central government subsidises fertiliser (sold at 9,000/- but purchased at 15,000/-) and machinery. All crops are harvested by hand using traditional tools, and stored in bags in individual houses. All crops are sold to middlemen. Extension services available are usually farm inputs and farming technicians.

Land Capability for Irrigation and Crop Suitability

The commanding area proposed for the irrigation scheme is all the farm land north of the Mawe river. This area encompasses 9 valleys: Tanki la Maji, Kibokwa B, Mbuzini A, Mbuzini, B, Mbuzini C, Kisima Fedha, Kijambani 2, Mkelegeni and

Machekechuni A. This area is currently rain-fed. 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.

Constraints in Crop Production, Input Supply and Marketing

The key constraints cited are grouped under the following headings:

Farm inputs are made available to the farmers at the Kibokwa farming station. There is a tractor available to rent. However, participants claim that the tractors, including private tractors, are insufficient to meet the demand. Some farmers fail to cultivate or cultivate by hand because the tractors have been overbooked. Fertiliser (TSP, Urea) is available to purchase from the government through a retailer. Many farmers are not able to afford to purchase fertiliser, agrochemicals. In many cases, farmer will sell livestock or crops in order to purchase inputs.

Farming implements. A lot of the agricultural work is done manually: clearing fields, tilling, weeding, protecting fields from destructive animals and harvesting. Participants claimed that using manual tools, such as the bush knife and the hoe, is very time-consuming and it is possible to till or weed a small portion of land at a time. Weed control was highlighted as particularly difficult. Given that the vegetation in Chaani is similar to that of Bumbwi Sudi, the dense vegetation can account for the difficulty in clearing and weeding. That many farmers are unable to afford herbicide, which is applied in Mar/Apr, can account for this comment.

Water scarcity is an issue from the very beginning of the season, due to unreliable rainfall. While growing seedlings, many farmers are obliged to use buckets and cans to manually irrigate their seedlings. Approximately 10 years ago, the farmers applied to MANREC (Ministry of Agriculture, Natural Resources, Environment and Cooperatives) for the development of a water-harvesting irrigation scheme using water from the Bwabwaja river.

Pests and crop diseases together constitute a problem over 10 months of the year. Bad roads make transportation of crops from the field to farmers' homes difficult. Farmers will either use a bicycle to transport sacks or carry the sacks themselves.

The lack of a secure market means that farmers sell their crops to middlemen, and thus have no control over market prices. Problems of marketing paddy were not discussed, as most paddy crops are consumed.

During the discussion on these constraints, a frequently cited solution to these problems was to form a group where farmers can organise and assist each other to clear fields, protect crops from destructive animals, rent a tractor jointly, apply for loan in order to purchase fertiliser and agrochemicals and to purchase cattle that can transport sacks from the fields.

FARMERS' ORGANISATION

Institution

The Kibokwa Valley Association of Farmers was formed in July 1998. It is first and foremost an association for rain-fed agriculture farmers. The Kibokwa Valley

Association of Farmers was registered in 1999 under the name of Ukweli Bora Association, with registration number 84. The decision to register as an association was influenced by the fact that the farmers prioritised the provision of services above profit. The association has a constitution, drafted in October 1998. The association has adopted by-laws, which are read out at every general meeting and therefore, only those members who do not attend the meeting do not know them.

The organisational structure is composed of an executive committee made up of a chairperson, vice-chairperson (♀), secretary, vice-secretary, treasurer and 7 committee members (one of whom is a woman). The executive committee is supplemented by 3 sub-committees: entitled Planning and Finance (1 female member), Management and Supervision of agricultural activities (1 female member) and Farm Inputs. Elections take place every four years by secret ballot and 2003 is election year. Each valley has its own farmers' group. There are 24 sub-associations. Each of these has a committee made up of a chairperson, secretary, treasurer and 4 committee members.

In total, the Kibokwa Valley Association has 350 registered farmers of whom 230 are men, and the remaining 120 are women. There are three types of membership, those founding members of the association (of which there are 18), late joiners (numbering 332) and valuable members (of which there are none as yet). Criteria for prospective members is that they are a farmer and agree to respect the regulations and procedures of the association. Tenant farmers are not allowed to register.

Activities

A general meeting is held once a year, with attendance of just above half the members. The executive and sub-committees meet monthly, while the sub-association committees meet whenever necessary. All meetings are always documented. A typical agenda will include a discussion of the evaluation of the previous harvest; plans for acquiring farm inputs for the next season (including booking the tractor¹); any problems related to agriculture; payment of membership fees, late planting, poor cooperation in the group activities and poor participation in operation and maintenance. Participants acknowledged that attendance and participation at the general meeting is poor. As a result, some issues remain unsolved even after being discussed on several occasions. Attempts to encourage increased attendance to the general meeting include conducting the meeting at the farm site. Additionally, the Sheha has been consulted and is assisting to mobilise farmers to attend the next meeting.

Members are required to pay a 200/- registration fee, and a 200/- annual membership fee. Both fees collected by the treasurer. However, there is a high rate of payment default, only 14% (50) of the farmers paid their fees last year. There additional contributions made to pay for special activities, but there have been none this year. The association has opened a bank account at the People's Bank of Zanzibar with a balance of 338,774.35 Tsh. The association prepares a monthly report and a financial report. These are reviewed by the cooperative and read at the general meeting. However, an annual budget has not been prepared.

Chaani farmers have benefited from various training courses at the Kizimbani Agricultural Training Institute. However, participants identified areas that require

¹ Booking the tractor requires a down-payment.

strengthening as paddy production, financial management, operation & maintenance, upland crops production and pest management.

Organisational Analysis

The Chaani group chairperson seems to be accepted by the group members and has reputedly been selected to lead the group. This implies that he is probably a good leader. However, the real test of his leadership will begin when the irrigation scheme is operational. The same applies to all the sub-associations. Based on the experience so far as an association of rain-fed farmers, there is good potential for the future management of the proposed irrigation scheme, which can be strengthened with appropriate capacity building. The main areas that require improvement include drawing up a budget, mobilising farmers to pay their membership fee, paddy production training for farmers without such experience.

The Kibokwa Valley farmers are experienced in organising themselves for communal work, for the construction of the school and dispensary, and for income generating activities. Both men and women supplement their income from agriculture with other businesses including upland agriculture, food-processing, livestock keeping, sale of coconuts and pineapples. Some have already registered themselves as a cooperative. Indeed, the proliferation of so many small businesses confirms the fact that paddy is cultivated at a loss. What remains to be strengthened is farmers', and in particular women's, participation and activeness in the association.

O & M FOR IRRIGATION AND DRAINAGE FACILITIES

Regulation of O & M

The Chaani Irrigation Scheme remains in a proposal stage. There has been no design or construction of permanent infrastructure. Currently, farmers have been diverting water directly from Bwabwaja river using traditional materials (coconut logs and iron sheets) to block and divert water. This form of irrigation is possible for farms that are alongside the river or those adjacent to these farms, as water flows from one plot to the next². A few farmers have built traditional canals to convey water to fields that are not alongside the river. Individual farmers are responsible for the maintenance of these canals.

Situation of O & M for Facilities

All the irrigation infrastructure has been built using locally available materials, and is temporary and fragile. The coconut logs and iron sheets used to dam the river water are washed away every rainy season when there is heavy flooding. Downstream, near the Kijambani 2, Machekuchini and Mbuzini A farms, flooding occurs every year. At this point, the river ends, and water is absorbed into a porous formation (called 'pokezi') that leads to caves and then out to the ocean. However, the absorption rate is slow, and the area can remain waterlogged for up to 1½ month, destroying crops. In this area, farmers have attempted construction of a culvert in an attempt to control the water flow.

² The second farmer to receive water may sometimes have to adjust the level of his/her farm to maximise efficiency of irrigation.

Conflict over Water

Participants pointed out that they have experiencing water scarcity for more than 10 years. It was the problem of water shortage that instigated the request for the development of an irrigation scheme in this area. Water shortage is particularly acute during the dry season. The practice of illicit tapping is quite common at Chaani, and usually involves mediation by the Sheha. The penalty for this transgression is 3 warnings followed by expulsion. So far this year, there has been one incident.

There has also been conflict over water between upstream and downstream user. When farmers (60) at Kisima Fedha obstruct water flow, they prevent downstream farmers at Kijambani 2 and Machekuchini (50) from receiving sufficient water. To-date, there has been discussion and negotiation between the two groups and an informal rotation rule has been established whereas the upstream group uses water for 2 days and then allows water to flow for another 2 days.

The form of irrigation, whereas one farmer will divert water onto his/her field and then allow other farmers with adjacent plots to take water is also a source of conflict. Simultaneous irrigation also requires simultaneous planting. If the second farmer plants later than the first, s/he will require water later, when the first farmer no longer requires water. Whenever, this type of conflict arises, the matter is taken up with the leaders of the sub-association.

The Chaani famers also commented on conflicts with livestock keepers, who graze their cattle near or on their farms. All conflicts are first discussed within the sub-association. Only if a solution is not found, is the Sheha called in for mediation or further action e.g. contacting the district or police.

Proposals for the Irrigation Scheme

As stated earlier, no permanent structures have been set up for the irrigation scheme at Chaani. Therefore, what is required is the design and construction of the intake, the main canals and field canals. The areas of Kijambani 2 and Machekuchini require the construction of drainage canals to prevent water-logging. Participants emphasised the necessity of rehabilitating farm roads, which are particularly affected during the rainy season. Farmers also request training on how to use river water for irrigation. The farmers expect government assistance in the design and construction of the above-mentioned infrastructure. However, they are also prepared to cover up to 20% of the cost of construction and to volunteer their labour to collect locally available materials and to undertake tasks such as the excavation of canals.

Possible Future Constraints based on Past Experience

It is difficult to predict future constraints because there has been no standard irrigation practice so far. It was reported that a previous irrigation project (pump irrigation) built in Kibokwa A, B, C failed because farmers were unable to contribute money towards the purchase of fuel. There has since been a change of energy source. Electricity wires have been connected to the pump. However, the farmers have so far not been able to purchase a transformer. This is an indication of low financial capacity of the targeted group, as well as of poor organisation. The exhibited high dependence on government experts and donors is cause for concern. Participants are worried as well about possible failure

GENDER ISSUES

Zanzibari society is akin to that of African Muslim societies. The head of the household is the man the main decision-maker in the family. Women are placed under the protection of their men-folk (father, brother or husband). Men are the financial managers of the household. The fact that it is mostly women and elderly men who are the farmers, confirms the fact that agriculture is not profitable. Younger men take up employment or initiate businesses that guarantee a return on investment, while agriculture has remained the domain of women and the elderly (men and women). Men may assist their wife during busy periods in the farming calendar, but their involvement is part-time. Domestic work has to be done by women upon to return from the fields. At home, the traditional division of labour remains.

There are 120 female members of the scheme, constituting 34% of the scheme membership. This low number may on the surface contradict the fact that it is mainly women who are responsible for agriculture. Although even married women register their land in their own name, very few women own land at Chaani. Therefore, it is likely that women farm their husband's land although it is their husband whose name is registered with the association. Unlike at Bumbwi Sudi, this land was not distributed by the government, therefore the prevailing land tenure is that of inheritance. Under Islamic inheritance law, women may inherit land from their parents or their husband, but usually they are allotted the smallest parcel. Divorcees are only entitled to a share of the land jointly owned during marriage. Women without land may borrow land from another farmer who does not want to cultivate it.

The focus group discussion revealed that women are more likely to attend meetings, stating that they are their household's representative in the scheme. However, the interaction between men and women at the workshop revealed women's lack of confidence to speak up in public. The high rate of illiteracy exhibited is an additional constraint to women's effective participation in meetings. Women are also elected to positions of leadership and given opportunities for training³. The participants were unable to name all the women leaders in the 24 sub-associations, except for the Kibokwa B where the treasurer is a woman.

Advantage and Disadvantage to Gender by Development Activity

There is a tendency for men to leave farming activities to women in addition to their household chores. As the result the amount produced is inadequate for family consumption, and there is no surplus leftover for sale. This negatively affects the household income and standard of living. One cannot expect under such arrangement to have enough farm output. Men as well as women should participate equally in farm activities and if possible men should spend more time in the farm because women have other equally important roles to play at home in which men do not participate at all.

Islamic religion allows one man to marry wives up to four. Some men marry without considering their ability to manage many wives in terms of resources available. Due to this tendency women do not have an incentive to work for increased production, working only to produce what is enough for the family consumption. The

³ Training cited as in Paddy Production conducted at the Kibokwa Station in 2002. Seven women and fourteen men attended.

arrangement of having more than one wife might affect negatively on agricultural activities and women's productivity in particular, especially where the household income and expenditure is controlled by husband. In order to mitigate conflict over income and women's labour, gender issues need to be addressed before the scheme is operational.

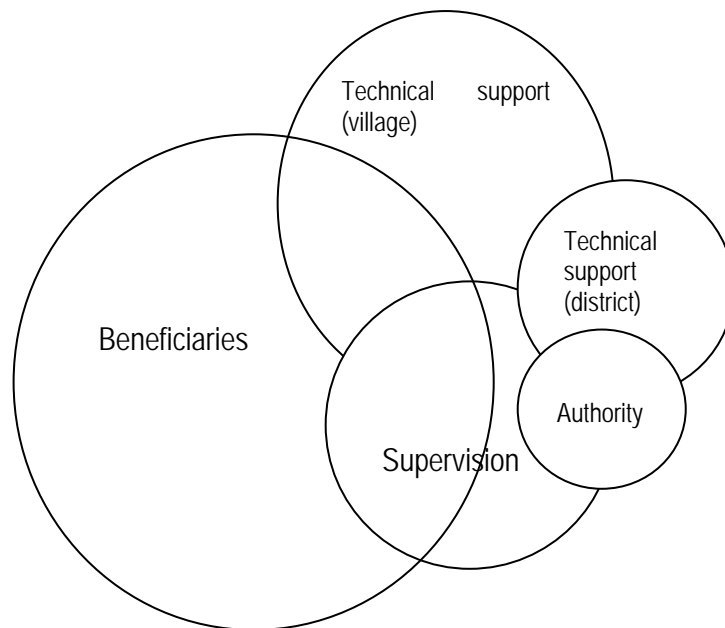
SUPPORT FROM THE GOVERNMENT OF TANZANIA

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 Chaani. These were grouped under five main headings based on the nature of their relationship with the irrigation group.

Beneficiaries:	Farmers, Irrigators' Association
Technical expertise (village):	Agricultural Extension Officer, Site Supervisor
Supervision:	Sheha's committee, Sheha ⁴ , Councillor
Technical expertise (district):	District agricultural officer, Regional agricultural officer
Authority:	Regional commissioner, District commissioner, 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 resident in the village are the most crucial individuals to the agricultural/irrigation activities in Chaani. These, and more specifically the site supervisor, form the channel of communication between the farmers and the district level. There is no direct interaction between the farmers and the district technical support. The Sheha and Councillor perform the function of supervisors and mobilisers. The communication between the farmers, the technical support (village) and supervision (Sheha, councillor) form a triangle of communication. The Sheha's role is that of mediator in village matters and the communication link between the District Council and the farmers.

⁴ A Sheha (in Zanzibar) occupies a similar position to the Chairperson (in mainland Tanzania). The main difference is that a Sheha is usually an elder of the village appointed by the District Commissioner to be a liaison between the villagers and the district office and to mediate on problems in the village. The village chairperson on mainland Tanzania is elected by the community. A Sheha is assisted in his work by a the Sheha's committee, which is the equivalent of the village government in mainland Tanzania



Communication

The technical expertise in the field encompasses the agricultural extension officer and the site supervisor⁵. Both are government employees and the agricultural extension officer is resident in the village. Frequency of communication with the site supervisor is daily and usually takes place on the farm. Participants stated that he responded to the farmers' request for an irrigation scheme to be developed at Chaani positively, by undertaking the necessary studies within the target area⁶ and as such they are satisfied with his performance. The agricultural extension officer also features daily in the farmers' work either at his/her office or in the fields. As evidenced in the seasonality diagram, extension services are available throughout the year. Communication goes both ways. A farmer may have a problem and look up the agricultural extension officer, or the agricultural extension officer may initiate contact with the farmer. The main issues discussed with the agricultural extension officer include all agricultural matters, in particular pest management, farm input supplies, seed selection and preparations for planting. Participants are satisfied with the communication and the agricultural extension officer's performance. However, they stressed that s/he requires a means of transportation and other working tools.

As explained above, the Sheha is the government's representative in the Shehia⁷. The Sheha is appointed by the District Commissioner. The Sheha is usually an elder man who is respected by the community. His key role is to convey the village's problems to the district and regional offices and to convey back their response or disseminate announcements. The Chaani Sheha is in close contact with the farmers, and communication with the farmers' association occurs frequently. He serves as a mediator when water disputes arise, and mobilises the community at the start of each

⁵ A new system is in effect in Zanzibar since 2002. A Subject Matter Specialist (SMS) in Irrigation has been appointed to each district. S/he will be responsible for irrigation and agriculture and will liaise with the site supervisor, the Sheha and the district agricultural officer.

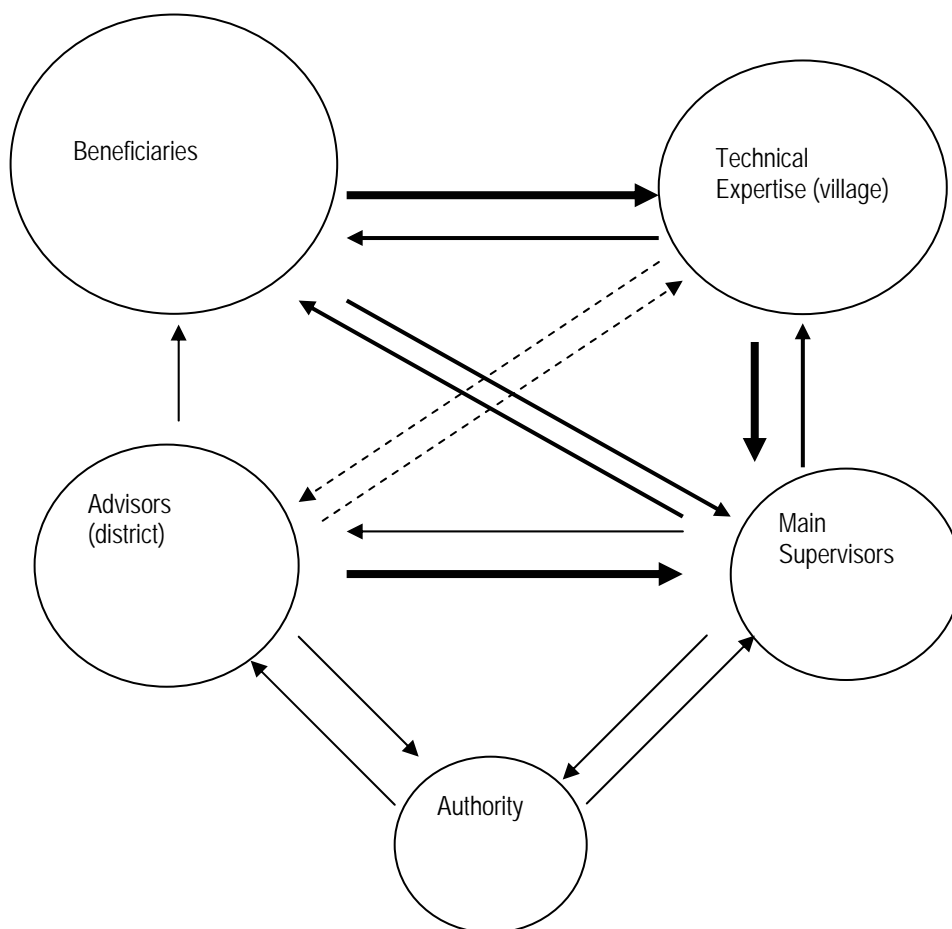
⁶ The present workshop was considered also as part of the efforts of the site supervisor to find a donor to construct the irrigation scheme.

⁷ A group of 3-5 neighbouring villages

agricultural season. He also communicates with the agricultural extension officer whenever necessary. The participants are satisfied with their Sheha.

Communication with the District agricultural officer is not direct, but diverted via the Sheha. Less often, the district agricultural officer will channel his/her messages through the agricultural extension officer. Occasionally the District agricultural officer may call a meeting of farmers at the farming station to discuss preparations for the up-coming season. Arrangements are usually made via the Sheha. The Regional and District Commissioner may summon the association's leaders to his/her office or visit the Kibokwa Farming station. Communication is made through the district office.

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



RECOMMENDATIONS

It is obvious that farmers cannot afford to purchase diesel to pump water for irrigation. This problem is experienced by Bumbwi Sudi and Nyakasungwa pump schemes. The cost involved exceeds the income or affordability of the target group. It is wise to look into possible alternative sources of energy, for e.g. solar energy and wind mills as an alternative to diesel. The technology used does not match with the affordability of the users. The Bumbwi Sudi case will be repeated, where Government pays for the electricity.

The communication between farmers and authorities is done through the site supervisor residing in the village. The farmers are satisfied with this arrangement but would like to see more of their leaders from District and Region offices. It is recommended that the authorities should work together with the farmers to improve the communication channels.

During the workshop the participants showed high expectation and dependence on Government assistance. There was a shopping list of requests to the Government with little or no contribution from the farmers. The farmers should be encouraged to take a lead and help themselves, particularly in contributing towards the expenses of the scheme's construction.

Like other schemes, farmers need training on leadership and management of the scheme. 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 extension officer/site Supervisor, in collaboration with farmers, should develop a farming calendar that is strictly followed by farmers. This is particularly important for planting. By doing so the conflict between the water users will be minimized.

Storage facilities are one among many factors which force farmers to sell crops at gate farm consequently low prices. It is recommended that a warehouse is constructed by the farmers with some support from the Government to store the crops so that the farmers can sell their crops when the market price is high. The government should also look into the possibilities of securing a market for the farmers' agricultural output. Farmers should organise themselves, with the assistance of the agricultural extension officer, and communal rehabilitate the farm roads.

In order to mitigate any negative effects on women, it is recommended that a study be conducted to produce a Gender Profile of Zanzibar. Findings from this study should be considered during any instances of assistance to the schemes. Furthermore, all government staff should attend a gender-awareness training course.

Annex 1: Registration

Observers

	Name	Position	Office
1	Kadir Ali Kadir	Site Technician	Kibokwa Site
2	T. Igawa	JICA Study Team	JICA
3	H. Ohnuma	JICA Study Team	JICA
4	T. Kuroda	JICA Study Team	JICA
5	S. Matsushima	JICA Study Team	JICA
6	Shaaban A. Shaaban	Head Rice Cultivation	MANREC
7	Mchenga A. Mchenga	Assist. Head Rice Cultivation	MANREC

Participants- Day 1

	Name	Occupation	Irrigation Group
1	Mussa Makul Mussa	Farmer	
2	Omari F. Barua	Farmer	
3	Khamis Juma Silime	Farmer	
4	Makunde Juma Kuji	Farmer	
5	Khamis Haj Juma	Farmer	
6	Seifi Juma Kundi	Farmer	
7	Chunu Kumbo Chunu	Farmer	
8	Abrahamani Mkuandi	Farmer	
9	Machano Mjoma M.	Farmer	
10	Ussi Fadhili M.	Farmer	
11	Khamis Iddi Macha	Farmer	
12	Khamis Haj Mdogo	Farmer	
13	Mwadini Ali Mwadini	Farmer	
14	Juma Ali Juma	Farmer	
15	Tatu Haji Juma	Farmer	
16	Mossi Machano Juma	Farmer	
17	Mtumwa Haji Khamis	Farmer	
18	Mwaka Ali Mossi	Farmer	
19	Haji Khamis Chonjo	Farmer	
20	Kazija Ali Omari	Farmer	
21	Mnono Haji Mussa	Farmer	

Annex 2: Workshop Schedule

Day 1

Registration of participants
Begin workshop Introduction Workshop rules
Group work
Presentation of group work
Group work: Institution, Agriculture, Irrigation
Lunch
Group work continued
VENN Diagram & Discussion
Presentation of group work
Workshop evaluation
Closing
Group picture

Annex 3: Workshop Evaluation

- ☺ happy with workshop proceedings overall
- ☺ happy about ice-breaker 'sinking boat'
- ☺ happy to meet donors
- ☺ that our leaders have managed to find donors for our scheme
- ☺ that facilitators are women
- ☺ that facilitator is not a proud individual

- ☹ the workshop schedule did not have specific times

Annex 4: Mapping

Ramani ya rasilimali za mradi wa umwagiliaji ionyeshe taarifa zifuatazo:

- a. mipaka ya kijiji
- b. kilimo cha umwagiliaji kinafanyika wapi?
- c. Maji ya umwagiliaji ni yapi na yamegawanywa kivipi?
- d. mifereji ya umwagiliaji
- e. vitaro vya mashamba na mmilikaji (kikundi au mtu binafsi)
- f. eneo la kilimo cha mvua
- g. eneo la umwagiliaji
- h. banio
- i. mifereji ya umwagiliaji
- j. mlango, vifaa na miundo-mbinu vya umwagiliaji
- k. eneo lote kulimika
- l. 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 mmepeewa, 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												
Destructive animals/birds												
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

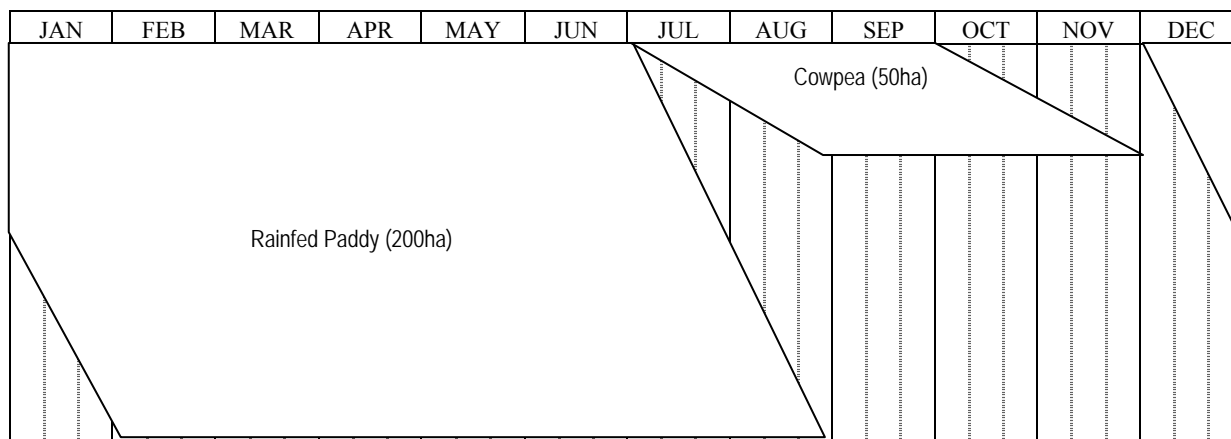
Item	(Area in ha)
Total Number of Household	600 Household
Total Farm Land (low land only)	250
Total Cultivated Area and Fluctuation (low land only)	250
Rainfed Area	200
Irrigated Area	-
Potentially Irrigable Area	250

- 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	200	1.5				
(2) Cowpea	50	0.2				
(3) Cassava	↑	1.5				
(4) Sweet potato	2 acre	1.8				
(5) Cocoyam	/family	1.5				
(6) Banana	↓	600 bunch				

- Farming Calendar and Cropping Pattern

Wet season Paddy (Rainfed)	from	Dec-Jan	to	Jul-Aug
Upland Crops				
1. Cowpea	from	Jul-Aug	to	Oct-Nov
2. Cassava	from	Sep-Nov	to	After 6-12 months
3. Sweet potato	from	Mar-Jun	to	Jun-Jul
4. Cocoyam	from	Mar-May	to	After 12 months
5. Banana	from	Mar-May	to	After 12 months (2-4 years)



- Land Ownership Situation and Problems

Low land for paddy is owned individually through inheritance.
 Upland is obtained through (i) borrow land, (ii) inherited land, (iii) distributed land (3 acre/family) or (iv) bought land.
 There are no land ownership problems in the area.

- Farm Size Distribution

Land hold (ha)	Number of Farmer	Total area in ha
0-0.4	↑	↑
0.4-0.8	600	250
0.8-1.2	↓	↓
1.2-1.6		
1.6-2.0		
2.0-4.0		
4.0-6.0		
6.0-8.0		
8.0-		
Total		

- Major Constraints in Crop Production, Input Supply and Marketing

Problems/Difficulties	Notes
Some farmers fail to cultivate, start late or have to cultivate by hand due to the delay of tractor services.	There are two sources of tractor services including government service and private owner but insufficient.
Difficult weed control	
Unreliable rainfall	
High input cost specially for fertilizer (TSP, Urea) from government through retailer.	Farmers are obliged to depend on retailer due to no transportation means.
Since paddy products are mainly for consumption, it is not clear for farmers that there is any market problems for paddy or not.	

Half of upland crops are consumed and the other half are sold to middleman who comes to the village or middleman in the market.	
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- Major Significance for the Introduction of Irrigation System

Farmer believes that they can increase their income through double cropping of paddy when irrigation system is introduced. According to the farm gate price and production cost, however, it seems paddy production is not profitable. Farmers are also thinking to produce vegetables such as onion, tomato, potato and eggplant. Farmers are reluctant to produce spice crops due to market problems such as high fluctuation of farm gate price.

Farmers Supporting System

- Post Harvest

Crop	Harvest Method	Storage Method	Storage Facility
Paddy/Cowpea	By hand	Bags	No
Cassava/Sweet potato	By hand	Bags	No
Banana/Cocoyam	By hand	Bags	No

- Marketing and Prices

Crop	Market Channels	Farm Gate Price (low/high) in Tsh/kg	Season (low/high)
Paddy	Middleman	80	
Cowpea	Middleman	250/500-700	Ordinary/Special variety
Cassava	Middleman	60-100	-
Sweet potato	Middleman	60-100	-
Cocoyam	Middleman	160-300	-
Banana	Middleman	1,500-3,000/bunch	

- Input Supply

Kind of Input	Obtained from where	Purchasing Method	Availability and Source of Loan	Availability of Subsidy
Certified Seed	↑	Cash	No	-
Fertilizer	Agriculture	Cash	No	5%
Chemical	Section	Cash	No	-
Machinery	↓	Cash	No	50%
Others ()				

- Extension Service

1) Are you a member of any organizations or cooperatives?	Yes
2) Which organization provides you with technical assistance?	MANREC
3) How frequently do you have technical assistance?	Every cultivation season
4) What kind of support do you get from them?	Farming inputs support

- Indigenous Knowledge

Unique knowledge for effective use of limited natural resources, environmental conservation, unique technologies for crop production:

Farm Economics (for typical farm family of 6 members)

- Farm Income

(1) Lowland:

0.4ha Paddy: $0.4\text{ha} \times 1.5\text{ t/ha} \times 1,000\text{ kg/t} = 600\text{kg} \rightarrow$ consumption

0.2ha Cowpea: $0.2\text{ha} \times 0.2\text{ t/ha} \times 1,000\text{kg/t} = 40\text{kg} \rightarrow$ consumption

(2) Upland

0.4ha Cassava and Sweet potato:

Cassava: $0.4\text{ha} \times 1.5\text{t/ha} \times 1,000\text{kg/t} = 600\text{kg} - 300\text{kg for consumption} = 300\text{kg} \times 80\text{Tsh/kg} = 24,000\text{Tsh}$

S.Potato: $0.4\text{ha} \times 1.8\text{t/ha} \times 1,000\text{kg/t} = 720\text{kg} - 360\text{kg for consumption} = 360\text{kg} \times 80\text{Tsh/kg} = 28,800\text{Tsh}$

0.4ha Banana and Cocoyam:

Cocoyam: $0.4\text{ha} \times 1.5\text{t/ha} \times 1,000\text{kg/t} = 600\text{kg} - 150\text{kg for consumption} = 450\text{kg} \times 230\text{Tsh/kg} = 103,500\text{Tsh}$

Banana: $0.4\text{ha} \times 675\text{ bunch} = 270\text{bunch} - 70\text{bunch for consumption} = 200\text{bunch} \times 2,000\text{Tsh/bunch} = 400,000\text{Tsh}$

- Production Cost

(1) Paddy (0.4ha)	Land clearing	12,000
	Plowing and harrowing	20,000
	Transplanting	()
	Weeding	40,000
	Fertilization	13,500
	Bags	2,800
	Harvesting and Threshing	18,000
	<u>Transportation from field to home</u>	<u>2,800</u>
Total	109,100	
(2) Cowpea (0.4ha)	Plowing	10,000
	Sowing	()
	<u>Weeding</u>	<u>20,000</u>
	Total	30,000
For 0.2 ha	15,000	
(3) Cassava+S.Potato (0.4ha)	Ridging	30,000
	Planting	()
	Weeding	12,000
	Harvesting	()
	Transportation from field to market	10,800
	<u>Unloading</u>	<u>2,700</u>
	Total	55,500
(4) Banana+Cocoyam (0.4ha)	Banana hole (@200x150hole)	30,000
	Cocoyam hole (@400x100hole)	40,000
	Banana seedling	26,250
	Cocoyam seedling	20,000
	Planting	()
	Weeding	15,000
	Harvesting	()
	Banana Transportation	24,000
	Banana Unloading	6,000
	Cocoyam Transportation	3,600
	<u>Cocoyam Unloading</u>	<u>1,800</u>
	Total	166,650

- Expenditure

3,000 Tsh/day x 30 days/month x 12 months/year = 1,080,000

Note: High expenditure due to purchasing of fire wood (= There is no fire wood collection field around the village).

- 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		0.4	-			109			
Cowpea		0.2	-			15			
Sub-total		0.4	-			124	-124		
Outside the scheme									
Cassava/Sweet potato		0.4	53			56			
Banana/Cocoyam		0.4	504			167			
Sub-total		0.8	557			223	334		
Total	1.2	1.2	557	α	$557+\alpha$		$210+\alpha$	1,080	$\alpha-870$

Appendix G
Report on Preliminary Environmental Assessment

APPENDIX G

PRELIMINARY ENVIRONMENTAL ASSESSMENT FOR MODEL IRRIGATION SCHEMES IN ZANZIBAR

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I INTRODUCTION

1. Background Information

Based on the Agricultural Sector Policy, Poverty Reduction Plan, Vision 2020 and the Zanzibar Irrigation Master Plan, the irrigation development projects aim at poverty reduction through food security from irrigated agricultural production by empowerment of farming communities to engage in profitable farming activities and increased agricultural productivity. These projects will involve rehabilitation and improvement of the existing dilapidated irrigation and drainage infrastructures. Expansion of irrigation areas and construction of dams and storage ponds are also envisaged.

Economic, social and environmental change is inherent to development. Whilst development aims to bring about positive change it can lead to conflicts. In the past, the promotion of economic growth as the motor for increased well-being was the main development thrust with little sensitivity to adverse social or environmental impacts. The need to avoid adverse impacts and to ensure long term benefits led to the concept of sustainability. This has become accepted as an essential feature of development if the aim of increased well-being and greater equity in fulfilling basic needs is to be met for this and future generations.

In order to predict environmental impacts of any development activity and to provide an opportunity to mitigate against negative impacts and enhance positive impacts, the environmental legislation by the name of “The Environmental Management for Sustainable Development Act, 1996” was produced and enacted by “The House of Representative in Zanzibar”. EIA is included in the Chapter five of the legislation.

In the environmental legislation it has been stated that EIA is mandatory for all project engaged in irrigated agriculture of 20 hectares or more, therefore in this context there is no need for carrying out IEE for Zanzibar, this process is eliminated as well as screening. Since the screening process has decided right from the beginning in the schedule given for those projects which EIA is mandatory. What has been required by the legislation at this junction is to carry out scoping process.

The Environmental Impact Assessment (EIA) for any development project is vital because it allows the identification of the potential environmental impacts of a proposed development project. The assessment examines how the project might benefit or cause harm to people, their homeland or their livelihoods, or to other nearby development activities. After predicting potential problems the EIA identify measures to minimize the problems and outline ways to improve the projects suitability for its proposed development.

The preliminary environmental assessment was carried out making reference to the Zanzibar Environmental guidelines, and those of JICA (JICA Guidelines 1992). The JICA guidelines propose screening, scoping, Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) consideration in the process.

2. Objectives of the Study

The main objectives of carrying out this preliminary environmental assessment were as follows:

- i. To identify the potential environmental impacts (positive and negative), that may result due to the implementation of the projects.
- ii. To formulate the Terms of Reference for Environmental Impact Assessment, to be carried out for the proposed projects.

3. Institutional Arrangement

According to the Act, there shall be a special committee of the revolutionary council of environmental matters in Zanzibar, which is the highest decision making body on environmental matters of Zanzibar.

Department of Environment under the Ministry of Agriculture, Natural Resources, Environment and Cooperatives, Zanzibar, is responsible for all matters pertaining to the environment in Zanzibar.

4. Methodology

Basically a combination of approaches was employed in gathering information from different sources. Some of the interviewers are farmers who practice irrigations and some are not but they are very fascinated hearing that such a big project is going to take place.

Semi-structured interviews were conducted which took place in informal setting, in a face-to-face mode using predetermined questions. This enabled the respondents to answer spontaneously and was not limited to a set of answers.

The study was carried out through physical observation, interview and collection of data in Chaani, Bumbwi Unguja and Mlemele, Makwararani Pemba. While in the field, aspects like land use, vegetation, animal spp, existence of stagnant water, cutting and burnings of trees considered during observation. Interviews were also conducted so as to get information on possible sources of diseases like malaria, bilharzia, water distribution and their availability, land tenure system and crop management system.

II. PRELIMINARY ENVIRONMENTAL ASSESSMENT

1. MLEMELE IRRIGATION SCHEME

1.1 Project Description (Mlemele)

1.1.1 Back ground Information and Objective of Project:

The Mlemele Irrigation Project has a potential area of 73 ha in which at present, farmers from the near by villages cultivate the area and produce crops like paddy, vegetable, sweet potatoes, sugar cane etc. under rain fed conditions and traditional irrigation. The Project intends to construct a dam and reservoir in the upstream side of a semi permanent river which crosses the project area, disposing its water into Indian Ocean through a mangrove forest.

1.1.2 Brief Description of Project

Outline of Project Area : The Project is about 15 kms South of Chake Chake Town, Chake Chake administrative district, South Region of Pemba, surrounded by villages of Chuchuu, Pujini, Mabieni, Muembe Karata, Kwa Sharifu, Mnazi Mmoja and Kichanjaani

Beneficiaries & Benefited Area : About 10,000 peoples 73 hectares

Relevant Project Components : Irrigation drainage, land clearing, land consolidation, pond construction, lining of irrigation canals, water IA facilities.

Executing Agencies : Ministry of Agriculture, Natural Resources, Environment and Cooperatives (MANREC)

Environmental Agencies Concerned: Department of Environment Zanzibar (MANREC)

1.1.3 Major Components and Development Scale of Project

(1) Main Project Components (Development activity)	(2) Type of Project		(3)Scale of project			(4) Remarks
	New project	Rehabilitation	Area,etc	Dimensions major facilities		
a. Irrigation	x	0	ha.	Not yet designed		EIA is required for all Irrigation Development Projects from 20 ha according to the Environmental Management for Sustainable Development Act 1996.
b. Drainage	x	0	ha.	“ “		
c. Land clearing & leveling	x	0	ha.	Not yet designed		
d. Sea/swamp reclamation	0	0	ha.	“ “		
e. Land consolidation	x	0	ha.	“ “		
f. New land settlement	0	0	households	“ “		
g. Dam and reservoir	x	0	Number of reservoirs	Reservoir area.	Reservoir capacity	
			reservoirs;	02 ha.	m ³	
h. Substantial changes in farming system	x	0	ha.	Name of new crops Vegetable and fruits		
i. Farm roads	x	x	8.8 kms			
j. Others	0	0				

1.2 Site Description (Mlemele)

1.2.1 Present Socioeconomic Status of Project Area

- (1) Land ownership and land use, etc. : Mostly inherited land. These valley areas are commonly cultivated with vegetable, maize, cowpeas or sweet potatoes. Vegetable and small amount of sugar cane is also produced in the Project Area.
- (2) Economic activities in and around project area : Agricultural production, small scale animal husbandry, wood charcoal making, and timber production.
- (3) Customs (Riparian rights, water right, etc) : No water right is yet existing in the country. The department for Water is considering a water right act in its new water policy proposal.
- (4) Host people or community : Indigenous Pemba (Zanzibari) peasants
- (5) Public health : Malaria and schistosomiasis are frequently reported
- (6) Population : Between 8,000 to 10,000 people
- (7) Others :

1.2.2 Natural Conditions of Project Area.

- (1) Climate :
- (2) Topography : Gentle sloping valleys surrounded by hills
- (3) Hydrology and drainage condition : The area is drained through the existing river to the Indian Ocean, through mangrove beach.
: Poor drainage of the area, results in heavy floods during heavy rain making the villages around inaccessible by road.
- (4) Soils : Vary from black cracking clay soils, to clay loam
- (5) Vegetation : Dominated with borasus, mango trees, *mimosa Pudica*, *Leptochloa chinensis* and mitomondo
- (6) Rare species or fragile ecology :
- (7) Others : Indian almond (*Terminalia catappa*) & mango trees are endangered as they are for timber and charcoal making respectively. The catchment area is threatened by tree cutting.
-

1.2.3 Environmentally Sensitive Area in Project Site or Vicinity

Environmentally Sensitive Area	Applicable or Not					
	In project Area			In vicinity of Project Area		
	Appl.	N.A	Unknown	Appl.	N.A	Unknown
** Area under Specific designation**						
S1. Habitat of fauna and flora listed in CITES	0	0	0	0	0	0
S2. Wetland designated under the Ramsar Convention	0	0	0	0	0	0
S3. Heritage sites listed in the world heritage convention	0	0	0	x	0	0
S4. National park, nature reserve, etc.	0	0	0	0	0	0
S5. Others()	0	0	0	0	0	0
Socio economically sensitive area						
S6. Areas inhabited by indigenous people, ethnic minorities, nomads etc	0	0	0	0	0	0
S7. Historically remains, cultural assets, aesthetic site	0	0	0	x	0	0
S8. Area likely to suffer from significant negative economic impact	x	0	0	0	0	0
S9. Others()	0	0	0	0	0	0
** Environmentally sensitive natural land**						
S10. Arid and semi-arid lands (including savanna, range land, etc)	0	0	0	0	0	0
S11. Tropical forests and wild lands	0	0	0	0	0	0
S12. Wetland or peat lands	0	0	0	0	0	0
S12-1 Wetlands	x	0	0	0	0	0
S12-2 Peat lands	0	0	0	0	0	0
S13. Coastal zones	0	0	0	0	0	0
S13 -1 Mangrove forest	0	0	0	x	0	0
S13-2 Coral reefs	0	0	0	x	0	0
S14. Mountainous, steep sloped, erodible or devastated lands	x	0	0	0	0	0
S15. Closed water bodies such as lakes, swamps or reservoirs	x	0	0	0	0	0
S16. Others ()	0	0	0	0	0	0

1.3 Screening (Mlemele)

SOCIAL ENVIRONMENT			
Social economic issues		Health and sanitary issues	
Planned agricultural settlement	Unknown	Increased use of agrochemicals	Yes
Involuntary resettlement	Yes	Outbreak of endemic diseases	No
Substantial change in way of life	Yes	Prevalence of water borne diseases	No
Conflicts among communities or people	Yes	Residual toxic of agrochemicals	Unknown
Impacts on native people	Yes	Increase in domestic and other human wastes	Yes
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	Yes	Damage to aesthetic sites	No
Relocation of bases of economic activities	Unknown		
Occupational change and loss of labour opportunity	No		
Increase in income disparities	Unknown		
Adjustment and regulation of water or fishing rights	Yes		
Changes in social and institutional structures	Yes		
Changes in existing institutions and customs	Yes		
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	No	Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	No	Deterioration of soil fertility	No
Proliferation of exotic and/or hazardous species	Unknown	Soil contamination by agrochemicals	No
Encroachment on wetlands	Unknown	Devastation or desertification of land	No
Encroachment on tropical forests	Unknown	Devastation of hinterland	Unknown
Destruction or degradation of mangrove forests	Yes	Ground subsidence	Unknown
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Yes		
Changes in ground water hydrology	Yes		
Inundation and flood	Unknown		
Soil sedimentation	Yes		
Riverbank degradation	Yes		
Water contamination and deterioration of water quality	No		
Water eutrophication	Unknown		
Low water temperature	Unknown		
Atmospheric pollution	No		
Poor water management	No	Overall evaluation	Yes = 18
Landscape and Mineral Resources			No = 16
Damage to landscape	No		Unknown = 13

1.4 Scoping (Mlemele)

Social Environment	Project Activities					
1. Social economic issues	LC	DC	CC	FS	RT	DS
<i>a) Social issues</i>						
Planned agricultural settlement	B	B	B	B	B	B
Involuntary resettlement	C	A	C	A	B	C
Substantial change in way of life	A	A	A	A	B	A
Conflicts among community and people	C	C	C	C	B	C
Impacts on native people	C	A	A	B	B	B
Impediment to movement of people and livestock	C	C	C	C	B	C
<i>b) Demographic issues</i>						
Population increase	A	C	C	A	B	C
Drastic change in population composition	B	B	B	B	B	B
<i>c) Economic activities</i>						
Relocation of bases of economic activities	B	B	B	B	B	B
Occupational change and loss of labour opportunities	C	C	C	C	B	C
Increase in income disparities	B	B	B	B	B	B
<i>d) Institutional and Custom related Issues</i>						
Adjustment and regulation of water for fishing right	B	B	B	B	B	B
Changes in social and institutional structure	A	A	C	A	B	C
Changes in existing institution and customs	A	A	C	A	B	C
2. Health and sanitary issues						
Increase use of agrochemicals	A	C	C	A	B	C
Prevalence of water borne diseases	A	A	A	C	B	C
Residual toxic of agrochemicals	C	C	B	B	B	B
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	B	C
Damage to aesthetic sites	C	C	C	C	B	C
Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	C	C	A	B	C
Impacts on indigenous fauna and flora	C	C	C	C	B	C
Degradation of ecosystem	C	C	C	C	B	C
Encroachment on wetlands	B	B	B	B	B	B
Encroachment on tropical forest	B	B	B	B	B	B
Destruction or degradation of mangrove forest	C	C	C	C	B	A
Degradation of coral reef	C	C	C	C	B	A
5. Soil and Land Resources						
<i>(a) Soil Resources</i>						
Soil erosion	A	C	C	A	B	C
Soil salinization	B	B	B	B	B	B
Deterioration of soil fertility	C	C	C	B	B	B
Soil contamination by agrochemicals	B	B	B	B	B	B
<i>(b) Land Resources</i>						
Soil sedimentation	C	C	C	C	B	C
Riverbank degradation	B	B	B	B	B	B
Inundation and flood	C	C	C	C	B	C
6. Hydrology, water quality and quantity issues						
<i>(a) Hydrology</i>						
Ground subsidence	B	B	B	B	B	B
Devastation of hinterland	B	B	B	B	B	B
Change in surface water hydrology	A	A	C	A	B	A
Change in ground water hydrology	C	A	C	A	B	C
Poor water management	C	C	C	B	B	C
<i>(b) Water quality</i>						
Water deterioration and deterioration of water quality	B	B	B	B	B	B
Water eutrophication	B	B	B	B	B	B
<i>(c) Water quantity</i>						
Adequacy and reliability of water supply	A	A	A	A	B	A

LC – Land Clearing DC – Dam 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

1.5 Potential Environmental Impacts for Mlemele

- 1) Clearing of the perennial vegetation may cause erosion as well as insufficiency of shade.
- 2) There are farming activities between catchment areas. Flooding frequently occurs during the heavy rainy season (Masika) which disturbs the whole farming pattern. Such a present situation should carefully be examined prior to the implementation of the project for the effective utilization of water resources.
- 3) Water borne disease especially malaria and bilharzias are common, this is due to the stagnant water, and the research done by the Ministry of Health has revealed that the rate of malaria has increased in areas where irrigation has been adopted.
- 4) There is a fear of destroying the mangrove stand as well as the coral reef due to the flow of basin discharge into the ocean when fertilizers and pesticides are introduced under the project implementation.
- 5) Disappearance of species such as *Migomba Kofi* will be intensified under the project implementation. The role of this species to the environment is not clearly identified but it is considered that they possess a positive role.
- 6) Wild animals are not common in this scheme but precaution should be taken to avoid the migration of wild animal from nearby areas due to the changing of the ecological niche of irrigated land.
- 7) Siltation of dams due to agricultural activities on the upstream in catchment areas seems to be an important potential impact.
- 8) Population increase due to migration to the project area and vicinity is forecasted. Possibilities of pressure on land and other basic human needs can thus be a potential impact.
- 9) There will be a loss of land that will be submerged in the upstream of the dam and/or reservoir areas that are now used for agricultural production.

1.6 Proposed TOR for EIA

The EIA of Mlemele irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1. Health and sanitation

- ❖ Increased use of agro-chemicals, especially those with residual toxic effects
- ❖ Prevalence of water borne diseases

2. Socio-economic Issues

- ❖ Conflicts between indigenous and immigrants
- ❖ Issues of compensation of land
- ❖ Land tenure system

NATURAL ENVIRONMENT

1. Biological and ecological issues

- ❖ Degradation of ecosystem
- ❖ Impact of exotic species
- ❖ Degradation of mangrove and coral reefs

2. Soil and land resources

- ❖ Soil erosion
- ❖ Soil salinity
- ❖ Contamination of soil by agro-chemicals
- ❖ Sedimentation

3. Land Resources

- ❖ Vegetation pattern
- ❖ Land use pattern

4. Water resources

- ❖ Poor water management
- ❖ Deterioration of water quality
- ❖ Changing of water pattern

2. MAKWARARANI IRRIGATION SCHEME

2.1 Project Description (Makwararani)

2.1.1 Back ground Information and Objective of Project

The Makwararani Irrigation Project has a potential area of 114 ha in which at present, farmers from the near by villages cultivate the area and produce crops like paddy, vegetable, cowpeas, bananas under rain fed conditions. Floods frequently affect the area during heavy rain seasons. Land consolidation and development, and construction of irrigation and drainage infrastructure, will be carried out in order to irrigate the command of 114 ha downstream.

2.1.2 Brief Description of Project

Outline of Project Area : The project Area is 7 kms from Wingwi Town, Micheweni Administrative District.
 Beneficiaries & Benefited Area : About 15,000 to 18,000 people
 Relevant Project Components : Land consolidation, land leveling, dam & reservoir construction, irrigation & drainage infrastructure, IA facilities.
 Executing Agencies : Ministry of Agriculture, Natural Resources, Environment and Cooperatives (MANREC)
 Environmental Agencies Concerned: Department of Environment Zanzibar (MANREC)

2.1.3 Major Components and Development Scale of Project

(1) Main Project Components (Development activity)	(2) Type of Project		(3) Scale of project			(4) Remarks
	New project	Rehabilitation	Area, etc	Dimensions major facilities		
a. Irrigation	x	0	ha.	Not yet designed		EIA is required for all Irrigation Development Projects from 20 ha according to the Environmental Management for Sustainable Development Act 1996.
b. Drainage	x	0	ha.	“ “		
c. Land clearing & leveling	x	0	ha.	“ “		
d. Sea/swamp reclamation	0	0	ha.	“ “		
e. Land consolidation	x	0	ha.	“ “		
f. New land settlement	0	0	households	“ “		
g. Dam and reservoir	x	0	Number of reservoirs	Reservoir area.	Reservoir capacity	
			reservoirs; 1	ha.	m ³	
h. Substantial changes in farming system	x	0	ha.	Name of new crops Vegetable and fruits		
i. Others	0	0				
J. Farm roads construction	x			3.7 kms		
k. IA facilities						

2.2 Site Description (Makwararani)

2.2.1 Present Socioeconomic Status of Project Area

- | | |
|--|---|
| (1) Land ownership and land use, etc. | : Mostly inherited land, with small fragmented plots. These valley areas are commonly cultivated with an intensive production of paddy, followed by cowpeas or sweet potatoes. Crops like cassava, vegetable and bananas are also produced in the vicinity of the Project Area. |
| (2) Economic activities in and around project area | : Agricultural production, where paddy, cowpeas, banana etc are produced. Small scale animal husbandry (cattle, chicken etc.) is also practiced. |
| (3) Customs (Riparian rights, water right, etc) | : Neither water right, nor riparian right is yet existing in the country. The department for Water is considering a water right act in its new Zanzibar Water policy proposal |
| (4) Host people or community | : The Area is inhabited by indigenous Pemba (Zanzibari) people peasants |
| (5) Public health | : Malaria and schistosomiasis are frequently reported in villages around the Area. |
| (6) Population | : Population around the Project Area is between 15,000 and 18, 000 people. |
| (7) Others | : |

2.2.2 Natural Conditions of Project Area

- | | |
|--------------------------------------|---|
| (1) Climate | : The area receives a bimodal rainfall pattern, with an annual rainfall between 1,600 and 1,700 mm. |
| (2) Topography | : Gentle topography, mostly flat rice grown valleys. |
| (3) Hydrology and drainage condition | : Poorly drained rice valleys, draining to the mangrove beach of Indian ocean. Upstream of the area is believed to have spring, pouring its water to the downstream valley. |
| (4) Soils | : Deep sandy loam to sand clay loam |
| (5) Vegetation | : Dominating natural vegetation includes grass (<i>Cyperus diformis</i>), and <i>Mimosa pudica</i> |
| (6) Rare species or fragile ecology | : |
| (7) Others | : |
-

2.2.3 Environmentally Sensitive Area in Project Site or Vicinity

Environmentally Sensitive Area	Applicable or Not					
	In project Area			In vicinity of Project Area		
	Appl.	N.A	Unknown	Appl.	N.A	Unknown
** Area under Specific designation**						
S1. Habitat of fauna and flora listed in CITES	0	0	0	0	0	0
S2. Wetland designated under the Ramsar Convention	x	0	0	0	0	0
S3. Heritage sites listed in the world heritage convention	0	0	0	0	0	0
S4. National park, nature reserve, etc.	0	0	0	0	0	0
S5. Others()	0	0	0	0	0	0
Socio economically sensitive area						
S6. Areas inhabited by indigenous people, ethnic minorities, nomads etc	0	0	0	0	0	0
S7. Historically remains, cultural assets, aesthetic site	0	0	0	0	0	0
S8. Area likely to suffer from significant negative economic impact	x	0	0	0	0	0
S9. Others()	0	0	0	0	0	0
** Environmentally sensitive natural land**						
S10. Arid and semi-arid lands (including savanna, range land, etc)	0	0	0	0	0	0
S11. Tropical forests and wild lands	0	0	0	0	0	0
S12. Wetland or peat lands	0	0	0	0	0	0
S12-1 Wetlands	x	0	0	0	0	0
S12-2 Peat lands	0	0	0	0	0	0
S13. Coastal zones						
S13 -1 Mangrove forest	0	0	0	x	0	0
S13-2 Coral reefs	0	0	0	x	0	0
S14. Mountainous, steep sloped, erodible or devastated lands	0	0	0	0	0	0
S15. Closed water bodies such as lakes, swamps or reservoirs	0	0	0	0	0	0
S16. Others ()	0	0	0	0	0	0

2.3 Screening (Makwararani)

SOCIAL ENVIRONMENT			
Social economic issues		Health and sanitary issues	
Planned agricultural settlement	Unknown	Increased use of agrochemicals	Yes
Involuntary resettlement	Yes	Outbreak of endemic diseases	Yes
Substantial change in way of life	Yes	Prevalence of water borne diseases	Yes
Conflicts among communities or people	No	Residual toxic of agrochemicals	No
Impacts on native people	Yes	Increase in domestic and other human wastes	Yes
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	Yes	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	Yes		
Changes in existing institutions and customs	Yes		
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	Unknown	Deterioration of soil fertility	No
Proliferation of exotic and/or hazardous species	Unknown	Soil contamination by agrochemicals	No
Encroachment on wetlands	Unknown	Devastation or desertification of land	No
Encroachment on tropical forests	Unknown	Devastation of hinterland	Unknown
Destruction or degradation of mangrove forests	No	Ground subsidence	Unknown
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Yes		
Changes in ground water hydrology	Yes		
Inundation and flood	No		
Soil sedimentation	Yes		
Riverbank degradation	No		
Water contamination and deterioration of water quality	No		
Water eutrophication	Unknown		
Low water temperature	Unknown		
Atmospheric pollution	Unknown		
Poor water management	No	Overall evaluation	Yes = 15
Landscape and Mineral Resources			No = 20
Damage to landscape	No		Unknown = 12

2.4 Scoping (Makwararani)

Social Environment	Project Activities					
1 Social economic issues	LC	DC	CC	FS	RT	DS
<i>a) Social issues</i>						
Planned agricultural settlement	B	B	B	B	B	B
Involuntary resettlement	A	C	C	A	B	C
Substantial change in way of life	A	A	A	A	B	C
Conflicts among community and people	C	C	C	C	B	C
Impacts on native people	A	A	A	A	B	C
Impediment to movement of people and livestock	C	C	C	C	B	C
<i>b) Demographic issues</i>						
Population increase	A	A	A	A	B	C
Drastic change in population composition	A	A	B	A	B	C
<i>c) Economic activities</i>						
Relocation of bases of economic activities	B	B	B	B	B	B
Occupational change and loss of labour opportunities	C	C	C	C	B	C
Increase in income disparities	B	B	B	B	B	B
<i>d) Institutional and Custom related Issues</i>						
Adjustment and regulation of water for fishing right	B	B	B	B	B	B
Changes in social and institutional structure	A	A	A	A	B	C
Changes in existing institution and customs	A	A	A	A	B	C
2. Health and sanitary issues						
Increase use of agrochemicals	A	C	C	A	B	C
Prevalence of water borne diseases	A	A	C	C	B	C
Residual toxic of agrochemicals	B	B	B	B	B	B
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	B	C
Damage to aesthetic sites	C	C	C	C	B	C
Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	A	C	C	B	C
Impacts on indigenous fauna and flora	C	C	B	B	B	B
Degradation of ecosystem	C	C	C	C	B	C
Encroachment on wetlands	B	B	B	B	B	B
Encroachment on tropical forest	B	B	B	B	B	B
Destruction or degradation of mangrove forest	C	C	C	C	B	C
Degradation of coral reef	C	C	C	C	B	C
5. Soil and Land Resources						
<i>(a) Soil Resources</i>						
Soil erosion	C	C	C	C	B	C
Soil salinization	C	C	B	B	B	B
Deterioration of soil fertility	C	C	C	A	B	C
Soil contamination by agrochemicals	B	B	B	B	B	B
<i>(b) Land Resources</i>						
Soil sedimentation	C	C	C	C	B	C
Riverbank degradation	C	C	B	B	B	B
Inundation and flood	C	C	C	C	B	C
6. Hydrology, water quality and quantity issues						
<i>(a) Hydrology</i>						
Ground subsidence	B	B	B	B	B	B
Devastation of hinterland	B	B	B	B	B	B
Change in surface water hydrology	A	A	C	A	B	A
Change in ground water hydrology	B	B	B	B	B	A
Poor water management	C	C	C	C	B	C
<i>(b) Water quality</i>						
Water deterioration and deterioration of water quality	B	B	B	B	B	B
Water eutrophication	B	B	B	B	B	B
<i>(c) Water quantity</i>						
Adequacy and reliability of water supply	A	A	A	A	B	A

LC – Land Clearing DC – Dam 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 Potential Environmental Impacts for Makwararani

- 1) Clearing of the perennial vegetation may cause erosion as well as insufficiency of shade.
- 2) Land use conflict is common between the livestock keepers and farmers but these problems are minimal in this scheme.
- 3) Water borne disease especially malaria and bilharzias are common in this scheme, this is due to the stagnant water, and the research done by the Ministry of Health has revealed that the rate of malaria has increased in areas where irrigation has been adopted.
- 4) Disappearance of species such as *Migomba Kofi* will be intensified under the project implementation. The role of this species to the environment is not clearly identified but it is considered that they possess a positive role.
- 5) Wild animals are not common in this scheme but precaution should be taken to avoid the migration of wild animal from nearby areas due to the changing of the ecological niche of irrigated land.
- 6) Siltation of dams due to agricultural activities on the upstream in catchment areas seems to be an important potential impact.
- 7) Population increase due to migration to the project area and vicinity is forecasted. Possibilities of pressure on land and other basic human needs can thus be a potential impact.
- 8) There will be a loss of land that will be submerged in the upstream of the dam and/or reservoir areas that are now used for agricultural production.

2.6 Proposed TOR for EIA

The EIA of Makwararani irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1. Health and sanitation

- ❖ Increased use of agro-chemicals, especially those with residual toxic effects
- ❖ Prevalence of water borne diseases

2. Socio-economic Issues

- ❖ Conflicts between indigenous and immigrants
- ❖ Issues of compensation of land
- ❖ Land tenure system

NATURAL ENVIRONMENT

1. Biological and ecological issues

- ❖ Degradation of ecosystem
- ❖ Impact of exotic species

2. Soil and land resources

- ❖ Soil erosion
- ❖ Soil salinity
- ❖ Contamination of soil by agro-chemicals
- ❖ Sedimentation

3. Land Resources

- ❖ Vegetation pattern
- ❖ Land use pattern

4. Water resources

- ❖ Change in groundwater hydrology
- ❖ Poor water management
- ❖ Deterioration of water quality
- ❖ Changing of water pattern

3. BUMBWI SUDI IRRIGATION SCHEME

3.1 Project Description (Bumbwi Sudi)

3.1.1 Back ground Information and Objective of Project:

The Bumbwisudi Irrigation Project has an irrigation potential area of about 560 ha, out of which, about 150 ha was developed back in late seventies, with the assistance of UNCDF, UNDP and FAO, for small holder oriented irrigated rice production.

3.1.2 Brief Description of Project

Outline of Project Area : The project is 13 km N-E of Zanzibar Town in the Western District of the Urban West Region of Unguja Island. Villages near the project area includes Bumbwisudi, Mwachealale, Mwalaje, Dole, Kizimbani and Mbuzini, Miwani and Kiboje.

Beneficiaries & Benefited Area : About 12,000 to 15,000 person 560 ha

Relevant Project Components : Irrigation, Drainage, Land clearing, Land consolidation and reallocation, Ponds construction, Replacement of Irrigation pumps, Lining of irrigation canals, Construction of pump houses and IA facilities.

Executing Agencies : Ministry of Agriculture, Natural Resources, Environment and Cooperatives (MANREC)

Environmental Agencies Concerned : Department of Environment Zanzibar (MANREC)

3.1.3 Major Components and Development Scale of Project

(1) Main Project Components Development activity)	(2) Type of Project		(3) Scale of project			(4) Remarks
	New project	Rehabilitation	Area, etc.	Dimensions	major facilities	
a. Irrigation	x	x	560 ha.	Not yet designed		EIA is required for all Irrigation Development Projects from 20 ha. according to the Environmental Management for Sustainable Development Act 1996.
b. Drainage	x	x	560 ha.	“	“	
c. Land clearing & leveling	x	0	ha.	“	“	
d. Sea/swamp reclamation	0	0	ha.	“	“	
e. Land consolidation	x	0	ha.	“	“	
f. New land settlement	0	0	households			
g. Dam and reservoir	0	0	Number of reservoirs	Reservoir area.	Reservoir capacity	
			reservoirs; 2	ha.	m ³	
h. Substantial changes in farming system	x	x	560 ha.	Name of new crops Bananas, pineapples, vegetable, black paper, fruit trees, cardamom & vanilla		
i. Construction of ponds	x	0		2		
j. Replacement of pumps	x			9		
k. Farm roads	x	x		16 Km		

3.2 Site Description (Bumbwi Sudi)

3.2.1 Present Socioeconomic Status of Project Area

- | | |
|--|--|
| (1) Land ownership and land use, etc. | : Basically the land belongs to the Government, giving the farmers the right to occupy and produce for as long as they live. As for the existing scheme, land holding is between 0.1 ha and 0.3 ha per plot |
| (2) Economic activities in and around project area | : Agriculture, principally paddy production, with other crops as maize, variety of vegetable, cassava, sweet potatoes, banana, pineapples and other fruits etc. Animal husbandry is also practiced (cattle, chicken etc) |
| (3) Customs (Riparian rights, water right, etc) | : No water right or riparian right is yet existing in the country. The department for Water is considering a water right act in its New Zanzibar Water Policy Proposal. |
| (4) Host people or community | : A good mixture of indigenous Zanzibari and of the mainland Tanzania origin |
| (5) Public health | : Malaria is a common problem as in most parts of the Island |
| (6) Population | : Estimated between 12,000 to 15,000 people, with about 2,500 households. Population growth rate is 3% per annum. |
| (7) Others | : |

3.2.2 Natural Conditions of Project Area.

- | | |
|--------------------------------------|--|
| (1) Climate | : Bimodal average annual rainfall of about 1,518mm, falling mainly between March and June. mean annual temperature is 26 ⁰ C with annual Evapo-transpiration of 1,600mm. |
| (2) Topography | : Gentle topography of about 1:100 at elevation 40 – 50 m above mean sea level. |
| (3) Hydrology and drainage condition | : Rich ground water resources with hypothetical yields of 50,000 to 950,000 m ³ /day per 10km ² , indicating bore hole capacity of between 30- 60 L/s. Quality is excellent with TDS 50 – 150 ppm. |
| (4) Soils | : Poorly drained sandy loam to sandy clay loam soils, having moderate to medium crumb structure at the top soils. |
| (5) Vegetation | : Grass land with scattered bushes and trees. |
| (6) Rare species or fragile ecology | : |
| (7) Others | : |

3.2.3 Environmentally Sensitive Area in Project Site or Vicinity

Environmentally Sensitive Area	Applicable or Not					
	In project Area			In vicinity of Project Area		
	Appl.	N.A	Unknown	Appl.	N.A	Unknown
** Area under Specific designation**						
S1. Habitat of fauna and flora listed in CITES	0	0	0	0	0	0
S2. Wetland designated under the Ramsar Convention	0	0	0	0	0	0
S3. Heritage sites listed in the world heritage convention	0	0	0	0	0	0
S4. National park, nature reserve, etc.	0	0	0	0	0	0
S5. Others()	0	0	0	0	0	0
Socio economically sensitive area						
S6. Areas inhabited by indigenous people, ethnic minorities, nomads etc	0	x	0	0	x	0
S7. Historically remains, cultural assets, aesthetic site	0	x	0	x	0	0
S8. Area likely to suffer from significant negative economic impact	0	0	x	0	0	x
S9. Others()	0	0	0	0	0	0
** Environmentally sensitive natural land**						
S10. Arid and semi-arid lands (including savanna, range land, etc)	0	0	0	0	0	0
S11. Tropical forests and wild lands	0	0	0	0	0	0
S12. Wetland or peat lands	0	0	0	0	0	0
S12-1 Wetlands	0	0	0	0	0	0
S12-2 Peat lands	0	0	0	0	0	0
S13. Coastal zones	0	0	0	0	0	0
S13 -1 Mangrove forest	0	0	0	0	0	0
S13-2 Coral reefs	0	0	0	0	0	0
S14. Mountainous, steep sloped, erodible or devastated lands	0	0	0	0	0	0
S15. Closed water bodies such as lakes, swamps or reservoirs	0	0	0	0	0	0
S16. Others (springs)	0	0	0	x	0	0

3.3 Screening (Bumbwi Sudi)

SOCIAL ENVIRONMENT			
Social economic issues		Health and sanitary issues	
Planned agricultural settlement	Unknown	Increased use of agrochemicals	Yes
Involuntary resettlement	Yes	Outbreak of endemic diseases	No
Substantial change in way of life	Yes	Prevalence of water borne diseases	Yes
Conflicts among communities or people	Yes	Residual toxic of agrochemicals	Unknown
Impacts on native people	Yes	Increase in domestic and other human wastes	Yes
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	Yes	Damage to aesthetic sites	No
Relocation of bases of economic activities	Unknown		
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	Yes		
Changes in existing institutions and customs	Yes		
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	No	Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	No	Deterioration of soil fertility	No
Proliferation of exotic and/or hazardous species	Unknown	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	Unknown	Devastation or desertification of land	No
Encroachment on tropical forests	Unknown	Devastation of hinterland	Unknown
Destruction or degradation of mangrove forests	No	Ground subsidence	Unknown
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	No		
Water contamination and deterioration of water quality	No		
Water eutrophication	Unknown		
Low water temperature	Unknown		
Atmospheric pollution	Unknown		
Poor water management	No	Overall evaluation	Yes = 14
Landscape and Mineral Resources			No = 18
Damage to landscape	No		Unknown = 15

3.4 Scoping (Bumbwi Sudi)

Social Environment	Project Activities					
1 Social economic issues	LC	WD	CC	FS	PC	DS
<i>a) Social issues</i>						
Planned agricultural settlement	B	B	B	B	B	B
Involuntary resettlement	A	A	C	C	A	A
Substantial change in way of life	A	A	C	A	A	A
Conflicts among community and people	A	C	C	C	C	C
Impacts on native people	A	A	A	A	A	A
Impediment to movement of people and livestock	C	C	C	C	C	C
<i>b) Demographic issues</i>						
Population increase	A	A	C	A	A	C
Drastic change in population composition	A	A	C	A	A	C
<i>c) Economic activities</i>						
Relocation of bases of economic activities	B	B	B	B	B	B
Occupational change and loss of labour opportunities	C	C	C	C	C	C
Increase in income disparities	B	B	B	B	B	B
<i>d) Institutional and Custom related Issues</i>						
Adjustment and regulation of water for fishing right	B	B	B	B	B	B
Changes in social and institutional structure	C	C	C	C	A	C
Changes in existing institution and customs	A	B	B	B	B	B
2. Health and sanitary issues						
Increase use of agrochemicals	A	C	C	A	C	C
Prevalence of water borne diseases	A	B	B	B	B	B
Residual toxic of agrochemicals	B	B	B	B	B	B
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	C	C
Damage to aesthetic sites	C	B	B	B	B	B
Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	C	C	A	A	C
Impacts on indigenous fauna and flora	C	B	B	B	B	B
Degradation of ecosystem	C	C	C	C	C	C
Encroachment on wetlands	B	B	B	B	B	B
Encroachment on tropical forest	B	B	B	B	B	B
Destruction or degradation of mangrove forest	C	C	C	C	C	C
Degradation of coral reef	C	B	B	B	B	B
5. Soil and Land Resources						
<i>(a) Soil Resources</i>						
Soil erosion	A	C	C	C	C	C
Soil salinization	B	B	B	B	B	B
Deterioration of soil fertility	C	C	C	A	C	C
Soil contamination by agrochemicals	B	B	B	B	B	B
<i>(b) Land Resources</i>						
Soil sedimentation	C	C	C	C	A	C
Riverbank degradation	B	B	B	B	B	B
Inundation and flood	C	C	C	C	C	C
6. Hydrology, water quality and quantity issues						
<i>(a) Hydrology</i>						
Ground subsidence	B	B	B	B	B	B
Devastation of hinterland	B	B	B	B	B	B
Change in surface water hydrology	B	B	B	B	B	B
Change in ground water hydrology	B	B	B	B	B	B
Poor water management	C	B	B	B	B	B
<i>(b) Water quality</i>						
Water deterioration and deterioration of water quality	B	B	B	B	B	B
Water eutrophication	B	B	B	B	B	B
<i>(c) Water quantity</i>						
Adequacy and reliability of water supply	A	B	B	B	B	B

LC – Land Clearing WD – Well Drilling CC – Canal Construction FS – Farming System

PC – Pond Construction DS – Drainage System

A – Identified or potential significant environmental impact B – Environmental impact not clarified

C – Issue having no environmental impact

3.5 Potential Environmental Impacts for Bumbwi Sudi

- 1) It seems that the migratory birds used to visit Zanzibar island are commonly found in this scheme, probably one of the factors which attracts them is due to the vast area and exclusion of natural predators, therefore changing the ecological pattern of the area might jeopardize the safe haven for the migratory birds.
- 2) Clearing of the perennial vegetation may cause erosion as well as insufficiency of shade.
- 3) Land use conflict is common between the livestock keepers and farmers, these problems are much intensified in this scheme.
- 4) Water borne disease especially malaria and bilharzias are common in this scheme, this is due to the stagnant water, and the research done by the Ministry of Health has revealed that the rate of malaria has increased in areas where irrigation has been adopted.
- 5) Wild animals are not common in this scheme but precaution should be taken to avoid the migration of wild animal from nearby areas due to the changing of the ecological niche of irrigated land.
- 6) Population increase due to migration to the project area and vicinity is forecasted. Possibilities of pressure on land and other basic human needs can thus be a potential impact.

3.6 Proposed TOR for EIA

The EIA of Bumbwi Sudi irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1. Health and sanitation

- ❖ Increased use of agro-chemicals, especially those with residual toxic effects
- ❖ Prevalence of water borne diseases

2. Socio-economic Issues

- ❖ Conflicts between indigenous and immigrants
- ❖ Issues of compensation of land
- ❖ Land tenure system

NATURAL ENVIRONMENT

1. Biological and ecological issues

- ❖ Displacement of migratory birds
- ❖ Degradation of ecosystem
- ❖ Impact of exotic species

2. Soil and land resources

- ❖ Soil erosion
- ❖ Soil salinity
- ❖ Contamination of soil by agro-chemicals

3. Land Resources

- ❖ Vegetation pattern
- ❖ Land use pattern

4. Water resources

- ❖ Change in groundwater hydrology
- ❖ Poor water management
- ❖ Deterioration of water quality
- ❖ Changing of water pattern

4. CHAANI IRRIGATION SCHEME

4.1 Project Description (Chaani)

4.1.1 Back ground Information and Objective of Project

The Chaani Irrigation Project has a gross potential area of about 320 ha, out of which 250 ha is the potentially command area. The area is in the vicinity of the Kibokwa Irrigation scheme, with a potential area of about 250 ha, out of which about 52 ha was developed by FAO/UNDP in mid eighties, and put in to production utilizing ground water resource.

4.1.2 Brief Description of Project

Outline of Project Area : The Project is located in the North A District of Unguja Island, North Region, near Chaani, Ketwa and Mbuzini villages. River Bwabwaja traverses the valley, with farmers cultivating paddy and vegetable under rain fed and traditional Irrigation methods. The gross command area is about 320ha.

Beneficiaries & Benefited Area : About 7000 Persons 250 ha

Relevant Project Components : Irrigation, Drainage, Land clearing and leveling, Land consolidation and reallocation, Dam and reservoir construction, IA facilities and farm roads improvement.

Executing Agencies : Ministry of Agriculture, Natural Resources, Environment and Cooperatives (MANREC)

Environmental Agencies Concerned: Department of Environment Zanzibar (MANREC)

4.1.3 Major Components and Development Scale of Project

(1) Main Project Components (Development activity)	(2) Type of Project		(3) Scale of project			(4) Remarks
	New project	Rehabilitation	Area, etc	Dimensions major facilities		
a. Irrigation	x	0	250 ha.	Not yet designed		EIA is required for all Irrigation Development Projects from 20 ha. according to the Environmental Management for Sustainable Development Act 1996.
b. Drainage	x	0	250 ha.	“ “		
c. Land clearing & leveling	x	0	250 ha.	“ “		
d. Sea/swamp reclamation	0	0	ha.	“ “		
e. Land consolidation	x	0	250 ha.	“ “		
f. New land settlement	0	0	households	“ “		
g. Dam and reservoir	x	0	Number of reservoirs reservoirs; 01	Reservoir area. ha.	Reservoir capacity m ³	
h. Substantial changes in farming system	x	0	250 ha.	Name of new crops Vegetables and fruits		
i. Others	0	0				
j. Farm roads construction	x	0		6.6 kms		

4.2 Site Description (Chaani)

4.2.1 Present Socioeconomic Status of Project Area

- (1) Land ownership and land use, etc. : Basically, the land is owned by the Government giving rights to occupy and produce to the farmers for their life time.
- (2) Economic activities in and around project area : Agricultural production principally paddy and vegetable, with animal husbandry practices (cattle, chicken, goats etc).
- (3) Customs (Riparian rights, water right, etc) : No water right is yet existing in the country. The department for Water is considering a water right act in its new Water policy proposal.
- (4) Host people or community : Indigenous Zanzbari peasants
- (5) Public health : As in many parts of Zanzibar Islands, malaria is a frequently occurring problem.
- (6) Population : About 7,000 people, with approximately 2,000 households. Population growth rate is about 3% per annum.
- (7) Others : None

4.2.2 Natural Conditions of Project Area.

- (1) Climate : Bimodal average annual rainfall of 1,200mm, mostly between March and June. Mean temperature is about 26⁰C and relative humidity of 79% with mean annual Evapotranspiration of 1,862mm.
- (2) Topography : Gentle topography, with land slopes of approximately 1:1000.
- (3) Hydrology and drainage condition : Seasonal ground water fluctuation is between 0.5m and 5.0m. Quality is good 7,184.5mg/l suitable for irrigation. Natural drainage density is about 50m²/ha, draining into Indian ocean through underground caves.
- (4) Soils : Sandy clay, sandy loam and silt clay, with depths between (0 and 1.0) m. Non saline soils with pH 6.5, and base exchange 5.0. Fertility is promisingly good.
- (5) Vegetation : Grassland with scattered bushes and trees.
- (6) Rare species or fragile ecology :
- (7) Others :
-

4.2.3 Environmentally Sensitive Area in Project Site or Vicinity

Environmentally Sensitive Area	Applicable or Not					
	In project Area			In vicinity of Project Area		
	Appl.	N.A	Unknown	Appl.	N.A	Unknown
** Area under Specific designation**						
S1. Habitat of fauna and flora listed in CITES	0	0	0	0	0	0
S2. Wetland designated under the Ramsar Convention	0	0	0	0	0	0
S3. Heritage sites listed in the world heritage convention						
S4. National park, nature reserve, etc.	0	0	0	0	0	0
S5. Others()	0	0	0	0	0	0
Socio economically sensitive area						
S6. Areas inhabited by indigenous people, ethnic minorities, nomads etc	0	0	0	0	0	0
S7. Historically remains, cultural assets, aesthetic site	0	0	0	0	0	0
S8. Area likely to suffer from significant negative economic impact	0	0	0	0	0	0
S9. Others()	0	0	0	0	0	0
** Environmentally sensitive natural land**						
S10. Arid and semi-arid lands (including savanna, range land, etc)	0	0	0	0	0	0
S11. Tropical forests and wild lands	0	0	0	0	0	0
S12. Wetland or peat lands	0	0	0	0	0	0
S12-1 Wetlands	0	0	0	0	0	0
S12-2 Peat lands	0	0	0	0	0	0
S13. Coastal zones	0	0	0	0	0	0
S13 -1 Mangrove forest	0	0	0	0	0	0
S13-2 Coral reefs	0	0	0	0	0	0
S14. Mountainous, steep sloped, erodible or devastated lands	0	0	0	0	0	0
S15. Closed water bodies such as lakes, swamps or reservoirs	0	0	0	0	0	0
S16. Others ()	0	0	0	0	0	0

4.3 Screening (Chaani)

SOCIAL ENVIRONMENT			
Social economic issues		Health and sanitary issues	
Planned agricultural settlement	Unknown	Increased use of agrochemicals	Yes
Involuntary resettlement	Yes	Outbreak of endemic diseases	No
Substantial change in way of life	Yes	Prevalence of water borne diseases	Yes
Conflicts among communities or people	No	Residual toxic of agrochemicals	No
Impacts on native people	Yes	Increase in domestic and other human wastes	Yes
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	Yes	Damage to aesthetic sites	No
Relocation of bases of economic activities	Unknown		
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	Yes		
Changes in existing institutions and customs	Yes		
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	No	Soil Salinization	Unknown
Degradation of ecosystem with biological diversity	No	Deterioration of soil fertility	No
Proliferation of exotic and/or hazardous species	Unknown	Soil contamination by agrochemicals	Unknown
Encroachment on wetlands	Unknown	Devastation or desertification of land	No
Encroachment on tropical forests	Unknown	Devastation of hinterland	Unknown
Destruction or degradation of mangrove forests	No	Ground subsidence	Unknown
Degradation of coral reef	No		
Hydrology and Air and Water Quality issues			
Changes in surface water hydrology	Yes		
Changes in ground water hydrology	Yes		
Inundation and flood	No		
Soil sedimentation	Yes		
Riverbank degradation	No		
Water contamination and deterioration of water quality	Unknown		
Water eutrophication	Unknown		
Low water temperature	Unknown		
Atmospheric pollution	Unknown		
Poor water management	No	Overall evaluation	Yes = 15
Landscape and Mineral Resources			No = 17
Damage to landscape	No		Unknown = 15

4.4 Scoping (Chaani)

Social Environment	Project Activities					
1 Social economic issues	LC	DC	CC	FS	RT	DS
<i>a) Social issues</i>						
Planned agricultural settlement	B	B	B	B	B	B
Involuntary resettlement	A	A	A	A	B	C
Substantial change in way of life	A	A	A	A	B	C
Conflicts among community and people	C	C	C	C	B	C
Impacts on native people	A	A	A	A	B	B
Impediment to movement of people and livestock	C	C	B	B	B	C
<i>b) Demographic issues</i>						
Population increase	A	A	C	A	B	C
Drastic change in population composition	A	A	B	A	B	C
<i>c) Economic activities</i>						
Relocation of bases of economic activities	B	B	B	B	B	B
Occupational change and loss of labour opportunities	C	C	C	C	B	C
Increase in income disparities	B	B	B	B	B	B
<i>d) Institutional and Custom related Issues</i>						
Adjustment and regulation of water for fishing right	B	B	B	B	B	B
Changes in social and institutional structure	A	A	A	A	B	C
Changes in existing institution and customs	A	A	A	A	B	C
2. Health and sanitary issues						
Increase use of agrochemicals	A	A	A	A	B	C
Prevalence of water borne diseases	A	A	A	A	B	C
Residual toxic of agrochemicals	B	B	B	B	B	B
3. Cultural Property Issues						
Impairment of historical remains and cultural sites	C	C	C	C	B	C
Damage to aesthetic sites	C	C	C	C	B	C
Natural Environment						
4. Biological and Ecological Issues						
Deterioration or degradation of vegetation	A	C	C	A	B	C
Impacts on indigenous fauna and flora	C	C	C	C	B	C
Degradation of ecosystem	B	B	B	B	B	B
Encroachment on wetlands	B	B	B	B	B	B
Encroachment on tropical forest	B	B	B	B	B	B
Destruction or degradation of mangrove forest	C	C	C	C	B	C
Degradation of coral reef	C	C	C	C	B	C
5. Soil and Land Resources						
<i>(a) Soil Resources</i>						
Soil erosion	A	C	C	C	B	C
Soil salinization	B	B	B	B	B	B
Deterioration of soil fertility	C	C	C	C	B	C
Soil contamination by agrochemicals	B	B	B	B	B	B
<i>(b) Land Resources</i>						
Soil sedimentation	C	A	A	C	B	C
Riverbank degradation	B	B	B	B	B	B
Inundation and flood	C	C	C	C	B	C
6. Hydrology, water quality and quantity issues						
<i>(a) Hydrology</i>						
Ground subsidence	B	B	B	B	B	B
Devastation of hinterland	B	B	B	B	B	B
Change in surface water hydrology	A	A	C	C	B	C
Change in ground water hydrology	A	A	C	C	B	C
Poor water management	C	C	C	C	B	C
<i>(b) Water quality</i>						
Water deterioration and deterioration of water quality	B	B	B	B	B	B
Water eutrophication	B	B	B	B	B	B
<i>(c) Water quantity</i>						
Adequacy and reliability of water supply	A	A	A	A	B	A

LC – Land Clearing DC – Dam 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

4.5 Potential Environmental Impacts for Chaani Irrigation Scheme

- 1) It seems that the migratory birds use to visit Zanzibar island are commonly found in this scheme, probably one of the factor which attracts them is due to the vast area and exclusion of natural predators, therefore changing the ecological pattern of the area might jeopardize the safe heaven for the migratory birds.
- 2) Clearing of the perennial vegetation may cause erosion as well as insufficiency of shade.
- 3) Land use conflict is common between the livestock keepers and farmers, these problems are much intensified in this scheme.
- 4) Water borne disease especially malaria and bilharzias are common in this scheme, this is due to the stagnant water, and the research done by the Ministry of Health has revealed that the rate of malaria has increased in areas where irrigation has been adopted.
- 5) There is frequent eruption of rats especially in this scheme. Although the scientific findings are not yet being explored, there is a need of looking this problem in depth to avoid the negative implication of the project.
- 6) Wild animals are not common in this scheme precaution should be taken to avoid the migration of wild animal from nearby areas due to the changing of the ecological niche of irrigated land.
- 7) Siltation of dams due to agricultural activities on the upstream in catchment areas seems to be an important potential impact.
- 8) Population increase due to migration to the project area and vicinity is forecasted. Possibilities of pressure on land and other basic human needs can thus be a potential impact.
- 9) There will be a loss of land that will be submerged in the upstream of the dam and/or reservoir areas that are now used for agricultural production.

4.6 Proposed TOR for EIA

The EIA of Chaani irrigation scheme should focus on the following issues:

SOCIAL ENVIRONMENT

1. Health and sanitation
 - ❖ Increased use of agro-chemicals, especially those with residual toxic effects
 - ❖ Prevalence of water borne diseases
2. Socio-economic Issues
 - ❖ Conflicts between indigenous and immigrants
 - ❖ Issues of compensation of land
 - ❖ Land tenure system

NATURAL ENVIRONMENT

1. Biological and ecological issues
 - ❖ Displacement of migratory birds
 - ❖ Degradation of ecosystem
 - ❖ Impact of exotic species
2. Soil and land resources
 - ❖ Soil erosion
 - ❖ Soil salinity
 - ❖ Contamination of soil by agro-chemicals
 - ❖ Sedimentation
3. Land Resources
 - ❖ Vegetation pattern
 - ❖ Land use pattern
4. Water resources
 - ❖ Change in groundwater hydrology
 - ❖ Poor water management
 - ❖ Deterioration of water quality
 - ❖ Changing of water pattern