

# ***TABLES***



**Table 1.1.1 Description of Typical Soil Profile (1/4)**

**Mapping Unit: Mk1-1**

Soil Pit No.:	Mkula-3
Soil Name:	Eutric Combisols
Date of examination:	12 August 1996
Elevation:	290 m above sea level
Land-form:	Fan (middle reach)
Slope:	Nearly level, <1%
Land Use/Vegetation:	Cultivated with maize
Parent Material:	Fan deposits
Drainage:	Moderately well drained
Soil Moisture Condition:	Moist throughout
Groundwater Depth:	> 150 cm
Surface Stone or Rock Outcrop:	None
Erosion:	None

**Brief Description of the Profile:**

Dark brown clay loam soil, moderately developed subangular structure, slightly sticky and slightly plastic when wet, friable when moist, under 50 cm very few to common mottles, main roots between 0 and 50 cm.

**Soil Profile Description**

Ap	0 - 18 cm	Dark brown (10YR 3/3) moist; clay loam; moderate fine subangular blocky structure; sticky, plastic, friable moist; common fine tubular and interstitial pores; common fine roots; clear smooth boundary.
AB	18 - 50 cm	Dark brown (10YR 3/3) moist; clay loam; medium fine subangular blocky structure; sticky, plastic, friable moist; common fine interstitial and tubular pores; common fine roots; gradual smooth boundary.
B2	50 - 95 cm	Dark grayish brown (10YR 5/4) and very few medium distinct clear yellowish brown (2.5Y 5/6) mottles moist; clay loam; moderate fine subangular blocky structure; sticky, plastic, friable moist; few fine pores; very few fine roots; gradual smooth boundary.
C	95 -115 cm +	Brown (10YR 4/4) and common medium distinct clear yellow brown (2.5Y 5/6) mottles moist; silty clay loam; moderate medium angular blocky structure; sticky, plastic, friable moist; common fine pores; very few fine roots.

Land Class (for paddy rice/for upland crops): SR2r/SU1

**Table 1.1.1 Description of Typical Soil Profile (2/4)**

**Mapping Unit: Mkl-2**

Soil Pit No.:	Mkula-1
Soil Name:	Eutric Fluvisols
Date of examination:	12 August 1996
Elevation:	285 m above sea level
Land-form:	Fan
Slope:	Nearly level
Land Use/Vegetation:	Cultivated with paddy rice in the rainy season, and maize or potatoes in the dry season
Parent Material:	Fan deposits
Drainage:	Imperfectly drained
Groundwater Depth:	90 cm
Soil Moisture Condition:	Moist and wet under groundwater
Surface Stone or Rock Outcrop:	None
Erosion:	None

**Brief Description of the Profile:**

Deep, imperfectly drained clay loam to silty clay loam soil having brownish black topsoil and dark grayish yellow and yellowish brown mottles subsoil, friable when moist, slightly sticky and slightly plastic when wet, friable when moist, moderately developed crumb or subangular blocky structure. Groundwater appears at 90 cm from the surface at examination season. The soil contains many mica flakes which increase with depth

**Soil Profile Description**

Ap	0 - 28 cm	Brownish black (10YR 3/2) moist; clay loam; moderate medium, crumb structure; slightly sticky, slightly plastic, friable moist; many fine tubular and vesicular pores; many fine roots; clear smooth boundary.
B2	28 - 40 cm	Dark grayish yellow (2.5Y 4/2) and common fine distinct clear yellowish brown (10YR 5/6) mottles moist; silty clay loam; moderate medium subangular blocky structure; slightly sticky, slightly plastic, friable moist; many very fine vesicular pores; common fine roots; gradual smooth boundary.
C1	40 - 90 cm	Olive brown (2.5Y 4/3) and few fine faint clear yellowish brown (10YR 5/8) mottles moist, clay loam; moderate medium subangular blocky structure; sticky, plastic friable moist; many fine vesicular and fine tubular pores; many mica fraction; few fine roots; existing groundwater table at 90 cm from surface; gradual smooth boundary.
C2g	90 - 110 cm +	Dark grayish yellow (2.5Y 4/2) moist, silty loam; weak medium subangular blocky structure; slightly sticky, slightly plastic, friable moist; many fine vesicular pores.

Land Class (for paddy rice/for upland crops): SR2ld/SU2fd

**Table 1.1.1 Description of Typical Soil Profile (3/4)**

**Mapping Unit: Mkl-3**

Soil Pit No.:	Mkula-14
Soil Classification:	Eutric Gleysols
Date of examination:	1 July 1996
Elevation:	280 m above sea level
Land-form:	Fan, depression
Slope:	Nearly level
Land Use/Vegetation:	Cultivated lowland paddy rice in the rainy season
Parent Material:	Fan deposits
Drainage:	Poorly drained
Groundwater Depth:	40 cm
Soil Moisture Condition:	Wet
Surface Stone or Rock Outcrop:	None
Erosion:	None

**Brief Description of the Profile:**

Deep, poorly drained soils in clay loam, silty clay loam to sandy clay loam sediments. The topsoil is brownish black, clay loam with moderately developed crumb structure. The subsoil, below 27 to 50 cm, have silty clay loam texture. Groundwater table is 40 cm from the surface.

**Soil Profile Description**

A	0 - 27 cm	Brownish black (10YR 3/1) moist; clay loam; moderate fine and medium crumb structure; sticky, plastic, friable moist; many coarse pores; many very fine roots; clear smooth boundary.
B2g	27 - 50 cm	Olive dark (5Y 3/1) and many medium distinct clear yellowish brown (10YR 5/6) mottles moist, silty clay loam; moderate medium subangular blocky structure; sticky, plastic, friable moist; common fine pores; common fine roots; gradual smooth boundary.
C1g	50 - 80 cm	Olive black (5Y 3/1) moist; silty clay loam; weak medium subangular blocky structure; sticky, plastic, friable moist; many mica flakes (by auger examination).
C2g	80 - 100 cm +	Grayish olive (5Y 4/2) moist; sandy clay loam; sticky, plastic, friable moist; (by auger examination)

Land Class (for paddy rice/for upland crops): SR3d/SU3fd

**Table 1.1.1 Description of Typical Soil Profile (4/4)**

**Mapping Unit: Mk1-4**

Soil Pit No.:	Mkula-11
Soil Name:	Eutric Fluvisols
Date of examination:	30 June 1997
Elevation:	282 m above sea level
Land-form:	Natural levee
Slope:	Nearly level with undulating in micro-relief
Land Use/Vegetation:	Cultivated with maize in the wet season, and sweet potatoes in the dry season
Parent Material:	Alluvial deposits, natural levee
Drainage:	Excessively well drained
Soil Moisture Condition:	Dry and moist
Groundwater Depth:	> 150 cm
Surface Stone or Rock Outcrop:	None
Erosion:	None

**Brief Description of the Profile:**

Moderately deep, excessively well drained sandy soil having very dark reddish brown topsoil. Subsoil is dull reddish brown.

**Profile Description**

Ap	0 - 30 cm	Very dark reddish brown (5YR 3/2) moist; sandy loam; weak fine subangular blocky structure; non-sticky, non-plastic, loose moist; many fine pores; common fine roots; clear smooth boundary.
BC	30 - 42 cm	Dull reddish brown (5YR 4/3) moist; sandy loam; structureless, single grain; non-sticky, non-plastic; many fine pores; common fine roots; clear smooth boundary.
C1	42 b- 52 cm	Dark reddish brown (5YR 3/3), fine sand; structureless, single grain; non-sticky, non-plastic, loose friable moist; many fine pores; few fine roots; clear smooth boundary.
C2	52- 75 cm	Bright reddish brown (5YR 5/6) moist, silty loam; structureless, single grain; non-sticky, non-plastic, loose moist; common fine pores; few fine roots; abrupt wavy boundary.
C3	75 -110 cm +	Dull brown (7.5YR 5/3) and few fine distinct clear yellowish brown (10YR 5/6) mottles moist; silty loam; structureless, single grain; non-sticky, non-plastic, friable moist; few fine pores.

Land Class (for paddy rice/for upland crops): NRr/SU3r

Table 1.3.1 Present Farming Practices for Major Crops- Mkula Scheme

Item	Paddy	Maize
1 Land preparation	- Plowing by hand tractor or hand - no harrowing - Puddling by hand tractor or hand (over the nursery period)	- Plowing by hand tractor or hand - Harrowing by hand
2 Nursery	- 40 ~ 50 kg per ha - around 600 m <sup>2</sup> per ha	Not applied
3 Broadcasting	Not applied	- 70cm x 70cm ~ 90cm x 100cm - 20 kg per ha (2 ~3 seeds per hill)
4 Transplanting	- 1 to 2 seedlings per hill - 10cm x 10cm ~ 10cm x 20cm	Not applied
5 Application of fertilizer		Not applied
Nursery	- 2 kg of Urea per 250 m <sup>2</sup>	
Basal application	- 125 kg of Urea per ha	
1st top dressing		
Total application	130 kg of Urea per ha	
6 Weeding	- by rotary weeder - by herbicide (2,4-D : 2 lit. per ha)	- depending on the situation
7 Application of agro-chemicals	Not applied	Not applied
8 Water control	- Once a week up to 20 days before harvesting	Not applied
9 Harvesting	- around 2/3 of panicle from top side is changed to yellowish collar.	- depending on the degree on home consumption

Item	Pulse
1 Land preparation	- Plowing by hand tractor or hand - Harrowing by hand
2 Nursery	Not applied
3 Broadcasting	- 20cm x 40cm ~ 30cm x 50cm - 20 kg per ha (2 ~3 seeds per hill)
4 Transplanting	Not applied
5 Application of fertilizer	Not applied
Nursery	
Basal application	
1st top dressing	
Total application	
6 Weeding	- depending on the situation
7 Application of agro-chemicals	Not applied
8 Water control	Not applied
9 Harvesting	- around 4 months after sowing

Table 1.3.2 Present Situation of Sugarcane Industry in Kilombero Sugar Company

(1) Outgrowers

	1992/93	1993/94	1994/95	1995/96	1996/97
<b>Cultivated area (ha)</b>					
Msolwa	na	na	375	375	375
Mkula	na	na	26	26	26
Sonjo	na	na	185	185	185
Total	na	na	586	586	586
<b>Harvested area (ha)</b>					
Msolwa	90	175	210	291	280
Mkula	na	5	10	22	11
Sonjo	5	85	90	59	106
Others	915	833	1,355	1,408	1,383
Total	1,010	1,098	1,665	1,780	1,780
<b>Harvested amount (ton)</b>					
Msolwa	1,900	7,040	8,400	11,230	9,850
Mkula	70	135	535	837	402
Sonjo	na	3,890	4,270	2,280	3,742
Others	39,822	50,461	63,649	48,785	49,549
Total	41,792	61,526	76,854	63,132	63,543
<b>Unit yield (ton/ha)</b>					
Msolwa	21	40	40	39	35
Mkula	-	27	54	38	37
Sonjo	-	46	47	39	35
<b>Portion of harvested area against cultivated area (%)</b>					
Msolwa	na	na	56	78	75
Mkula	na	na	38	85	42
Sonjo	na	na	49	32	57
<b>Portion of harvested area against the total harvested area of outgrowers (%)</b>					
Msolwa	9	16	13	16	16
Mkula	na	0	1	1	1
Sonjo	0	8	5	3	6
<b>Portion of harvested amount against the total harvested amount of the company (%)</b>					
Msolwa	0.9	3.9	4.7	6.5	6.9
Mkula	0.0	0.1	0.3	0.5	0.3
Sonjo	na	2.2	2.4	1.3	2.6

(2) Kilombero Sugar Company (Kilombero - 1)\*4

	1992/93	1993/94	1994/95	1995/96	1996/97
Cultivated area (ha)	3,287	3,377	3,417	3,399	3,367
Harvested area (ha)	2,797	2,285	2,694	2,908	3,252
Harvested amount (ton) *1	214,633	179,801	179,538	173,825	142,260
Unit yield (ton/ha) *2	62	52	38	38	24
Processing capacity (ton/day)	1,422	1,304	1,232	1,294	1,314
Installed capacity (ton/day)	2,000	2,000	2,000	2,000	2,000
Operation period (day)	151	138	146	134	108
Processing efficiency (%) *3	71	65	62	65	66

Remarks)

\*1 : Including the amount from outgrowers

\*2 : Subtracting the portion of outgrowers

\*3 : Portion of processing capacity against installed capacity

\*4 : Kilombero Sugar Company consists of Kilombero - 1 and 2. Villages mentioned above are concerned with Kilombero - 1.

Source) Kilombero Sugar Company, 1997



Table 1.3.3 Present Crop Budget for Major Crops in Mkula Scheme

Mkula Scheme	Unit	Paddy			Maize			Pulse		
		Unit Price (TSh)	Q'ty	Value (TSh)	Unit Price (TSh)	Q'ty	Value (TSh)	Unit Price (TSh)	Q'ty	Value (TSh)
<b>Production Cost</b>										
(A) Farm Input	kg/ha	120	50	6,000	590	20	11,800	800	20	16,000
1 Seed	kg/ha	120	50	6,000	590	20	11,800	800	20	16,000
2 Fertilizer										
: Urea (46 %-N)	kg/ha	240	0	0	240	0	0	240	0	0
: SA (21 %-N)	kg/ha	180	0	0	180	0	0	180	0	0
: TSP (46 %-P <sub>2</sub> O <sub>5</sub> )	kg/ha									
3 Agro-chemical										
: Pesticide	lit./ha	5,500	0.0	0	5,500	0.0	0	5,500	0.0	0
: Herbicide	lit./ha	3,500	2.5	8,750	3,500	0.0	0	3,500	0.0	0
: Fungicide	lit./ha	4,000	0.0	0	4,000	0.0	0	4,000	0.0	0
4 Packing material		500	27	13,500	500	17	8,500	500	6	3,000
<u>Sub-total (A)</u>				<u>28,250</u>			<u>20,300</u>			<u>19,000</u>
(B) Labour Requirement				0			0			0
1 Family labour			60	0		50	0		50	0
2 Hired labour		500	40	20,000	500	25	12,500	500	15	7,500
<u>Sub-total (B)</u>			<u>100</u>	<u>20,000</u>		<u>75</u>	<u>12,500</u>		<u>65</u>	<u>7,500</u>
(C) Machinery or draught cattle										
1 Ploughing by tractor	L.S	30,000	1	30,000	30,000	1	30,000	30,000	1	30,000
2 Ploughing by hand tractor	L.S	25,000	0	0	25,000	0	0	25,000	0	0
3 Puddling by hand tractor	L.S	17,500	0	0	17,500	0	0	17,500	0	0
<u>Sub-total (C)</u>				<u>30,000</u>			<u>30,000</u>			<u>30,000</u>
(D) Miscellaneous cost				3,913			3,140			2,825
5 % of (A) and (B)										
<b>Total Production Cost</b>				<b>82,163</b>			<b>65,940</b>			<b>59,325</b>
<b>Gross Return</b>										
(A) Yield	kg/ha		2,000			1,500			500	
(B) Producer price	per kg	160			120			200		
Gross return				320,000			180,000			100,000
<b>Net return</b>				<b>237,837</b>			<b>114,060</b>			<b>40,675</b>

Table 1.3.4 Annual Programme for Monthly Training Session for Kilombero District

Month	1996/97		1997/98	
	Main Subject	Resource	Main Subject	Resource
July	- General discussion and laying out strategies for carrying out activities in the District	DALDO DEO DIO DSMS	- Review of 1996/97 implementation of activities in the District and laying out strategies for implementation of 1997/98 activities	DALDO DLO DEO DSMS-C/I. SMS-Statist.
August	- Selection of new contact farmers and selected farmers and discuss with them on activities to be carried out	DEO DSMS	- Extension methodologies (Adult learning)	DEO DSMS-C DSMS-L SMS-N
September	- Discussion with research staffs in KATRIN on issues related to common crop grown in the District No Monthly Training Session		- Training of farmers at FDC Ifakara One group for rice and maize One group for dairy No Monthly Training Session	DEO DSMS-C DSMS-L FDC
October	- Tobacco - nursery preparation - Revision and follow-up on land preparation and procurement need of inputs	DSMS SMS	- Demonstration Livestock deworming	DEO DSMS-C DSMS-L
November	- Revision and follow-up on planting of rice and maize - Poultry, dairy cattle, pigs, and goats - management		- Rice-Band preparation - Livestock - dairy management (sanitation and proper feeding)	DEO DSMS-C DSMS-L SMS-Dairy
December	- As above - Assessment of input situation		- Maize - land preparation and planting - Rice - planting	DEO DSMS-C/I. SMS-Mech.
January	- Tobacco - field establishment and care - Rice and maize - field management - Livestock - management		- Maize - planting, fertilizer application	DEO DSMS-C DSMS-L
February	- Cocoa - pest and disease control - Rice and maize - field management - Livestock - management - Assessment of input situation		- Rice - field visit to see activities taking place in farmers fields - Holding discussions with farmers	DALDO DEO DSMS-C/I/I VEOs
March	- Rice and maize - field management - Livestock - management		- Horticultural crops (tomato, amaranths, and okra) - nursery establishment and field management	DEO DSMS-C DSMS-L SMS-Hort. SMS-Nutrition
April	- Tobacco - harvesting and processing - Onion - nursery establishment and disease / pests		- Maize - field visit to see activities taking place in farmers fields - Holding discussions with farmers	DALDO DEO DSMS-C DSMS-L
May	- Horticultural crops (tomato, amaranths, eggplant and okra) - revision and follow-up - New castle disease - follow-up		- Livestock - management of common disease diagnosis and treatment - Maize and rice - proper storage	DEO DSMS-C DSMS-L SMS-Clinic SMS-Crops
June	- Evaluation of the programme implementation and discussion	DALDO DEO DIO DSMS	- Evaluation of the programme implementation and discussion	DALDO DEO DSMS-C DSMS-L DLO SMS-Statist.

Source) Morogoro regional office, 1997

Table 1.3.5 Target and Progress for Extension Services in Morogoro Region in 1996/97

(as of March 1997)

	Districts in Morogoro Region							
	Morogoro		Kilosa		Kilombero		Ulanga	
	Target	Progress	Target	Progress	Target	Progress	Target	Progress
<b>1 Extension Targets</b>								
No. of village to be reached	215	131	91	58	38	36	64	35
No. of farmers to be reached	94,971	39,266	39,653	25,273	8,436	4,443	64,000	3,500
No. of active VEOs	215	131	91	58	38	36	64	35
No. of contact farmers	6,096	5,808	4,368	2,784	429	249	2,476	1,488
No. of active farmer groups	360	77	-	-	76	39	128	70
No. of group meetings	6,096	6,760	4,368	2,784	912	194	-	-
No. of adoption plots/units								
Crops		1,345					114	59
Livestock		484					14	11
<b>Total</b>	<b>6,240</b>	<b>1,829</b>	<b>4,368</b>	<b>1,108</b>	<b>1,900</b>	<b>1,041</b>	<b>128</b>	<b>70</b>
No. of message disseminated	30	7	96	3	84	3	24	2
Adoption rate (%)	80	55	100	69	100	60	100	60
No. of trials / demo	-	-	-	-	-	-	2	0
No. of visits by								
DEO	144	0	60	3	108	25	72	5
DIVEOs	96	0	120	24	-	-	-	20
DSMS	-	-	120	6	72	30	106	10
VEOs	-	-	-	-	-	-	-	-
<b>2 Extension Training Targets</b>								
No. of MTS	12	0	12	0	12	0	12	1
<b>3 Equipment</b>								
DEO Extension Kits	3	3	15	3	3	3	10	0
VEO Extension Kits	145	141	97	77	38	34	35	35
Veterinary Kits	5	4	6	4	7	2	3	2
<b>4 Vehicles</b>								
4WD	1	1	1	1	1	1	1	1
Motor Cycle	25	23	14	14	8	8	34	7
Bicycles	215	157	91	59	-	-	21	21

Source) Regional Agriculture Office

Table 1.3.6 Retraining Programme of VEOs in Morogoro Region

	District				Total
	Morogoro	Kilosa	Kilombero	Ulanga	
Total VEOs					
Diploma holder *1	57	27	20	10	114
Certificate holder *2	74	38	16	20	148
Total	131	65	36	30	262
Retraining Programme up to 1996/97					
Diploma holder *1					
Crops	0	0	0	0	0
Livestock	0	0	0	0	0
Certificate holder *2					
Crops	41	31	8	4	84
Livestock	16	7	6	7	36
Total					
Crops	41	31	8	4	84
Livestock	16	7	6	7	36
in 1997/98					
Diploma holder *1					
Crops	14	6	0	0	20
Livestock	14	6	0	0	20
Certificate holder *2					
Crops	9	0	1	3	13
Livestock	8	0	1	6	15
Total					
Crops	23	6	1	3	33
Livestock	22	6	1	6	35
VEOs who received or will receive retraining programme by 1997/98					
Diploma holder *1	28	12	0	0	40
Certificate holder *2	74	38	16	20	148
VEOs who needs retraining programme in 1998/99 onward					
Diploma holder *1	29	15	20	10	74
Certificate holder *2	0	0	0	0	0

Note )

\*1 Diploma holder : VEO who graduated from college (Two years diploma course after Form VI or certificated in Agriculture)

\*2 Certificate holder : VEO who graduated from secondary school (Two years course after Form IV)

**Table 2.1.1 Criteria for Land Suitability Assessment for Irrigated Farming**

Land Class Determination Factors	(unit) Rating	For Paddy Rice Cultivation				For Upland Crop Cultivation (maize, vegetables)			
		1	2	3	4	1	2	3	4
<b>[A] Agronomic Factors</b>									
<b>1 (r) Conditions of Root Zone</b>									
Texture of surface soil		loam - friable - Clay	Silt., Sil. firm - C	LS, Si	Sand, Gravel	St., L, Sil., CL, SCL, SiCL	Si, LS	SC, SiC friable - C	S, firm C
Effective soil depth	(cm)	>60	>60	60 - 30	<30	>100	100 - 60	100 - 60	<60
Drainage class		moderate - poor	moderate - poor	well, very poor	excessive	imperfect - well	imperfect - well	poor, excessive	very poor
Percolation	(mm/day)	<2	2 - 5	5 - 10	>10	-	-	-	-
Water holding capacity	(mm/100cm)	-	-	-	-	>200	200 - 150	150 - 100	<100
<b>2 (n) Soil Nutrients of Surface Soil</b>									
Organic carbon	(%)	>2.25	2.25 - 0.75	0.75 - 0.15	<0.15	>2.25	2.25 - 0.75	0.75 - 0.15	<0.15
Total nitrogen	(%)	>0.15	0.15 - 0.05	0.05 - 0.01	<0.01	>0.15	0.15 - 0.05	0.05 - 0.01	<0.01
Available Phosphate	(ppm)	>15	15 - 10	10 - 5	<5	>15	15 - 10	10 - 5	<5
Cation exchange capacity	(me/100g)	>16	16 - 8	8 - 4	<4	>16	16 - 8	8 - 4	<4
Exchangeable K	(me/100g)	>0.4	0.4 - 0.2	0.2 - 0.1	<0.1	>0.4	0.4 - 0.2	0.2 - 0.1	<0.1
Total cations	(me/100g)	>14	14 - 8	8 - 2	<2	>14	14 - 8	8 - 2	<2
Micro-nutrients		sufficient	sufficient	slightly deficient	severe deficient	sufficient	sufficient	slightly deficient	severe deficient
<b>3 (t) Soil Toxities</b>									
EC	(dS/m)	<3	3 - 5	5 - 8	>8	<1.7	1.7 - 3.5	3.5 - 6	>6
Sodium absorption ratio		<8	8 - 18	18 - 38	>38	<8	8 - 18	18 - 38	>38
pH		5.5 - 7.0	5.0 - 5.5, 7.0 - 8.0	4.0 - 5.0, 8.0 - 8.5	<4.0, >8.5	5.5 - 7.0	5.0 - 5.5, 7.0 - 8.0	4.5 - 5.0	<4.5, >8.0
Others (chloride, boron, etc.)		non toxic	non toxic	slightly toxic	severe toxic	non toxic	non toxic	slightly toxic	severe toxic
<b>4 (f) Flooding Risk</b>									
Frequency	(times/10years)	-	-	-	-	<1	1 - 2	2 - 5	>5
Inundated period		<4 weeks	<8 weeks	<8 weeks	>8 weeks	>2days	2 - 7days	1 - 2weeks	>2weeks
<b>[M] Management Factors</b>									
<b>5 (a) Accessibility to Farm</b>									
Distance from village	(km)	<1	1 - 3	3 - 6	>6	<1	1 - 3	3 - 6	>6
Farm-road condition		improved	seasonal	footpath		improved	seasonal	footpath	
<b>6 (w) On-farm Workability</b>									
Slope	(%)	<0.5	0.5 - 2	2 - 3	>3	<1	1 - 5	terraced	>5
Micro-relief (difference in height, cm)		<5	5 - 10	10 - 20	>20	<30	30 - 60	60 - 90	>90
Stones/rocks	(%)	<0.01	0.01 - 0.1	0.1 - 3	>3	<0.01	0.01 - 0.1	0.1 - 3	>3
Soil consistence (wet): Stickiness		non - sticky	very sticky			non - slightly	sticky	very sticky	
Soil consistence (wet): Plasticity		non - plastic	very plastic			non - slightly	plastic	very plastic	
Soil consistence (dry)		loose - hard	very hard	extrem. hard		loose - slightly	hard	very hard	extrem. hard
Farm size	(ha)	>0.04	0.04 - 0.005	<0.005		>0.2	0.2 - 0.02	<0.02	
Irrigation management		easy	moderate	intensive		easy	moderate	intensive	
<b>[D] Land Development Factors</b>									
<b>7 (l) Grading/Leveling, Ridging</b>									
Grading/Leveling		no-required	low cost	moderate cost	high cost	no-required	low cost	moderate cost	high cost
Ridging		no-required	low cost	moderate cost	high cost	no-required	low cost	moderate cost	high cost
Consolidation		no-required	low cost	moderate cost	high cost	no-required	low cost	moderate cost	high cost
Clearing		no-required	low cost	moderate cost	high cost	no-required	low cost	moderate cost	high cost
<b>8 (d) Drainage, Flood Protection</b>									
Drainage		no-required	low cost	moderate cost	high cost	no-required	low cost	moderate cost	high cost
Flood protection		no-required	low cost	moderate cost	high cost	no-required	low cost	moderate cost	high cost
<b>[E] Conservation and Environmental Factors</b>									
<b>9 (s) Long-term Prevention of Salinity/Sodicity</b>									
Prevention for salinity/sodicity		not subject	not subject	somewhat	with severe	not subject	not subject	somewhat	with severe
<b>10 (b) Prevention of Groundwater and Surface Water</b>									
Groundwater		no affecting	no affecting	somewhat	with severe	no affecting	no affecting	somewhat	with severe
Surface water		no affecting	no affecting	somewhat	with severe	no affecting	no affecting	somewhat	with severe
Watershed control of upstream		good condition	required	degraded	extremely degraded	good condition	required	degraded	extremely degraded
<b>11 (e) Soil Erosion Control</b>									
Soil erosion		no occurrence	no occurrence	slight erosion	severe erosion	no occurrence	no occurrence	slight erosion	severe erosion

Table 3.3.1 Outline of Group Discussion with Farmers (1/4)

Topics	Outline of Dialogue in Each Project Scheme			
	Mgongola	Mgeeta	Mkula	Mweza
1. Preferable crops	<p>Rainy season : paddy Dry season : beans, vegetables</p> <ul style="list-style-type: none"> <li>- Inter-cropping to be preferable</li> <li>- Demonstration to be confirmed promising crops and arming practices</li> <li>- Shortage of vegetables is serious point.</li> <li>- Upland crops as income source</li> </ul>	<p>Rainy season : maize, pulse crops Dry season : cabbage, Irish potato, pulse crops</p> <ul style="list-style-type: none"> <li>- In the future, promising market should be checked before starting the cultivation of new crops.</li> </ul>	<p>Rainy season : maize, paddy Dry season : maize, pulse crops, vegetables</p> <ul style="list-style-type: none"> <li>- Sugarcane should be changed to another crops.</li> <li>- It is difficult to take out sugarcane completely because of its marketability.</li> <li>- Farmers have lack of knowledge on vegetable cultivation.</li> <li>- Beans should be included as promising crop.</li> </ul>	<p>Rainy season : maize, paddy Dry season : onion, maize, pulse crops, vegetables</p> <ul style="list-style-type: none"> <li>- Shortage of vegetables is to be solved.</li> <li>- Farmers have lack of knowledge on vegetable cultivation.</li> <li>- Farmers desired to expand the area of onion and paddy cultivation.</li> </ul>
2. Cropping pattern	<ul style="list-style-type: none"> <li>- Double cropping of paddy and rotational cropping with paddy and upland crops are agreeable.</li> </ul>	<ul style="list-style-type: none"> <li>- Proposed cropping pattern is acceptable.</li> <li>- Water in the rainy season is enough, while August to November in the dry season there is water shortage.</li> </ul>	<ul style="list-style-type: none"> <li>- Proposed cropping pattern is acceptable.</li> </ul>	<ul style="list-style-type: none"> <li>- Concerning expansion of the onion cultivation, there is no serious labour shortage in the future.</li> <li>- Water shortage should be solved for expansion of irrigated area.</li> <li>- Prevailing harvesting season for onion is August and September.</li> <li>- If onion will be planted late, farmers suffer to protect them against pests and diseases.</li> </ul>
3. Farming practices	<p><i>Guideline of Special Programme of FAO was discussed.</i></p> <ul style="list-style-type: none"> <li>- Special Programme is acceptable.</li> <li>- Transplanting is laborious, so that it can not cover big area.</li> <li>- Production with transplanting is higher than one with broadcasting.</li> </ul>	<ul style="list-style-type: none"> <li>- Concerning cabbage, club root disease (fungus) is most serious in the village.</li> <li>- As one of the countermeasures, rotational cropping is conducted.</li> <li>- Due to feeding problems, animal keeping has not been promoted.</li> <li>- During animal keepers, application of manure is common.</li> </ul>	<ul style="list-style-type: none"> <li>- They are not aware of Special Programme of FAO.</li> <li>- Farmers are not aware of importance, necessity, etc. of field band.</li> </ul>	<ul style="list-style-type: none"> <li>- Mixing-up of paddy varieties in the paddy fields due to flooding</li> <li>- Peak season of water shortage is in March/April for the upstream and August/September for the down stream.</li> </ul>

Table 3.3.1 Outline of Group Discussion with Farmers (2/4)

Outline of Dialogue in Each Project Scheme				
Topics	Mgongola	Migeta	Mkula	Mwega
4. Seeds	<ul style="list-style-type: none"> <li>- Farmers multiply seeds by themselves.</li> <li>- Sometimes, seeds are bought from another farmers.</li> <li>- In Mkindo pilot area, Line 88 is cultivated, while Supa India in the Mgongola area.</li> <li>- Line 88 was obtained in 1993.</li> <li>- Quality of Line 88 has been deteriorated year by year.</li> <li>- Qualified seeds should be supplied.</li> <li>- Line 88 is a promising variety for the Project.</li> </ul>	<ul style="list-style-type: none"> <li>- Except cabbage and other minor vegetable, seeds are produced by farmers themselves.</li> <li>- Quality of seeds is generally not satisfied.</li> <li>- Local potatoes for consumption are adopted as seed potatoes.</li> <li>- Storage for seed potatoes is not available.</li> <li>- Seed potatoes which is bought from local market have been infected by some disease or insects</li> <li>- Price of vegetable seeds is expensive.</li> <li>- Local seed potato is of low price and low quality.</li> <li>- Some farmers try to organize group and try to arrange seeds by group.</li> <li>- Vegetable seeds are available in Morogoro town.</li> <li>- There is no problem on seed availability of vegetable seeds.</li> </ul>	<ul style="list-style-type: none"> <li>- Farmers multiply seeds by themselves.</li> <li>- They prefer to apply Line 88 as promising variety of paddy.</li> <li>- Cowpea is not in good quality.</li> </ul>	<ul style="list-style-type: none"> <li>- Seeds are generally multiplied by farmers themselves.</li> <li>- Qualified seeds are from informal sectors in Arusha.</li> <li>- Sometimes, commercial seeds to be sold by traders are not in good quality.</li> <li>- Concerning onion, some farmers produce their own seeds by themselves, while some of them buy commercial seeds from Arusha.</li> <li>- Some traders sell onion seeds of other sources under the pretext of seeds from Arusha.</li> <li>- Onion seeds is available in town, those seeds are imported, so that its price is expensive.</li> </ul>
5. Land preparation	<ul style="list-style-type: none"> <li>- They have used tractor.</li> <li>- Availability of tractors is low.</li> <li>- Number of tractors is insufficient.</li> <li>- Hiring charge is not stable and expensive.</li> <li>- Farm land is not prepared properly, due to few tractors.</li> <li>- Farmers believe that they are ready to buy tractors.</li> </ul>		<ul style="list-style-type: none"> <li>- Farmers have used tractor or hand hoe for land preparation.</li> <li>- Availability of tractors is low.</li> <li>- Number of tractors is insufficient.</li> <li>- Farmers organized group and tried to contact with tractor owners. However, owner broke their contract.</li> </ul>	<ul style="list-style-type: none"> <li>- Land preparation is conducted by manpower.</li> <li>- Neither tractor nor draught cattle is not applied in the area.</li> </ul>

Table 3.3.1 Outline of Group Discussion with Farmers (3/4)

Topics	Outline of Dialogue in Each Project Scheme		
	Msongola	Mgeta	Mkula
			Mwega
6. Oxenization	<ul style="list-style-type: none"> <li>- Formulation of farmer's organization was tried before, but farmers in charge were not trustful.</li> <li>- Oxenization in the area is very difficult to be applied due to hard soil.</li> <li>- It is difficult for oxen to perform well, as oxen may be stuck in wet soil condition.</li> <li>- Oxenization project was failed.</li> <li>- Farmers have no experience concerning keeping cattle.</li> </ul>		<ul style="list-style-type: none"> <li>- Oxenization in the area is very difficult to be applied due to hard soil.</li> <li>- There are a lot of weeds and then it is difficult to use oxen.</li> <li>- Once some oxen were brought to the school but later they were withdrawn because of tsetse fly.</li> </ul>
7. Fertilizer	<ul style="list-style-type: none"> <li>- No application of fertilizer in the Project area</li> <li>- Price is expensive.</li> <li>- Fertilizer is not available.</li> <li>- Application of fertilizer is not effective due to the seasonal flooding condition.</li> </ul>	<ul style="list-style-type: none"> <li>- Fertilizer is available in town and even village.</li> <li>- Price at village is expensive, compared with one at Morogoro town.</li> <li>- Except beans, fertilizer are generally applied.</li> </ul>	<ul style="list-style-type: none"> <li>- No application of fertilizer in the Project area</li> <li>- If apply fertilizer for paddy, it will be tall and lodged.</li> <li>- Fertilizer is available, but expensive.</li> </ul>
8. Agro-chemicals	<ul style="list-style-type: none"> <li>- Some farmers apply 2,4-D of herbicide in the Project area.</li> <li>- Grass hopper and stalk-eyed shoot fly are major insects in the Project area.</li> <li>- Shortage of agro-chemicals, price, quality are problem.</li> <li>- It is not available in time</li> <li>- There are no stockists near the Project area.</li> <li>- Expired and mixed/diluted agro-chemicals are sold.</li> </ul>	<ul style="list-style-type: none"> <li>- Agro-chemicals is available in town and even village.</li> <li>- Price is expensive.</li> <li>- Side-effect is appeared due to lack of protective gears.</li> </ul>	<ul style="list-style-type: none"> <li>- Major farmers for onion cultivation apply fertilizer.</li> <li>- For paddy, fertilizer is mainly not applied.</li> <li>- For beans, fertilizer is applied.</li> <li>- Farmers are not aware of proper dosage of fertilizer.</li> </ul>
			<ul style="list-style-type: none"> <li>- Availability of agro-chemicals is not in good condition.</li> <li>- Agro-chemicals is expensive.</li> </ul>



Table 3.3.1 Outline of Group Discussion with Farmers (4/4)

Topics	Outline of Dialogue in Each Project Scheme		
	Mgongola	Mgeta	Mkula Mwega
9. Drying	<ul style="list-style-type: none"> <li>- Drying is done in the field, that is dried grains are harvested.</li> <li>- Drying after cutting is not necessary.</li> <li>- Shattering loss and breakage are many due to over-dried condition before cutting.</li> <li>- Early harvesting and drying at home yard are necessary.</li> <li>- In the case which fields are controlled well, it is possible to dry grains in the fields.</li> </ul>	<ul style="list-style-type: none"> <li>- Paddy is dried in the field.</li> <li>- After cutting paddy, it is left to dry in the field for a few days.</li> </ul>	<ul style="list-style-type: none"> <li>- Drying is done in the field, that is dried grains are harvested.</li> <li>- Drying after cutting is not necessary.</li> <li>- Shattering loss and breakage are many due to over-dried condition before cutting.</li> </ul>
10. Marketing	<ul style="list-style-type: none"> <li>- Price is cheap and flexible.</li> <li>- Due to lack of milling machine, it is difficult to sell milled rice.</li> </ul>	<ul style="list-style-type: none"> <li>- For products, middleman come and buy products.</li> <li>- Farmers should have knowledge concerning market power, so that they can negotiate with traders.</li> <li>- Farm gate price of cabbage is fluctuated.</li> <li>- Farmers can not decide selling price, but by traders.</li> <li>- Farmers have tried to organize farmer's group for selling products and farm inputs.</li> </ul>	<ul style="list-style-type: none"> <li>- Formerly, farmers used to sell to Co-op society, but since they were collapsed, farmers depend on traders who offer low prices.</li> <li>- Farmers can not decide selling price, but by traders.</li> <li>- Traders check the quality of dried paddy, if breakage is too much, they will not buy them.</li> </ul>
			<ul style="list-style-type: none"> <li>- Farmers are ready to organize themselves to facilitate purchase of farm inputs and sell products.</li> <li>- Fertilizer is available in Iringa of Iringa Region.</li> <li>- Products is sold in the trader's price which is relatively low.</li> </ul>

Table 3.3.2 Proposed Farming Practices in Mkula Scheme

Item	Paddy	Maize
1 Land preparation	- Plowing by hand tractor or hand - No harrowing - Puddling by hand tractor or hand (over the nursery period)	- Plowing by hand - Harrowing by hand
2 Nursery	- 40 ~ 50 kg of seeds per ha - around 600 m <sup>2</sup> per ha - Seed selection by water before sowing	Not applied
3 Broadcasting	Not applied	- 70cm x 70cm ~ 90cm x 100cm - 20 kg per ha (2 ~3 seeds per hill)
4 Transplanting	- 1 to 2 seedlings per hill - 10cm x 10cm ~ 10cm x 20cm of planting density	Not applied
5 Application of fertilizer		
Nursery	- 7 kg of Urea per ha (3 kg N/ha)	- 71 kg of AS per ha (15 kg N/ha)
Basal application	- 87 kg of Urea per ha (40 kg N/ha) - 125 kg of TSP per ha (25 kg P <sub>2</sub> O <sub>5</sub> /ha)	- 100 kg of TSP per ha (20 kg P <sub>2</sub> O <sub>5</sub> /ha)
1st top dressing	- 87 kg of Urea per ha (40 kg N/ha)	- 71 kg of AS per ha (15 kg N/ha)
Total application	174 kg Urea, 125 kg TSP (NPK = 80:25:0)	142 kg AS, 100 kg TSP (NPK = 30:20:0)
6 Weeding	- by rotary weeder - by herbicide (2,4-D : 2 lit. per ha)	- One or twice during growing season
7 Application of agro-chemicals	see Tables 3.3.3 and 3.3.4	see Tables 3.3.3 and 3.3.4
8 Water control	- Once a week up to 20 days before harvesting	- Furrow irrigation every one week - Critical period : from flowering to 20 days before maturing
9 Harvesting	- around 2/3 of panicle from top side is changed to yellowish collar.	

Item	Pulse
1 Land preparation	- Plowing by hand - Harrowing by hand
2 Nursery	Not applied
3 Broadcasting	- 20 cm x 40cm ~ 30cm x 50cm - 20kg per ha
4 Transplanting	Not applied
5 Application of fertilizer	
Basal application	190 kg of AS per ha (40 kg N/ha)
Total application	190 kg AS (NPK = 40:0:0)
6 Weeding	- depending on the situation
7 Application of agro-chemicals	see Tables 3.3.3 and 3.3.4
8 Water control	- Furrow irrigation every one week - Critical period : from flowering to 20 days before maturing
9 Harvesting	

Table 3.3.3 (1/3) Schedule of Proposed Farming Practices by Crops

Crop : Paddy

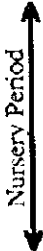
Days after Sowing	Growth Stage	Days after Planting	Proposed Farming Practices	Remarks
0	Germination  	-30	Nursery Preparation	
10		-25	Sowing in nursery ↕ Land Preparation	( Plowing ( Harrowing ( Bund Making
25		-4	Puddling	by hand
30		-2	Basal dressing	Basal Dressing (NPK = 40 : 25 : 0) Urea = 87 kg per ha TSP = 125 kg per ha
40		0	Transplanting	
50	Rooting	14	↕ Weeding Plant Protection	by hand or rotary weeder see Tables 3.3.4 and 3.3.5
60		35	Top dressing	Top Dressing (NPK = 40 : 0 : 0) Urea = 87 kg per ha
80		↕ Weeding Plant Protection	by hand or rotary weeder see Tables 3.3.4 and 3.3.5	
90	Panicle Initiation	↕		
110		85	Drainage	
130	Maturity	105	Harvesting	

Table 3.3.3 (2/3) Schedule of Proposed Farming Practices by Crops

Crop : Maize

Days after Sowing	Growth Stage	Days after Planting	Proposed Farming Practices	Remarks
			Land Preparation	( Plowing ( Harrowing
0	Germination	-2	Basal Dressing	Basal Dressing (NPK = 15 : 20 : 0) AS = 71 kg per ha TSP = 100 kg per ha
		0	Sowing	
10				
20			Weeding	by hand
			Plant Protection	see Tables 3.3.4 and 3.3.5
30	Tassel Formation			
40	Ear Formation	40	Top Dressing	Top Dressing (NPK = 15 : 0 : 0) AS = 71 kg per ha
50				
60				
75	Tassel Emergence			
85	Silking stage		Weeding	by hand
			Plant Protection	see Tables 3.3.4 and 3.3.5
90				
105	Milk Ripe Stage			
115	Dough Ripe Stage			
125	Yellow Ripe Stage			
135	Full Ripe Stage	135	Harvesting	

Table 3.3.3 (3/3) Schedule of Proposed Farming Practices by Crops

Crop : Pulse

Days after Sowing	Growth Stage	Days after Planting	Proposed Farming Practices	Remarks
			↓ Land Preparation	( Plowing ( Harrowing
0	Germination	-2 0	Basal Dressing Sowing	Basal Dressing (NPK = 40 : 0 : 0) AS = 190 kg per ha
10			↑	
20				
30	Appearance of lateral branches		Weeding	by hand
45	Start of Flowering		Plant Protection	see Tables 3.3.4 and 3.3.5
50				
60				
70				
80	End of Flowering			
90				
100	Maturing Stage			
110				
120	Full Ripe Stage	120	↓ Harvesting	

Table 3.3.4 Recommendable Agro-Chemicals by Crops

Agro-chemicals		Paddy	Maize	Cabbage	Onion	Pulse	Potato
Common Name	Trade Name						
Endosulfan	Thiodan	Bugs	Aphids Cutworms	Cutworms Bugs	Aphids Thrips Bugs	Aphids Cutworms Bugs	
Carbaryl	Sevin	Green leafhopper Planthoppers Rice leaf beetle	Stalk borer	C. armyworm C. cutworm Diamond moth		S. pod borer Aphids C. armyworm	Ladybirds C. armyworm
Trichlorfon	Dipterex	Armyworm	Armyworm Stalk borer Aphids	C. C. worm Diamond moth C. armyworm Cutworms	Aphids	Aphids C. armyworm Cutworms Scarabs Bean webworm Bugs	C. armyworm
Diazinon	Diazinon	Stem Borer Paddy borer Plant/leafhopper Rice leafroller Rice skipper Stem maggot Rice leaf beetle	Cutworms Stalk borer Pink borer	Seedcorn maggot Diamond moth Cutworms C. C. worm S. leaf beetle		Cutworms Scarabs Maggot Bean fly	
Penitrothion	Sumithion	Stem Borer Paddy borer Bugs Rice skipper Armyworm Ladybirds	Aphids Stalk borer Pink borer		Aphids	S. pod borer Aphids	Ladybirds
Phosphamidon	Actellic			C. C. worm Aphids Diamond moth C. armyworm	Aphids		
Malathion	Malathion	Planthoppers Green leafhopper Black rice bug			Aphids Thrips	S. pod borer Scarabs Aphids Mites	
Copper Hydroxide	Kocide			Downy mildew	Downy mildew P. blight	Downy mildew	Late blight
Mancozeb	Dithane			Downy mildew	Downy mildew P. blight	Downy mildew	Late blight
Fenvalerate	Sumicidin			Diamond moth			
Cypermethrin	Cymbush				Aphids Thrips Diamond moth	S. pod borer Scarabs Aphids Mites	
Carbofuran	Furadan			Nematodes	Aphids		Beetles
Thiophanate	Fopsin	Seed dressing			Purple blotch	Stem rot	

Note) C. armyworm : Cabbage armyworm, C. cutworm : Common cutworm, Diamond moth : Diamondback moth  
S leaf beetle : Stripped leaf beetle, S. pod borer : Soybean pod borer, C.C.worm : Common cabbageworm  
Leafhopper : Rice green leafhopper, P blight : Phytophthora blight

Table 3.3.5 Recommendable Application Rate of Agro-Chemicals by Crops

Common Name	Trade Name	Paddy	Vegetables	Pulse	Potato
Endosulfan	Thiodan		1. Spraying 2. Up to 7 DBH 3. less than 3 times 4. 3 lit./ha	1. Spraying 2. Up to 7 DBH 3. less than 3 times 4. 2 lit./ha	
Carbaryl	Sevin	1. Spraying 2. Up to 45 DBH 3. less than 5 times 4. 2 lit./ha	1. Spraying 2. Up to 14 DBH 3. less than 3 times 4. 3 lit./ha	1. Spraying 2. Up to 7 DBH 3. less than 3 times 4. 2 lit./ha	
Trichlorfon	Dipterex		1. Spraying 2. Up to 14 DBH 3. less than 6 times 4. 3 lit./ha		
Diazinon	Diazinon	1. Spraying 2. Up to 21 DBH 3. less than 4 times 4. 2 lit./ha	1. Spraying 2. Up to 30 DBH 3. less than 2 times 4. 3 lit./ha		
Fenitrothion	Sumithion	1. Spraying 2. Up to 21 DBH 3. less than 4 times 4. 2 lit./ha	1. Spraying 2. Up to 21 DBH 3. less than 2 times 4. 3 lit./ha	1. Spraying 2. Up to 21 DBH 3. less than 4 times 4. 2 lit./ha	1. Spraying 2. Up to 3 DBH 3. less than 6 times 4. 3 lit./ha
Pirimiphos-methyl	Actellic		1. Spraying 2. Up to 7 DBH 3. less than 4 times 4. 3 lit./ha		
Malathion	Malathion	1. Spraying 2. Up to 7 DBH 3. less than 6 times 4. 2 lit./ha	1. Spraying 2. Up to 14 DBH 3. less than 3 times 4. 3 lit./ha	1. Spraying 2. Up to 7 DBH 3. less than 3 times 4. 2 lit./ha	
Copper Hydroxide	Kocide		1. Spraying 2. not specified 3. not specified 4. 3 kg/ha		1. Spraying 2. not specified 3. not specified 4. 3 kg/ha
Mancozeb	Dithane		1. Spraying 2. Up to 3 DBH 3. less than 5 times 4. 3 lit./ha		1. Spraying 2. Up to 7 DBH 3. less than 7 times 4. 3 lit./ha
Fenvalerate	Sumicidin		1. Spraying 2. Up to 30 DBH 3. less than 3 times 4. 3 lit./ha		
Thiophanate	Topsin	1. Soaking 2. before sowing 3. once 4.	1. Spraying 2. Up to 7 DBH 3. less than 2 times 4. 3 lit./ha	1. Spraying 2. Up to 7 DBH 3. less than 4 times 4. 2 lit./ha	

Note) DBH : Days before harvesting

Table 3.3.6 Proposed Crop Budget for Major Crops in Mkula Scheme

	Unit	Paddy			Maize			Pulse		
		Unit Price (TSh)	Qty	Value (TSh)	Unit Price (TSh)	Qty	Value (TSh)	Unit Price (TSh)	Qty	Value (TSh)
<b>Production Cost</b>										
(A) Farm Input										
1 Seed	kg/ha	120	50	6,000	590	20	11,800	800	20	16,000
2 Fertilizer	kg/ha	240	174	41,760	240	0	0	240	0	0
: Urea (46 %-N)	kg/ha	180	0	0	180	142	25,560	180	190	34,200
: AS (21 %-N)	kg/ha	220	125	27,500	220	100	22,000	220	0	0
: TSP (20 %-P <sub>2</sub> O <sub>5</sub> )	kg/ha									
3 Agro-chemical	lit./ha	5,500	4.0	22,000	5,500	4.0	22,000	5,500	4.0	22,000
: Pesticide	lit./ha	3,500	2.0	7,000	3,500	0.0	0	3,500	0.0	0
: Herbicide	lit./ha	4,000	0.0	0	4,000	0.0	0	4,000	0.0	0
: Fungicide	lit./ha	500	67	33,500	500	33	16,500	500	17	8,500
4 Packing material				137,760			97,860			80,700
Sub-total (A)										
(B) Labour Requirement										
1 Family labour		500	140	0	500	90	0	500	90	0
2 Hired labour		500	87	43,500	500	40	20,000	500	35	17,500
Sub-total (B)			227	43,500		130	20,000		125	17,500
(C) Machinery or draught cattle										
1 Ploughing by tractor	L.S	30,000	1	30,000	30,000	1	30,000	30,000	1	30,000
2 Ploughing by hand tractor	L.S	25,000	0	0	25,000	0	0	25,000	0	0
3 Puddling by hand tractor	L.S	17,500	0	0	17,500	0	0	17,500	0	0
Sub-total (C)				30,000			30,000			30,000
(D) Miscellaneous cost										
5 % of (A) and (B)				10,563			7,393			6,410
Total Production Cost				221,823			155,253			134,610
Gross Return										
(A) Yield	kg/ha		5,000		120	3,000		200	1,500	
(B) Producer price	per kg	160		800,000			360,000			300,000
Gross return				578,177			204,747			165,390
Net return										



**Table 3.4.1 Project Irrigation Water Requirement for Mkula Scheme**  
(Total Area : 149 ha in net)

(1) Diversion Water Requirement for Overall Cropping Pattern

Year	Unit : lit/sec											
	Jan			Feb			Mar			Apr		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	11	9	48	74	110	175	97	224	38	9	2	5
1972	7	10	45	64	117	66	159	133	38	23	2	70
1973	7	9	45	97	63	101	148	188	74	0	87	5
1974	11	9	35	100	119	83	182	225	100	0	44	5
1975	7	10	52	72	129	140	120	133	100	0	37	11
1976	7	10	52	77	111	177	112	124	69	158	2	59
1977	7	10	35	74	141	56	119	159	38	59	82	5
1978	7	10	39	106	132	159	148	65	38	119	92	5
1979	7	10	34	69	59	101	64	76	38	0	2	57
1980	10	9	35	69	132	151	96	152	60	93	2	16
1981	7	19	34	88	71	169	200	141	38	103	27	5
1982	9	10	35	101	139	155	181	118	78	0	104	121
1983	7	10	52	106	104	148	141	54	197	73	67	76
1984	7	10	35	61	76	142	78	54	119	22	126	5
1985	7	18	53	96	120	136	186	131	38	0	104	5
1986	7	10	38	76	126	189	171	75	64	0	64	49
1987	7	10	47	92	100	133	56	91	205	113	2	100
1988	9	10	35	99	81	153	197	54	38	42	53	47
1989	7	10	35	70	126	186	83	89	124	0	2	9
1990	7	10	39	96	139	187	92	144	38	0	2	123
Average	8	11	41	84	110	140	131	122	76	41	45	39
Year	May			Jun			Jul			Aug		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	63	20	76	53	33	17	20	52	57	92	102	106
1972	57	4	53	53	38	28	36	39	69	92	102	101
1973	70	57	76	53	32	28	38	53	66	92	102	106
1974	45	74	29	53	38	17	16	34	69	92	100	106
1975	90	4	60	43	33	26	36	41	69	92	100	99
1976	69	89	75	35	35	23	34	47	69	80	65	106
1977	78	88	42	53	38	28	38	21	69	67	100	106
1978	117	101	72	53	35	28	38	53	62	88	98	106
1979	24	101	63	53	38	28	31	52	69	92	90	99
1980	11	67	43	53	38	28	38	52	56	90	96	106
1981	27	69	69	24	38	28	38	53	69	90	100	106
1982	5	79	70	53	23	17	27	53	20	82	102	106
1983	44	52	42	48	38	23	33	53	50	71	102	106
1984	63	64	66	49	38	16	27	53	69	92	94	106
1985	5	101	75	53	38	21	22	39	69	80	102	77
1986	109	89	44	54	38	28	36	53	65	92	102	84
1987	8	4	75	53	38	28	38	20	39	73	102	95
1988	100	74	47	42	25	28	38	53	69	92	102	72
1989	5	15	54	54	30	21	34	48	69	92	102	97
1990	24	57	62	53	38	22	37	22	68	86	102	106
Average	51	60	60	49	35	24	33	45	62	86	99	100
Year	Sep			Oct			Nov			Dec		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	128	118	115	119	69	67	50	29	10	0	2	4
1972	2	79	115	78	78	68	21	18	10	0	2	4
1973	128	124	108	119	92	68	48	18	13	0	2	5
1974	103	124	115	18	92	60	49	31	13	0	2	4
1975	99	109	115	118	81	56	50	27	13	0	2	4
1976	128	116	115	119	89	67	50	31	12	0	2	4
1977	128	57	110	84	74	17	21	18	10	0	2	4
1978	119	124	115	114	92	68	43	18	10	0	2	4
1979	105	124	115	119	65	67	39	31	10	0	2	4
1980	128	124	115	119	92	51	21	18	13	0	2	4
1981	125	124	115	118	38	62	46	31	10	0	2	4
1982	128	88	64	5	9	17	48	18	10	0	2	4
1983	128	124	97	119	92	68	50	23	13	0	2	4
1984	128	107	115	91	92	17	21	18	12	0	2	4
1985	128	124	115	119	92	58	50	18	10	0	2	5
1986	125	124	115	119	9	64	50	19	10	0	2	4
1987	128	122	115	99	85	68	50	18	10	0	2	4
1988	127	107	115	112	92	54	46	18	13	0	2	4
1989	125	124	115	102	73	34	49	18	10	0	2	4
1990	128	98	111	112	91	67	44	18	10	0	2	4
Average	117	112	111	100	75	55	42	22	11	0	2	4

(2) Diversion Water Requirement for Paddy (108 ha)

Year	Unit :lit/Sec											
	Jan			Feb			Mar			Apr		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	1	3	30	70	94	141	97	185	38	9	0	0
1972	1	3	30	61	97	66	136	125	38	23	0	66
1973	1	3	30	75	63	101	130	162	74	0	85	0
1974	1	3	30	75	97	83	150	185	97	0	42	0
1975	1	3	30	69	101	125	112	125	97	0	35	7
1976	1	3	30	70	94	139	107	119	69	136	0	54
1977	1	3	29	70	105	56	112	142	38	59	80	0
1978	1	3	30	76	103	135	130	65	38	107	90	0
1979	1	3	29	66	59	101	64	76	38	0	0	53
1980	1	3	29	66	103	127	96	138	60	89	0	11
1981	1	4	29	73	71	141	159	130	38	96	25	0
1982	1	3	29	75	105	133	149	115	78	0	100	114
1983	1	3	30	76	91	129	125	54	165	73	65	71
1984	1	3	29	58	76	122	78	54	110	22	115	0
1985	1	4	30	74	98	123	153	124	38	0	100	0
1986	1	3	30	70	100	149	143	75	64	0	63	44
1987	1	3	30	73	90	122	56	91	171	103	0	96
1988	1	3	29	75	81	128	160	54	38	42	51	43
1989	1	3	29	67	100	149	83	89	114	0	0	4
1990	1	3	30	74	105	149	92	133	38	0	0	116
Average	1	3	30	71	92	121	117	112	72	38	43	34
Year	Unit :lit/Sec											
	May			Jun			Jul			Aug		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	59	16	71	49	24	3	0	0	0	0	0	0
1972	52	0	49	49	27	5	0	0	0	0	0	0
1973	65	53	73	49	24	5	0	0	0	0	0	0
1974	40	70	26	49	27	3	0	0	0	0	0	0
1975	85	0	56	40	24	5	0	0	0	0	0	0
1976	64	85	71	31	26	5	0	0	0	0	0	0
1977	73	84	39	49	27	5	0	0	0	0	0	0
1978	110	94	68	49	26	5	0	0	0	0	0	0
1979	19	94	59	49	27	5	0	0	0	0	0	0
1980	6	63	39	49	27	5	0	0	0	0	0	0
1981	22	65	65	21	27	5	0	0	0	0	0	0
1982	0	75	67	49	15	3	0	0	0	0	0	0
1983	39	48	39	45	27	5	0	0	0	0	0	0
1984	59	60	63	46	27	2	0	0	0	0	0	0
1985	0	94	71	49	27	5	0	0	0	0	0	0
1986	103	85	40	50	27	5	0	0	0	0	0	0
1987	4	0	71	49	27	5	0	0	0	0	0	0
1988	96	70	43	39	17	5	0	0	0	0	0	0
1989	0	11	50	50	22	5	0	0	0	0	0	0
1990	19	53	58	49	27	5	0	0	0	0	0	0
Average	46	56	56	45	25	5	0	0	0	0	0	0

(3) Diversion Water Requirement for Upland Crop in Rainy Season (41 ha)

Year	Unit :lit/sec											
	Jan			Feb			Mar			Apr		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	10	7	18	5	16	31	0	40	0	0	2	5
1972	6	7	15	2	21	0	23	8	0	0	2	5
1973	6	7	15	22	0	0	19	26	0	0	2	5
1974	10	7	6	25	21	0	32	41	3	0	2	5
1975	6	7	21	3	27	15	8	8	3	0	2	5
1976	6	7	22	7	17	38	4	5	0	22	2	5
1977	6	7	6	5	36	0	7	17	0	0	2	5
1978	6	7	9	30	29	24	19	0	0	11	2	5
1979	6	7	6	3	0	0	0	0	0	0	2	5
1980	9	7	6	2	29	24	0	14	0	4	2	5
1981	6	15	6	15	0	29	41	11	0	7	2	5
1982	8	7	6	25	34	22	31	3	0	0	5	7
1983	6	7	22	30	13	18	16	0	31	0	2	5
1984	6	7	6	2	0	20	0	0	8	0	10	5
1985	6	15	22	22	22	13	33	7	0	0	5	5
1986	6	7	9	6	26	40	27	0	0	0	2	5
1987	6	7	17	18	10	11	0	0	34	10	2	5
1988	7	7	6	24	0	25	38	0	0	0	2	5
1989	6	7	6	3	26	36	0	0	10	0	2	5
1990	6	7	9	21	35	39	0	12	0	0	2	7
Average	7	7	11	14	18	19	15	10	4	3	3	5
Year	Unit :lit/sec											
	May			Jun			Jul			Aug		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	5	4	3	0	0	0	0	0	0	0	0	0
1972	5	4	2	0	0	0	0	0	0	0	0	0
1973	5	4	2	0	0	0	0	0	0	0	0	0
1974	5	4	2	0	0	0	0	0	0	0	0	0
1975	5	4	2	0	0	0	0	0	0	0	0	0
1976	5	4	3	0	0	0	0	0	0	0	0	0
1977	5	4	2	0	0	0	0	0	0	0	0	0
1978	7	7	2	0	0	0	0	0	0	0	0	0
1979	5	7	2	0	0	0	0	0	0	0	0	0
1980	5	4	2	0	0	0	0	0	0	0	0	0
1981	5	4	2	0	0	0	0	0	0	0	0	0
1982	5	4	2	0	0	0	0	0	0	0	0	0
1983	5	4	2	0	0	0	0	0	0	0	0	0
1984	5	4	2	0	0	0	0	0	0	0	0	0
1985	5	7	3	0	0	0	0	0	0	0	0	0
1986	6	4	2	0	0	0	0	0	0	0	0	0
1987	5	4	2	0	0	0	0	0	0	0	0	0
1988	5	4	2	0	0	0	0	0	0	0	0	0
1989	5	4	2	0	0	0	0	0	0	0	0	0
1990	5	4	2	0	0	0	0	0	0	0	0	0
Average	5	4	2	0	0	0	0	0	0	0	0	0
Year	Unit :lit/sec											
	Sep			Oct			Nov			Dec		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	0	0	0	0	0	0	0	0	0	0	2	4
1972	0	0	0	0	0	0	0	0	0	0	2	4
1973	0	0	0	0	0	0	0	0	0	0	2	5
1974	0	0	0	0	0	0	0	0	0	0	2	4
1975	0	0	0	0	0	0	0	0	0	0	2	4
1976	0	0	0	0	0	0	0	0	0	0	2	4
1977	0	0	0	0	0	0	0	0	0	0	2	4
1978	0	0	0	0	0	0	0	0	0	0	2	4
1979	0	0	0	0	0	0	0	0	0	0	2	4
1980	0	0	0	0	0	0	0	0	0	0	2	4
1981	0	0	0	0	0	0	0	0	0	0	2	4
1982	0	0	0	0	0	0	0	0	0	0	2	4
1983	0	0	0	0	0	0	0	0	0	0	2	4
1984	0	0	0	0	0	0	0	0	0	0	2	4
1985	0	0	0	0	0	0	0	0	0	0	2	5
1986	0	0	0	0	0	0	0	0	0	0	2	4
1987	0	0	0	0	0	0	0	0	0	0	2	4
1988	0	0	0	0	0	0	0	0	0	0	2	4
1989	0	0	0	0	0	0	0	0	0	0	2	4
1990	0	0	0	0	0	0	0	0	0	0	2	4
Average	0	0	0	0	0	0	0	0	0	0	2	4

## (4) Diversion Water Requirement for Upland crop in Dry Season (149 ha)

Year	Unit :lit/sec											
	May			Jun			Jul			Aug		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	0	0	0	0	4	9	12	31	36	62	73	79
1972	0	0	0	0	4	12	20	22	44	62	73	75
1973	0	0	0	0	4	12	21	32	42	62	73	79
1974	0	0	0	0	4	9	12	20	44	62	71	79
1975	0	0	0	0	4	10	20	24	44	62	71	74
1976	0	0	0	0	4	9	19	28	44	54	45	79
1977	0	0	0	0	4	12	21	13	44	45	71	79
1978	0	0	0	0	4	12	21	32	39	59	70	79
1979	0	0	0	0	4	12	17	31	44	62	64	74
1980	0	0	0	0	4	12	21	31	35	61	68	79
1981	0	0	0	0	4	12	21	32	44	61	71	79
1982	0	0	0	0	4	9	15	32	11	55	73	79
1983	0	0	0	0	4	9	18	32	31	47	73	79
1984	0	0	0	0	4	9	15	32	44	62	67	79
1985	0	0	0	0	4	9	12	22	44	54	73	58
1986	0	0	0	0	4	12	20	32	41	62	73	63
1987	0	0	0	0	4	12	21	13	24	49	73	71
1988	0	0	0	0	4	12	21	32	44	62	73	54
1989	0	0	0	0	4	9	19	28	44	62	73	73
1990	0	0	0	0	4	9	21	13	43	58	73	79
Average	0	0	0	0	4	10	18	27	39	58	70	75
Year	Unit :lit/sec											
	Sep			Oct			Nov			Dec		
	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end	1-10	11-20	21-end
1971	102	99	102	111	67	67	50	29	10	0	0	0
1972	0	69	102	74	76	68	21	18	10	0	0	0
1973	102	103	96	111	90	68	48	18	13	0	0	0
1974	83	103	102	13	90	60	49	31	13	0	0	0
1975	80	92	102	110	79	56	50	27	13	0	0	0
1976	102	98	102	111	87	67	50	31	12	0	0	0
1977	102	51	97	80	72	17	21	18	10	0	0	0
1978	94	103	102	107	90	68	43	18	10	0	0	0
1979	84	103	102	111	63	67	39	31	10	0	0	0
1980	102	103	102	111	90	51	21	18	13	0	0	0
1981	99	103	102	110	37	62	46	31	10	0	0	0
1982	102	76	58	0	7	17	48	18	10	0	0	0
1983	102	103	87	111	90	68	50	23	13	0	0	0
1984	102	90	102	87	90	17	21	18	12	0	0	0
1985	102	103	102	111	90	58	50	18	10	0	0	0
1986	99	103	102	111	7	64	50	19	10	0	0	0
1987	102	102	102	94	83	68	50	18	10	0	0	0
1988	100	90	102	106	90	54	46	18	13	0	0	0
1989	99	103	102	97	71	34	49	18	10	0	0	0
1990	102	83	99	106	88	67	44	18	10	0	0	0
Average	93	94	98	94	73	55	42	22	11	0	0	0

**Table 3.5.1 Proposed Training Courses for O&M and Strengthening of WUA**

Training Course	Total Period of Course (day)	Persons/ Course (Person)	Times/ Year (Time)	Trainees	Contents of Training
Course-A	2	4 - 5	1	<ul style="list-style-type: none"> <li>- District Commissioner, District Executive Director, District Administrative Officer.</li> <li>- Senior officials of the offices of RALDO, and RCO, and the Zonal Irrigation Office.</li> <li>- Senior officials of the offices involved in WUA's activities (DALDO, District Water Engineers, District Community Development Officers, DCO, etc.).</li> </ul>	<ul style="list-style-type: none"> <li>- Outline of the project</li> <li>- Farmers' participant management system</li> <li>- Outline of O&amp;M by WUA</li> <li>- Organization and activities of WUA</li> <li>- Necessity of agricultural supporting services</li> <li>- Field investigation, etc.</li> </ul>
Course-B (for each district)	5	20	1	<ul style="list-style-type: none"> <li>- Officials involved in O&amp;M (Zonal Irrigation Office, RALDO and DALDO's offices, Division Extension Officers, DCO).</li> <li>- Village Extension Officers and Irrigation Technicians to be attached to the project.</li> </ul>	<ul style="list-style-type: none"> <li>- Development plan of smallholder irrigation project</li> <li>- Estimation of water requirement</li> <li>- Preparation of irrigation schedule</li> <li>- O&amp;M of facilities</li> <li>- Strengthening of WUA, articles and by-laws, water right, registration</li> <li>- Management of WUA</li> <li>- Collection of irrigation service charge</li> <li>- Monitoring system, measuring and surveying methods</li> <li>- Agricultural supporting services to WUA</li> <li>- Promoting women in development</li> <li>- Study tour at advanced areas, etc.</li> </ul>
Course-C (for each scheme)	10	20 - 30	2	<ul style="list-style-type: none"> <li>- Farmer's level training to leaders of WUA, gate keepers and key farmers.</li> </ul>	<ul style="list-style-type: none"> <li>- Outline of the project</li> <li>- O&amp;M of facilities, water requirement, water delivery, etc.</li> <li>- Irrigation schedule and cropping calendar</li> <li>- Management of WUA such as accounting and book keeping and auditing</li> <li>- Articles and by-laws, water right, registration</li> <li>- Collection of irrigation service charge</li> <li>- Monitoring system, measuring and surveying methods</li> <li>- Marketing and credit, etc.</li> <li>- Promoting women in development.</li> <li>- Study tour at advanced areas, etc.</li> </ul>
Course-D (for each scheme)	2	20	2	<ul style="list-style-type: none"> <li>- Village Chairmen, Village Executive Officers, Chairmen of Ward Council, Ward Executive Officers, elder people, informal rural leaders in the villages related to the project, etc.</li> </ul>	<ul style="list-style-type: none"> <li>- Outline of the project</li> <li>- Organization and activities of WUA</li> <li>- Required agricultural supporting services</li> <li>- Promoting women in development, etc.</li> </ul>

Table 3.5.2 (1/2) Training Schedule for Proposed Farming Practices by Crops in Mkula Scheme

Training Subjects	Major Points	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Crop : Paddy													
1 Nursery preparation	- Size / formation - Seedling management	—	—	—									
2 Land preparation	- Plowing depth	—	—	—									
3 Planting	- Planting density		—	—									
4 Application of fertilizer													
4.1 Basal dressing	- Amount and timing		—	—									
4.2 Top dressing	- Amount and timing			—	—								
5 Plant protection	- Identification of pests and disease - Amount and timing	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
6 Water management	- Timing and condition	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
7 Harvesting	- Timing						—	—					

Training Subjects	Major Points	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Target : Maize / Pulse													
1 Land preparation	- Plowing depth						—	—					
2 Planting	- Planting density						—	—					
3 Application of fertilizer													
3.1 Basal dressing	- Amount and timing						—	—					
3.2 Top dressing	- Amount and timing							—	—				
4 Plant protection	- Identification of pests and disease - Amount and timing	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
5 Water management	- Timing and condition	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
6 Harvesting	- Timing											—	—

Table 3.5.2 (2/2) Training Schedule for Proposed Farming Practices by Crops in Mkula Scheme

Training Subjects	Major Points	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Crop : Maize / Pulse													
1 Land preparation	- Plowing depth	—											
2 Planting	- Planting density	—											
3 Application of fertilizer													
4.1 Basal dressing	- Amount and timing	—											
4.2 Top dressing	- Amount and timing		—										
4 Plant protection	- Identification of pests and disease	-	-	-	-	-	-	-	-	-	-	-	-
	- Amount and timing	-	-	-	-	-	-	-	-	-	-	-	-
5 Water management	- Timing and condition	-	-	-	-	-	-	-	-	-	-	-	-
6 Harvesting	- Timing					—							

Training Subjects	Major Points	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Crop : Pulse / Vegetables													
1 Land preparation	- Plowing depth					—							
2 Planting	- Planting density					—							
3 Application of fertilizer													
3.1 Basal dressing	- Amount and timing					—							
4 Plant protection	- Identification of pests and disease					-	-	-	-	-	-	-	-
	- Amount and timing					-	-	-	-	-	-	-	-
5 Water management	- Timing and condition					-	-	-	-	-	-	-	-
6 Harvesting	- Timing										—		

Table 3.5.3 Training Plan for Farmers Concerned

Subject	Stage	Objectives	Resource	Remarks
1. Field training (Implementation of demonstration plots)	through the project implementation	<ul style="list-style-type: none"> <li>- Demonstration of proper farming practices to general farmers</li> <li>- Guidance for proper farming practices</li> <li>- Guidance for proper water management</li> <li>- Guidance for method on the yield analysis</li> </ul>	<ul style="list-style-type: none"> <li>- DEO</li> <li>- DIVEO</li> <li>- VEO</li> </ul>	<ul style="list-style-type: none"> <li>- Aggressive farmers should be selected for the field training.</li> <li>- Demonstration will be carried out through the construction period.</li> <li>- Farmer's field to be selected.</li> </ul>
	after the project implementation	<ul style="list-style-type: none"> <li>- Practical training for proper farming practices (Proper farming practices for major crops will be transferred to the farmers concerned through the actual crop cultivation.)</li> <li>- Guidance for proper water management</li> </ul>	<ul style="list-style-type: none"> <li>- DEO</li> <li>- SMS</li> <li>- DIVEO</li> <li>- VEO</li> </ul>	<ul style="list-style-type: none"> <li>- Group training will be required.</li> <li>- Aggressive farmers should be selected as block leader each block of every tertiary blocks.</li> <li>- Group training will be required.</li> <li>- Training schedule for each scheme is shown in relevant tables in each Division.)</li> <li>- Farmer's field to be selected.</li> </ul> <p>Mgeta scheme (see Table 3.5.4 in Division 2)</p> <p>Mgongola scheme (see Table 3.5.4 in Division 3)</p> <p>Mkula scheme (see Table 3.5.4 in Division 4)</p> <p>Mwega scheme (see Table 3.5.4 in Division 5)</p>
3. Field Tour	after the project implementation	<ul style="list-style-type: none"> <li>- Inspection to the advanced area</li> <li>- Exchange of information and experience with farmers in the advanced area.</li> </ul>	<ul style="list-style-type: none"> <li>- SMS</li> <li>- DIVEO</li> <li>- VEO</li> </ul>	<ul style="list-style-type: none"> <li>- Upland crops in high altitude and cool-climate</li> <li>- Lushoto, Iringa, Mbeya</li> <li>- Paddy and Maize</li> <li>- Major fields in FAO special programme</li> </ul>
4. Special training in KATC	through the project implementation	<ul style="list-style-type: none"> <li>- Training of advanced practices</li> </ul>	<ul style="list-style-type: none"> <li>- KATC</li> </ul>	<ul style="list-style-type: none"> <li>- Key-farmer's course (20 days per course)</li> </ul>

Table 3.5.5 Training Plan for DIVEOs and VEOs Concerned

Subject	Stage	Objectives	Resource	Remarks
1. Field training (Implementation of demonstration plots)	through the project implementation	<ul style="list-style-type: none"> <li>- Enlightenment of proper farming practices</li> <li>- Theory for crop cultivation</li> <li>- Training for monitoring and evaluation method</li> <li>- Review and monitor of the demonstration activities</li> <li>- Guidance for method on the yield analysis</li> <li>- Guidance for proper water management</li> </ul>	<ul style="list-style-type: none"> <li>- REO</li> <li>- SMSs</li> <li>- DEO</li> </ul>	<ul style="list-style-type: none"> <li>- VEOs concerned select some aggressive farmers.</li> <li>- Farm inputs such as seeds and agro-chemicals to be supplied from the Committee.</li> <li>- Farmer's field to be selected.</li> </ul>
	after the project implementation	<ul style="list-style-type: none"> <li>- Training of proper cultivation of major crops</li> <li>- Preparation of guideline for fertilizer dosage</li> <li>- Approach of high yielding practices</li> <li>- Guidance for method on the yield analysis</li> <li>- Guidance for proper water management</li> </ul>	<ul style="list-style-type: none"> <li>- REO</li> <li>- SMSs</li> <li>- DEO</li> </ul>	<ul style="list-style-type: none"> <li>- Farmer's field to be selected.</li> </ul>
2. Workshop	through the project implementation	<ul style="list-style-type: none"> <li>- Enlightenment of agricultural development plan</li> <li>- Training for the dissemination method to farmers</li> <li>- Monitoring and review on the progress of implementation of the demonstration.</li> </ul>	<ul style="list-style-type: none"> <li>- REO</li> <li>- SMSs</li> <li>- DEO</li> </ul>	
	after the project implementation	<ul style="list-style-type: none"> <li>- Monitoring and review on the progress of training programme</li> <li>- Review of the activities on proposed farming practices</li> </ul>	<ul style="list-style-type: none"> <li>- REO</li> <li>- SMSs</li> <li>- DEO</li> </ul>	
3. Special training in KATC	through the project implementation	<ul style="list-style-type: none"> <li>- Training of advanced practices</li> </ul>	<ul style="list-style-type: none"> <li>- KATC</li> </ul>	<ul style="list-style-type: none"> <li>- Rice cultivation course (45 days per course)</li> <li>- Water management course (30 days per course)</li> </ul>



Table 3.5.4 Schedule of Field Training for Proposed Farming Practices by Crops in Mkula Scheme

Training Practices	Crops	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.											
1 Land preparation	Paddy		1	1	1																			
	Maize/Pulse	1	1				1	1	1	1			1											
	Pulse/vegetables					1	1	1	1															
2 Nursery preparation	Paddy	1	1	1	1																			
3 Planting	Paddy			1	1	1	1																	
	Maize/Pulse	1	1	1				1	1	1	1		1											
	Pulse/vegetables					1	1	1	1															
4 Basal dressing of fertilizer	Paddy			1	1	1	1																	
	Maize/Pulse	1	1	1				1	1	1	1		1											
5 Top dressing of fertilizer	Paddy					1	1	1	1															
	Maize/Pulse		1	1	1	1			1	1	1	1												
6 Plant protection		←----- Note *1 ----->																						
7 Water management		←----- Note *2 ----->																						
8 Harvesting	Paddy						1	1	1	1														
	Maize/Pulse					1	1	1	1			1	1											
	Pulse/vegetables									1	1	1	1											
Number of training days		4	6	7	5	4	3	1	1	2	4	5	7	6	4	3	1	1	1	1	2	1	2	4

Note)

\*1 On occurrence of damage by insects and diseases, VEOs will rapidly take guidance to farmers concerned.

Agricultural Coordinating Committee will also have to support VEOs and farmers in collaboration with relevant institutes such as SUA, Research centres, etc.

\*2 Guidance concerning proper water management is given as required, depending on the schedule of other training practices. Major training subjects on proper water management are (i) proper timing of irrigation and drainage, (ii) proper condition of irrigated fields, (iii) proper interval of irrigation, etc.

Remarks)

1. Figures in the table mean number of days for field training in the first and second halves of month.

2. Training day: -One-day training is required for each farming practice by crops.

-Block leaders as representatives of farmers in each tertiary block are strictly requested to participate in training programmes and also other farmers are requested to participate in the field training as much as possible.

3. Farmer's group: No. of tertiary block : 17 blocks (17 block leaders)

Period for each farming practice: 2 months (see Table 3.5.2 in Division 4)

Training days per month: 4 days

Total training days : 8 days

Participants for each training day: 3 block leaders and other farmers

**Table 4.1.1 List of Labour Cost**

Item	Unit	Rate(Tsh)
Foreman	Man-Day	4,400
Skilled labour	Man-Day	3,600
Semi-skilled labour	Man-Day	2,450
Unskilled labour	Man-Day	1,600
Operator for heavy equipment	Man-Day	3,800
Ass.operator for heavy equipment	Man-Day	2,450
Operator for lighth equipment	Man-Day	3,360
Ass.operator for lighth equipment	Man-Day	2,170
Civil engineer	Man-Day	12,000

**Table 4.1.2 List of Material Cost**

Item	Unit	Spec.	Rate(Tsh)
Diesel	litre		383
Engine oil	litre	for diesel	1,200
Ordinary portland cement	ton		89,070
Fine aggregate(sand)	m <sup>3</sup>	Collection in situ	
Coarse aggregates	m <sup>3</sup>	for concrete	39,860
Admixture	kg	AE/reducing	1,400
Mild steel reinforcement	ton		360,720
Softwood timber	m <sup>3</sup>		94,920
Nail	kg		600
Cobble stone	m <sup>3</sup>	Production in site	
RC Pipe	lin m	Dia.1.0m	71,400
RC Pipe	lin m	Dia.0.6m	41,160
RC Pipe	lin m	Dia.0.4m	32,340
RC Pipe	lin m	Dia.0.3m	27,930
Turf	m <sup>2</sup>		510
Sluice Gate	No.	B:0.5m H:0.5m	816,900

**Table 4.1.3 List of Machine Cost**

Equipment	Spec.	Unit	Rate(Tsh)
Bulldozer	15t	h	32,600
Backhoe	0.6m <sup>3</sup>	h	25,400
Backhoe	0.35m <sup>3</sup>	h	16,900
Dump truck	11t	h	13,400
Tire roller	8t	h	12,600
Water tanker	5.5kl	h	11,600
Crane truck	10t	h	21,100
Bacher Plant	0.5m <sup>3</sup>	h	36,300
Agitator	1.6m <sup>3</sup>	h	8,300
Generator	35KVA	h	3,200
Hydraulic Blaker	1,300kg	h	28,800
Compressor	5 m <sup>3</sup> /m	h	8,900
Concrete blaker	20 kg	h	470
Pick Hhammer	7.5kg	h	310

**Table 4.1.4 List of Construction Unit Prices**

No.	Work Item	Unit	Unit Price		
			Foreign (Tsh)	Local (Tsh)	Total (Tsh)
1	Stripping	m3	2,085	624	2,708
2	Excavation(Common,Removal HD=0.3km)	m3	2,500	1,084	3,584
3	Excavation(Rock ,Canal)	m3	9,184	15,755	24,940
4	Excavation(Man-Power)	m3	0	2,484	2,484
5	Excavation(Common,without Removal )	m3	1,186	520	1,706
6	Embankment(HD<50 m)	m3	1,634	540	2,174
7	Embankment Material Transportation(HD=7 Km,Mkula)	m3	3,286	1,456	4,742
8	Back Filling	m3	0	1,691	1,691
9	Sod Facing	m2	637	294	931
10	Concrete (240kg/cm2, Reinforced Concrete in Mkula)	m3	19,333	93,558	112,892
11	Concrete (210kg/cm2, Lining/Plain Concrete in Mkula)	m3	19,599	91,548	111,147
12	Concrete (180kg/cm2, Foundation Concrete in Mkula)	m3	19,406	78,122	97,528
13	Reinforce Bar(Processing & Assembly, HD<60 m)	ton	483,004	52,164	535,168
14	Concrete Form	m2	0	3,970	3,970
15	Chipping	m2	943	740	1,683
16	Plastering	m2	377	2,910	3,287
17	Demolishing of Existing Structure	m3	8,672	13,862	22,534
18	Riprap(in Mkula)	m3	40,225	14,075	54,299
19	Sluice Gate(B=0.5m, H=0.5m)	no.	0	1,061,970	1,061,970
20	Stoplog	m3	0	237,510	237,510
21	RC Pipe (Dia. 1.0m)	m	8,354	95,745	104,099
22	RC Pipe (Dia. 0.6m)	m	4,177	55,509	59,685
23	RC Pipe (Dia. 0.4m)	m	4,177	44,043	48,219
24	RC Pipe (Dia. 0.3m)	m	4,177	38,310	42,486
25	Storage Construction	m2	0	219,556	219,556

**Table 4.1.5 Breakdown of Direct Construction Cost of Mkula Scheme**

			(Unit : 1,000 Tshs)			
	Item	Unit	Qty	F.C.(Tshs)	L.C.(Tshs)	Total(Tshs)
<b>Headworks</b>						
	Demolishing of Existing Structure	m3	2	17	28	45
	Concrete(240kg/cm2)	m3	2	39	187	226
	Concrete(210kg/cm2)	m3	32	627	2,930	3,557
	Reinforcement Bar	ton	0.2	77	8	86
	Concrete Form	m2	10	0	40	40
	Excavation(Man-Power)	m3	22	0	55	55
	Sluice Gate	no.	2	0	2,124	2,124
	Sub-total			760	5,371	6,131
<b>Irrigation System</b>						
<b>Main Canal</b>						
	Demolishing of Existing Structure	m3	22	191	305	496
	Stripping	m3	71	148	44	192
	Embankment	m3	126	620	252	872
	Excavation(Common)	m3	112	280	121	401
	Excavation(Rock Canal)	m3	12	110	189	299
	Lining	m3	42	823	3,845	4,668
	Sod Facing	m2	93	59	27	87
<b>Secondary Canal</b>						
	Stripping	m3	2,487	5,185	1,551	6,736
	Embankment	m3	5,570	27,404	11,122	38,526
	Excavation(Common)	m3	10,918	27,294	11,841	39,135
	Lining	m3	89	1,744	8,148	9,892
	Chipping	m2	850	802	629	1,430
	Plastering	m2	652	246	1,898	2,143
	Concrete(210kg/cm2)	m3	10	196	915	1,111
	Sod Facing	m2	4,772	3,040	1,403	4,443
<b>Related Structure</b>						
	Concrete(240kg/cm2)	m3	161	3,113	15,063	18,176
	Concrete(180kg/cm2)	m3	32	621	2,500	3,121
	Reinforcement Bar	ton	12.9	6,231	673	6,904
	Concrete Form	m2	1,305	0	5,181	5,181
	RC Pipe(Dia 1.0m)	m	20	167	1,915	2,082
	RC Pipe(Dia 0.6m)	m	12	50	666	716
	RC Pipe(Dia 0.4m)	m	4	17	176	193
	RC Pipe(Dia 0.3m)	m	60	251	2,299	2,549
	Riprap	m3	200	1	2,815	2,816
<b>Tertiary Canal</b>						
	Stripping	m3	3,566	7,434	2,224	9,658
	Embankment	m3	14,253	70,125	28,460	98,585
	Excavation(Common)	m3	6,368	15,920	6,906	22,826
	Sod Facing	m2	1,081	689	318	1,007
<b>Related Structure</b>						
	Concrete(240kg/cm2)	m3	2	39	187	226
	Concrete(180kg/cm2)	m3	1	19	78	98
	Reinforcement Bar	ton	0.1	39	4	43
	Concrete Form	m2	42	0	167	167
	RC Pipe(Dia 0.3m)	m	12	50	460	510
	Riprap	m3	9	362	127	489
	Sub-total			173,269	112,507	285,777
<b>Agricultural Supporting Facility</b>						
	Godown Construction	m2	60	0	13,173	13,173
	Sub total			0	13,173	13,173
<b>Miscellaneous Works</b>						
		L. S.		8,701	6,553	15,254
<b>G.Total</b>				<b>182,731</b>	<b>137,604</b>	<b>320,335</b>

Table 5.1.1 Financial Crop Budget under the Present and Without-Project Condition in Mkula Scheme

	Unit	Paddy			Maize			Pulse Crops		
		Unit Price (TSh)	Qty	Value (TSh)	Unit Price (TSh)	Qty	Value (TSh)	Unit Price (TSh)	Qty	Value (TSh)
<b>Production Cost</b>										
(A) Farm Input										
1 Seed	kg/ha	120	50	6,000	590	20	11,800	800	20	16,000
2 Fertilizer										
: Urea (46 %-N)	kg/ha	240	0	0	240	0	0	240	0	0
: SA (21 %-N)	kg/ha	180	0	0	180	0	0	180	0	0
: TSP (46 %-P <sub>2</sub> O <sub>5</sub> )	kg/ha									
3 Agro-chemical										
: Pesticide	lit./ha	5,500	0.0	0	5,500	0.0	0	5,500	0.0	0
: Herbicide	lit./ha	3,500	2.5	8,750	3,500	0.0	0	3,500	0.0	0
: Fungicide	lit./ha	4,000	0.0	0	4,000	0.0	0	4,000	0.0	0
4 Packing material										
		500	27	13,500	500	17	8,500	500	6	3,000
<u>Sub-total (A)</u>				<u>28,250</u>			<u>20,300</u>			<u>19,000</u>
(B) Labour Requirement										
1 Family labour										
2 Hired labour										
		500	60	0	500	50	0	500	50	0
<u>Sub-total (B)</u>				<u>20,000</u>			<u>12,500</u>			<u>7,500</u>
(C) Machinery or draught cattle										
1 Ploughing by tractor	L.S	30,000	1	30,000	30,000	1	30,000	30,000	1	30,000
2 Ploughing by hand tractor	L.S	25,000	0	0	25,000	0	0	25,000	0	0
3 Puddling by hand tractor	L.S	17,500	0	0	17,500	0	0	17,500	0	0
<u>Sub-total (C)</u>				<u>30,000</u>			<u>30,000</u>			<u>30,000</u>
(D) Miscellaneous cost										
5 % of (A) and (B)				3,913			3,140			2,825
<b>Total Production Cost</b>				<b>82,163</b>			<b>65,940</b>			<b>59,325</b>
<b>Gross Return</b>										
(A) Yield	kg/ha		2,000		120	1,500		200	500	
(B) Producer price	per kg	160		320,000			180,000			100,000
<b>Gross return</b>				<b>237,837</b>			<b>114,060</b>			<b>40,675</b>
<b>Net return</b>										

Table S.1.2 Financial Crop Budget under the With Project Condition in Mkula Scheme

	Unit	Paddy			Maize			Pulse Crops		
		Unit Price (TSh)	Qty	Value (TSh)	Unit Price (TSh)	Qty	Value (TSh)	Unit Price (TSh)	Qty	Value (TSh)
<b>Production Cost</b>										
(A) Farm Input										
1 Seed	kg/ha	120	50	6,000	590	20	11,800	800	20	16,000
2 Fertilizer	kg/ha	240	174	41,760	240	0	0	240	0	0
: Urea (46 %-N)	kg/ha	180	0	0	180	142	25,560	180	190	34,200
: SA (21 %-N)	kg/ha	220	125	27,500	220	100	22,000	220	0	0
: TSP (46 %-P <sub>2</sub> O <sub>5</sub> )	kg/ha									
3 Agro-chemical	lit./ha	5,500	4.0	22,000	5,500	4.0	22,000	5,500	4.0	22,000
: Pesticide	lit./ha	3,500	2.0	7,000	3,500	0.0	0	3,500	0.0	0
: Herbicide	lit./ha	4,000	0.0	0	4,000	0.0	0	4,000	0.0	0
: Fungicide	lit./ha	500	67	33,500	500	33	16,500	500	17	8,500
4 Packing material				137,760			97,860			80,700
<u>Sub-total (A)</u>										
(B) Labour Requirement										
1 Family labour			140	0		90	0		90	0
2 Hired labour		500	87	43,500	500	40	20,000	500	55	17,500
<u>Sub-total (B)</u>			227	43,500		130	20,000		125	17,500
(C) Machinery or draught cattle										
1 Ploughing by tractor	L.S	30,000	1	30,000	30,000	1	30,000	30,000	1	30,000
2 Ploughing by hand tractor	L.S	25,000	0	0	25,000	0	0	25,000	0	0
3 Puddling by hand tractor	L.S	17,500	0	0	17,500	0	0	17,500	0	0
<u>Sub-total (C)</u>				30,000			30,000			30,000
(D) Miscellaneous cost										
5 % of (A) and (B)				10,563			7,393			6,410
<b>Total Production Cost</b>				221,823			155,253			134,610
<b>Gross Return</b>				800,000		3,000	360,000		1,500	300,000
(A) Yield	kg/ha		5,000							
(B) Producer price	per kg	160								
Gross return				578,177			204,747			165,390
<b>Net return</b>										

Table 5.1.3 Economic Crop Budget under the Present and Without-Project Condition in Mkula Scheme

	Unit	Paddy		Maize		Pulse Crops	
		Unit Price (TSh)	Q'ty	Value (TSh)	Unit Price (TSh)	Q'ty	Value (TSh)
<b>Production Cost</b>							
(A) Farm Input							
1 Seed	kg/ha	120	0	0	590	20	11,800
2 Fertilizer	kg/ha	126	125	15,750	126	0	0
: Urea (46 %-N)	kg/ha	73	0	0	73	0	0
: SA (21 %-N)	kg/ha	114	0	0	114	0	0
: TSP (46 %-P <sub>2</sub> O <sub>5</sub> )	kg/ha						
3 Agro-chemical	lit./ha	5,500	0.0	0	5,500	0.0	0
: Pesticide	lit./ha	3,500	2.5	8,750	3,500	0.0	0
: Herbicide	lit./ha	4,000	0.0	0	4,000	0.0	0
: Fungicide	lit./ha	500	27	13,500	500	17	8,500
4 Packing material				38,000			20,300
<b>Sub-total(A)</b>							
(B) Labour Requirement							
1 Family labour		400	60	24,000	400	50	20,000
2 Hired labour		400	40	16,000	400	25	10,000
<b>Sub-total(B)</b>				40,000		75	30,000
(C) Machinery or draught cattle	L.S						
1 Ploughing by tractor	L.S	24,000	1	24,000	24,000	1	24,000
2 Ploughing by hand tractor	L.S	20,000	0	0	20,000	0	0
3 Puddling by hand tractor	L.S	14,000	0	0	14,000	0	0
<b>Sub-total(C)</b>				24,000	0		24,000
(D) Miscellaneous cost							
5 % of (A) and (B)				5,100			3,450
<b>Total Production Cost</b>				107,100			78,015
<b>Gross Return</b>							
(A) Yield	kg/ha	160	2,000	319,500	120	1,500	180,000
(B) Producer price	per kg						200
<b>Gross return</b>							100,000
<b>Net return</b>				212,400			101,985
							27,550

Table S.1.4 Economic Crop Budget under the With-Project Condition in Mkula Scheme

	Unit	Paddy			Maize			Pulse Crops		
		Unit Price (TSh)	Q'ty	Value (TSh)	Unit Price (TSh)	Q'ty	Value (TSh)	Unit Price (TSh)	Q'ty	Value (TSh)
<b>Production Cost</b>										
(A) Farm Input	kg/ha	120	50	6,000	590	20	11,800	800	20	16,000
1 Seed	kg/ha	126	174	21,924	126	0	0	126	0	0
2 Fertilizer	kg/ha	73	0	0	73	142	10,366	73	190	13,870
: Urea (46 %-N)	kg/ha	114	125	14,250	114	100	11,400	114	0	0
: SA (21 %-N)										
: TSP (46 %-P <sub>2</sub> O <sub>5</sub> )										
3 Agro-chemical	lit./ha	5,500	4.0	22,000	5,500	4.0	22,000	5,500	4.0	22,000
: Pesticide	lit./ha	3,500	2.0	7,000	3,500	0.0	0	3,500	0.0	0
: Herbicide	lit./ha	4,000	0.0	0	4,000	0.0	0	4,000	0.0	0
: Fungicide	lit./ha	500	67	33,500	500	33	16,500	500	17	8,500
4 Packing material				104,674			72,066			60,370
Sub-total(A)										
(B) Labour Requirement										
1 Family labour		400	140	56,000	400	90	36,000	400	90	36,000
2 Hired labour		400	87	34,800	400	40	16,000	400	35	14,000
Sub-total(B)				90,800			52,000			50,000
(C) Machinery or draught cattle	L.S	24,000	1	24,000	24,000	1	24,000	24,000	1	24,000
1 Ploughing by tractor	L.S	20,000	0	0	20,000	0	0	20,000	0	0
2 Ploughing by hand tractor	L.S	14,000	0	0	14,000	0	0	14,000	0	0
3 Puddling by hand tractor				24,000			24,000			24,000
Sub-total(C)										
(D) Miscellaneous cost				10,974			7,403			6,719
5 % of (A) and (B)				230,448			155,469			141,089
Total Production Cost										
Gross Return	kg/ha		5,000	798,750	120	3,000	360,000	200	1,500	300,000
(A) Yield	per kg	160		568,302			204,531			158,911
(B) Producer price										
Gross return										
Net return										



Table 5.1.5(a) Economic Farm Gate Prices Calculation for Paddy

Item	Unit	PADDY (1)	
		US\$	TSh
FOB Price F.O.B. Bangkok US\$		278.90	
<i>Add: freight</i>		25.00	
insurance (1.5%)		4.18	
C.I.F. Price	per ton	308.08	
<i>Add: wharfage (1.5%)</i>	"	4.62	
clearing charges (2%)	"	6.16	
handling	"	4.00	
Landed Price	"	322.87	200177.18
<i>Add: transport to main market in</i>	"		2000.00
Dar-es-Salaam	"		
financial charges (3%-one-month)	"		6005.32
Wholesale Price	"		208182.50
	per kg.		208.18
<i>Add: 30% adjustment for quality (2)</i>			270.64
<i>Deduct: milling</i>			
extraction (minus 35%)			94.72
charges			5.00
in-land transport			6.00
losses/rebagging (2%)			4.16
local handling/storage			1.00
Economic Farm Gate Price			159.75

(1) Thai, white, milled, 5% broken, FOB, Bangkok

(2) Irrigators in the schemes are using local seed variety which produces a rice much preferred to the imported types.

The price of this local rice is about 30% higher than the foreign type.

Source : Commodity Markets and Developing Countries, World Bank, 1997. Additional information from MAC and MDV.

Table 5.1.5(b) Economic Farm Gate Prices Calculation for Urea. TSP, SA

Item	Unit	UREA (1)		TSP (2)		SA (3)	
		US\$	TSh	US\$	TSh	US\$	TSh
FOB Price F.O.B. Bangkok US\$		142.70		125.50		65.15	
Add: freight insurance (1.5%)		25.00		25.00		25.00	
		2.14		1.88		0.98	
C.I.F. Price	per ton	169.84		152.38		91.12	
Add: wharfage (1.5%)	"	2.55		2.29		1.37	
clearing charges (2%)	"	3.40		3.05		1.82	
handling	"	4.00		4.00		4.00	
Landed Price	"	179.78	111466.65	161.72	100263.85	98.31	60953.52
Add: transport to main market in Dar-es-Salaam	"		2000.00		2000.00		2000.00
financial charges (3%-one-month)	"		3344.00		3007.92		1828.61
Wholesale Price	"		116810.65		105271.77		64782.13
Add: in-land transport losses/rebagging (2%)	per kg.		116.81		105.27		64.78
local handling/storage			6.00		6.00		6.00
			2.34		2.11		1.30
			1.00		1.00		1.00
Economic Farm Gate Price			126.15		114.38		73.08

(1) Varying origins, bagged, spot, FOB, West Europe

(2) Standard grade, Spot, FOB, Vancouver

(3) Calculated based on its own nitrogen contents (21%) and that of urea (46%)

Source : Commodity Markets and Developing Countries, World Bank, 1997. Additional information from MAC and MDV.

Table 5.1.6 Financial and Economic Prices of Inputs and Crops

(Unit : TSh.)

	Unit	Paddy		Maize		Pulse	
		Economic Price	Financial Price	Economic Price	Financial Price	Economic Price	Financial Price
<u>(A) Farm Input</u>							
1) Seed	kg.	120	120	590	590	800	800
2) Fertilizer							
Urea	kg.	126	240	126	240	126	240
SA	kg.	73	180	73	180	73	180
TSP	kg.	114	220	114	220	114	220
3) Agro-chemical							
Pesticide	lit.	5500	5500	5500	5500	5500	5500
Herbicide	lit.	3500	3500	3500	3500	3500	3500
Fungicide	lit.	4000	4000	4000	4000	4000	4000
4) Packing Material							
		500	500	500	500	500	500
<u>(B) Labour Requirement</u>							
1) Family Labour	day	400	0	400	0	400	0
2) Hired labour	day	400	500	400	500	400	500
<u>(C) Machinery or draught cattle</u>							
1) Ploughing by tractor	L.S	24000	30000	24000	30000	24000	30000
2) Ploughing by hand tractor	L.S	20000	25000	20000	25000	20000	25000
3) Puddling by hand tractor	L.S	14000	17500	14000	17500	14000	17500
<u>(D) Crop Price</u>							
		159.75	160	120	120	200	200

**Table 5.1.7 Calculation of Economic Net Benefit for Mkula Scheme**

	Without-Project Situation			With-Project Situation			Net Benefit (Million TSh)
	Cultivated Area (ha)	Net Return per ha (Million Tsh)	Benefit (Million TSh)	Cultivated Area (ha)	Net Return per ha (Million Tsh)	Benefit (Million TSh)	
Maize	32	0.10	3.26	149	0.20	30.48	27.21
Paddy	108	0.23	24.73	108	0.57	61.38	36.65
Pulse	50	0.03	1.38	41	0.16	6.52	5.14
<b>TOTAL</b>							<b>69.00</b>

**Table 5.1.8 Estimation of Costs for Economic Evaluation (Mkula)**

(Unit : Million TSh)

Direct construction cost	256.27
Preparatory works	12.81
O&M facilities and equipment	19.72
Administration cost	4.02
Engineering services	132.61
<b>Total</b>	<b>425.43</b>

Table 5.1.9 EIRR Estimation for Mkula Scheme

(Unit : Million TSh)

Year	Construction Cost	O/M Cost	Benefit	Net Benefit
1	49.46			-49.46
2	360.66			-360.66
3	15.11	1.28	17.25	0.86
4		1.28	34.50	33.22
5		1.28	51.75	50.47
6		1.28	69.00	67.72
7		1.28	69.00	67.72
8		1.28	69.00	67.72
9		1.28	69.00	67.72
10		1.28	69.00	67.72
11		1.28	69.00	67.72
12		1.28	69.00	67.72
13		1.28	69.00	67.72
14		1.28	69.00	67.72
15		1.28	69.00	67.72
16		1.28	69.00	67.72
17		1.28	69.00	67.72
18		1.28	69.00	67.72
19		1.28	69.00	67.72
20		1.28	69.00	67.72
21		1.28	69.00	67.72
22		1.28	69.00	67.72
23		1.28	69.00	67.72
24		1.28	69.00	67.72
25		1.28	69.00	67.72
26		1.28	69.00	67.72
27		1.28	69.00	67.72
28		1.28	69.00	67.72
29		1.28	69.00	67.72
30		1.28	69.00	67.72
31		1.28	69.00	67.72
32		1.28	69.00	67.72
33		1.28	69.00	67.72
34		1.28	69.00	67.72
35		1.28	69.00	67.72
36		1.28	69.00	67.72
37		1.28	69.00	67.72
38		1.28	69.00	67.72
39		1.28	69.00	67.72
40		1.28	69.00	67.72
41		1.28	69.00	67.72
42		1.28	69.00	67.72
43		1.28	69.00	67.72
44		1.28	69.00	67.72
45		1.28	69.00	67.72
46		1.28	69.00	67.72
47		1.28	69.00	67.72
48		1.28	69.00	67.72
49		1.28	69.00	67.72
50		1.28	69.00	67.72
			EIRR	13.1%

Table 5.1.10(a) Sensitivity Analysis for Mkula Scheme  
(Increase of Costs)

Year	Construction Cost	OM Cost	Benefit	Net Benefit
1	62.82			-62.82
2	458.03			-458.03
3	19.19	1.63	17.25	-3.57
4		1.63	34.50	32.87
5		1.63	51.75	50.12
6		1.63	69.00	67.37
7		1.63	69.00	67.37
8		1.63	69.00	67.37
9		1.63	69.00	67.37
10		1.63	69.00	67.37
11		1.63	69.00	67.37
12		1.63	69.00	67.37
13		1.63	69.00	67.37
14		1.63	69.00	67.37
15		1.63	69.00	67.37
16		1.63	69.00	67.37
17		1.63	69.00	67.37
18		1.63	69.00	67.37
19		1.63	69.00	67.37
20		1.63	69.00	67.37
21		1.63	69.00	67.37
22		1.63	69.00	67.37
23		1.63	69.00	67.37
24		1.63	69.00	67.37
25		1.63	69.00	67.37
26		1.63	69.00	67.37
27		1.63	69.00	67.37
28		1.63	69.00	67.37
29		1.63	69.00	67.37
30		1.63	69.00	67.37
31		1.63	69.00	67.37
32		1.63	69.00	67.37
33		1.63	69.00	67.37
34		1.63	69.00	67.37
35		1.63	69.00	67.37
36		1.63	69.00	67.37
37		1.63	69.00	67.37
38		1.63	69.00	67.37
39		1.63	69.00	67.37
40		1.63	69.00	67.37
41		1.63	69.00	67.37
42		1.63	69.00	67.37
43		1.63	69.00	67.37
44		1.63	69.00	67.37
45		1.63	69.00	67.37
46		1.63	69.00	67.37
47		1.63	69.00	67.37
48		1.63	69.00	67.37
49		1.63	69.00	67.37
50		1.63	69.00	67.37
				10.6%

Table 5.1.10 (b) Sensitivity Analysis for Mkula Scheme  
(Decrease of Benefits)

Year	Construction Cost	OM Cost	Benefit	Net Benefit
1	49.46			-49.46
2	360.66			-360.66
3	15.11	1.28	15.53	-0.87
4		1.28	31.05	29.77
5		1.28	46.58	45.29
6		1.28	62.10	60.82
7		1.28	62.10	60.82
8		1.28	62.10	60.82
9		1.28	62.10	60.82
10		1.28	62.10	60.82
11		1.28	62.10	60.82
12		1.28	62.10	60.82
13		1.28	62.10	60.82
14		1.28	62.10	60.82
15		1.28	62.10	60.82
16		1.28	62.10	60.82
17		1.28	62.10	60.82
18		1.28	62.10	60.82
19		1.28	62.10	60.82
20		1.28	62.10	60.82
21		1.28	62.10	60.82
22		1.28	62.10	60.82
23		1.28	62.10	60.82
24		1.28	62.10	60.82
25		1.28	62.10	60.82
26		1.28	62.10	60.82
27		1.28	62.10	60.82
28		1.28	62.10	60.82
29		1.28	62.10	60.82
30		1.28	62.10	60.82
31		1.28	62.10	60.82
32		1.28	62.10	60.82
33		1.28	62.10	60.82
34		1.28	62.10	60.82
35		1.28	62.10	60.82
36		1.28	62.10	60.82
37		1.28	62.10	60.82
38		1.28	62.10	60.82
39		1.28	62.10	60.82
40		1.28	62.10	60.82
41		1.28	62.10	60.82
42		1.28	62.10	60.82
43		1.28	62.10	60.82
44		1.28	62.10	60.82
45		1.28	62.10	60.82
46		1.28	62.10	60.82
47		1.28	62.10	60.82
48		1.28	62.10	60.82
49		1.28	62.10	60.82
50		1.28	62.10	60.82
				11.9%

Table 5.1.10 (c) Sensitivity Analysis for Mkula Scheme  
(Combination of Increase of Costs and Decrease of Benefits)

Year	Construction Cost	OM Cost	Benefit	Net Benefit
1	62.82			-62.82
2	458.03			-458.03
3	19.19	1.63	15.53	-3.30
4		1.63	31.05	29.42
5		1.63	46.58	44.95
6		1.63	62.10	60.47
7		1.63	62.10	60.47
8		1.63	62.10	60.47
9		1.63	62.10	60.47
10		1.63	62.10	60.47
11		1.63	62.10	60.47
12		1.63	62.10	60.47
13		1.63	62.10	60.47
14		1.63	62.10	60.47
15		1.63	62.10	60.47
16		1.63	62.10	60.47
17		1.63	62.10	60.47
18		1.63	62.10	60.47
19		1.63	62.10	60.47
20		1.63	62.10	60.47
21		1.63	62.10	60.47
22		1.63	62.10	60.47
23		1.63	62.10	60.47
24		1.63	62.10	60.47
25		1.63	62.10	60.47
26		1.63	62.10	60.47
27		1.63	62.10	60.47
28		1.63	62.10	60.47
29		1.63	62.10	60.47
30		1.63	62.10	60.47
31		1.63	62.10	60.47
32		1.63	62.10	60.47
33		1.63	62.10	60.47
34		1.63	62.10	60.47
35		1.63	62.10	60.47
36		1.63	62.10	60.47
37		1.63	62.10	60.47
38		1.63	62.10	60.47
39		1.63	62.10	60.47
40		1.63	62.10	60.47
41		1.63	62.10	60.47
42		1.63	62.10	60.47
43		1.63	62.10	60.47
44		1.63	62.10	60.47
45		1.63	62.10	60.47
46		1.63	62.10	60.47
47		1.63	62.10	60.47
48		1.63	62.10	60.47
49		1.63	62.10	60.47
50		1.63	62.10	60.47
				9.6%

Table 5.1.11 Calculation of Financial Net Benefit for Mkula Scheme

	Without-Project Situation			With-Project Situation			Net Benefit (Million TSh)
	Cultivated Area (ha)	Net Return per ha (Million Tsh)	Benefit (Million TSh)	Cultivated Area (ha)	Net Return per ha (Million Tsh)	Benefit (Million TSh)	
Maize	32	0.11	3.65	149	0.20	30.51	26.86
Paddy	108	0.24	25.69	108	0.58	62.44	36.76
Pulse	50	0.04	2.03	41	0.17	6.78	4.75
<b>TOTAL</b>							<b>68.36</b>

Table 5.1.12 Estimation of Costs for Financial Evaluation (Mkula)  
(Unit : Million TSh)

Direct construction cost	320.34
Preparatory works	16.02
O&M facilities and equipment	24.65
Administration cost	5.02
Engineering services	132.60
<b>Total</b>	<b>498.62</b>

Table 5.1.13 FIRR Estimation for Mkula Scheme

(Unit : Million TSh)

Year	Construction Cost	O/M Cost	Benefit	Net Benefit
1	58.00			-58.00
2	422.90			-422.90
3	17.72	1.60	17.09	-2.23
4		1.60	34.18	32.58
5		1.60	51.27	49.67
6		1.60	68.36	66.76
7		1.60	68.36	66.76
8		1.60	68.36	66.76
9		1.60	68.36	66.76
10		1.60	68.36	66.76
11		1.60	68.36	66.76
12		1.60	68.36	66.76
13		1.60	68.36	66.76
14		1.60	68.36	66.76
15		1.60	68.36	66.76
16		1.60	68.36	66.76
17		1.60	68.36	66.76
18		1.60	68.36	66.76
19		1.60	68.36	66.76
20		1.60	68.36	66.76
21		1.60	68.36	66.76
22		1.60	68.36	66.76
23		1.60	68.36	66.76
24		1.60	68.36	66.76
25		1.60	68.36	66.76
26		1.60	68.36	66.76
27		1.60	68.36	66.76
28		1.60	68.36	66.76
29		1.60	68.36	66.76
30		1.60	68.36	66.76
31		1.60	68.36	66.76
32		1.60	68.36	66.76
33		1.60	68.36	66.76
34		1.60	68.36	66.76
35		1.60	68.36	66.76
36		1.60	68.36	66.76
37		1.60	68.36	66.76
38		1.60	68.36	66.76
39		1.60	68.36	66.76
40		1.60	68.36	66.76
41		1.60	68.36	66.76
42		1.60	68.36	66.76
43		1.60	68.36	66.76
44		1.60	68.36	66.76
45		1.60	68.36	66.76
46		1.60	68.36	66.76
47		1.60	68.36	66.76
48		1.60	68.36	66.76
49		1.60	68.36	66.76
50		1.60	68.36	66.76
			FIRR	11.3%

Table 5.1.14 Capacity-to-Pay Analysis for Mkula Scheme

(unit : 1,000 TSh)

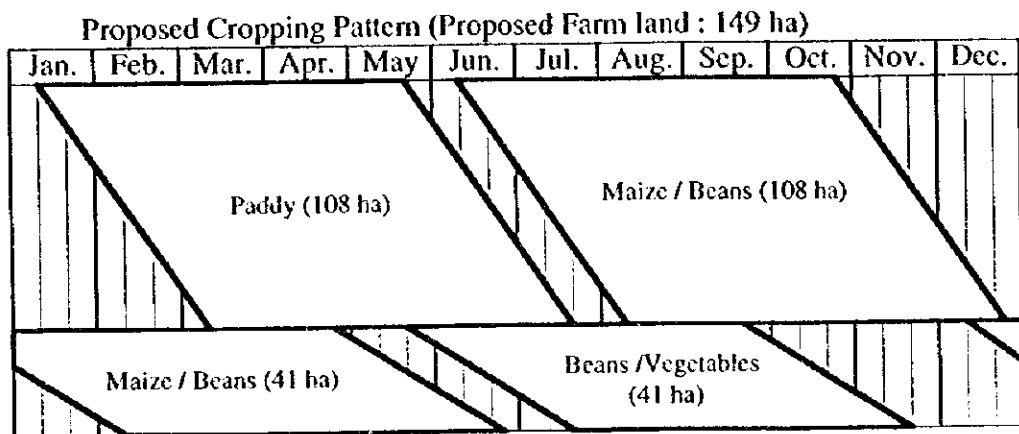
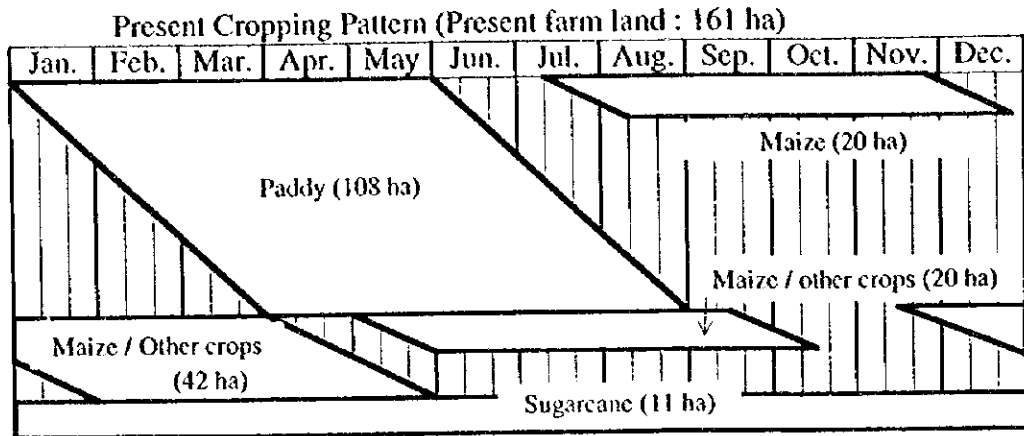
	Holding Size (ha)	Total Harvested Area (ha)	Farm Income	Production Cost	Net Farm Income	Income Tax	O/M Costs	Amortization Cost	Net Profit
Mkula Scheme									
Irrigated Area	0.3								
Crops									
Paddy		0.22	176	49					
Maize		0.30	103	47					
Pulse		0.08	24	11					
Total			308	107	201	7	4	57	133

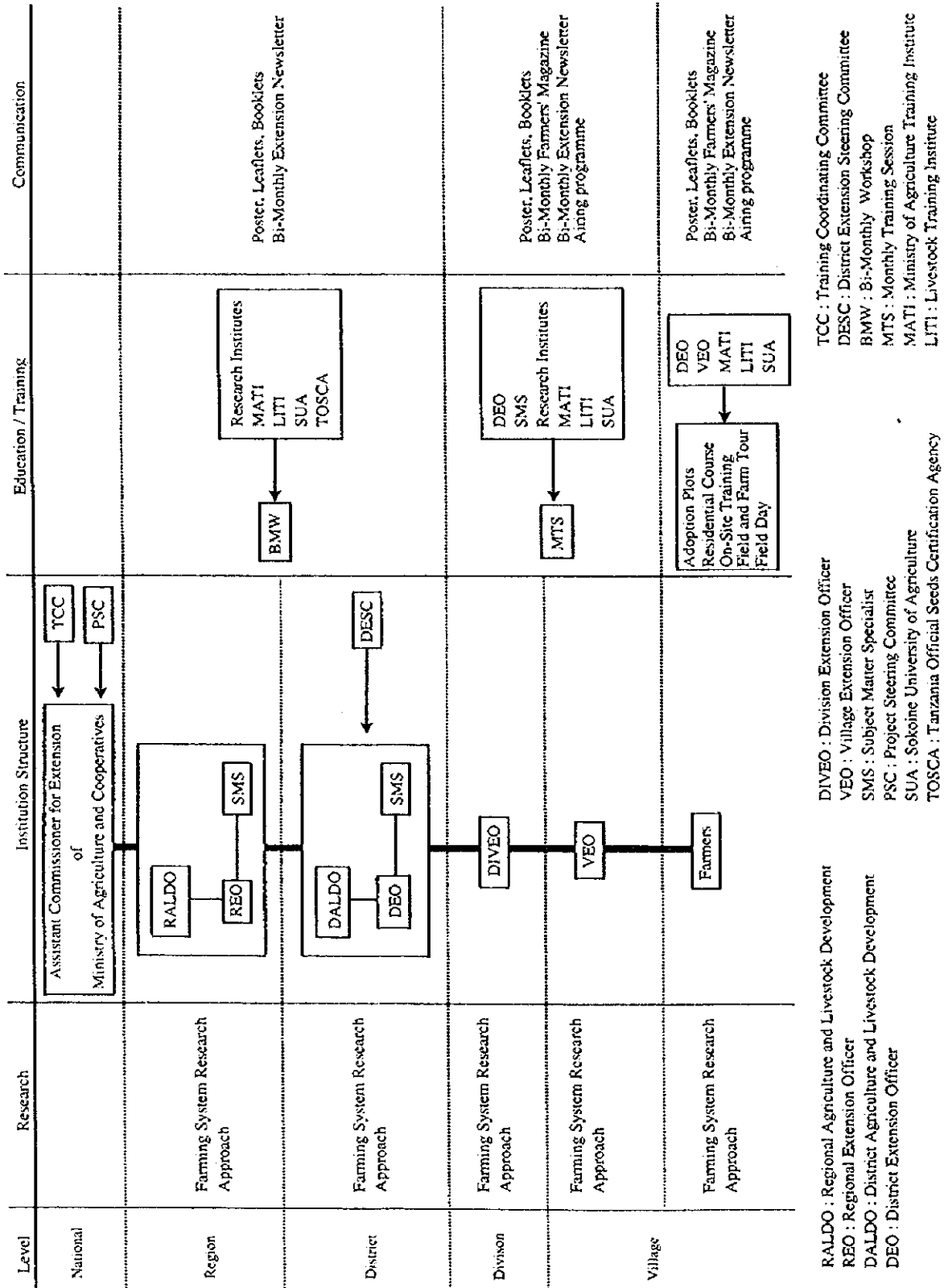


# ***FIGURES***



Figure 1.3.1 Present and Proposed Cropping Pattern in Mkula Scheme





RALDO : Regional Agriculture and Livestock Development  
 REO : Regional Extension Officer  
 DALDO : District Agriculture and Livestock Development  
 DEO : District Extension Officer  
 DIVEO : Division Extension Officer  
 VEO : Village Extension Officer  
 SMS : Subject Matter Specialist  
 PSC : Project Steering Committee  
 SUA : Sokoine University of Agriculture  
 TOSCA : Tanzania Official Seeds Certification Agency  
 TCC : Training Coordinating Committee  
 DESC : District Extension Steering Committee  
 BMW : Bi-Monthly Workshop  
 MTS : Monthly Training Session  
 MATI : Ministry of Agriculture Training Institute  
 LITI : Livestock Training Institute

Figure 1.3.2 Prevailing Structure of Extension Services under NAEP II

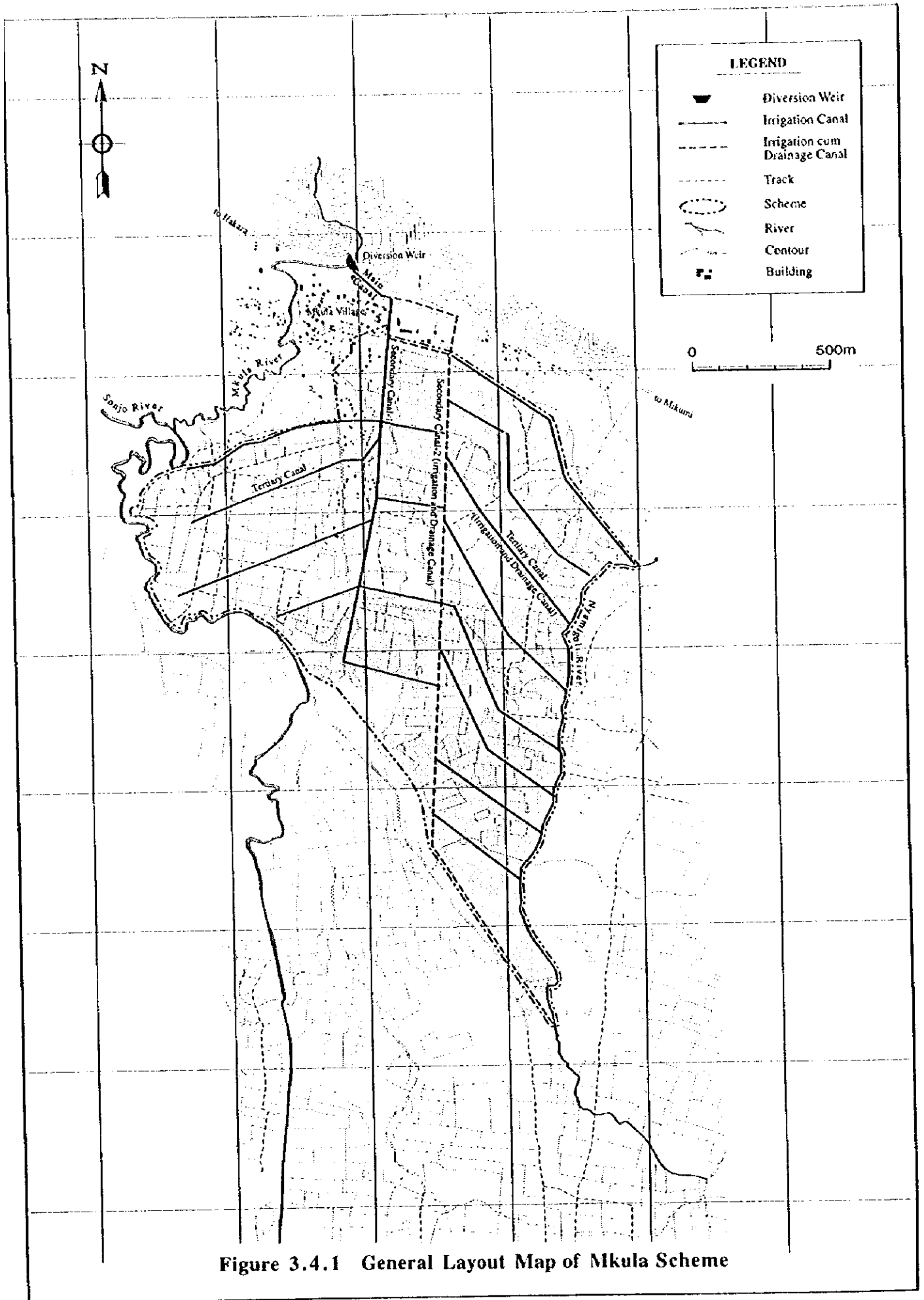


Figure 3.4.1 General Layout Map of Mkula Scheme

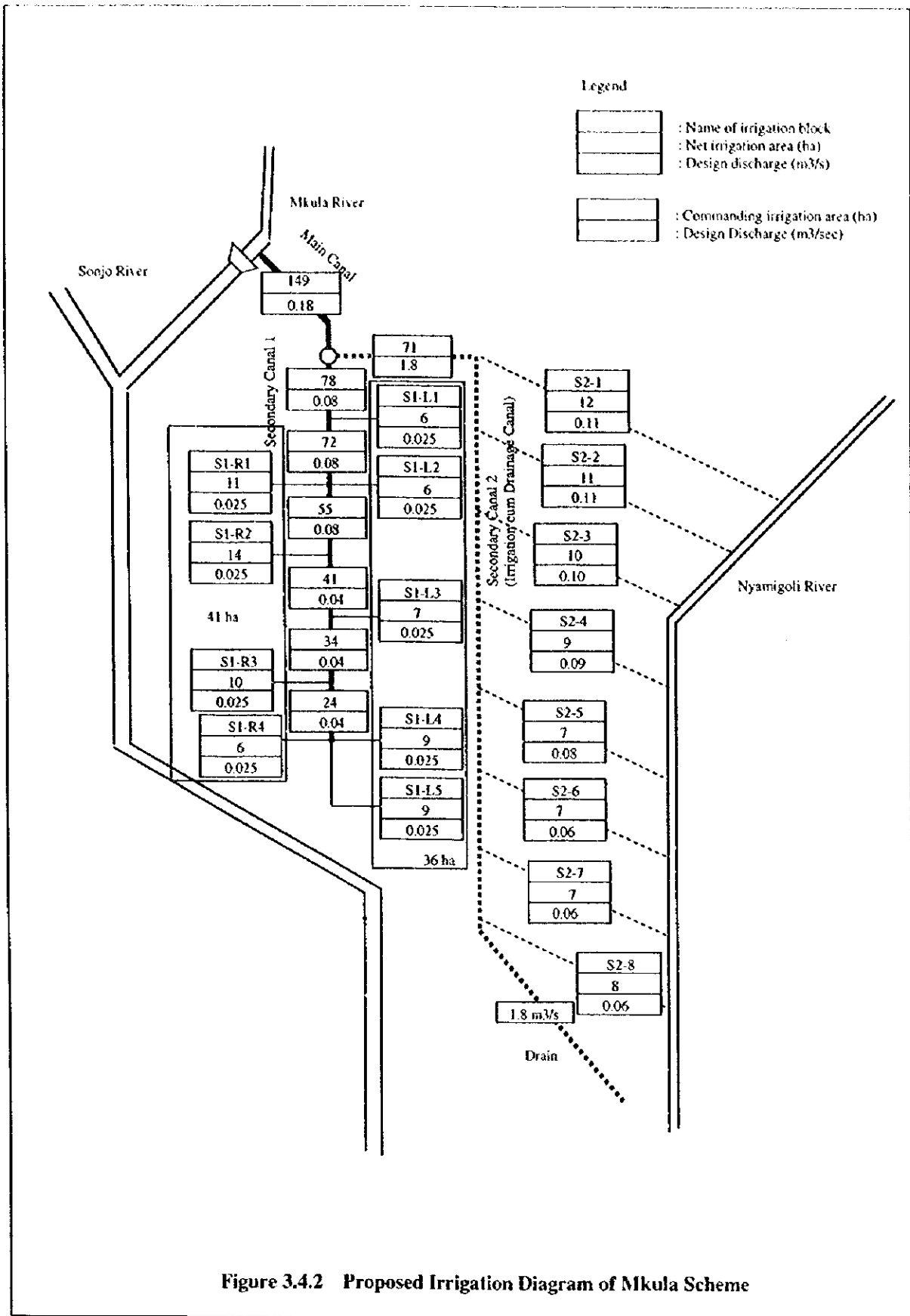
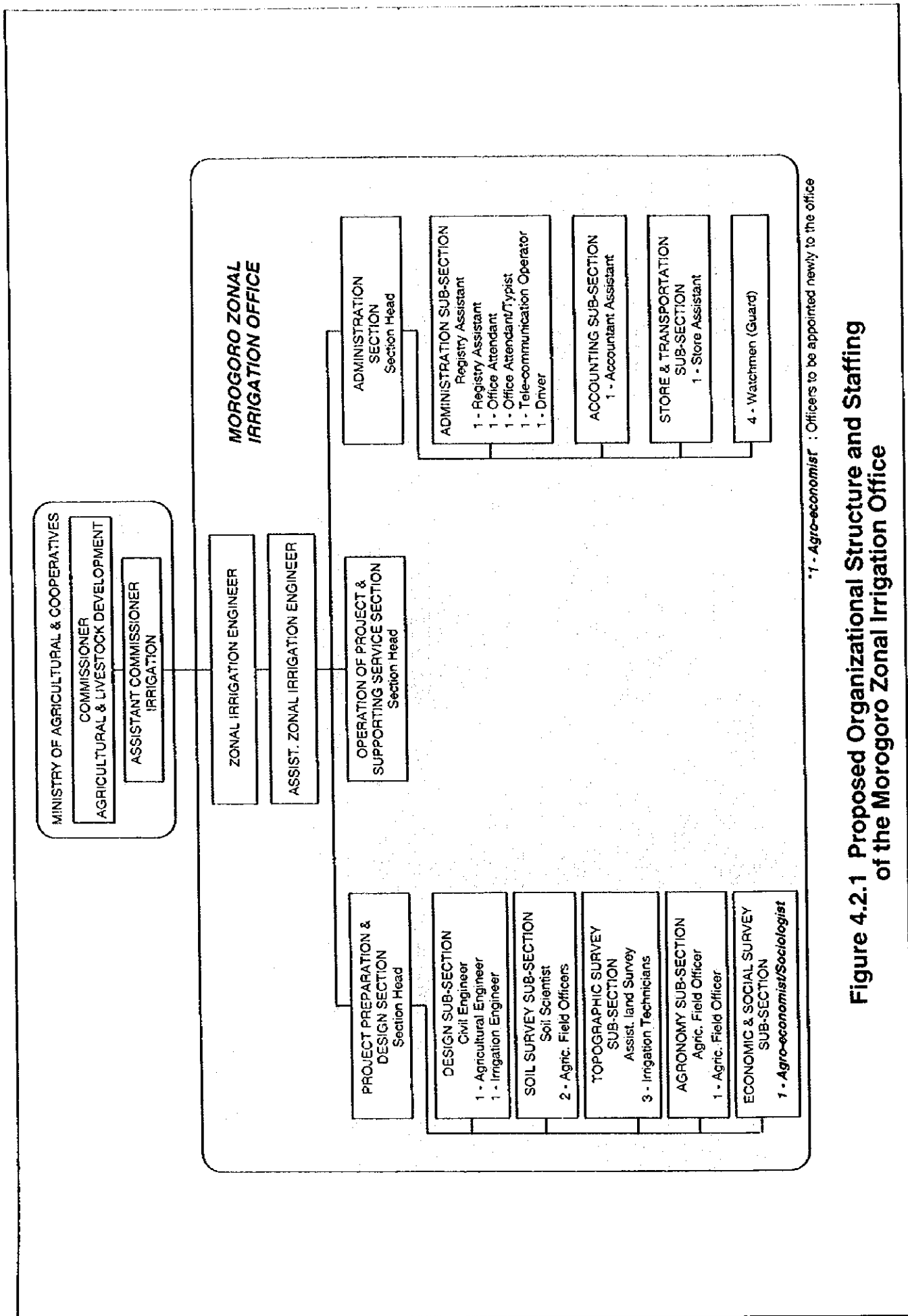


Figure 3.4.2 Proposed Irrigation Diagram of Mkula Scheme





\*1 - Agro-economist\* : Officers to be appointed newly to the office

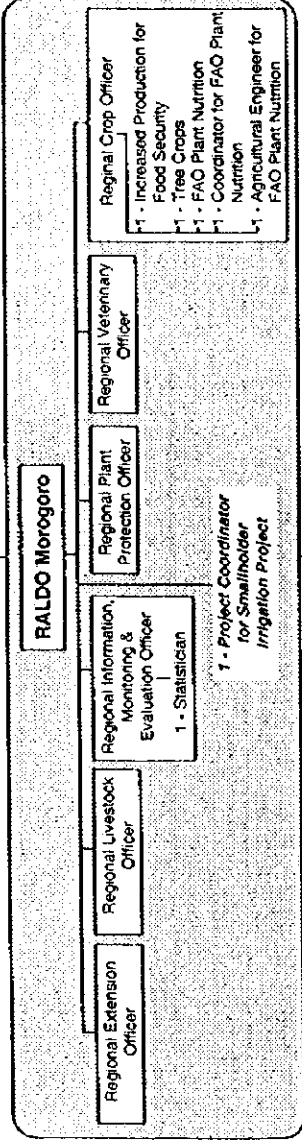
**Figure 4.2.1 Proposed Organizational Structure and Staffing of the Morogoro Zonal Irrigation Office**



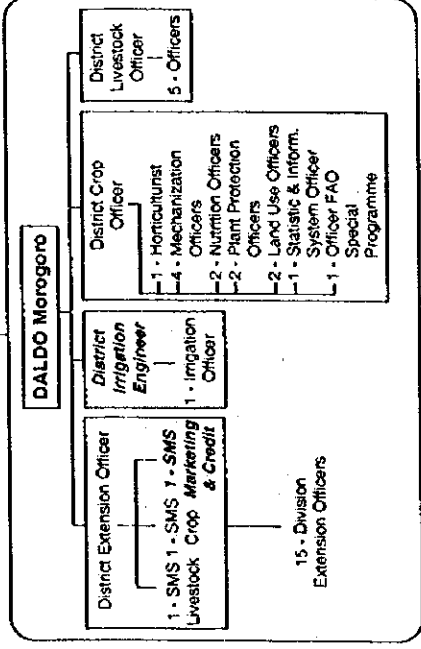
**Figure 4.2.2 Implementation Schedule of Reinforcement Programme for Water User' Group - Mkula Scheme**

	1st Year				2nd Year				3rd Year				4th Year				Remarks
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	
Zonal Irrigation Office	<ul style="list-style-type: none"> <li>- The public meeting is held at Mkula village. To all villagers, the Zonal Irrigation Office (ZIO) should explain all of development plan.</li> <li>- The project has to be acknowledged by the villagers.</li> <li>- ZIO and village government have to exchange an agreement document for the plan and farmers' duties, after the village's general meeting.</li> </ul>																
Village Government	<ul style="list-style-type: none"> <li>- After the public meeting, the village government holds the general meeting and discuss with villagers for the following matters: i) development plan, ii) land re-allocation, iii) land acquisition, and iv) establishment of WUG.</li> <li>- All members of existing WUG should attend to the general meeting.</li> <li>- Then the government establish land allocation committee and ad hoc committee of WUG for those implementation.</li> <li>- The committee consists of leaders of village government.</li> <li>- After the confirmation of project boundary and land tenure, re-allocation of farm land is implemented by the committee. DC provides necessary supporting services to the committee.</li> <li>- Land allocation plan should be finally decided at the village's general meeting attending all villagers.</li> <li>- The committee implements land acquisition of right of way in parallel with the land re-allocation.</li> </ul>																
Water Users Group	<ul style="list-style-type: none"> <li>- The ad hoc committee consists of leaders of village government.</li> <li>- The committee confirms the beneficiaries and prepares member list.</li> <li>- The preparatory works of the committee include i) preparation of organizational structure, articles and by-laws (draft) and budget estimate (draft), ii) candidates for posts of leaders, and iii) arrangement of first general meeting.</li> <li>- At first, the ad hoc committee takes initiative for first general meeting, and establishment of WUG is decided by the attendants. Then the ad hoc committee is closed, and the first general meeting is managed by new WUG.</li> <li>- At this general meeting, the articles and by-laws and yearly budget are decided by the members, and the leaders prepare minutes of meeting.</li> <li>- The existing WUG is closed after the establishment of new WUG.</li> </ul>																
District/Ward Governments	<ul style="list-style-type: none"> <li>- Supporting to land re-allocation and land acquisition.</li> <li>- Supporting to public meeting by the Zonal Irrigation Office and general committee and WUG.</li> <li>- Training Course-A and -B</li> <li>- Training Course-C and -D</li> <li>- Training Course-C</li> </ul>																
Agricultural Coordinating Committee	<ul style="list-style-type: none"> <li>- Irrigation technician and VEO provide technical advice to the farmers.</li> <li>- Supporting services for establishment and management of WUG.</li> </ul>																
Institutional Expert	<ul style="list-style-type: none"> <li>- The agricultural coordinating committee coordinates all of the governments' activities for the project implementation and agricultural supporting services to WUG/farmers.</li> </ul>																

Ministry of Agriculture and Cooperatives  
Commissioner  
Agricultural & Livestock Development

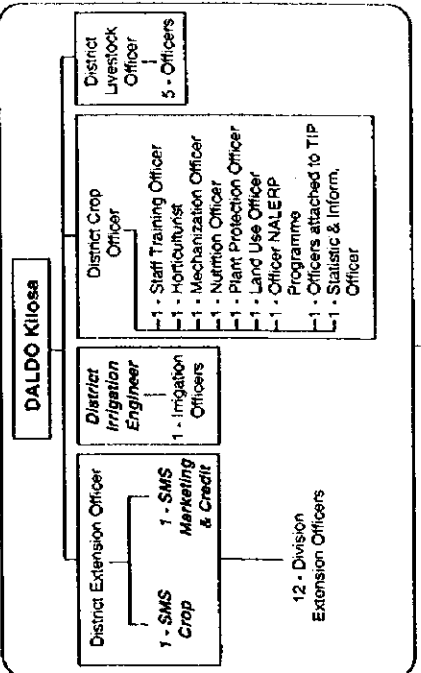


**District Level**



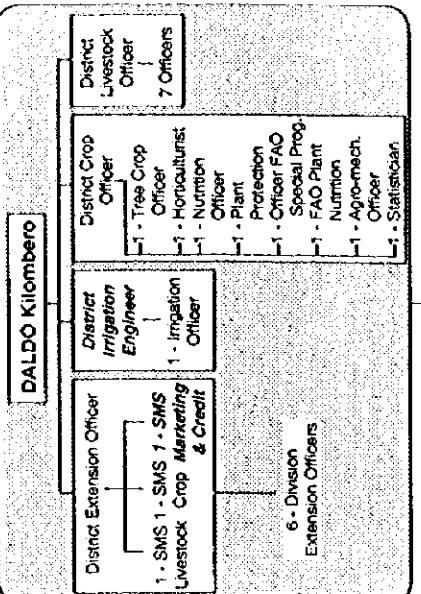
**Irrigation Schemes**

Mgeta	Villages	VEQ	IT
Mgongola	3	3	7*1
			1



**Supporting Services**

Nyirga	Villages	VEQ	IT
Malolo	1	1	*2
Mgogozzi	1	7	1



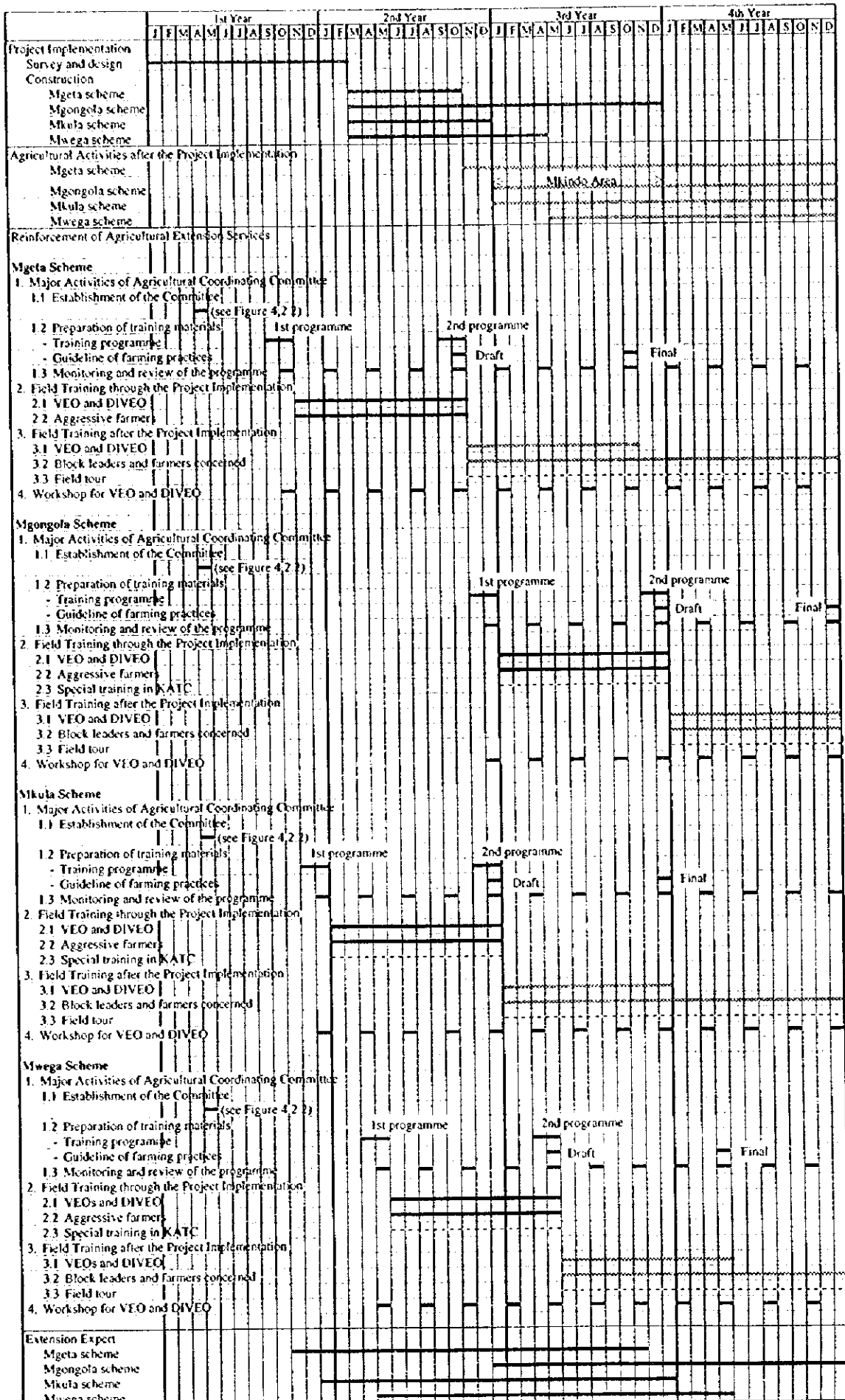
**Supporting Services**

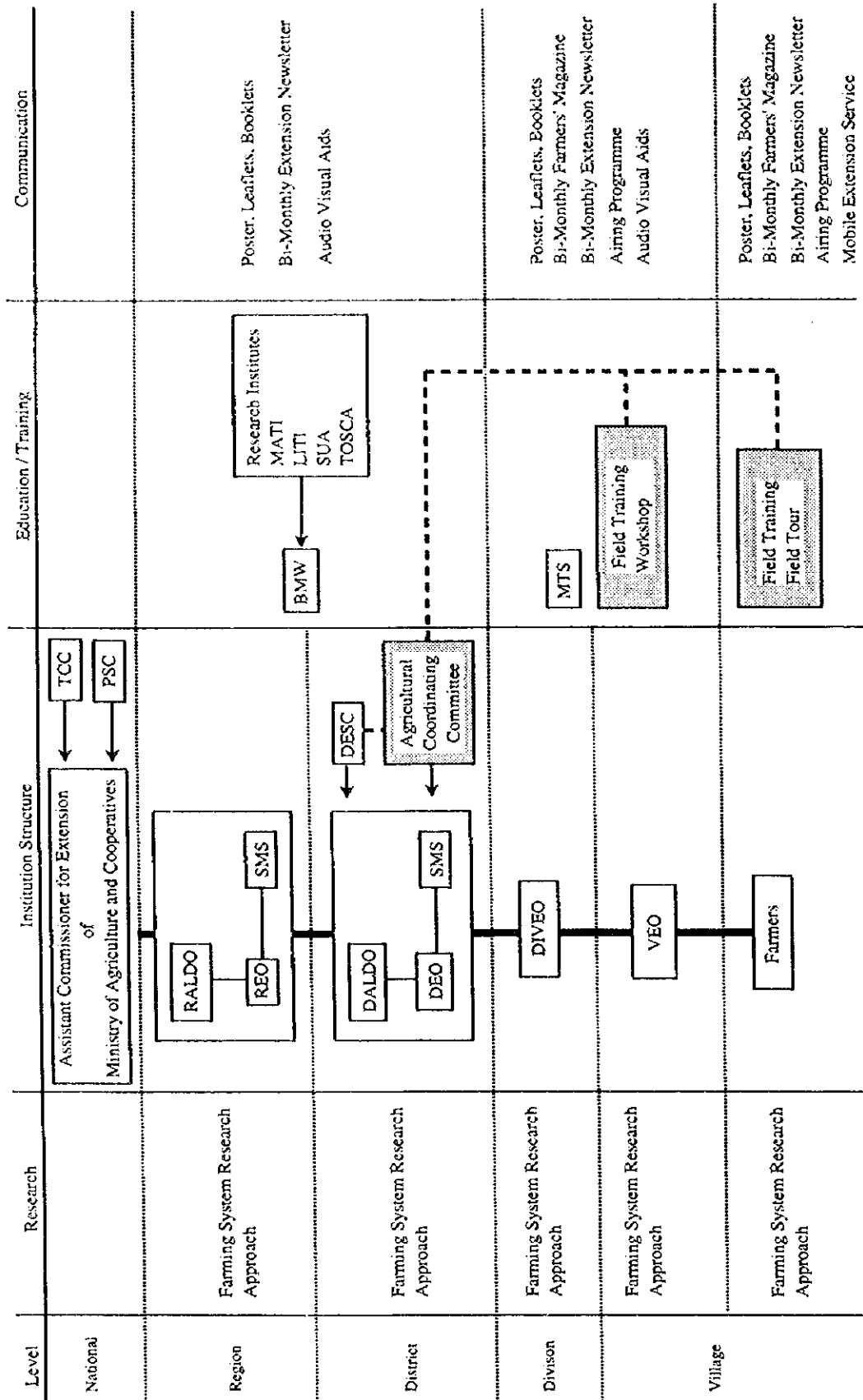
Mkula	Villages	VEQ	IT
	1	1	1

\*1 Appointed to each Ward  
\*2 Sub-village of Malolo, and covered by VEO and IT in Malolo.  
VEQ : Village Extension Officer  
IT : Irrigation Technician  
\*District Irrigation Engineer\* or \*J\* : Officers to be appointed newly to the offices of RALDO and DALDO

**Figure 4.2.3 Proposed Organizational Structure of the Offices of RALDO and DALDO**

Figure 4.2.4 Training Programme for Extension Staffs and Farmers





Function in training programme for extension staffs and farmers

Note : Refer Figure 1.3.2 for abbreviations

Figure 4.2.5 Proposed Structure of Extension Services under NAEP - II

Fig.5.1.1 Capacity-to-Pay Graphic Analysis for Mkula

ha	Income	Production Cost	Prod. Cost + O/M	Prod. Cost + O/M + Amort.	Total Expenses	Living Expenses	Prod. Cost	O/M	Amort.
0.2	205	71	73.1	111.1	191.1	80	71	24	38
0.3	308	107	110.2	167.2	271.2	101	107	32	57
0.4	411	143	147.3	223.3	345.3	122	143	43	76
0.5	513	178	183.4	278.4	414.4	136	178	54	95

