

TABLES

Table 1.1.1 Physical Natures and Chemical Properties of Soils

| Symbol of Mapping Unit (ha) | Area | Soil Unit (Phase) | Pysicography | Topography | Parent Material | Soil Characteristics | | Drainability | Water-Resume | | Land Use | |
|-----------------------------|------|-------------------|----------------------|--------------------|-----------------|----------------------|-----------|--------------|--------------|---------------|---------------|-------------------------|
| | | | | | | Texture | Depth | | Fertility | Rainy season | | Dry season |
| Mwg-1 | 50 | CMe (Stony) | Colluvial slopes | Gently sloping | Colluvium | LgSLgSL | Mod. deep | Mod. - low | Excessive | GWD: >150cm | GWD: >150cm | Upland crop land |
| Mwg-2 | 165 | FLe | Higher river terrace | Gently sloping | Alluvium | L-SLUSL | Shallow | Mod. - low | Excessive | GWD: >150cm | GWD: >150cm | Upland crop land |
| Mwg-3 | 25 | FLe | Lower river terrace | Flat - almost flat | Alluvium | CL/CLCL | Deep | High | Well | GWD: 50-100cm | GWD: >150cm | Upland crop land |
| Mwg-4 | 160 | FLe | Valley bottom | Flat - almost flat | Alluvium | SL/SLSL | Mod. deep | Moderate | Well | GWD: 30-100cm | GWD: >150cm | Upland crop land |
| Mwg-5 | 50 | FLe | Valley bottom | Flat - almost flat | Alluvium | CL/CLCL-SL | Mod. deep | High to mod. | Imperfect | GWD: 0-50cm | GWD: >150cm | Paddy, upland crop land |
| Mwg-6 | 275 | FLe | Valley bottom | Flat - almost flat | Alluvium | L-SLUSL-SL | Mod. deep | Moderate | Poor | GWD: 0-50cm | GWD: 50-150cm | Paddy |
| Mwg-7 | 55 | GLE | Valley bottom swamp | Flat | Alluvium | CL/CL-SIL | Mod. deep | Mod. - low | Very poor | Flooding | GWD: 0-50cm | Swamp/Fall grass |
| (Total) | 740 | | | | | | | | | | | |

| Soil Unit | Soil Texture | | | Soil depth | Water resume |
|-----------------------|--------------------------|-----------------------|-----------------------------|----------------------|-------------------------------------|
| | Topography | Soil Texture | Soil depth | | |
| CMe: Eutric Cambisols | Flat - almost flat: 0-2% | C: Clay | L: Loam | Deep: >150cm | GWD: Estimated depth of groundwater |
| FLe: Eutric Fluvisols | Gently sloping: 2-6% | StC: Silty Clay | SL: Sandy Loam | Mod. deep: 100-150cm | |
| GLE: Eutric Gleysols | Sloping: 0-13% | SC: Sandy Clay | LS: Loamy Sand | Shallow: 50-100cm | |
| | Mod. sloping | StCL: Silty Clay Loam | S: Sand | | |
| | Steep: 25-55% | CL: Clay Loam | g: contained gravel, stones | | |
| | | SCL: Sandy Clay Loam | or rocks of more than 3% | | |
| | | StL: Silty Loam | R: Consolidated bed rock | | |

Table 1.1.2 Physical Nature and Chemical Properties of Soils

| Location | Soil Mapping Unit | Horizon Name | Depth cm | EC mS/cm | pH (1:2.5) | | | Particle Size | | | Soil Texture | Bulk Density g/cm ³ | Total Nitrogen % | Organic Carbon % | C/N Ratio | CEC me/100g | Exchangeable Cations me/100g | | | | Saturation Ratio % | |
|----------|-------------------|--------------|----------|----------|------------------|-----|-----|---------------|--------|--------|--------------|--------------------------------|------------------|------------------|-----------|-------------|------------------------------|------|------|-------|--------------------|-------|
| | | | | | H ₂ O | KCl | KCl | Clay % | Silt % | Sand % | | | | | | | Ca | Mg | K | Na | | Total |
| Malolo | Mwg-4 | Ap | 0-17 | 0.20 | 8.0 | 7.1 | 20 | 9 | 71 | SCL | 1.29 | 0.08 | 0.51 | 6.4 | 12.0 | 18.68 | 0.66 | 1.30 | 0.07 | 20.71 | 173 | |
| | | B2 | 17-46 | 0.14 | 7.6 | 7.0 | 20 | 7 | 73 | SCL | 0.99 | 0.04 | 0.33 | 8.2 | 14.0 | 18.77 | 0.47 | 0.51 | 0.08 | 19.83 | 142 | |
| | | C | 46-83 | 0.23 | 7.5 | 7.0 | 30 | 25 | 45 | CL | 1.12 | 0.14 | 0.99 | 7.1 | 19.0 | 31.29 | 0.08 | 1.40 | 0.15 | 32.92 | 173 | |
| | Mwg-2 | Ap | 0-15 | 0.16 | 7.7 | 7.0 | 22 | 17 | 61 | SCL | 1.34 | 0.09 | 0.79 | 8.8 | 14.0 | 12.00 | 1.34 | 2.34 | 0.06 | 15.74 | 112 | |
| | | AB | 15-40 | 0.13 | 7.6 | 7.0 | 26 | 3 | 71 | SCL | 1.29 | 0.05 | 0.46 | 9.3 | 16.0 | 13.53 | 0.94 | 0.74 | 0.10 | 15.31 | 96 | |
| | | B2 | 40-75 | 0.11 | 7.8 | 7.2 | 22 | 11 | 67 | SCL | 1.31 | 0.12 | 0.27 | 2.2 | 12.0 | 15.52 | 0.64 | 0.40 | 0.11 | 16.67 | 139 | |
| | Nyanga | Mwg-6 | Ap | 0-16 | 0.06 | 6.8 | 5.7 | 20 | 27 | 53 | L | 1.08 | 0.21 | 2.09 | 10.0 | 18.5 | 10.80 | 3.32 | 0.38 | 0.14 | 14.64 | 79 |
| | | | B2 | 16-42 | 0.05 | 6.5 | 6.2 | 32 | 35 | 33 | CL | 1.03 | 0.20 | 2.16 | 10.8 | 24.8 | 16.02 | 4.50 | 0.61 | 0.14 | 21.27 | 86 |
| | | | C | 42-80 | 0.05 | 6.6 | 6.1 | 40 | 47 | 13 | SiC | 0.93 | 0.23 | 2.60 | 11.3 | 26.0 | 20.73 | 2.43 | 0.92 | 0.16 | 24.24 | 93 |
| Mwg-4 | | Ap | 0-20 | 0.17 | 7.2 | 6.2 | 16 | 5 | 79 | SL | 1.21 | 0.11 | 0.99 | 9.0 | 11.1 | 6.84 | 1.26 | 0.96 | 0.09 | 9.15 | 82 | |
| Mwg-4 | | Ap | 0-22 | 0.06 | 6.6 | 5.6 | 24 | 23 | 53 | SCL | 0.92 | 0.23 | 2.61 | 11.3 | 22.0 | 6.72 | 2.64 | 0.40 | 0.15 | 9.91 | 45 | |
| Mgogozi | Mwg-6 | Ap | 0-16 | 0.53 | 8.1 | 7.3 | 18 | 9 | 73 | SL | 1.36 | 0.11 | 1.34 | 12.2 | 13.2 | 17.23 | 1.84 | 2.52 | 0.80 | 22.39 | 170 | |
| | | B2 | 16-50 | 0.19 | 7.7 | 7.4 | 18 | 5 | 77 | SL | 1.44 | 0.04 | 0.35 | 8.8 | 12.2 | 19.89 | 1.44 | 0.77 | 0.23 | 22.33 | 183 | |
| | | C | 50-80 | 0.17 | 8.0 | 7.6 | 18 | 5 | 77 | SL | 1.49 | 0.03 | 0.18 | 6.0 | 14.0 | 17.68 | 0.97 | 0.46 | 0.21 | 19.32 | 138 | |
| | Mwg-4 | Ap | 0-17 | 0.08 | 6.9 | 6.3 | 18 | 45 | 37 | L | 1.25 | 0.08 | 0.70 | 8.7 | 9.1 | 4.88 | 1.16 | 0.50 | 0.10 | 6.64 | 73 | |
| | | C | 17-45 | 0.09 | 7.6 | 7.4 | 12 | 3 | 85 | LS | 1.28 | 0.03 | 0.15 | 4.8 | 9.0 | 5.40 | 0.69 | 0.25 | 0.07 | 6.41 | 71 | |
| | Mwg-5 | Ap | 0-18 | 0.24 | 7.5 | 6.6 | 49 | 32 | 19 | C | 0.94 | 0.22 | 1.99 | 9.0 | 23.0 | 18.70 | 2.02 | 1.84 | 0.52 | 23.08 | 100 | |
| | | BC | 18-46 | 0.20 | 7.5 | 6.3 | 52 | 27 | 21 | C | 1.01 | 0.12 | 1.05 | 8.8 | 25.9 | 15.84 | 3.72 | 1.59 | 0.85 | 22.00 | 85 | |
| | | C | 46-80 | 0.26 | 7.2 | 6.9 | 34 | 43 | 23 | CL | 0.82 | 0.07 | 0.67 | 9.6 | 18.6 | 12.95 | 3.64 | 0.47 | 1.06 | 18.12 | 97 | |

Analysis Methods: EC : EC meter

pH : 1:2.5 of soil water (KCl) ratio

Particle Size : Hydrometer Bouyoucos method

Bulk Density : USDA SCS Analysis No. 43

Total Nitrogen : Kjeldahl method

Organic Carbon : Black & Walkley method

Cation Exchange Capacity : Ammonium acetate method at pH 7.0

Exchangeable Cations : Atomic absorption spectrophotometry method

Analyzed at Sokoine University of Agriculture in 1996

Table 1.1.3 Description of Typical Soil Profile (1/7)

Mapping Unit: Mwg-1

| | |
|--------------------------------|---|
| Soil Pit No.: | Mwega-13 |
| Soil Classification: | Eutric Cambisols, stony phase |
| Date of Examination: | 25 June 1996 |
| Elevation: | 570 m above sea level |
| Land-form: | Colluvial gentle slope |
| Slope: | Gentle slope 2 - 3% |
| Land Use/Vegetation: | Cultivated with onion under irrigation conditions |
| Parent Material: | Colluvial deposits |
| Drainage: | Excessively drained |
| Soil Moisture Condition: | Dry to moist |
| Groundwater Depth: | > 150 cm |
| Surface Stone or Rock Outcrop: | 1 to 3% of gravel and stones (sandstone, limestone) |
| Erosion: | Slightly eroded, gully by rain water and irrigation water |

Brief Description of the Profile:

Moderate deep, well to excessively well drained, brownish black loam profile soil, strikingly uniform in appearance throughout its depth, especially when moist. Structure is weak to moderate throughout but finer particles are fairly strongly aggregated and the whole profile is friable, porous and permeable. Root distribution is normal, with the majority of roots in the top 45 cm. The soil contains gravel and stones (5 to 20 cm) of limestone and sandstone.

Soil Profile Description

| | | |
|----|---------------|---|
| Ap | 0 - 16 cm | Brownish black (7.5YR 3/2) moist and brown (7.5YR 4/4) dry; gravely loam; moderate coarse granular structure; slightly sticky and slightly plastic, friable moist; few sandstone and limestone (5 to 10 cm); many fine and medium pores; many fine roots; clear smooth boundary. |
| AB | 16 - 27 cm | Dark reddish brown (5YR 3/4) moist; gravely sandy clay loam; moderate fine subangular blocky; slightly sticky, slightly plastic, friable moist; few sandstone and limestone (5 to 10 cm); many fine pores; many fine roots; gradual smooth boundary. |
| B1 | 27 - 45 cm | Very dark reddish brown (5YR 2/4) moist; gravely sandy clay; weak coarse subangular blocky structure breaking easily to moderate fine and very fine angular blocky structure; slightly sticky, non-plastic, friable moist; few sandstone and limestone (5 to 10 cm); common fine pores; common fine roots; gradual smooth boundary. |
| B2 | 45 - 90 cm | Dark reddish brown (2.5YR 3/6) moist; gravely sandy clay loam; weak fine angular blocky structure; slightly sticky, slightly plastic, friable moist; few sandstone and limestone (10 to 20 cm); many fine pores; few fine roots; gradual smooth boundary. |
| C | 90 - 110 cm + | Reddish brown (5YR 4/6) moist; sandy clay loam; weak moderate angular blocky structure; slightly sticky, slightly plastic friable moist; many fine pores; many sandstone and limestone (10 to 20 cm). |

Land Class (for paddy rice/for upland crops): NRe/SU3awe

Table 1.1.3 Description of Typical Soil Profile (2/7)

Mapping Unit: Mwg-2

| | |
|--------------------------------|---------------------------------------|
| Soil Pit No.: | Malolo-4 |
| Soil Classification: | Eutric Fluvisols |
| Date of Examination: | 2 August 1996 |
| Elevation: | 540 m above sea level |
| Land-form: | Higher river terrace |
| Slope: | Gentle slope, 2 - 3% |
| Land Use/Vegetation: | Cultivated with maize, beans or onion |
| Parent Material: | River terrace deposits |
| Drainage: | Well drained |
| Soil Moisture Condition: | Moist |
| Groundwater Depth: | > 150 cm |
| Surface Stone or Rock Outcrop: | 1 to 2% of gravel |
| Erosion: | Slightly eroded |

Brief Description of the Profile:

Moderately deep, excessively well drained soil weakly developed in stratified layers of sandy loam and sandy clay loam, containing very few rounded gravel (1 to 5 cm) and 1 to 3% organic matter decreasing irregularly with depth.

Soil Profile Description

- Ap 0 - 15 cm Olive brown (7.5YR 4/3) moist, dark grayish brown (2.5Y 5/2) dry; sandy loam; weak fine subangular blocky structure; slightly sticky, non-plastic, very friable moist; very few gravel; many medium pores; many fine and medium roots; clear smooth boundary.
- BC 15 - 40 cm Grayish yellow brown (10YR 4/2) moist, sandy loam; weak subangular r blocky structure; non-sticky, non-plastic, loose moist; very few gravel; many fine pores; common fine roots; gradual smooth boundary.
- C1 40 - 75 cm Dull yellowish brown (10YR 5/4) moist, sandy clay loam; moderate angular to subangular blocky structure; slightly sticky, slightly plastic, friable moist; very few gravel; common fine pores; very few fine roots; gradual smooth boundary.
- C2 75 -110 cm + Dull yellow orange (10YR 6/4) moist, sandy loam; weak subangular blocky structure; non-sticky, non-plastic, friable moist; very few gravel; few fine pores; few fine roots.

Land Class (paddy rice/upland crops): NRr/SU2rnwe

Table 1.1.3 Description of Typical Soil Profile (3/7)

Mapping Unit: Mwg-3

| | |
|--------------------------------|---------------------------------------|
| Soil Pit No.: | Mwega-14 |
| Soil Classification: | Eutric Fluvisols |
| Date of Examination: | 26 June 1997 |
| Elevation: | 540 m above sea level |
| Land-form: | Lower river terrace |
| Slope: | Nearly level, under 1% |
| Land Use/Vegetation: | Cultivated with maize, beans or onion |
| Parent Material: | Recent river terrace deposits |
| Drainage: | Well drained |
| Soil Moisture Condition: | Moist throughout |
| Groundwater Depth: | > 150 cm |
| Surface Stone or Rock Outcrop: | None |
| Erosion: | None |

Brief Description of the Profile:

Deep to very deep, well drained soils weakly developed in layers of clay loam to sandy clay loam recent alluvial sediments. Friable, well structured dark brown topsoil. The subsoil, below 40 cm, are brown, and soil of under 95 cm has yellowish brown mottles. Non saline, non alkaline and non calcareous.

Soil Profile Description

| | | |
|----|---------------|---|
| Ap | 0 - 14 cm | Dark brown (10YR 3/3) moist, clay loam; moderate medium subangular blocky structure; sticky, plastic, friable moist; many medium pores; common fine roots; clear smooth boundary. |
| BC | 14 - 40 cm | Brown (10YR 4/6) moist, clay loam; moderate medium angular to subangular blocky structure; sticky, plastic, firm moist; common fine pores; common fine roots; gradual smooth boundary. |
| C1 | 40 - 95 cm | Brown (7.5YR 4/3) moist, clay loam; moderate medium subangular blocky structure; sticky, plastic, firm moist; few fine pores; few fine roots; gradual smooth boundary. |
| C2 | 95 - 110 cm + | Dull brown (10YR 5/3) and few fine distinct clear yellowish brown (2.5Y 5/4) mottles moist; sandy clay loam; weak subangular blocky structure; sticky, plastic, firm moist; few fine pores. |

Land Class (paddy rice/upland crops): SR2rwl/SU1

Table 1.1.3 Description of Typical Soil Profile (4/7)

Mapping Unit: Mwg-4

| | |
|--------------------------------|---------------------------------------|
| Soil Pit No.: | Malolo-3 |
| Soil Classification: | Eutric Fluvisols |
| Date of Examination: | 31 August 1996 |
| Elevation: | 535 m above sea level |
| Land-form: | Valley bottom plain |
| Slope: | Nearly level, under 1% |
| Land Use/Vegetation: | Cultivated with maize, beans or onion |
| Parent Material: | Recent alluvial (river) deposits |
| Drainage: | Well drained |
| Soil Moisture Condition: | Moist throughout |
| Groundwater Depth: | > 150 cm |
| Surface Stone or Rock Outcrop: | None |
| Erosion: | None |

Brief Description of the Profile:

Moderately deep moderately well drained, sandy loam textured soils with coarse and very coarse sand throughout the profile. The topsoil is brownish black, sandy loam with moderate fine crumb structure, slightly sticky and slightly plastic when wet. The subsoil is friable when moist and slightly sticky and non-plastic when wet.

Soil Profile Description

| | | |
|----|---------------|--|
| Ap | 0 - 17 cm | Brownish black (10YR 3/2) moist and grayish yellow brown (10YR 4/2) dry; fine sandy loam; moderate fine crumb structure; slightly sticky, slightly plastic, very friable moist; many medium pores; many fine and medium pores; many medium roots; clear smooth boundary. |
| B2 | 17 - 45 cm | Brown (7.5YR 4/4) moist; sandy loam; moderate fine subangular blocky structure; slightly sticky, non plastic, friable moist; many very fine pores; very many fine and medium roots; gradual smooth boundary. |
| C1 | 45 - 85 cm | Dull brown(7.5YR 5/3) moist; sandy loam; weak fine subangular blocky breaking easily to fine aggregate; slightly sticky, non plastic, friable moist; common fine pores; common fine pores; few fine roots; gradual smooth boundary. |
| C2 | 85 - 125 cm + | Dull yellowish orange (10YR 6/3) moist; sandy loam; weak medium subangular blocky; slightly sticky, slightly plastic, friable moist; common fine and medium pores and few fine; few medium roots. |

Land Class (for paddy rice/for upland crops): SR3r/SU2n

Table 1.1.3 Description of Typical Soil Profile (5/7)

Mapping Unit: Mwg-5

| | |
|--------------------------------|---|
| Soil Pit No.: | Mgogozi-3 |
| Soil Classification: | Eutric Fluvisols |
| Date of Examination: | 1 August 1996 |
| Elevation: | 585 m above sea level |
| Land-form: | Valley bottom plain |
| Slope: | Nearly level |
| Land Use/Vegetation: | Cultivated paddy rice in the rainy season, and beans or onion in the dry season |
| Parent Material: | Recent alluvial (river) deposits |
| Drainage: | Imperfectly drained |
| Soil Moisture Condition: | Moist and wet under groundwater |
| Groundwater Depth: | 100 cm |
| Surface Stone or Rock Outcrop: | None |
| Erosion: | None |

Brief Description of the Profile:

Moderately deep, imperfectly drained soil having brownish black friable clay loam topsoil with moderate subangular blocky structure. Subsoil is grayish yellow brown sandy clay loam,. Soil under 46 cm has dull brown or grayish brown mottles. Groundwater is shown at 100 cm depth from the surface.

Soil Profile Description

| | | |
|-----|--------------|---|
| Ap | 0 - 18 cm | Brownish black (10YR 2/2) moist; clay loam; moderate medium subangular structure; sticky, slightly plastic, friable moist; many few and medium pores; common fine roots; clear wavy boundary. |
| B2 | 18 - 46 cm | Grayish yellow brown (10YR 4/2) moist; sandy clay loam; moderate medium angular to subangular blocky structure; sticky, plastic, friable moist; common fine pores; common fine roots; gradual smooth boundary. |
| C1g | 46 - 80 cm | Yellowish brown (2.5Y 5/4) and common fine distinct clear dull brown (7.5YR 5/6) mottles moist, clay loam; moderate fine angular to subangular blocky structure; very sticky, plastic, firm moist; few fine pores; few fine roots; gradual smooth boundary. |
| C2g | 80 -105 cm + | Grayish yellow brown (10YR 5/2) and few fine distinct clear grayish brown (2.5Y 6/2) mottles moist; clay loam; moderate fine subangular blocky structure; sticky, plastic, firm moist; few fine pores. |

Land Class (for paddy rice/for upland crops): SR2rd/SU2rfd

Table 1.1.3 Description of Typical Soil Profile (6/7)

Mapping Unit: Mwg-6

| | |
|--------------------------------|---|
| Soil Pit No.: | Nyinga-4 |
| Soil Classification: | Eutric Fluvisols |
| Date of Examination: | 31 July 1996 |
| Elevation: | 595 m above sea level |
| Land-form: | Valley bottom plain |
| Slope: | Nearly level |
| Land Use/Vegetation: | Cultivated lowland paddy rice in the rainy season, and beans or onion in the dry season |
| Parent Material: | Recent alluvial (river) deposits |
| Drainage: | Poorly drained |
| Soil Moisture Condition: | Moist and wet under groundwater |
| Groundwater Depth: | 80 cm |
| Surface Stone or Rock Outcrop: | None |
| Erosion: | None |

Brief Description of the Profile:

Moderately deep, poor drained, and sandy textured soils developed in layers of sandy loam to sandy clay loam recent alluvial sediments. soils under 42 cm has dull yellowish orange or grayish olive mottles.

Soil Profile Description

| | | |
|----|---------------|---|
| Ap | 0 - 16 cm | Brownish black (10YR 2/2) moist; loam; moderate fine subangular blocky structure; slightly sticky, slightly plastic, friable moist; many fine and medium pores; common fine roots; clear smooth boundary. |
| BC | 16 - 42 cm | Grayish yellow brown (10YR 4/2) moist, sandy loam; moderate medium subangular blocky structure; slightly sticky, slightly plastic, friable moist; many medium pores; common fine roots; gradual smooth boundary. |
| C1 | 42 - 80 cm | Dull yellowish brown (10YR 5/3) and few fine faint diffuse dull yellow orange (10YR 6/3) mottles moist; sandy loam; weak fine angular to subangular blocky structure; slightly sticky, slightly plastic, friable moist; few fine pores; few very fine roots; groundwater table is shown at 80 cm depth from the surface; gradual smooth boundary. |
| C2 | 80 - 100 cm + | Dull yellowish orange (10YR 6/4) and common fine distinct clear grayish olive (10YR 6/2) mottles moist; sandy loam (by auger examination). |

Land Class (for paddy rice/for upland crops): SR2rdfd/SU3fd

Table 1.1.3 Description of Typical Soil Profile (7/7)

Mapping Unit: Mwg-7

| | |
|--------------------------------|----------------------------------|
| Soil Pit No.: | Malolo-4 |
| Soil Classification: | Eutric Gleysols |
| Date of Examination: | 26 July 1996 |
| Elevation: | 575 m above sea level |
| Land-form: | Valley bottom swamp |
| Slope: | Nearly level |
| Land Use/Vegetation: | Swampy paddy field |
| Parent Material: | Recent alluvial (river) deposits |
| Drainage: | Very poor drained |
| Soil Moisture Condition: | Wet |
| Groundwater Depth: | > 40 cm |
| Surface Stone or Rock Outcrop: | None |
| Erosion: | None |

Brief Description of the Profile:

Moderately deep, poorly drained, clay loam soil having high groundwater table or submerged throughout year.

Profile Description

| | | |
|----|--------------|--|
| Ap | 0 - 22 cm | Brownish black (2.5Y 3/2) and few fine distinct clear dull yellow (10YR 6/3) mottles moist; clay loam; slightly sticky, slightly plastic (by auger examination). |
| B | 22 - 45 cm | Very dark gray (2.5Y 6/3) and few fine faint dark grayish yellow (2.5Y 4/2) mottles moist, silty clay (by auger examination). |
| B | 45 - 60 cm + | Gray (7.5Y 4/1) and common fine distinct clear yellowish brown (2.5Y 5/4) mottles moist; clay loam (by auger examination). |

Land Class (for paddy rice/for upland crops): NRfd/NUrfd

Table 1.3.1 Present Farming Practices for Major Crops - Mwega 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 per ha - around 600 m ² 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 | Around 25 days after sowing - 1 to 2 seedlings per hill - 10cm x 10cm ~ 10cm x 20cm | Not applied |
| 5 Application of fertilizer | | Not applied |
| Application at nursery | - 2 kg of Urea per 250 m ² | |
| 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 | Onion | Pulse |
|---------------------------------|---|---|
| 1 Land preparation | - Plowing by hand tractor or hand - Harrowing by hand | - Plowing by hand - Harrowing by hand |
| 2 Nursery | - 13 ~ 15 kg per ha - around 200 m ² per ha | Not applied |
| 3 Broadcasting | Not applied | - 20cm x 40cm ~ 30cm x 50cm - 20 kg per ha (2 ~3 seeds per hill) |
| Amount of seeds | | |
| 4 Transplanting | Around 45 days after sowing - Planting bed : 4m x 2m - 10cm x 10cm ~ 20cm x 20cm - 1,000 beds per ha | Not applied |
| 5 Application of fertilizer | | Not applied |
| Application at nursery | - 2 weeks after sowing | |
| Basal application | - 125 kg of SA per ha : 3~4 WAT | |
| 1st top-dressing | - 125 kg of CAN per ha : 3~4 weeks later | |
| Total application | | |
| 6 Weeding | Once or twice during the growth period | - depending on the situation |
| 7 Application of agro-chemicals | Thrip : 1 lit. of Fenitrothion | Not applied |
| 8 Water control | 2 to 3 times a week | Not applied |
| 9 Harvesting | - Neck of plant dries drying for 1 to 2 days. | - around 4 months after sowing |

Table 1.3.2 Present Crop Budget for Major Crops in Mwega Scheme

| Mwega Scheme | Unit | Paddy | | | Maize | | | Pulse | | | Onion | | |
|---|---------|------------------|-------|-------------|------------------|-------|-------------|------------------|-----|-------------|------------------|--------|-------------|
| | | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) |
| Production Cost | | | | | | | | | | | | | |
| (A) Farm Input | | | | | | | | | | | | | |
| 1 Seed | kg/ha | 120 | 50 | 6,000 | 590 | 20 | 11,800 | 800 | 20 | 16,000 | 4,000 | 5 | 20,000 |
| 2 Fertilizer | kg/ha | 240 | 0 | 0 | 240 | 0 | 0 | 240 | 0 | 0 | 240 | 125 | 30,000 |
| : Urea (46 %-N) | kg/ha | 180 | 0 | 0 | 180 | 0 | 0 | 180 | 0 | 0 | 180 | 125 | 22,500 |
| : SA (21 %-N) | kg/ha | | 0 | 0 | | | 0 | | | 0 | | | 0 |
| : TSP (46 %-P ₂ O ₅) | kg/ha | | 0 | 0 | | | 0 | | | 0 | | | 0 |
| 3 Agro-chemical | lit./ha | 5,500 | 0.0 | 0 | 5,500 | 0.0 | 0 | 5,500 | 0.0 | 0 | 5,500 | 2.0 | 11,000 |
| : Pesticide | lit./ha | 3,500 | 2.5 | 8,750 | 3,500 | 0.0 | 0 | 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 | 4,000 | 0.0 | 0 |
| : Fungicide | lit./ha | 500 | 27 | 13,500 | 500 | 17 | 8,500 | 500 | 9 | 4,500 | 500 | 83 | 41,500 |
| 4 Packing material | | | | 28,250 | | | 20,300 | | | 20,500 | | | 125,000 |
| Sub-total (A) | | | | | | | | | | | | | |
| (B) Labour Requirement | | | | | | | | | | | | | |
| 1 Family labour | | 500 | 90 | 0 | 500 | 70 | 0 | 500 | 60 | 0 | 500 | 160 | 0 |
| 2 Hired labour | | | 61 | 30,500 | | 30 | 15,000 | | 30 | 15,000 | | 155 | 77,500 |
| Sub-total (B) | | | 151 | 30,500 | | 100 | 15,000 | | 90 | 15,000 | | 315 | 77,500 |
| (C) Machinery or draught cattle | | | | | | | | | | | | | |
| 1 Ploughing by tractor | L.S | 30,000 | 0 | 0 | 30,000 | 0 | 0 | 30,000 | 0 | 0 | 30,000 | 0 | 0 |
| 2 Ploughing by hand tractor | L.S | 25,000 | 0 | 0 | 25,000 | 0 | 0 | 25,000 | 0 | 0 | 25,000 | 0 | 0 |
| 3 Pudding by hand tractor | L.S | 17,500 | 0 | 0 | 17,500 | 0 | 0 | 17,500 | 0 | 0 | 17,500 | 0 | 0 |
| Sub-total (C) | | | | 0 | | | 0 | | | 0 | | | 0 |
| (D) Miscellaneous cost | | | | | | | | | | | | | |
| 5 % of (A) and (B) | | | | 2,938 | | | 1,765 | | | 1,775 | | | 10,125 |
| Total Production Cost | | | | 61,688 | | | 37,065 | | | 37,275 | | | 212,625 |
| Gross Return | | | | | | | | | | | | | |
| (A) Yield | kg/ha | | 2,000 | 320,000 | | 1,500 | 180,000 | | 800 | | 85 | 10,000 | 850,000 |
| (B) Producer price | per kg | 160 | | | 120 | | | 200 | | | | | |
| Gross return | | | | 258,312 | | | 142,935 | | | | | | 637,375 |
| Net return | | | | | | | | | | | | | |

Table 1.3.3 Annual Programme for Monthly Training Session for Kilosa District

| Month | 1996/97 | | 1997/98 | |
|-----------|---|------------------------|---|---------------------------------------|
| | Main Subject | Resource | Main Subject | Resource |
| July | <ul style="list-style-type: none"> - Maize, paddy, sorghum : harvesting and storage management - Control of livestock disease | DSMS SMS-C SMS-L | <ul style="list-style-type: none"> - Cereal crops : harvesting, storage, and disease control - Cotton : harvesting and grading - Poultry : control of NCD - Goat : disease control | SMS-Crops SMS-Livestock |
| August | <ul style="list-style-type: none"> - Cotton : uprooting and burning of residue - Tree nursery establishment - Examination of sick animals | DSMS SMS | <ul style="list-style-type: none"> - Cotton : uprooting and burning of residue - Fruit /tree nursery establishment - Goat : management of kids - Extension methodology | SMS-Crops SMS-Livestock |
| September | <ul style="list-style-type: none"> - Sunflower : harvesting, drying, and oil extraction - Soil conservation : contour layout - Livestock disease treatment | DSMS SMS | <ul style="list-style-type: none"> - Sunflower : harvesting, drying, and oil extraction - Soil conservation : contour layout and soil fertility - Livestock disease treatment - Vermin control (rodent) | SMS-Crops SMS-Livestock |
| October | <ul style="list-style-type: none"> - Maize and sorghum : land preparation - Agroforestry : tree holes making - Livestock : disease treatment (bacterias and TB) | DSMS SMS | <ul style="list-style-type: none"> - Maize and sorghum : production - Agroforestry : field preparation - Goat : control of CBPP | SMS-Crops SMS-Livestock |
| November | <ul style="list-style-type: none"> - Rice : nursery preparation - Soil conservation : gully rehabilitation by sisal or cactus - Livestock : upgrading of local chicken | DSMS SMS | <ul style="list-style-type: none"> - Rice : nursery preparation - Soil conservation : gully rehabilitation - Livestock : upgrading of local chicken | SMS-Crops SMS-Livestock SMS-Sto |
| December | <ul style="list-style-type: none"> - Rice : pest control of stalk borer and army worm - Agroforestry : tree planting - Livestock : pasture establishment | DSMS SMS | <ul style="list-style-type: none"> - Rice : pest control of stalk borer and army worm - Agroforestry : tree planting - Livestock : pasture establishment | SMS-Crops SMS-Livestock |
| January | <ul style="list-style-type: none"> - Maize, cotton, sorghum, sunflower : plant population and spacing - Livestock : disease control for sheep and goat | DSMS SMS | <ul style="list-style-type: none"> - Plant population and spacing - Paddy : weed control - Livestock : disease control for goat | SMS-Crops SMS-Livestock |
| February | <ul style="list-style-type: none"> - Cereals : vermin control and weeding - Livestock : control of pig disease | DSMS SMS | <ul style="list-style-type: none"> - Fertilizer application and weeding - Livestock : control of pig disease | SMS-Crops SMS-Livestock |
| March | <ul style="list-style-type: none"> - Cotton : pest control - Onion : purple blotch control and nursery preparation - Livestock : control of fowl typhoid | DSMS SMS | <ul style="list-style-type: none"> - Cotton : pest control - Onion : purple blotch control and nursery preparation - Livestock : control of fowl typhoid and fowl pox | SMS-Crops SMS-Livestock |
| April | <ul style="list-style-type: none"> - Onion : transplanting and purple blotch control - Livestock : disease control of poultry | DSMS SMS | <ul style="list-style-type: none"> - Onion : transplanting and purple blotch control - Livestock : goat management system | SMS-Crops SMS-Livestock |
| May | <ul style="list-style-type: none"> - Cereals : harvesting and storage - Livestock : disease control of poultry | DSMS SMS | <ul style="list-style-type: none"> - Cereals : harvesting and storage - Livestock : disease control of poultry | SMS-Crops SMS-Livestock |
| June | <ul style="list-style-type: none"> - Maize : storage management - Livestock : rearing of kids and lambs for sheep and goats | DSMS SMS | <ul style="list-style-type: none"> - Maize : storage management - Livestock : rearing of kids and lambs for sheep and goats | SMS-Crops SMS-Livestock |

Source) Morogoro regional office, 1997

Table 1.3.4 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 |
| 1 Extension Targets | | | | | | | | |
| 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 |
| Total | 6,240 | 1,829 | 4,368 | 1,108 | 1,900 | 1,041 | 128 | 70 |
| 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 | - | - | - | - | - | - | - | - |
| 2 Extension Training Targets | | | | | | | | |
| No. of MTS | 12 | 0 | 12 | 0 | 12 | 0 | 12 | 1 |
| 3 Equipment | | | | | | | | |
| 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 |
| 4 Vehicles | | | | | | | | |
| 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 1.3.5 Retraining Programme of VEOs in Morogoro Region

| | District | | | | Total |
|--|------------|-----------|-----------|-----------|------------|
| | Morogoro | Kilosa | Kilombero | Utanga | |
| 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 1.5.1 Present Condition for Water Users' Groups in Mwega Scheme (1/2)

| | Mwega | | |
|---------------------------------|---|---|--|
| | Nyinga *1 | | |
| | (200) *1 | | |
| | (50) *1 | | |
| | Upper Nyinga | Middle Nyinga | Lower Nyinga |
| Village | | | |
| Population | | | |
| Household | | | |
| WUA/WUG | | | |
| Year established | 1940s | 1980s | 1996 |
| No. of farmer | 9 | 40 *2 | 60 |
| Organizational Structure | - The irrigation group of the Upper Nyinga consists of only 9 farmers including a chairman. | - The organizational structure of the committee consists of a chairman, a secretary, and 2 block leaders. | - The organizational structure of the committee consists of a chairman, a secretary, and several block leaders. |
| Water allocation | - No rotational irrigation - Water allocation is decided by the leader, and any farmers can take water at any time, under the approval of the leader. In general, a farmer takes water twice a week. | - Farmers are divided into 2 blocks. - Each block takes water during 3 days, and the remaining one day is free. Within a block, water allocation is decided by a block leader, considering the crops, farm size and soils. Irrigation is carried out only in the daytime, but farmers can take water in the nighttime. | - Farmers are divided into 4 blocks, and each block takes water for 3 days (rotational irrigation at 12-day intervals). - Within a block, water allocation is decided by a block leader, depending on the farm size. Farmers can take water in the nighttime. |
| Maintenance | - Communal work: 1-2 times per year and 5 days per one time. - All canal and intake weir are maintained by the all farmers. - Absentees: punished with a fine (one chicken/person). | - Communal work: 2 times per year and 5 days per one time. - All farmers maintain all canals and intake weir. - Absentees: punished with a fine (Tsh.2,500/ person). - All farmers have joined to the communal work. | - Communal work: 2-3 times per year and 2-3 days per one time. - All facilities are maintained by all farmers. (Not piece work) - Absentees: punished with a fine of Tsh.500/person. (Almost no absentee) |
| Water charge | No ISC | No ISC | No ISC |
| Registration | - | - | - |
| Water right | - | - | - |
| By-laws | - | - | - |
| Water dispute among the farmers | - There is no water dispute among the farmers, because the size of water users' groups in the upper and middle Nyinga areas are relatively small, and they have close communication for water allocation. | | - There are often water dispute among the farmers. - Settled by the canal leader, then sub-village government. |
| Water dispute among WUGs. | - According to the leaders of irrigation groups in Nyinga, Malolo and Mgogozi, there is no water dispute among them, and they are helping each other for water allocation. | | |
| Major problems | - Frequent damage of canals due to over flow. No control of water because of no gate at intake weir. - Damage of intake weir due to flood | | |
| VEO *3 | | | |
| IT *3 | | | |
| Remarks | <i>The farmers of Nyinga have a long experience for irrigation farming.</i> | | |

*1 Sub-village of Malolo.

*2 Nyinga farmers only.

*3 VEO: Village extension officer, IT: Irrigation technician

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

Table 1.5.1 Present Condition for Water Users' Associations in Mwega (2/2)

| | Mwega | | | | Mgogozi |
|---------------------------------|--|---|---|---|--|
| Village | Malolo | | | | Mgogozi |
| Population | 3,800 *1 | | | | 1,270 |
| Household | 480 *1 | | | | 180 |
| WUG | Canal A | Canal B | Canal C | Canal D | WUG |
| Year established | 1992-1993 | 1992-1993 | 1980s | Over 40 years | 1986 |
| No. of farmer | 300 | 200-250 | 80 | 30 | 550 |
| Organizational Structure | <p>The village government has provided supporting services for maintenance work to Canals A and B</p> | | | | <p>Mwega Scheme</p> |
| Water allocation | <ul style="list-style-type: none"> - Rotational irrigation at 7-day intervals. - There are 7 irrigation blocks, and each block takes water for 1 day. A block has different water allocation. In general, farmers in a block are divided into two groups, and each group takes water during 6 hrs. Irrigation is carried out in the daytime, and in case of water shortage, farmers can take water in the nighttime. A farmer takes water once a week and its irrigation period differs depending on the farm size. | | <ul style="list-style-type: none"> - Canal C has unclear water allocation, because its operation was started from 1996. Canal C had been used by the District Council, and handed over to the farmers in 1996. | <ul style="list-style-type: none"> - Canal D has two branches, and one branch takes water for 4 days and another branch for 3 days. Within a branch canal, any farmers can take water at any time. Water is allocated to each farmer by mutual consent among the farmers. | <ul style="list-style-type: none"> - Farmers are divided into 9 blocks. Each block takes water for 3 days, and within a block, each farmer takes water in turn depending on the farm size. No rotation with Nyinga is carrying out, since new aqueduct was constructed in 1996. |
| Maintenance | <ul style="list-style-type: none"> - Communal work - Communal works are announced to farmers through the village government, and carried out 3-4 times per year. Each farmer takes over a portion of canals for those maintenance, while the maintenance of intake weir and emergency repair are carried out by all farmers. Almost all farmers have joined to canal cleaning. - All canals are cleaned by the communal work of 2 days/week and within 2-3 weeks. Absentees are punished with a fine (Tsh. 1,200- 2,000). The village government takes these fines. | | <ul style="list-style-type: none"> - Communal work: 2 time per year - Each farmer takes over a portion of canals, and maintenance of intake weir is carried out by all farmers. The arrangement of communal works is decided by the farmers themselves, and the village government does not touch it like canals A and B. | <ul style="list-style-type: none"> - No ISC - Communal work: 2 time per year (6 & 11) 2-3 days per time. The arrangement of communal works is decided by the farmers themselves, and the village government does not touch it, as well as canal C. Absentees are punished with a fine of Tsh.1,000. | <ul style="list-style-type: none"> - No ISC. - Communal work: 2 times per year and 2 days per time. - The village government arranges this communal work. There is no fixed schedule on this work, and farmers can carry out canal clearing at any time. - In case of no cleaning, the village government collects a fine (Tsh.500-1,000) from its farmer. |
| Water charge | No ISC | No ISC | No ISC | No ISC | No ISC *2 |
| Registration | - | - | - | - | - |
| Water right | Exist | (Unclear) | - | - | Exist |
| By-laws | - | - | - | - | - |
| Water dispute among the farmers | <ul style="list-style-type: none"> - There are some water dispute among the farmers, these are settled by the block leaders, then if it is difficult, the village government settle them. | | - | <ul style="list-style-type: none"> - There is no water dispute. | <ul style="list-style-type: none"> - There are often water dispute among the farmers, but these are not serious. - Settled by leaders, then by village government. |
| Water dispute among WUGs. | <ul style="list-style-type: none"> - According to the leaders of irrigation groups in Nyinga, Malolo and Mgogozi, there is no water dispute among them, and they are helping each other for water allocation. | | | | |
| Major problems | <ul style="list-style-type: none"> - Soil siltation in canals - Damage of canals due to over flow - Water shortage - Small capacity of canal | <ul style="list-style-type: none"> - Water shortage - Poor maintenance of canals - Several block leaders have no leadership. - No control of water because of breakdown of gate at the intake weir. | <ul style="list-style-type: none"> - Drainage problem in the rainy season. - Excess water come from the upper canal (canal B) | - | <ul style="list-style-type: none"> - Water shortage - Frequent damage of canals due to over flow of water - Slashing out of intake weir due to flood |
| VEO *3 | | | | | 1 *4 |
| IT *3 | | | | | |
| Remarks | | | | | |

*1 Excluding population and households of Nyinga sub-village

*2 In 1996, the WUGs had a plan for collecting ISC (30 kg of onion/season/acre) under the guidance of TIP. But it is not conducted yet as of June 1997.

*3 VEO: Village extension officer

IT: Irrigation technician

*4 Irrigation technician attached to TIP

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

Table 1.5.2 Present Situation for O&M of Existing Irrigation Facilities - Mwega Scheme (1/5)

| Sample No. | Canal A | | | | |
|--|--|--|---|---|---|
| | 4 | 5 | 2 | 9 | 12 |
| 1. Irrigation Facilities | <i>Chairman</i> | <i>Secretary</i> | | | |
| 1.1 Construction year of facilities | 1936 | Before 1948 | (Unclear) | (Unclear) | Before inde. |
| 1.2 Number of farmers | 300 | 300 | (Unclear) | (Unclear) | (Unclear) |
| 2. Operation and maintenance of irrigation facilities | | | | | |
| 2.1 Irrigation period | Year-round irrigation | Year-round irrigation | Year-round irrigation | Year-round irrigation | Year-round irrigation |
| 2.2 Availability of irrigation water | | | | | |
| (1) Did you take enough water? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| (2) Did you take water on time? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 2.3 Water allocation among the farmers | - Rotational irrigation with 7 days interval. - There are 7 irrigation blocks, and each block can take water 1 day (24 hrs.) - Gate operation is carried out by each farmer under supervision of block leaders. | - Rotational irrigation with 7 days interval. - There are 7 irrigation blocks, and each block can take water 1 day (12 hrs.) - Each farmer can take water once a week and 2-6 hrs per one time depending on cultivation size. | - Rotational irrigation with 7 days interval. - Each block can take water once a week (24 hrs), and farmers in the block take water 3 hrs/3 farmers. | - Rotational irrigation with 7 days interval. - Farmers in his block are divided into two groups, and first group take water 6 hrs. and the other is 6 hrs. Irrigation is carried out in daytime only. | - Rotational irrigation with 7 days interval. - Farmers in his block divided into two groups, and first group take water 6 hrs. and the other is 6 hrs. Irrigation is carried out in daytime only. The nighttime is free to take water. |
| 2.4 Problems/troubles for water allocation among the farmers | - There are some water dispute among the farmers. | - There are often water dispute among the farmers. | - There are serious water dispute. Farmers watch the fields in the nighttime. | - There is no water dispute. | - There are some water dispute among the farmers. |
| How to settle them? | | - Village government | - Village government | - Village government | - Leaders of group and blocks |
| 2.5 Maintenance of irrigation facilities | | | | | |
| (1) Irrigation service charge | - No ISC | - No ISC | - No ISC | - No ISC | - No ISC |
| (2) Maintenance method | - Communal work - Maintenance works are announced to farmers through the village government, and carried out 4 times per year. Each farmer takes over a portion of canals for those maintenance. The maintenance of intake weir and emergency repair are carried out by all farmers. The rate of absenteeism is about 10%. - Punished with a fine (Tsh. 1,200) to absentees. The village government takes these fines. | - Communal work - Communal works are announced to farmers through village government, and carried out 6 times per year. - Each farmer takes over a portion of canals, and maintenance of intake weir is carried out by all farmers. All canals are cleaned within 3 weeks. - Punished with a fine (Tsh. 1,700) to absentees, and the village government takes them. | - Communal work - Punishment to absentees: 1st: Warning 2nd: Increase of their communal works 3rd: Take to court | - Communal work - Punishment to absentees: Tsh. 2,000/time | - Communal work - The leaders report to village government for necessity of cleaning. Then, the government despatch an inspector to the fields. If the village government acknowledges its necessity, communal work is announced to all farmers. |
| 3. Irrigation Group | | | | | |
| 3.1 Year established | (Unclear) | (Unclear) | (Unclear) | (Unclear) | (Unclear) |
| 3.2 Leader of irrigation group | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 3.3 Regular meeting for O&M | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 3.4 Major problems of irrigation group | - Soil siltation - Damage of canals due to over-topping or water leakage - Small capacity of canals - Water shortage | | | | |
| 4. Water dispute among irrigation groups | (According to the leaders of irrigation groups, there is no water dispute among them, and they are helping each other for water allocation.) | | | | |
| 5. Remarks | <i>Chairman of Canal A group</i> | <i>Secretary of Canal A group</i> | According to the farmer, Canal A group has written by-laws. However, the study team couldn't confirm it. | The irrigation block of this farmer consists of 5 farmers. | The irrigation block of this farmer consists of 10 farmers. |

Note: Data and information obtained through the farmers' intention survey carried out by the JICA Study Team in June 1997.

Table 1.5.2 Present Situation for O&M of Existing Irrigation Facilities - Mwega Scheme (2/5)

| Sample No. | Canal A | Canal B | | | |
|--|--|--|---|--|---|
| | 17 | 6 | 1 | 3 | 11 |
| 1. Irrigation Facilities | | | | | |
| 1.1 Construction year of facilities | (Unclear) | Chairman (Unclear) | 1967 | Before 1961 | (Unclear) |
| 1.2 Number of farmers | (Unclear) | 125 | 200 | 250 | (Unclear) |
| 2. Operation and maintenance of irrigation facilities | | | | | |
| 2.1 Irrigation period | Year-round irrigation | Year-round irrigation | Year-round irrigation | Year-round irrigation | Year-round irrigation |
| 2.2 Availability of irrigation water | | | | | |
| (1) Did you take enough water? | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| (2) Did you take water on time? | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 2.3 Water allocation among the farmers | - Rotational irrigation with 7 days interval. Each block takes water one day (12 hrs 7:00 AM to 7:00 PM). In the block, they are divided into several groups and each group takes water 2-3 hrs. - Irrigation is carried out in the daytime, but in case of water shortage, some farmers have taken water in the nighttime. | - Rotational irrigation with 7 days interval. Each farmer is divided into 7 irrigation blocks, and each block has a leader. Each block takes water 1 day (24 hrs). - Within a block, irrigation hour of each farmer is decided depending on the size of cultivation area. | - Farmers of canal B is divided into 6 irrigation blocks, and each block has a leader. Rotational irrigation with 7 days interval. Each block takes water one day (24 hrs.), and the remaining one day (Sunday) is stopped. - In general, irrigation is carried out in the daytime (6:00 AM to 8:00 PM), and any farmers in the block can take water in the nighttime. | - Rotational irrigation with 7 days interval. Farmers are divided into 7 irrigation blocks. Each block takes water 1 day (24 hrs). Within a block, farmers are divided to 2 groups, and each group takes water 6 hrs. Irrigation is normally carried out in the daytime, and in case of water shortage, farmers take water in the nighttime. | - Rotational irrigation with 7 days interval. In the block of this farmer, farmers (15-20) are divided into 2 groups, and each group takes water 6 hrs. Irrigation is carried out in the daytime. |
| 2.4 Problems/Troubles for water allocation among the farmers | - There are some water dispute among the farmers in the block. | - There are some water dispute. | - There are some water dispute among the farmers. | - There are often water dispute. | - There are some water dispute, but these are not serious. |
| How to settle them? | - Settled by block leaders. | - Settled by group and block leaders | - Settled by farmers themselves | - Settled by leaders. | - Settled by leaders. |
| 2.5 Maintenance of irrigation facilities | | | | | |
| (1) Irrigation service charge | - No ISC | - No ISC | - No ISC | - No ISC | - No ISC |
| (2) Maintenance method | - Communal work - The village government announced the communal work to all farmers. - 2-3 times of canal clearing per year - All canals are cleaned by the communal work of 2 days/week and within 2-3 weeks. | - Communal work - The group and block leaders arrange communal work for canal cleaning at every 3 months, and village government announce them to all farmers of canal B. - Punished with a fine (Tsh.1,200) to absentees. The village government takes these fines. | - Communal work - Canal clearing is carried out by every three months. - Punished with a fine (Tsh.2,000/person) to absentees. | - Communal work - Canal clearing: 2 times per year - For clearing, a farmer takes over a portion of canals, and in most case it is just front of farmer's field, maintenance of intake weir is carried out by all farmers. - Punished with a fine (Tsh.1,200/person) to absentees. The village government takes these fines. | - Communal work - Canal clearing: 3 times per year |
| 3. Irrigation Group | | | | | |
| 3.1 Year established | (Unclear) | (Unclear) | (Unclear) | 1992 | (Unclear) |
| 3.2 Leader of irrigation group | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3.3 Regular meeting for O&M | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3.4 Major problems of irrigation group | Water shortage | - Water shortage - Poor maintenance of canals - Several block leaders have no leadership. | - No control of water flow in the canal because of breakdown of gate. | | - Canals are not completely constructed. |
| 4. Water dispute among irrigation groups | (According to the leaders of irrigation groups, there is no water dispute among them, and they are helping each other for water allocation.) | | | | |
| 5. Remarks | | - Chairman of Canal B - Leaders are elected by the farmers in very year. | - This farmer has lands belonging to both canals of A and B. His all answers mentioned above are for Canal B | According to this farmer, the irrigation group of canal B has written by-laws. However, the study team couldn't confirm it. | |

Table 1.5.2 Present Situation for O&M of Existing Irrigation Facilities - Mwega Scheme (3/5)

| Sample No. | Canal B | | Canal C | | Canal D |
|--|--|---|---|---|---|
| | 13 | 7 | 10 | 16 | 8 |
| 1. Irrigation Facilities | | | | | |
| 1.1 Construction year of facilities | Before independence | Chairman After independence | 1987 (Unclear) | (Unclear) (Unclear) | Chairman Before independence |
| 1.2 Number of farmers | (Unclear) | 82 | (Unclear) | (Unclear) | 30 |
| 2. Operation and maintenance of irrigation facilities | | | | | |
| 2.1 Irrigation period | Year-round irrigation | June to December (Dry season only) | Year-round irrigation | Year-round irrigation | Year-round irrigation |
| 2.2 Availability of irrigation water | | | | | |
| (1) Did you take enough water? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 1 - | - 1 | - 1 | 1 - |
| (2) Did you take water on time? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 1 - | 1 - | 1 - | 1 - |
| 2.3 Water allocation among the farmers | - Rotational irrigation with 7 days interval. - Farmers of canal B are divided into 7 blocks, and each block can take water one day. - The block of this farmer consists of 20 farmers, and they are divided into 2 groups. Each group takes water 6 hrs, and irrigation is carried out in the daytime (6:00 AM to 6:00 PM). | - Rotational irrigation with 7 days interval. - Farmers are divided into 7 blocks, and each block can take water one day. - In a block, there is no fixed schedule, and water is allocated to each farmer depending on the size of field. - Irrigation is carried out in the daytime only (7:00 AM to 6:00 PM), but farmers can take water in the nighttime. | This farmer said that farmers of canal C are divided into three blocks. Each block takes water 6 hrs, then turn to next block. Irrigation is carried out only in the daytime. | - Rotational irrigation with 7 days interval. | - Canal D has two branches, and one branch takes water 4 days and another branch for 3 days. Within a branch canal, any farmers can take water at any time. Water is allocated to each farmer by mutual consent among the farmers. |
| 2.4 Problems/troubles for water allocation among the farmers | - There are often water dispute among the farmers. | - There is no water dispute among the farmers. | - There are some water dispute among the farmers. | - There are often water dispute. | - There is no water dispute among the farmers because of enough water. |
| How to settle them? | | | - Settled by canal leaders. | - Settled by canal leaders. | |
| 2.5 Maintenance of irrigation facilities | | | | | |
| (1) Irrigation service charge | - No ISC | - No ISC | - No ISC | - No ISC | - No ISC |
| (2) Maintenance method | - Communal work: 3-4 times per year - 2 days per week and 2-3 weeks per one time. - Punished with a fine (Tsh.500/ person) to absentees. | - Communal work: 2 time per year - Punished with a fine (Tsh.1,000/ person) to absentees. - Almost all farmers have join to communal work. - The arrangement of communal works for canal maintenance is decided by the farmers themselves, and the village government does not touch it like canal A and B. | - Communal work: 2 time per year - Each farmer takes over a portion of canals, and maintenance of intake weir is carried out by all farmers. | - Communal work: Several times per year depending on its necessity. | - Communal work: 2 time per year (June & Nov.) - 2-3 days per time. - Punished with a fine (Tsh.1,000) to absentees. - The arrangement of communal works for canal maintenance is decided by the farmers themselves, and the village government does not touch it, as well as canal C. |
| 3. Irrigation Group | | | | | |
| 3.1 Year established | (Unclear) | 1996 | 1996 | | (Unclear) |
| 3.2 Leader of irrigation group | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | 1 - | 1 - | | 1 - |
| 3.3 Regular meeting for O&M | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | 1 2 times per year | 1 2 times per year | 1 2 times per year | 1 2 times per year |
| 3.4 Major problems of irrigation group | - Damage of canal - Weed problem | (Chairman said that canal C has no problem.) | - Drainage problem in the rainy season. - Excess water from the upper canal (canal B) | | |
| 4. Water dispute among irrigation groups | (According to the leaders of irrigation groups, there is no water dispute among them, and they are helping each other for water allocation.) | | | | |
| 5. Remarks | This farmer has lands belonging to both canals of A and B. | - Canal C had been used by the District Council, and handed over to the farmers in 1996. - Irrigation group of Canal C has no by-laws. | - Canal C is a branch of Canal B. | | - Chairman of Canal D |

Table 1.5.2 Present Situation for O&M of Existing Irrigation Facilities - Mwega Scheme (4/5)

| Sample No. | Upper Nyloga | | | Middle Nyinga | |
|--|---|--|--|--|---|
| | 18 | 21 | 24 | 22 | 23 |
| 1. Irrigation Facilities | | | | | |
| 1.1 Construction year of facilities | 1960 | 1940s (Unclear) | 1966 | 1980s | Before 1985 |
| 1.2 Number of farmers | 9 | | 9 | 40 * | 100 * |
| 2. Operation and maintenance of irrigation facilities | | | | | |
| 2.1 Irrigation period | Year-round irrigation | Year-round irrigation | Year-round irrigation | June to Nov. (Dry season only) | Year-round irrigation |
| 2.2 Availability of irrigation water | | | | | |
| (1) Did you take enough water? | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| (2) Did you take water on time? | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 2.3 Water allocation among the farmers | - No fixed schedule - A canal leader decides water allocation to each farmer depending on their demand. - In general, a farmer takes water 1-2 times per week. | - No rotational irrigation - Water allocation is decided by the leader, and any farmers can take water at any time, under the approval of the leader. - In general, a farmer takes water twice a week. | - No rotational irrigation - A leader decides its allocation to each farmer. | - No rotational irrigation - A leader decides its allocation to each farmer depending on the size of fields. - In general, a farmer takes water 1-2 times per week. - Irrigation is carried out only in the daytime. | Farmers are divided into 2 blocks. Each block takes water during 3 days, and the remaining one day is free to take water among the farmers. Within a block, water allocation is decided by a block leader, considering the crops, size of farm and soils. Irrigation is carried out only in the daytime, but farmers can take water in the nighttime. |
| 2.4 Problems/troubles for water allocation among the farmers | - There is no water dispute among the farmers. | - There is no water dispute among the farmers. | - There is no water dispute. | - There are some water dispute. | - There are often water dispute in the dry season. |
| How to settle them? | | | Settled by leader. | Settled by sub-village chairman. | Settled by the block leaders. |
| 2.5 Maintenance of irrigation facilities | | | | | |
| (1) Irrigation service charge | No ISC | No ISC | No ISC | No ISC | No ISC |
| (2) Maintenance method | - Communal work: 2 times per year and 3 days per one time. - Punished with a fine (one chicken/person) to absentees. - Almost all farmers have joined to communal work. | - Communal work: 1-2 times per year and 5 days per one time. - All canal and intake weir are maintained by the all farmers. - Punished with a fine (one chicken/person) to absentees. | - Communal work: 2 times per year and 3-5 days per one time. - All canal and intake weir had been maintained by the all farmers. In 1997, this method was changed into piece work. Namely, a farmer takes over a portion of canal. - Punished with a fine (one chicken/person) to absentees. | - Communal work: 2 times per year and 5 days per one time. - All farmers maintain all canals and intake weir. - Punished with a fine (Tsh.2,500/person) to absentees. - All farmers have joined to the communal work. | - Communal work: 3-4 times per year and 2-4 days per one time. - Punished with a fine (Tsh.500/person) to absentees. - Almost all farmers have joined to the communal work. |
| 3. Irrigation Group | | | | | |
| 3.1 Year established | (Long ago) | (Long ago) | 1996 | 1996 ** | (Long ago) |
| 3.2 Leader of irrigation group | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3.3 Regular meeting for O&M | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3.4 Major problems of irrigation group | - Damage of canal due to flood and over-topping of water in the rainy season. | - Frequent damage by flood and over-topping of water. - Slashing out of intake due to flood. | - Frequent damage by flood and over-topping of water. - Water in the canal can not control due to no gate at intake. | - Some farmers do not agree with the present water allocation method. | - Slash out of intake weir. |
| 4. Water dispute among irrigation groups | (According to the leaders of irrigation groups, there is no water dispute among them, and they are helping each other for water allocation.) | | | | |
| 5. Remarks | - The executive committee of this group consists of three members including the chairman and secretary. | - This canal was constructed before the 1920s, and completely damaged by the flood in the 1920s. In the 1940s, the canal was reconstructed. | | * Including Nyinga farmers only ** There was an irrigation group itself before 1996, but it was no leader and very loose organization. | * Including Nyinga and Mgozi farmers. |

Table 1.5.2 Present Situation for O&M of Existing Irrigation Facilities - Mwega Scheme (5/5)

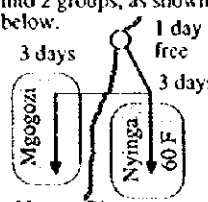
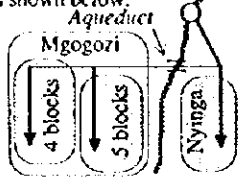
| Sample No. | Lower Nyinga | | | Mgogoz-Mwega |
|--|---|--|---|---|
| | 19 | 20 | 25 | 27 |
| 1. Irrigation Facilities | | | | |
| 1.1 Construction year of facilities | 1996 | 1996 | 1996 | 1986* |
| 1.2 Number of farmers | 60* | 55* | (Unclear) | 552** |
| 2. Operation and maintenance of Irrigation facilities | | | | |
| 2.1 Irrigation period | July - Dec. | July - Dec.** | Aug.-Oct. (Dry season only) | Year-round irrigation |
| 2.2 Availability of irrigation water | | | | |
| (1) Did you take enough water? | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| (2) Did you take water on time? | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 2.3 Water allocation among the farmers | <p>Farmers are divided into 2 groups, as shown below.</p>  <p>3 days 1 day free 3 days 60 F</p> <p>Mgogoz Nyinga Mwega River</p> <p>Within Nyinga, farmers are divided into 4 blocks, and each block takes water 3 days (24 hrs/day)</p> | <p>This farmer also said that farmers are divided into 2 groups (Nyinga and Mgogoz). Each group takes water mutually at 3-day intervals, and 1 day is free for both groups.</p> <p>Within Nyinga, farmers are divided into about 10 blocks, and each block takes water for 1 day (24 hrs). Within a block, each farmer takes water in turn, and its period is depend on the farm size.</p> | <p>This farmer said that farmers are divided into 4 blocks, and each block takes water 3 days (rotational irrigation at 12-day intervals).</p> <p>Within a block, water allocation is decided by a block leader, depending on the farm size. Farmers can take water in the nighttime.</p> | <p>Farmers are divided into 9 blocks as shown below.</p>  <p>Aqueduct Mgogoz Nyinga</p> <p>4 blocks 5 blocks</p> <p>Each block takes water for 3 days, and within a block, each farmer takes water in turn depending on the farm size. No rotation with Nyinga is carrying out, since new aqueduct was constructed in 1996.</p> |
| 2.4 Problems/troubles for water allocation among the farmers | - There are often water dispute in the dry season. (once a week) | - There are water dispute among the farmers (1-2 times/week) in the dry season. | - There are very serious water dispute sometime in the dry season. | - There are often water dispute in the dry season, but these are not serious problems. |
| How to settle them? | - Settled by canal leader. | - Settled by sub-village government | - Settled by block/group leaders, then village government | |
| 2.5 Maintenance of irrigation facilities | | | | |
| (1) Irrigation service charge | - No ISC | - No ISC | - No ISC | - No ISC |
| (2) Maintenance method | - Communal work: 2-3 times per year and 2-3 days per one time. - All facilities are maintained by all farmers. - Punished with a fine to absentees. Almost all farmers have joined to the communal works. | - Communal work: 2-3 times per year and 2-3 days per one time. - All facilities are maintained by all farmers. (Not piece work) - Punished with a fine (Tsh 500/person) to absentees. (Almost no absentee) | - Communal work: 2 times per year and 3 days per one time. - Punished with a fine (Tsh.1,000 for heavy work and Tsh.500 for light work) to absentees. | - Communal work: 2 times per year and 2 days per one time. - Village government arranges this communal work. There is no fixed schedule on this work, and farmers can carry out canal clearing at any time. - In case of no cleaning, the village government punish a fine (Tsh 500-1,000) to the farmer. - In 1996, the irrigation group had a plan for collecting fixed ISC (30kg of onion/acre) under the guidance of TIP, but it is not commenced yet. |
| 3. Irrigation Group | | | | |
| 3.1 Year established | 1996 | 1996 | 1996 | 1996 |
| 3.2 Leader of irrigation group | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3.3 Regular meeting for O&M | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| 3.4 Major problems of irrigation group | - Flood damage of canals (due to over flow of water) in the rainy season. | - Flood damage of intake weir and canals | - Damage of canals by flood water (no water control at intake weir) - Soil siltation | - Water shortage - Canals have frequently damaged by over flow of water - Slashing out of intake weir |
| 4. Water dispute among irrigation groups | (According to the leaders of irrigation groups, there is no water dispute among them, and they are helping each other for water allocation.) | | | |
| 5. Remarks | * Including Nyinga farmers only - This canal was constructed by the farmers in 1996. | * Including Nyinga farmers only ** Some farmers have taken water during the rainy season. | | * Construction year of old aqueduct ** According to the village chairman, there are two irrigation system in Mgogoz village (Mgogoz and Mwega rivers). All farmers have lands in both irrigation system. |

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 |
| [A] Agronomic Factors | | | | | | | | | |
| 1 (a) Conditions of Root Zone | | | | | | | | | |
| Texture of surface soil | | loam - friable-Clay | SiL, SiL firm-C | I.S, Si | Sand, Gravel | St, L, SiL, CL, SCL, SiCL | Si, I.S | 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 |
| 2 (a) Soil Nutrients of Surface Soil | | | | | | | | | |
| 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 |
| 3 (i) Soil Toxities | | | | | | | | | |
| 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 |
| 4 (f) Flooding Risk | | | | | | | | | |
| Frequency | (times/10years) | - | - | - | - | <1 | 1 - 2 | 2 - 5 | >5 |
| Inundated period | | <4 weeks | <8 weeks | <8 weeks | >8weeks | >2days | 2 - 7days | 1 - 2weeks | >2weeks |
| [M] Management Factors | | | | | | | | | |
| 5 (a) Accessibility to Farm | | | | | | | | | |
| 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 | |
| 6 (w) On-farm Workability | | | | | | | | | |
| 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 | |
| [D] Land Development Factors | | | | | | | | | |
| 7 (b) Grading/Leveling, Ridging | | | | | | | | | |
| 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 |
| 8 (d) Drainage, Flood Protection | | | | | | | | | |
| 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 |
| [E] Conservation and Environmental Factors | | | | | | | | | |
| 9 (s) Long-term Prevention of Salinity/Sodicity | | | | | | | | | |
| Prevention for salinity/sodicity | | not subject | not subject | somewhat | with severe | not subject | not subject | somewhat | with severe |
| 10 (h) Prevention of Groundwater and Surface Water | | | | | | | | | |
| 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 |
| 11 (e) Soil Erosion Control | | | | | | | | | |
| 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 | Migeta | Mkula | Mwega |
| 1. Preferable crops | <p>Rainy season : paddy Dry season : beans, maize, vegetables</p> <ul style="list-style-type: none"> - Inter-cropping to be preferable - Demonstration to be confirmed promising crops and aiming practices - Shortage of vegetables is serious point. - Upland crops as income source | <p>Rainy season : maize, pulse crops Dry season : cabbage, Irish potato, pulse crops</p> <ul style="list-style-type: none"> - In the future, promising market should be checked before starting the cultivation of new crops. | <p>Rainy season : maize, paddy Dry season : maize, pulse crops, vegetables</p> <ul style="list-style-type: none"> - Sugarcane should be changed to another crops. - It is difficult to take out sugarcane completely because of its marketability. - Farmers have lack of knowledge on vegetable cultivation. - Beans should be included as promising crop. | <p>Rainy season : maize, paddy Dry season : onion, maize, pulse crops, vegetables</p> <ul style="list-style-type: none"> - Shortage of vegetables is to be solved. - Farmers have lack of knowledge on vegetable cultivation. - Farmers desired to expand the area of onion and paddy cultivation. |
| 2. Cropping pattern | <ul style="list-style-type: none"> - Double cropping of paddy and rotational cropping with paddy and upland crops are agreeable. | <ul style="list-style-type: none"> - Proposed cropping pattern is acceptable. - Water in the rainy season is enough, while August to November in the dry season there is water shortage. | <ul style="list-style-type: none"> - Proposed cropping pattern is acceptable. | <ul style="list-style-type: none"> - Concerning expansion of the onion cultivation, there is no serious labour shortage in the future. - Water shortage should be solved for expansion of irrigated area. - Prevailing harvesting season for onion is August and September. - If onion will be planted late, farmers suffer to protect them against pests and diseases. |
| 3. Farming practices | <p><i>Guideline of Special Programme of FAO was discussed.</i></p> <ul style="list-style-type: none"> - Special Programme is acceptable. - Transplanting is laborious, so that it can not cover big area. - Production with transplanting is higher than one with broadcasting. | <ul style="list-style-type: none"> - Concerning cabbage, club root disease (fungus) is most serious in the village. - As one of the countermeasures, rotational cropping is conducted. - Due to feeding problems, animal keeping has not been promoted. - During animal keepers, application of manure is common. | <ul style="list-style-type: none"> - They are not aware of Special Programme of FAO. - Farmers are not aware of importance, necessity, etc. of field band. | <ul style="list-style-type: none"> - Mixing-up of paddy varieties in the paddy fields due to flooding - Peak season of water shortage is in March/April for the upstream and August/September for the down stream. |

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

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

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

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

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

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

Table 3.3.2 Proposed Farming Practices in Mwega Scheme

| Item | Paddy | Maize |
|---------------------------------|---|---|
| 1 Land preparation | <ul style="list-style-type: none"> - Plowing by hand tractor or hand - No harrowing - Puddling by hand tractor or hand (over the nursery period) | <ul style="list-style-type: none"> - Plowing by hand - Harrowing by hand |
| 2 Nursery | <ul style="list-style-type: none"> - 40 ~ 50 kg of seeds per ha - around 600 m² per ha | Not applied |
| 3 Broadcasting | Not applied | <ul style="list-style-type: none"> - 70cm x 70cm ~ 90cm x 100cm - 20 kg per ha (2 ~3 seeds per hill) |
| 4 Transplanting | <ul style="list-style-type: none"> - 1 to 2 seedlings per hill - 10cm x 10cm ~ 10cm x 20cm of planting density | Not applied |
| 5 Application of fertilizer | | |
| Application at nursery | <ul style="list-style-type: none"> - 7 kg of Urea per ha (3 kg N/ha) | <ul style="list-style-type: none"> - 71 kg of AS per ha (15 kg N/ha) |
| Basal application | <ul style="list-style-type: none"> - 87 kg of Urea per ha (40 kg N/ha) - 125 kg of TSP per ha (25 kg TSP per) | <ul style="list-style-type: none"> - 100 kg of TSP per ha (20 kg P₂O₅/ha) |
| 1st top-dressing | <ul style="list-style-type: none"> - 87 kg of Urea per ha (40 kg N/ha) | <ul style="list-style-type: none"> - 71 kg of AS per ha (15 kg N/ha) |
| Total application | <ul style="list-style-type: none"> - 174 kg Urea, 125 kg TSP (NPK = 80:25:0) | <ul style="list-style-type: none"> - 142 kg AS, 100 kg TSP (NPK = 30:20:0) |
| 6 Weeding | <ul style="list-style-type: none"> - by rotary weeder - by herbicide (2,4-D : 2 lit. per ha) | <ul style="list-style-type: none"> - 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 | <ul style="list-style-type: none"> - Once a week up to 20 days before harvesting | <ul style="list-style-type: none"> - Furrow irrigation every one week - Critical period : from flowering to 20 days before maturing |
| 9 Harvesting | <ul style="list-style-type: none"> - around 2/3 of panicle from top side is changed to yellowish collar. | |

| Item | Onion | Pulse |
|---------------------------------|---|---|
| 1 Land preparation | <ul style="list-style-type: none"> - Plowing by hand tractor or hand - Harrowing by hand | <ul style="list-style-type: none"> - Plowing by hand - Harrowing by hand |
| 2 Nursery | <ul style="list-style-type: none"> - 5-6 kg per ha - around 600 m² per ha - Seed selection by water before sowing | Not applied |
| 3 Broadcasting | Not applied | <ul style="list-style-type: none"> - 20 cm x 40cm ~ 30cm x 50cm - 20kg per ha |
| 4 Transplanting | <ul style="list-style-type: none"> - Around 45 days after sowing - Planting bed : 4m x 2m - 10cm x 10cm ~ 20cm x 20cm - 1,000 beds per ha | Not applied |
| 5 Application of fertilizer | | |
| Basal application | <ul style="list-style-type: none"> - 142 kg of AS per ha (30 kg N/ha) - 200 kg of TSP per ha (40 kg P₂O₅/ha) | <ul style="list-style-type: none"> - 190 kg of AS per ha (40 kg N/ha) |
| 1st top-dressing | <ul style="list-style-type: none"> - 71 kg of AS per ha (15 kg N/ha) | |
| 2nd top-dressing | <ul style="list-style-type: none"> - 71 kg of AS per ha (15 kg N/ha) | |
| Total application | <ul style="list-style-type: none"> - 284 kg AS, 200 kg TSP (NPK = 60:40:0) | <ul style="list-style-type: none"> - 190 kg AS (NPK = 40:0:0) |
| 6 Weeding | <ul style="list-style-type: none"> - around 4 times during the growth period | <ul style="list-style-type: none"> - depending on the situation |
| 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 | <ul style="list-style-type: none"> - 2 to 3 times a week - Irrigation should be stopped one month before harvesting. | <ul style="list-style-type: none"> - Furrow irrigation every one week - Critical period : from flowering to 20 days before maturing |
| 9 Harvesting | <ul style="list-style-type: none"> - Neck of plant dries drying for 1 to 2 days. | |

Table 3.3.3 (1/4) Schedule of Proposed Farming Practices by Crops

Crop : Paddy

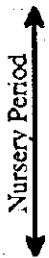
| Days after Sowing | Growth Stage | Days after Planting | Proposed Farming Practices | Remarks |
|-------------------|---|---------------------|-----------------------------|--|
| 0 | Germination | -30 | Nursery Preparation | |
| 10 |  Nursery Period | -25 | Sowing in nursery | (Plowing (Harrowing (Bund Making |
| | | | Land Preparation | |
| | | -4 | Puddling | by hand |
| | | -2 | Basal dressing | |
| 25 | | 0 | Transplanting | Basal Dressing (NPK = 40 : 25 : 0) Urea = 87 kg per ha TSP = 125 kg per ha |
| 30 | Rooting | | | |
| 40 | | 14 | ↑ | |
| 50 | | | Weeding Plant Protection | by hand or rotary weeder see Tables 3.3.4 and 3.3.5 |
| 60 | Panicle Initiation | 35 | ↓ Top dressing | Top Dressing (NPK = 40 : 0 : 0) Urea = 87 kg per ha |
| 70 | | | ↑ | |
| 80 | | | Weeding Plant Protection | by hand or rotary weeder see Tables 3.3.4 and 3.3.5 |
| 90 | Heading | | ↓ | |
| 100 | | | | |
| 110 | | 85 | Drainage | |
| 120 | | | | |
| 130 | Maturity | 105 | Harvesting | |

Table 3.3.3 (2/4) 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 0 | Basal Dressing Sowing | Basal Dressing (NPK = 15 : 20 : 0) AS = 71 kg per ha TSP = 100 kg per ha |
| 10 | | | | |
| 20 | | | Weeding | by hand |
| 30 | Tassel Formation | | Plant Protection | see Tables 3.3.4 and 3.3.5 |
| 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 |
| 90 | | | Plant Protection | see Tables 3.3.4 and 3.3.5 |
| 105 | Milk Ripe Stage | | | |
| 115 | Dough Ripe Stage | | | |
| 125 | Yellow Ripe Stage | | | |
| 135 | Full Ripe Stage | 135 | Harvesting | |

Table 3.3.3 (3/4) Schedule of Proposed Farming Practices by Crops

Crop : Onion

| Days after Sowing | Growth Stage | Days after Planting | Proposed Farming Practices | Remarks |
|-------------------|--------------------------|---------------------|----------------------------|--|
| 0 | Germination | -50 | Nursery Preparation | ← by hand |
| 10 | Nursery Period | -45 | Sowing in Nursery | |
| 20 | | | Land Preparation | ← (Plowing (Harrowing (Bed Preparation (Ridging |
| 30 | | | Plant Protection | ← see Tables 3.3.4 and 3.3.5 |
| 40 | 1 ~ 2 true leaves stage | -2 | Basal dressing | ← Basal Dressing (NPK = 30 : 40 : 0) |
| 45 | Setting | 0 | Setting | ← AS = 142 kg per ha TSP = 200 kg per ha |
| 50 | | | Weeding | ← by hand |
| 60 | | | Plant Protection | ← see Tables 3.3.4 and 3.3.5 |
| 70 | | | | |
| 75 | Start of Visible Bulbing | 30 | 1st Top Dressing | ← 1st Top Dressing (NPK = 15 : 0 : 0) AS = 71 kg per ha |
| 80 | | | Weeding | ← by hand |
| 90 | | | Plant Protection | ← see Tables 3.3.4 and 3.3.5 |
| 100 | | | | |
| 105 | Start of Maturing Stage | 60 | 2nd Top Dressing | ← 2nd Top Dressing (NPK = 15 : 0 : 0) AS = 71 kg per ha |
| 110 | Thickening Growth Stage | | Weeding | ← by hand |
| 120 | | | Plant Protection | ← see Tables 3.3.4 and 3.3.5 |
| 135 | Leaf Dying / Maturity | 90 | Harvesting | |

Table 3.3.3 (4/4) 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 | | | Weeding | by hand |
| 30 | Appearance of lateral branches | | Plant Protection | see Tables 3.3.4 and 3.3.5 |
| 45 | Start of Flowering | | | |
| 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 | |
| Fenitrothion | Sumithion | Stem Borer Paddy borer Bugs Rice skipper Armyworm Ladybirds | Aphids Stalk borer Pink borer | | Aphids | S. pod borer Aphids | Ladybirds |
| Pirimiphos-methyl | 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 | Topsin | 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 Mwegu Scheme

| | Unit | Paddy | | | Maize | | | Onion | | | Pulse | | |
|---|---------|------------------|-------|-------------|------------------|-------|-------------|------------------|--------|-------------|------------------|-------|-------------|
| | | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) |
| Production Cost | | | | | | | | | | | | | |
| (A) Farm Input | | | | | | | | | | | | | |
| 1 Seed | kg/ha | 120 | 50 | 6,000 | 590 | 20 | 11,800 | 4,000 | 5 | 20,000 | 800 | 20 | 16,000 |
| 2 Fertilizer | kg/ha | 240 | 174 | 41,760 | 240 | 0 | 0 | 240 | 0 | 0 | 240 | 0 | 0 |
| : Urea (46 %-N) | kg/ha | 180 | 0 | 0 | 180 | 142 | 25,560 | 180 | 284 | 51,120 | 180 | 190 | 34,200 |
| : AS (21 %-N) | kg/ha | 220 | 125 | 27,500 | 220 | 100 | 22,000 | 220 | 200 | 44,000 | 220 | 0 | 0 |
| : TSP (20 %-P ₂ O ₅) | | | | | | | | | | | | | |
| 3 Agro-chemical | lit./ha | 5,500 | 4.0 | 22,000 | 5,500 | 4.0 | 22,000 | 5,500 | 6.0 | 33,000 | 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 | 3,500 | 0.0 | 0 |
| : Herbicide | lit./ha | 4,000 | 0.0 | 0 | 4,000 | 0.0 | 0 | 4,000 | 6.0 | 24,000 | 4,000 | 0.0 | 0 |
| : Fungicide | lit./ha | 500 | 67 | 33,500 | 500 | 33 | 16,500 | 500 | 125 | 62,500 | 500 | 17 | 8,500 |
| 4 Packing material | | | | | | | | | | | | | |
| Sub-total (A) | | | | 137,260 | | | 97,860 | | | 234,620 | | | 80,700 |
| (B) Labour Requirement | | | | | | | | | | | | | |
| 1 Family labour | | | 150 | 0 | | 100 | 0 | | 180 | 0 | | 100 | 0 |
| 2 Hired labour | | 500 | 107 | 53,500 | 500 | 45 | 22,500 | 500 | 177 | 88,500 | 500 | 40 | 20,000 |
| Sub-total (B) | | | 257 | 53,500 | | 145 | 22,500 | | 357 | 88,500 | | 140 | 20,000 |
| (C) Machinery or draught cuttle | | | | | | | | | | | | | |
| 1 Ploughing by tractor | L.S | 30,000 | 0 | 0 | 30,000 | 0 | 0 | 30,000 | | 0 | 30,000 | | 0 |
| 2 Ploughing by hand tractor | L.S | 25,000 | 0 | 0 | 25,000 | 0 | 0 | 25,000 | | 0 | 25,000 | | 0 |
| 3 Puddling by hand tractor | L.S | 17,500 | 0 | 0 | 17,500 | 0 | 0 | 17,500 | | 0 | 17,500 | | 0 |
| Sub-total (C) | | | | 0 | | | 0 | | | 0 | | | 0 |
| (D) Miscellaneous cost | | | | 9,563 | | | 6,018 | | | 16,156 | | | 5,035 |
| 5 % of (A) and (B) | | | | | | | | | | | | | |
| Total Production Cost | | | | 200,823 | | | 126,378 | | | 339,276 | | | 105,735 |
| Gross Return | | | | | | | | | | | | | |
| (A) Yield | kg/ha | | 5,000 | | 120 | 3,000 | | 85 | 15,000 | | 200 | 1,500 | |
| (B) Producer price | per kg | | | 800,000 | | | 360,000 | | | 1,275,000 | | | 300,000 |
| Gross return | | | | 599,177 | | | 233,622 | | | 935,724 | | | 194,265 |
| Net return | | | | | | | | | | | | | |

Table 3.4.1 Project Irrigation Water Requirement for Mwega Scheme
(Total Area : 580 ha)

(1) Diversion Water Requirement for Project 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 |
| 1978 | 477 | 352 | 672 | 873 | 746 | 457 | 584 | 297 | 462 | 413 | 231 | 113 |
| 1979 | 563 | 584 | 262 | 763 | 859 | 189 | 606 | 730 | 235 | 190 | 120 | 120 |
| 1980 | 563 | 701 | 813 | 370 | 555 | 846 | 674 | 202 | 313 | 195 | 284 | 105 |
| 1981 | 392 | 476 | 438 | 873 | 207 | 867 | 844 | 246 | 286 | 413 | 284 | 131 |
| 1982 | 563 | 701 | 719 | 554 | 372 | 243 | 652 | 758 | 226 | 177 | 178 | 163 |
| 1983 | 309 | 557 | 806 | 873 | 633 | 867 | 823 | 461 | 409 | 235 | 180 | 157 |
| 1984 | 557 | 413 | 597 | 754 | 487 | 569 | 844 | 234 | 611 | 180 | 284 | 99 |
| 1985 | 289 | 341 | 813 | 330 | 418 | 528 | 686 | 462 | 600 | 375 | 284 | 163 |
| 1986 | 364 | 370 | 719 | 873 | 588 | 386 | 652 | 363 | 170 | 413 | 79 | 163 |
| 1987 | 441 | 656 | 307 | 752 | 831 | 655 | 550 | 758 | 435 | 336 | 108 | 163 |
| 1988 | 563 | 372 | 653 | 839 | 838 | 846 | 844 | 550 | 550 | 413 | 158 | 114 |
| Average | 462 | 502 | 618 | 714 | 594 | 587 | 706 | 460 | 391 | 304 | 199 | 136 |
| 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 |
| 1978 | 50 | 10 | 23 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1979 | 37 | 9 | 23 | 36 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1980 | 50 | 10 | 23 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1981 | 37 | 8 | 23 | 35 | 109 | 172 | 249 | 58 | 391 | 470 | 473 | 455 |
| 1982 | 37 | 10 | 16 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1983 | 50 | 9 | 23 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1984 | 50 | 8 | 23 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1985 | 50 | 10 | 23 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1986 | 32 | 10 | 23 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1987 | 50 | 10 | 19 | 53 | 109 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| 1988 | 36 | 10 | 23 | 53 | 67 | 172 | 249 | 322 | 391 | 470 | 473 | 455 |
| Average | 44 | 9 | 22 | 50 | 105 | 172 | 249 | 298 | 391 | 470 | 473 | 455 |
| 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 |
| 1978 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 26 | 129 | 242 | 405 |
| 1979 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 28 | 140 | 256 | 252 |
| 1980 | 443 | 340 | 195 | 161 | 54 | 0 | 0 | 4 | 25 | 130 | 300 | 280 |
| 1981 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 27 | 143 | 264 | 321 |
| 1982 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 26 | 143 | 253 | 343 |
| 1983 | 443 | 340 | 234 | 161 | 54 | 0 | 0 | 4 | 27 | 129 | 260 | 405 |
| 1984 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 28 | 128 | 249 | 301 |
| 1985 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 26 | 143 | 308 | 429 |
| 1986 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 28 | 143 | 262 | 414 |
| 1987 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 27 | 131 | 250 | 292 |
| 1988 | 443 | 340 | 234 | 161 | 72 | 0 | 0 | 4 | 28 | 143 | 253 | 319 |
| Average | 443 | 340 | 231 | 161 | 69 | 0 | 0 | 4 | 27 | 137 | 263 | 342 |

(2) Diversion Water Requirement for Paddy (240 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 |
| 1978 | 354 | 331 | 474 | 540 | 462 | 351 | 399 | 269 | 301 | 246 | 151 | 71 |
| 1979 | 377 | 422 | 261 | 501 | 506 | 189 | 407 | 436 | 213 | 148 | 72 | 77 |
| 1980 | 377 | 456 | 519 | 357 | 388 | 498 | 433 | 202 | 251 | 153 | 167 | 63 |
| 1981 | 332 | 391 | 399 | 540 | 207 | 508 | 498 | 246 | 242 | 246 | 167 | 83 |
| 1982 | 377 | 456 | 489 | 425 | 320 | 243 | 425 | 436 | 204 | 135 | 129 | 91 |
| 1983 | 263 | 414 | 519 | 540 | 419 | 508 | 498 | 329 | 284 | 188 | 131 | 91 |
| 1984 | 377 | 372 | 450 | 496 | 362 | 393 | 498 | 234 | 352 | 138 | 167 | 57 |
| 1985 | 242 | 321 | 519 | 329 | 337 | 378 | 438 | 329 | 352 | 234 | 167 | 91 |
| 1986 | 317 | 349 | 489 | 540 | 402 | 324 | 425 | 293 | 148 | 246 | 30 | 91 |
| 1987 | 345 | 443 | 306 | 497 | 506 | 426 | 386 | 436 | 293 | 221 | 59 | 91 |
| 1988 | 377 | 352 | 468 | 532 | 497 | 498 | 498 | 360 | 331 | 246 | 110 | 72 |
| Average | 340 | 391 | 445 | 482 | 401 | 392 | 446 | 324 | 270 | 200 | 123 | 80 |
| 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 |
| 1978 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1979 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1980 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1981 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1982 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1983 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1984 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1985 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1986 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1987 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1988 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 17 | 0 | 0 | 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 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 93 | 189 | 281 |
| 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 203 | 192 |
| 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 9 | 94 | 218 | 220 |
| 1981 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 211 | 261 |
| 1982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 200 | 268 |
| 1983 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 92 | 207 | 281 |
| 1984 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 91 | 196 | 241 |
| 1985 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 218 | 286 |
| 1986 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 209 | 286 |
| 1987 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 197 | 233 |
| 1988 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 200 | 259 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 10 | 94 | 204 | 255 |

Table 3.4.1

(3) Diversion Water Requirement for Upland Crops in Wet Season (340 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 |
| 1978 | 122 | 20 | 198 | 332 | 284 | 106 | 185 | 28 | 160 | 167 | 80 | 41 |
| 1979 | 185 | 162 | 0 | 262 | 354 | 0 | 199 | 294 | 22 | 42 | 49 | 41 |
| 1980 | 185 | 245 | 293 | 13 | 166 | 347 | 241 | 0 | 61 | 42 | 116 | 41 |
| 1981 | 60 | 85 | 38 | 332 | 0 | 360 | 346 | 0 | 44 | 167 | 116 | 48 |
| 1982 | 185 | 245 | 230 | 129 | 52 | 0 | 227 | 322 | 22 | 42 | 49 | 71 |
| 1983 | 46 | 142 | 287 | 332 | 214 | 360 | 325 | 133 | 125 | 46 | 49 | 65 |
| 1984 | 180 | 40 | 147 | 258 | 124 | 176 | 346 | 0 | 259 | 42 | 116 | 41 |
| 1985 | 46 | 20 | 293 | 0 | 80 | 150 | 248 | 133 | 248 | 141 | 116 | 71 |
| 1986 | 46 | 20 | 230 | 332 | 185 | 62 | 227 | 70 | 22 | 167 | 49 | 71 |
| 1987 | 96 | 213 | 0 | 255 | 325 | 228 | 164 | 322 | 143 | 114 | 49 | 71 |
| 1988 | 185 | 20 | 185 | 307 | 341 | 347 | 346 | 189 | 219 | 167 | 49 | 41 |
| Average | 122 | 111 | 173 | 232 | 193 | 194 | 259 | 135 | 120 | 103 | 76 | 55 |
| 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 |
| 1978 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1979 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1980 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1981 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1982 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1983 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1984 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1985 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1986 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1987 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1988 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 24 | 0 | 0 | 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 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 36 | 53 | 124 |
| 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 45 | 53 | 60 |
| 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 36 | 82 | 60 |
| 1981 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 49 | 53 | 60 |
| 1982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 49 | 53 | 76 |
| 1983 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 36 | 53 | 124 |
| 1984 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 36 | 53 | 60 |
| 1985 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 49 | 91 | 143 |
| 1986 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 49 | 53 | 128 |
| 1987 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 36 | 53 | 60 |
| 1988 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 49 | 53 | 60 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 43 | 59 | 86 |

(4) Diversion Water Requirement for Onion in Dry Season (443 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 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1981 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1983 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1984 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1985 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1986 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1987 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1988 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 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 |
| 1978 | 3 | 4 | 6 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1979 | 2 | 4 | 6 | 19 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1980 | 3 | 4 | 6 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1981 | 2 | 3 | 6 | 18 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1982 | 2 | 4 | 4 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1983 | 3 | 4 | 6 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1984 | 3 | 3 | 6 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1985 | 3 | 4 | 6 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1986 | 2 | 4 | 6 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1987 | 3 | 4 | 5 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| 1988 | 2 | 4 | 6 | 24 | 66 | 112 | 168 | 227 | 289 | 359 | 372 | 372 |
| Average | 2 | 4 | 6 | 23 | 64 | 112 | 168 | 211 | 289 | 359 | 372 | 372 |
| 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 |
| 1978 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1979 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1980 | 369 | 291 | 178 | 152 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1981 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1982 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1983 | 369 | 291 | 210 | 152 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1984 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1985 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1986 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1987 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1988 | 369 | 291 | 210 | 152 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 369 | 291 | 207 | 152 | 68 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 3.4.1

(5) Diversion Water Requirement for Upland Crops (Pulse) in Dry Season (136 ha)

| Year | Jan | | | Feb | | | Mar | | | Apr | | | Unit: lit/sec | | |
|---------|------|-------|--------|------|-------|--------|------|-------|--------|------|-------|--------|---------------|-------|--------|
| | 1-10 | 11-20 | 21-end | 1-10 | 11-20 | 21-end | 1-10 | 11-20 | 21-end | 1-10 | 11-20 | 21-end | 1-10 | 11-20 | 21-end |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1981 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1983 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1984 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1985 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1986 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1987 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1988 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Average | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 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 | | | |
| 1978 | 0 | 5 | 16 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1979 | 0 | 5 | 16 | 17 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1980 | 0 | 5 | 16 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1981 | 0 | 5 | 16 | 17 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1982 | 0 | 5 | 12 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1983 | 0 | 5 | 16 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1984 | 0 | 5 | 16 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1985 | 0 | 5 | 16 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1986 | 0 | 5 | 16 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1987 | 0 | 5 | 14 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| 1988 | 0 | 5 | 16 | 29 | 44 | 60 | 80 | 94 | 102 | 110 | 100 | 82 | | | |
| Average | 0 | 5 | 16 | 27 | 41 | 60 | 80 | 86 | 102 | 110 | 100 | 82 | | | |
| 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 | | | |
| 1978 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1979 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1980 | 73 | 48 | 17 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1981 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1982 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1983 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1984 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1985 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1986 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1987 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 1988 | 73 | 48 | 24 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Average | 73 | 48 | 23 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |

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

| Training Course | Total Period of Course (day) | Persons/ Course (Person) | Times/ Year (Time) | Trainees | Contents of Training |
|---------------------------------|------------------------------|--------------------------|--------------------|---|--|
| Course-A | 2 | 4 - 5 | 1 | - District Commissioner, District Executive Director, District Administrative Officer, Senior officials of the offices of RALDO, and RCO, and the Zonal Irrigation Office. - Senior officials of the offices involved in WUG's activities (DALDO, District Water Engineers, District Community Development Officers, DCO, etc.). | - Outline of the project - Farmers' participatory management system - Outline of O&M by WUG - Organization and activities of WUG - Necessity of agricultural supporting services - Field investigation, etc. |
| Course-B (for each district) | 5 | 20 | 1 | - Officials involved in O&M (Zonal Irrigation Office, RALDO and DALDO's offices, Division Extension Officers, DCO). - Village Extension Officers and Irrigation Technicians to be attached to the project. | - Development plan of smallholder irrigation project - Estimation of water requirement - Preparation of irrigation schedule - O&M of facilities - Strengthening of WUG, articles and by-laws, water right, registration - Management of WUG - Collection of irrigation service charge - Monitoring system, measuring and surveying methods - Agricultural supporting services to WUG - Promoting women in development - Study tour at advanced areas, etc. |
| Course-C (for each scheme) | 10 | 20 - 30 | 2 | Farmer's level training to leaders of WUG, gate keepers and key farmers. | - Outline of the project - O&M of facilities, water requirement, water delivery, etc. - Irrigation schedule and cropping calendar - Management of WUG such as accounting and book keeping and auditing - Articles and by-laws, water right, registration - Collection of irrigation service charge - Monitoring system, measuring and surveying methods - Marketing and credit, etc. - Promoting women in development. - Study tour at advanced areas, etc. |
| Course-D (for each scheme) | 2 | 20 | 2 | 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. | - Outline of the project - Organization and activities of WUG - Required agricultural supporting services - Promoting women in development, etc. |

Table 3.5.2 (1/2) Training Schedule for Proposed Farming Practices by Crops in Mwega 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. |
|-----------------------------|--|------|------|------|------|-----|------|------|------|------|------|------|------|
| Maize / Pulse | | | | | | | | | | | | | |
| 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 3.5.2 (2/2) Training Schedule for Proposed Farming Practices by Crops in Mwega 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 | - | | | | | | | | | | | - |
| 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. |
|-----------------------------|---------------------------------------|------|------|------|------|-----|------|------|------|------|------|------|------|
| Crop : Onion | | | | | | | | | | | | | |
| 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 Basal dressing | - Amount and timing | | | | | | - | - | | | | | |
| 4.3 Basal dressing | - Amount and timing | | | | | | | - | - | | | | |
| 5 Plant protection | - Identification of pests and disease | | | | - | - | - | - | - | - | - | - | - |
| | - Amount and timing | | | | - | - | - | - | - | - | - | - | - |
| 6 Water management | - Timing and condition | | | | - | - | - | - | - | - | - | - | - |
| 7 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"> - Demonstration of proper farming practices to general farmers - Guidance for proper farming practices - Guidance for proper water management - Guidance for method on the yield analysis | <ul style="list-style-type: none"> - DEO - DIVEO - VEO | <ul style="list-style-type: none"> - Aggressive farmers should be selected for the field training. - Demonstration will be carried out through the construction period. - Farmer's field to be selected. |
| | after the project implementation | <ul style="list-style-type: none"> - Practical training for proper farming practices (Proper farming practices for major crops will be transferred to the farmers concerned through the actual crop cultivation.) - Guidance for proper water management | <ul style="list-style-type: none"> - DEO - SMS - DIVEO - VEO | <ul style="list-style-type: none"> - Group training will be required. - Aggressive farmers should be selected as block leader each block of every tertiary blocks. - Group training will be required. - Training schedule for each scheme is shown in relevant tables in each Division.) - Farmer's field to be selected. <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"> - Inspection to the advanced area - Exchange of information and experience with farmers in the advanced area. | <ul style="list-style-type: none"> - SMS - DIVEO - VEO | <ul style="list-style-type: none"> - Upland crops in high altitude and cool climate - Lushoto, Iringa, Mbeya - Paddy and Maize - Major fields in FAO special programme |
| 4. Special training in KATC | through the project implementation | <ul style="list-style-type: none"> - Training of advanced practices | <ul style="list-style-type: none"> - KATC | <ul style="list-style-type: none"> - Key-farmer's course (20 days per course) |

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

Table 3.5.4 Schedule of Field Training for Proposed Framing Practices by Crops in Mwega Scheme

Malolo area

| Training Programme | 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 | | | | | | | | | | | | |
| | Onion | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | |
| 2 Nursery preparation | Paddy | 1 | | | | | | | | | | 1 | 1 | | | | | | | | | | | | |
| | Onion | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | |
| 3 Planting | Paddy | 1 | 1 | | | | | | | | | | 1 | | | | | | | | | | | | |
| | Maize/Pulse | 1 | 1 | | | 1 | 1 | 1 | | | | | 1 | | | | | | | | | | | | |
| | Onion | | | | | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | |
| 4 Basal dressing of fertilizer | Paddy | 1 | 1 | 1 | | | | | | | | | 1 | | | | | | | | | | | | |
| | Maize/Pulse | 1 | | | | 1 | 1 | 1 | | | | 1 | 1 | | | | | | | | | | | | |
| | Onion | | | | | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | |
| 5 1st top dressing of fertilizer | Paddy | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | |
| | Maize/Pulse | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 2nd top dressing of fertilizer | Onion | | | | | | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 Plant protection | | ←----- Note *1 -----→ | | | | | | | | | | | | | | | | | | | | | | | |
| 8 Water management | | ←----- Note *2 -----→ | | | | | | | | | | | | | | | | | | | | | | | |
| 9 Harvesting | Paddy | | | | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | |
| | Maize/Pulse | | | | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | |
| | Onion | | | | | | | | | 1 | 1 | 1 | 1 | | | | | | | | | | | | |
| Number of training days | | 7 | 3 | 3 | 1 | 1 | 1 | 2 | 5 | 6 | 8 | 7 | 5 | 4 | 3 | 2 | 1 | 3 | 2 | 2 | 2 | 0 | 4 | 5 | 7 |

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 : 21 blocks (21 block leaders)

Period for each farming practice: 2 months (see Table 3.5.2 in Division 5)

Training days per month: 2 days

Total training days : 4 days

Participants for each training day: 6 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 ligh equipment | Man-Day | 3,360 |
| Ass.operator for ligh 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 | | 91,730 |
| Fine aggregate(sand) | m3 | Collection in situ | |
| Coarse aggregates | m3 | for concrete | 45,570 |
| Admixture | kg | AE/reducing | 1,400 |
| Mild steel reinforcement | ton | | 360,720 |
| Hardwood timber | m3 | | 150,000 |
| Nail | kg | | 600 |
| Cobble stone | m3 | Production in situ | |
| Gabion box | m3 | | 27,000 |
| RC Pipe | lin m | Dia.1.2m | 85,680 |
| RC Pipe | lin m | Dia.1.0m | 71,400 |
| RC Pipe | lin m | Dia.0.9m | 64,260 |
| RC Pipe | lin m | Dia.0.8m | 57,120 |
| RC Pipe | lin m | Dia.0.6m | 41,160 |
| RC Pipe | lin m | Dia.0.5m | 36,750 |
| RC Pipe | lin m | Dia.0.4m | 32,340 |
| RC Pipe | lin m | Dia.0.3m | 27,930 |
| Turf | m2 | | 510 |
| Sluice Gate | No. | B:1.2m H:1.2m | 1,532,900 |
| Sluice Gate | No. | B:1.2m H:1.0m | 1,509,000 |
| Screen | No. | B:1.0m H:1.0m | 325,000 |
| Wood (Dia. 0.25m) | m | | 7,360 |

Table 4.1.3 List of Machine Cost

| Equipment | Spec. | Unit | Rate(Tsh) |
|------------------|---------|------|-----------|
| Bulldozer | 15t | h | 32,600 |
| Backhoe | 0.6m3 | h | 25,400 |
| Backhoe | 0.35m3 | 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 | 0.5m3 | h | 36,300 |
| Agitator | 1.6m3 | h | 8,300 |
| Generator | 35KVA | h | 3,200 |
| Hydraulic Blaker | 1,300kg | h | 28,800 |
| Compressor | 5 m3/m | h | 8,900 |
| Concrete blaker | 20 kg | h | 470 |
| Water pump | 10 m | h | 1,400 |
| Winche | 3m/m. | h | 2,900 |

Table 4.1.4 List of Construction Unit Prices

| No. | Work Item | Unit | Unit Price | | Total (Tsh) |
|-----|---|------|---------------|-------------|-------------|
| | | | Foreign (Tsh) | Local (Tsh) | |
| 1 | Land Clearing | m2 | 1,719,270 | 526,055 | 2,245,325 |
| 2 | Stripping | m3 | 2,085 | 624 | 2,708 |
| 3 | Excavation(Common,Removal HD=0.3km) | m3 | 2,500 | 1,084 | 3,584 |
| 4 | Excavation(Rock in the River) | m3 | 17,931 | 3,376 | 21,306 |
| 5 | Excavation(Rock ,Canal) | m3 | 9,184 | 15,755 | 24,940 |
| 6 | Excavation(Man-Power) | m3 | 0 | 2,484 | 2,484 |
| 7 | Excavation(Common,without Removal) | m3 | 1,186 | 520 | 1,706 |
| 8 | Embankment(HD<50 m) | m3 | 1,634 | 540 | 2,174 |
| 9 | Embankment Material Transportation(HD=3Km,Mwega) | m3 | 2,484 | 1,048 | 3,532 |
| 10 | Back Filling | m3 | 0 | 1,691 | 1,691 |
| 11 | Land Levelling | ha | 387,414 | 158,462 | 545,875 |
| 12 | Excavation(Massive, Headworks in Mwega, Removal HD=0.3km) | m3 | 1,942 | 860 | 2,802 |
| 13 | Refilling(Headworks in Mwega) | m3 | 1,962 | 587 | 2,549 |
| 14 | Back Filling & Embankment (Massive, Headworks in Mwega) | m3 | 2,584 | 1,074 | 3,659 |
| 15 | Concrete (300kg/cm2, Bridge, Aqueduct & Chute in Mwega) | m3 | 18,037 | 105,567 | 123,604 |
| 16 | Concrete (240kg/cm2, Reinforced Concrete in Mwega) | m3 | 18,106 | 100,453 | 118,559 |
| 17 | Concrete (210kg/cm2, Lining/Plain Concrete in Mwega) | m3 | 18,265 | 98,371 | 116,636 |
| 18 | Concrete (180kg/cm2, Foundation Concrete in Mwega) | m3 | 18,150 | 84,337 | 102,486 |
| 19 | Reinforce Bar(Processing & Assembly, HD<60 m) | ton | 483,004 | 52,164 | 535,168 |
| 20 | Concrete Form | m2 | 0 | 3,970 | 3,970 |
| 21 | Demolishing of Existing Structure | m3 | 8,672 | 13,862 | 22,534 |
| 22 | Gabion(in Mwega) | m3 | 22,974 | 42,371 | 65,345 |
| 23 | Sluice Gate(B=1.2m, H=1.2m) | no. | 0 | 1,992,770 | 1,992,770 |
| 24 | Sluice Gate(B=1.2m, H=1.0m) | no. | 0 | 1,961,700 | 1,961,700 |
| 25 | Screen(B:1.0m H:1.0m) | no. | 0 | 422,500 | 422,500 |
| 26 | Stoplog | m3 | 0 | 237,510 | 237,510 |
| 27 | RC Pipe (Dia. 1.2m) | m | 8,354 | 114,309 | 122,663 |
| 28 | RC Pipe (Dia. 1.0m) | m | 8,354 | 95,745 | 104,099 |
| 29 | RC Pipe (Dia. 0.9m) | m | 8,354 | 82,485 | 90,839 |
| 30 | RC Pipe (Dia. 0.8m) | m | 8,354 | 73,645 | 81,999 |
| 31 | RC Pipe (Dia. 0.6m) | m | 4,177 | 55,509 | 59,685 |
| 32 | RC Pipe (Dia. 0.5m) | m | 4,177 | 49,776 | 53,952 |
| 33 | RC Pipe (Dia. 0.4m) | m | 4,177 | 44,043 | 48,219 |
| 34 | RC Pipe (Dia. 0.3m) | m | 4,177 | 38,310 | 42,486 |
| 35 | Pile Hammering(Wooden Pile, 3m) | no. | 3,529 | 47,589 | 51,117 |
| 36 | Pile Hammering(Wooden Pile, 5m) | no. | 5,791 | 78,466 | 84,257 |
| 37 | Storage Construction | m2 | 0 | 219,556 | 219,556 |
| 38 | Dewatering | day | 46,800 | 21,868 | 68,668 |

Table 4.1.5 Breakdown of Direct Construction Cost of Mwega Scheme (1/2)

| | | (Unit : 1,000 Tshs) | | | | |
|--------------------------|-------------------------------------|---------------------|--------|------------|------------|-------------|
| | Item | Unit | Qty | F.C.(Tshs) | L.C.(Tshs) | Total(Tshs) |
| Headworks | | | | | | |
| | Land Clearing | ha | 1 | 1,375 | 421 | 1,796 |
| Diversion Channel | | | | | | |
| | Excavation(Common,without removal) | m3 | 4,882 | 5,791 | 2,538 | 8,329 |
| | Refilling | m3 | 4,882 | 9,579 | 2,865 | 12,444 |
| Coffering | | | | | | |
| | Embankment | m3 | 751 | 1,941 | 807 | 2,748 |
| | Removal | m3 | 751 | 891 | 390 | 1,281 |
| Weir & Intake | | | | | | |
| | Excavation(Massive) | m3 | 9,457 | 18,366 | 8,130 | 26,497 |
| | Concrete(240kg/cm2) | m3 | 117 | 2,118 | 11,753 | 13,871 |
| | Concrete(210kg/cm2) | m3 | 1,505 | 27,489 | 148,048 | 175,538 |
| | Concrete(180kg/cm2) | m3 | 1,220 | 22,143 | 102,891 | 125,033 |
| | Reinforcement Bar | ton | 22 | 10,626 | 1,148 | 11,774 |
| | Concrete Form | m2 | 2,108 | 0 | 8,370 | 8,370 |
| | Gabion | m3 | 250 | 5,744 | 10,593 | 16,336 |
| | Dewatering | day | 300 | 14,040 | 6,560 | 20,600 |
| | Sluice Gate(B=1.2m*H=1.2m) | no. | 1 | 0 | 1,993 | 1,993 |
| | Sluice Gate(B=1.2m*H=1.0m) | no. | 1 | 0 | 1,962 | 1,962 |
| | Sub-total | | | 120,103 | 308,469 | 428,572 |
| Irrigation System | | | | | | |
| Main Canal | | | | | | |
| | Stripping | m3 | 8,233 | 17,164 | 5,134 | 22,298 |
| | Embankment | m3 | 29,428 | 121,173 | 46,753 | 167,926 |
| | Excavation(Common) | m3 | 25,393 | 63,481 | 27,539 | 91,020 |
| | Excavation(Rock Canal) | m3 | 1,336 | 12,270 | 21,049 | 33,319 |
| | Lining | m3 | 3,066 | 56,001 | 301,605 | 357,607 |
| | Sod Facing | m2 | 25,448 | 16,214 | 7,481 | 23,695 |
| Related Structure | | | | | | |
| | Concrete(240kg/cm2) | m3 | 406 | 7,351 | 40,784 | 48,135 |
| | Concrete(180kg/cm2) | m3 | 180 | 3,267 | 15,181 | 18,448 |
| | Reinforcement Bar | ton | 33 | 15,939 | 1,721 | 17,661 |
| | Concrete Form | m2 | 4,978 | 0 | 19,764 | 19,764 |
| | RC Pipe(Dia.1.2m) | m | 18 | 150 | 2,058 | 2,208 |
| | RC Pipe(Dia.1.0m) | m | 112 | 936 | 10,723 | 11,659 |
| | RC Pipe(Dia.0.9m) | m | 28 | 234 | 2,310 | 2,543 |
| | RC Pipe(Dia.0.8m) | m | 36 | 301 | 2,651 | 2,952 |
| | RC Pipe(Dia.0.6m) | m | 73 | 305 | 4,052 | 4,357 |
| | RC Pipe(Dia.0.5m) | m | 59 | 246 | 2,937 | 3,183 |
| | RC Pipe(Dia.0.4m) | m | 2 | 8 | 88 | 96 |
| | RC Pipe(Dia.0.3m) | m | 44 | 184 | 1,686 | 1,869 |
| | Gabion | m3 | 288 | 6,617 | 12,203 | 18,819 |
| | Stoplog | m3 | 6.6 | 0 | 1,568 | 1,568 |
| | Screen | no. | 17 | 7,183 | 7,183 | 14,365 |
| Secondary Canal | | | | | | |
| | Stripping | m3 | 3,328 | 6,938 | 2,075 | 9,013 |
| | Embankment | m3 | 10,427 | 42,934 | 16,565 | 59,500 |
| | Excavation(Common) | m3 | 9,591 | 23,977 | 10,401 | 34,378 |
| | Excavation(Rock Canal) | m3 | 505 | 4,638 | 7,957 | 12,595 |
| | Lining | m3 | 993 | 18,137 | 97,682 | 115,820 |
| | Flume Chute Lining (300kg/cm2) | m3 | 78 | 1,407 | 8,234 | 9,641 |
| | Reinforcement Bar(Chute Lining) | ton | 8 | 3,864 | 417 | 4,281 |
| | Sod Facing | m2 | 13,223 | 8,425 | 3,887 | 12,312 |
| Related Structure | | | | | | |
| | Pile Foundation(Wooden Pile, L=3 m) | no. | 6 | 21 | 286 | 307 |
| | Pile Foundation(Wooden Pile, L=5 m) | no. | 6 | 35 | 471 | 506 |
| | Concrete(300kg/cm2) | m3 | 108 | 1,948 | 11,401 | 13,349 |
| | Concrete(240kg/cm2) | m3 | 169 | 3,069 | 16,977 | 20,036 |
| | Concrete(180kg/cm2) | m3 | 45 | 817 | 3,795 | 4,612 |
| | Reinforcement Bar | ton | 22 | 10,626 | 1,148 | 11,774 |
| | Concrete Form | m2 | 1,833 | 0 | 7,278 | 7,278 |
| | RC Pipe(Dia.1.0m) | m | 63 | 526 | 6,032 | 6,558 |
| | RC Pipe(Dia.0.6m) | m | 4 | 17 | 222 | 239 |
| | RC Pipe(Dia.0.5m) | m | 41 | 171 | 2,041 | 2,212 |
| | RC Pipe(Dia.0.3m) | m | 23 | 96 | 881 | 977 |
| | Gabion | m3 | 513 | 11,786 | 21,736 | 33,522 |
| | Stoplog | m3 | 2.9 | 0 | 689 | 689 |
| | Wooden Cover Plate of Aqueduct | m3 | 1.2 | 0 | 293 | 293 |
| | Screen | no. | 2 | 845 | 845 | 1,690 |

Table 4.4.5 Breakdown of Direct Construction Cost of Mwega Scheme (2/2)

| | | (Unit : 1,000 Tshs) | | | |
|---|------|---------------------|----------------|------------------|------------------|
| Item | Unit | Qty | F.C.(Tshs) | L.C.(Tshs) | Total(Tshs) |
| Connection Canal | | | | | |
| Stripping | m3 | 281 | 586 | 175 | 761 |
| Embankment | m3 | 815 | 3,356 | 1,295 | 4,651 |
| Excavation(Common) | m3 | 723 | 1,807 | 784 | 2,592 |
| Excavation(Rock Canal) | m3 | 38 | 349 | 599 | 948 |
| Flume Chute Lining (300kg/cm2) | m3 | 148 | 2,670 | 15,624 | 18,293 |
| Reinforcement Bar(Chute lining) | ton | 15 | 7,245 | 782 | 8,028 |
| Sod Facing | m2 | 1,008 | 642 | 296 | 939 |
| Sub-total | | | 485,947 | 775,336 | 1,261,284 |
| Road & Drainage | | | | | |
| Side Drain of Malolo-Chabi Road | | | | | |
| Stripping | m3 | 480 | 1,001 | 299 | 1,300 |
| Excavation(Common) | m3 | 2,943 | 7,357 | 3,192 | 10,549 |
| Gabion | m3 | 372 | 8,551 | 15,770 | 24,321 |
| Malolo-Chabi Road | | | | | |
| Stripping | m3 | 786 | 1,639 | 490 | 2,129 |
| Embankment | m3 | 5,876 | 24,195 | 9,335 | 33,530 |
| Sod Facing | m2 | 2,888 | 1,840 | 849 | 2,689 |
| Bridge on Malolo-Chabi Road | | | | | |
| Excavation(Common) | m3 | 1,000 | 2,500 | 1,084 | 3,584 |
| Excavation(Rock) | m3 | 50 | 459 | 788 | 1,247 |
| Concrete(300kg/cm2) | m3 | 148 | 2,670 | 15,624 | 18,293 |
| Reinforcement Bar | ton | 15 | 7,245 | 782 | 8,028 |
| Concrete Form | m2 | 390 | 0 | 1,548 | 1,548 |
| Back Filling | m3 | 500 | 0 | 846 | 846 |
| Gabion | m3 | 90 | 2,068 | 3,813 | 5,881 |
| Steel Rail | ton | 0.5 | 242 | 26 | 268 |
| Causeway on Trunk Road(A7)-Malolo Road | | | | | |
| Excavation(Common) | m3 | 610 | 1,525 | 662 | 2,187 |
| Concrete(240kg/cm2) | m3 | 135 | 2,444 | 13,561 | 16,005 |
| Reinforcement Bar | ton | 11 | 5,313 | 574 | 5,887 |
| Concrete Form | m2 | 240 | 0 | 953 | 953 |
| Gabion | m3 | 432 | 9,925 | 18,304 | 28,229 |
| Sub-total | | | 78,973 | 88,501 | 167,474 |
| River Improvement | | | | | |
| Demolishing of Existing Structure | m3 | 30 | 260 | 416 | 676 |
| Excavation(Common) | m3 | 30,994 | 77,483 | 33,613 | 111,096 |
| Excavation(Rock in the River) | m3 | 3,444 | 61,753 | 11,625 | 73,379 |
| Sub-total | | | 139,497 | 45,654 | 185,151 |
| Agricultural Supporting Facility | | | | | |
| Storage Construction | m2 | 330 | 0 | 72,453 | 72,453 |
| Sub-total | | | 0 | 72,453 | 72,453 |
| Miscellaneous Works | | | | | |
| | L.S. | | 41,226 | 64,521 | 105,747 |
| G.Total | | | 865,746 | 1,354,934 | 2,220,681 |

Table S.1.1 Financial Crop Budget under the Present and Without-Project Condition in Mwega Scheme

| | Unit | Paddy | | | Maize | | | Pulse Crops | | | Onion | | |
|---|--------------|------------------|-------|-------------|------------------|-------|-------------|------------------|-----|-------------|------------------|--------|-------------|
| | | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) |
| Production Cost | | | | | | | | | | | | | |
| (A) Farm Input | kg/ha | 120 | 50 | 6,000 | 590 | 20 | 11,800 | 800 | 20 | 16,000 | 4,000 | 5 | 20,000 |
| 1 Seed | kg/ha | 240 | 0 | 0 | 240 | 0 | 0 | 240 | 0 | 0 | 240 | 125 | 30,000 |
| 2 Fertilizer | kg/ha | 180 | 0 | 0 | 180 | 0 | 0 | 180 | 0 | 0 | 180 | 125 | 22,500 |
| : Urea (46 %-N) | kg/ha | | | | | | | | | | | | 0 |
| : SA (21 %-N) | kg/ha | | | | | | | | | | | | 0 |
| : TSP (46 %-P ₂ O ₅) | kg/ha | | | | | | | | | | | | 0 |
| 3 Agro-chemical | lit/ha | 5,500 | 0.0 | 0 | 5,500 | 0.0 | 0 | 5,500 | 0.0 | 0 | 5,500 | 2.0 | 11,000 |
| : Pesticide | lit/ha | 3,500 | 2.5 | 8,750 | 3,500 | 0.0 | 0 | 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 | 4,000 | 0.0 | 0 |
| : Fungicide | lit/ha | 500 | 27 | 13,500 | 500 | 17 | 8,500 | 500 | 9 | 4,500 | 500 | 83 | 41,500 |
| 4 Packing material | | | | 28,250 | | | 20,500 | | | 20,500 | | | 125,000 |
| Sub-total(A) | | | | | | | | | | | | | |
| (B) Labour Requirement | | | | 0 | | | 0 | | | 0 | | | 0 |
| 1 Family labour | | | 90 | 0 | | 70 | 0 | | 60 | 0 | | 160 | 0 |
| 2 Hired labour | | 500 | 61 | 30,500 | 500 | 30 | 15,000 | 500 | 30 | 15,000 | 500 | 155 | 77,500 |
| Sub-total(B) | | | 151 | 30,500 | | 100 | 15,000 | | 90 | 15,000 | | 315 | 77,500 |
| (C) Machinery or draught cattle | L.S | 30,000 | 0 | 0 | 30,000 | 0 | 0 | 30,000 | 0 | 0 | 30,000 | 0 | 0 |
| 1 Ploughing by tractor | L.S | 25,000 | 0 | 0 | 25,000 | 0 | 0 | 25,000 | 0 | 0 | 25,000 | 0 | 0 |
| 2 Ploughing by hand tractor | L.S | 17,500 | 0 | 0 | 17,500 | 0 | 0 | 17,500 | 0 | 0 | 17,500 | 0 | 0 |
| 3 Puddling by hand tractor | | | 0 | 0 | | | 0 | | | 0 | | | 0 |
| Sub-total(C) | | | | 2,978 | | | 1,765 | | | 1,775 | | | 10,125 |
| (D) Miscellaneous cost | | | | 61,688 | | | 37,065 | | | 37,275 | | | 212,625 |
| 5 % of (A) and (B) | | | | | | | | | | | | | |
| Total Production Cost | | | | 320,000 | | 1,500 | 180,000 | | 800 | 160,000 | | 10,000 | 850,000 |
| Gross Return | kg/ha per kg | 160 | 2,000 | | 120 | | | 200 | | | 85 | | |
| (A) Yield | | | | | | | | | | | | | |
| (B) Producer price | | | | | | | | | | | | | |
| Gross return | | | | 258,312 | | | 142,935 | | | 122,725 | | | 637,975 |
| Net return | | | | | | | | | | | | | |

Table 5.1.2 Financial Crop Budget under the With Project Condition in Mwega Scheme

| | Unit | Paddy | | | Maize | | | Onion | | | Pulse Crops | | |
|---|--------|------------------|-------|-------------|------------------|-------|-------------|------------------|--------|-------------|------------------|-------|-------------|
| | | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) |
| Production Cost | | | | | | | | | | | | | |
| (A) Farm Input | kg/ha | 120 | 50 | 6,000 | 590 | 20 | 11,800 | 4,000 | 5 | 20,000 | 800 | 20 | 16,000 |
| 1 Seed | kg/ha | 240 | 174 | 41,760 | 240 | 0 | 0 | 240 | 0 | 0 | 240 | 0 | 0 |
| 2 Fertilizer | kg/ha | 180 | 0 | 0 | 180 | 142 | 25,560 | 180 | 284 | 51,120 | 180 | 190 | 34,200 |
| : Urea (46 %-N) | kg/ha | 220 | 125 | 27,500 | 220 | 100 | 22,000 | 220 | 200 | 44,000 | 220 | 0 | 0 |
| : SA (21 %-N) | kg/ha | | | | | | | | | | | | |
| : TSP (46 %-P ₂ O ₅) | kg/ha | | | | | | | | | | | | |
| 3 Agro-chemical | lit/ha | 5,500 | 4 | 22,000 | 5,500 | 4 | 22,000 | 5,500 | 6 | 33,000 | 5,500 | 4 | 22,000 |
| : Pesticide | lit/ha | 3,500 | 2 | 7,000 | 3,500 | 0 | 0 | 3,500 | 0 | 0 | 3,500 | 0 | 0 |
| : Herbicide | lit/ha | 4,000 | 0 | 0 | 4,000 | 0 | 0 | 4,000 | 6 | 24,000 | 4,000 | 0 | 0 |
| : Fungicide | lit/ha | 500 | 67 | 33,500 | 500 | 33 | 16,500 | 500 | 125 | 62,500 | 500 | 17 | 8,500 |
| 4 Packing material | | | | 137,760 | | | 97,860 | | | 234,620 | | | 80,700 |
| Sub-total(A) | | | | | | | | | | | | | |
| (B) Labour Requirement | | | | 0 | | | 0 | | | 0 | | | 0 |
| 1 Family labour | | | 150 | 0 | | 100 | 0 | | 180 | 0 | | 100 | 0 |
| 2 Hired labour | | 500 | 107 | 53,500 | 500 | 45 | 22,500 | 500 | 177 | 88,500 | 500 | 40 | 20,000 |
| Sub-total(B) | | | 257 | 53,500 | | 145 | 22,500 | | 357 | 88,500 | | 140 | 20,000 |
| (C) Machinery or draught cattle | L.S | 30,000 | 0 | 0 | 30,000 | 0 | 0 | 30,000 | 0 | 0 | 30,000 | 0 | 0 |
| 1 Ploughing by tractor | L.S | 25,000 | 0 | 0 | 25,000 | 0 | 0 | 25,000 | 0 | 0 | 25,000 | 0 | 0 |
| 2 Ploughing by hand tractor | L.S | 17,500 | 0 | 0 | 17,500 | 0 | 0 | 17,500 | 0 | 0 | 17,500 | 0 | 0 |
| 3 Puddling by hand tractor | | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 |
| Sub-total(C) | | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 |
| (D) Miscellaneous cost | | | | 9,563 | | | 6,018 | | | 16,156 | | | 5,035 |
| 5 % of (A) and (B) | | | | 200,823 | | | 126,378 | | | 339,276 | | | 105,735 |
| Total Production Cost | | | | 800,000 | | 3,000 | 360,000 | | 15,000 | 1,275,000 | | 1,500 | 300,000 |
| Gross Return | kg/ha | 160 | 5,000 | 800,000 | 120 | 3,000 | 360,000 | 85 | 15,000 | 1,275,000 | 200 | 1,500 | 300,000 |
| (A) Yield | per kg | | | | | | | | | | | | |
| (B) Producer price | | | | | | | | | | | | | |
| Gross return | | | | 599,177 | | | 233,622 | | | 935,724 | | | 194,265 |
| Net return | | | | | | | | | | | | | |

Table S.1.3 Economic Crop Budget under the Present and Without-Project Condition in Mwega Scheme

| | Unit | Paddy | | | Maize | | | Pulse Crops | | | Onion | | |
|---|--------|------------------|-------|-------------|------------------|-------|-------------|------------------|-----|-------------|------------------|--------|-------------|
| | | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) |
| Production Cost | | | | | | | | | | | | | |
| (A) Farm Input | | | | | | | | | | | | | |
| 1 Seed | kg/ha | 120 | 50 | 6,000 | 590 | 20 | 11,800 | 800 | 20 | 16,000 | 4,000 | 5 | 20,000 |
| 2 Fertilizer | | | | | | | | | | | | | |
| : Urea (46 %-N) | kg/ha | 126 | 0 | 0 | 126 | 0 | 0 | 126 | 0 | 0 | 126 | 125 | 15,750 |
| : SA (21 %-N) | kg/ha | 73 | 0 | 0 | 73 | 0 | 0 | 73 | 0 | 0 | 73 | 125 | 9,125 |
| : TSP (46 %-P ₂ O ₅) | kg/ha | 114 | 0 | 0 | 114 | 0 | 0 | 114 | 0 | 0 | 114 | 0 | 0 |
| 3 Agro-chemical | | | | | | | | | | | | | |
| : Pesticide | lit/ha | 5,500 | 0.0 | 0 | 5,500 | 0.0 | 0 | 5,500 | 0.0 | 0 | 5,500 | 2.0 | 11,000 |
| : Herbicide | lit/ha | 3,500 | 2.5 | 8,750 | 3,500 | 0.0 | 0 | 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 | 4,000 | 0.0 | 0 |
| 4 Packing material | lit/ha | 500 | 27 | 13,500 | 500 | 17 | 8,500 | 500 | 9 | 4,500 | 500 | 83 | 41,500 |
| Sub-total(A) | | | | 28,250 | | | 20,300 | | | 20,500 | | | 97,375 |
| (B) Labour Requirement | | | | | | | | | | | | | |
| 1 Family labour | | 400 | 90 | 36,000 | 400 | 70 | 28,000 | 400 | 60 | 24,000 | 400 | 160 | 64,000 |
| 2 Hired labour | | 400 | 61 | 24,400 | 400 | 30 | 12,000 | 400 | 30 | 12,000 | 400 | 155 | 62,000 |
| Sub-total(B) | | | 151 | 60,400 | | 100 | 40,000 | | 90 | 36,000 | | 315 | 126,000 |
| (C) Machinery or draught cattle | | | | | | | | | | | | | |
| 1 Ploughing by tractor | L.S | 24,000 | 0 | 0 | 24,000 | 0 | 0 | 24,000 | 0 | 0 | 24,000 | 0 | 0 |
| 2 Ploughing by hand tractor | L.S | 20,000 | 0 | 0 | 20,000 | 0 | 0 | 20,000 | 0 | 0 | 20,000 | 0 | 0 |
| 3 Puddling by hand tractor | L.S | 14,000 | 0 | 0 | 14,000 | 0 | 0 | 14,000 | 0 | 0 | 14,000 | 0 | 0 |
| Sub-total(C) | | | | 0 | | | 0 | | | 0 | | | 0 |
| (D) Miscellaneous cost | | | | | | | | | | | | | |
| 5 % of (A) and (B) | | | | 4,433 | | | 3,015 | | | 2,825 | | | 11,169 |
| Total Production Cost | | | | 93,083 | | | 63,315 | | | 59,325 | | | 234,544 |
| Gross Return | | | | | | | | | | | | | |
| (A) Yield | kg/ha | | 2,000 | | | 1,500 | | | 800 | | | 10,000 | |
| (B) Producer price | per kg | 160 | | 319,500 | 120 | | 180,000 | 200 | | 160,000 | 85 | | 850,000 |
| Gross return | | | | 226,417 | | | 116,685 | | | 100,675 | | | 615,456 |
| Net return | | | | | | | | | | | | | |

Table 5.1.4 Economic Crop Budget under the With-Project Condition in Mwega Scheme

| | Unit | Paddy | | | Maize | | | Onion | | | Pulse Crops | | |
|---|---------|------------------|------------|----------------|------------------|------------|---------------|------------------|------------|----------------|------------------|------------|---------------|
| | | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) | Unit Price (TSh) | Qty | Value (TSh) |
| Production Cost | | | | | | | | | | | | | |
| (A) Farm Input | | | | | | | | | | | | | |
| 1 Seed | kg/ha | 120 | 50 | 6,000 | 590 | 20 | 11,800 | 4,000 | 5 | 20,000 | 800 | 20 | 16,000 |
| 2 Fertilizer | kg/ha | 126 | 174 | 21,924 | 126 | 0 | 0 | 126 | 0 | 0 | 126 | 0 | 0 |
| : Urea (46 %-N) | kg/ha | 73 | 0 | 0 | 73 | 142 | 10,366 | 73 | 284 | 20,752 | 73 | 190 | 13,870 |
| : SA (21 %-N) | kg/ha | 114 | 125 | 14,250 | 114 | 100 | 11,400 | 114 | 200 | 22,800 | 114 | 0 | 0 |
| : TSP (46 %-P ₂ O ₅) | kg/ha | | | | | | | | | | | | |
| 3 Agro-chemical | lit./ha | 5,500 | 4 | 22,000 | 5,500 | 4 | 22,000 | 5,500 | 6 | 33,000 | 5,500 | 4 | 22,000 |
| : Pesticide | lit./ha | 3,500 | 2 | 7,000 | 3,500 | 0 | 0 | 3,500 | 0 | 0 | 3,500 | 0 | 0 |
| : Herbicide | lit./ha | 4,000 | 0 | 0 | 4,000 | 0 | 0 | 4,000 | 6 | 24,000 | 4,000 | 0 | 0 |
| : Fungicide | lit./ha | 500 | 67 | 33,500 | 500 | 33 | 16,500 | 500 | 125 | 62,500 | 500 | 17 | 8,500 |
| 4 Packing material | | | | <u>104,674</u> | | <u>145</u> | <u>72,066</u> | | | <u>183,032</u> | | | <u>60,372</u> |
| Sub-total(A) | | | | | | | | | | | | | |
| (B) Labour Requirement | | | | | | | | | | | | | |
| 1 Family labour | | 400 | 150 | 60,000 | 400 | 100 | 40,000 | 400 | 180 | 72,000 | 400 | 100 | 40,000 |
| 2 Hired labour | | 400 | 107 | 42,800 | 400 | 45 | 18,000 | 400 | 177 | 70,800 | 400 | 40 | 16,000 |
| Sub-total(B) | | | <u>257</u> | <u>102,800</u> | | <u>145</u> | <u>58,000</u> | | <u>357</u> | <u>152,800</u> | | <u>140</u> | <u>56,000</u> |
| (C) Machinery or draught cattle | | | | | | | | | | | | | |
| 1 Ploughing by tractor | L.S | 24,000 | 0 | 0 | 24,000 | 0 | 0 | 24,000 | 0 | 0 | 24,000 | 0 | 0 |
| 2 Ploughing by hand tractor | L.S | 20,000 | 0 | 0 | 20,000 | 0 | 0 | 20,000 | 0 | 0 | 20,000 | 0 | 0 |
| 3 Pudding by hand tractor | L.S | 14,000 | 0 | 0 | 14,000 | 0 | 0 | 14,000 | 0 | 0 | 14,000 | 0 | 0 |
| Sub-total(C) | | | | <u>0</u> | | | <u>0</u> | | | <u>0</u> | | | <u>0</u> |
| (D) Miscellaneous cost | | | | | | | | | | | | | |
| 5 % of (A) and (B) | | | | 10,374 | | | 6,503 | | | 16,292 | | | 5,819 |
| Total Production Cost | | | | 217,848 | | | 136,569 | | | 342,124 | | | 122,189 |
| Gross Return | | | | | | | | | | | | | |
| (A) Yield | kg/ha | | 5,000 | 798,750 | | 3,000 | 360,000 | | 15,000 | 1,275,000 | | 1,500 | 300,000 |
| (B) Producer price | per kg | 160 | | | 120 | | | 85 | | | 200 | | |
| Gross return | | | | 580,902 | | | 223,431 | | | 932,876 | | | 177,811 |
| 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 | |
| Add: freight | | 25.00 | |
| insurance (1.5%) | | 4.18 | |
| C.I.F. Price | per ton | 308.08 | |
| Add: wharfage (1.5%) | " | 4.62 | |
| clearing charges (2%) | " | 6.16 | |
| handling | " | 4.00 | |
| Landed Price | " | 322.87 | 200177.18 |
| Add: transport to main market in Dar-es-Salaam | " | | 2000.00 |
| financial charges (3%-one-month) | " | | 6005.32 |
| Wholesale Price | " | | 208182.50 |
| | per kg. | | 208.18 |
| Add: 30% adjustment for quality (2) | | | 270.64 |
| Deduct: milling | | | |
| 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 | |
| cleaning 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 | per kg. | | 116.81 | | 105.27 | | 64.78 |
| losses/rebagging (2%) | | | 6.00 | | 6.00 | | 6.00 |
| local handling/storage | | | 2.34 | | 2.11 | | 1.30 |
| 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 | | Onion | |
|--|------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| | | Economic Price | Financial Price | Economic Price | Financial Price | Economic Price | Financial Price | Economic Price | Financial Price |
| (A) Farm Input | | | | | | | | | |
| 1) Seed | kg. | 120 | 120 | 590 | 590 | 800 | 800 | 4000 | 4000 |
| 2) Fertilizer | | | | | | | | | |
| Urea | kg. | 126 | 240 | 126 | 240 | 126 | 240 | 126 | 240 |
| SA | kg. | 73 | 180 | 73 | 180 | 73 | 180 | 73 | 180 |
| TSP | kg. | 114 | 220 | 114 | 220 | 114 | 220 | 114 | 220 |
| 3) Agro-chemical | | | | | | | | | |
| Pesticide | lit. | 5500 | 5500 | 5500 | 5500 | 5500 | 5500 | 5500 | 5500 |
| Herbicide | lit. | 3500 | 3500 | 3500 | 3500 | 3500 | 3500 | 3500 | 3500 |
| Fungicide | lit. | 4000 | 4000 | 4000 | 4000 | 4000 | 4000 | 4000 | 4000 |
| 4) Packing Material | | | | | | | | | |
| | | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| (B) Labour Requirement | | | | | | | | | |
| 1) Family Labour | day | 400 | 0 | 400 | 0 | 400 | 0 | 400 | 0 |
| 2) Hired labour | day | 400 | 500 | 400 | 500 | 400 | 500 | 400 | 500 |
| (C) Machinery or draught cattle | | | | | | | | | |
| 1) Ploughing by tractor | L.S | 24000 | 30000 | 24000 | 30000 | 24000 | 30000 | 24000 | 30000 |
| 2) Ploughing by hand tractor | L.S | 20000 | 25000 | 20000 | 25000 | 20000 | 25000 | 20000 | 25000 |
| 3) Puddling by hand tractor | L.S | 14000 | 17500 | 14000 | 17500 | 14000 | 17500 | 14000 | 17500 |
| (D) Crop Price | | | | | | | | | |
| | | 159.75 | 160 | 120 | 120 | 200 | 200 | 85 | 85 |

Table 5.1.7 Calculation of Economic Net Benefit for Mgwega 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 | 320 | 0.12 | 37.34 | 420 | 0.22 | 93.84 | 56.50 |
| Paddy | 210 | 0.23 | 47.55 | 222 | 0.58 | 128.96 | 81.41 |
| Pulse | 130 | 0.10 | 13.09 | 74 | 0.18 | 13.16 | 0.07 |
| Onion | 182 | 0.62 | 112.01 | 444 | 0.93 | 414.20 | 302.18 |
| TOTAL | | | | | | | 440.17 |

Table 5.1.8 Estimation of Costs for Economic Evaluation (Mwega)

(Unit : Million TSh)

| | |
|--|-----------------|
| Direct construction cost | 1,776.54 |
| - Road an Bridge Const. Cost Share for Chabi | 29.77 |
| Net Direct Construction Cost | 1,746.77 |
| Preparatory works | 87.34 |
| O&M facilities and equipment | 38.96 |
| Administration cost | 8.92 |
| Engineering services | 516.18 |
| Total | 2,398.17 |

Table 5.1.9 EIRR Estimation for Mwega Scheme

(Unit : Million TSh)

| Year | Construction Cost | O/M Cost | Benefit | Net Benefit |
|------|-------------------|----------|---------|-------------|
| 1 | 171.34 | | | -171.34 |
| 2 | 1427.84 | | | -1427.84 |
| 3 | 791.69 | 8.73 | 110.04 | -690.39 |
| 4 | 7.29 | 8.73 | 220.09 | 204.06 |
| 5 | | 8.73 | 330.13 | 321.39 |
| 6 | | 8.73 | 440.17 | 431.44 |
| 7 | | 8.73 | 440.17 | 431.44 |
| 8 | | 8.73 | 440.17 | 431.44 |
| 9 | | 8.73 | 440.17 | 431.44 |
| 10 | | 8.73 | 440.17 | 431.44 |
| 11 | | 8.73 | 440.17 | 431.44 |
| 12 | | 8.73 | 440.17 | 431.44 |
| 13 | | 8.73 | 440.17 | 431.44 |
| 14 | | 8.73 | 440.17 | 431.44 |
| 15 | | 8.73 | 440.17 | 431.44 |
| 16 | | 8.73 | 440.17 | 431.44 |
| 17 | | 8.73 | 440.17 | 431.44 |
| 18 | | 8.73 | 440.17 | 431.44 |
| 19 | | 8.73 | 440.17 | 431.44 |
| 20 | | 8.73 | 440.17 | 431.44 |
| 21 | | 8.73 | 440.17 | 431.44 |
| 22 | | 8.73 | 440.17 | 431.44 |
| 23 | | 8.73 | 440.17 | 431.44 |
| 24 | | 8.73 | 440.17 | 431.44 |
| 25 | | 8.73 | 440.17 | 431.44 |
| 26 | | 8.73 | 440.17 | 431.44 |
| 27 | | 8.73 | 440.17 | 431.44 |
| 28 | | 8.73 | 440.17 | 431.44 |
| 29 | | 8.73 | 440.17 | 431.44 |
| 30 | | 8.73 | 440.17 | 431.44 |
| 31 | | 8.73 | 440.17 | 431.44 |
| 32 | | 8.73 | 440.17 | 431.44 |
| 33 | | 8.73 | 440.17 | 431.44 |
| 34 | | 8.73 | 440.17 | 431.44 |
| 35 | | 8.73 | 440.17 | 431.44 |
| 36 | | 8.73 | 440.17 | 431.44 |
| 37 | | 8.73 | 440.17 | 431.44 |
| 38 | | 8.73 | 440.17 | 431.44 |
| 39 | | 8.73 | 440.17 | 431.44 |
| 40 | | 8.73 | 440.17 | 431.44 |
| 41 | | 8.73 | 440.17 | 431.44 |
| 42 | | 8.73 | 440.17 | 431.44 |
| 43 | | 8.73 | 440.17 | 431.44 |
| 44 | | 8.73 | 440.17 | 431.44 |
| 45 | | 8.73 | 440.17 | 431.44 |
| 46 | | 8.73 | 440.17 | 431.44 |
| 47 | | 8.73 | 440.17 | 431.44 |
| 48 | | 8.73 | 440.17 | 431.44 |
| 49 | | 8.73 | 440.17 | 431.44 |
| 50 | | 8.73 | 440.17 | 431.44 |
| | | | EIRR | 15.2% |

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

| Year | Construction Cost | O/M Cost | Benefit | Net Benefit |
|------|-------------------|----------|---------|-------------|
| 1 | 217.60 | | | -217.60 |
| 2 | 1813.36 | | | -1813.36 |
| 3 | 1005.45 | 11.18 | 110.04 | -906.58 |
| 4 | 9.26 | 11.18 | 230.09 | 199.65 |
| 5 | | 11.18 | 370.13 | 318.95 |
| 6 | | 11.18 | 440.17 | 428.99 |
| 7 | | 11.18 | 440.17 | 428.99 |
| 8 | | 11.18 | 440.17 | 428.99 |
| 9 | | 11.18 | 440.17 | 428.99 |
| 10 | | 11.18 | 440.17 | 428.99 |
| 11 | | 11.18 | 440.17 | 428.99 |
| 12 | | 11.18 | 440.17 | 428.99 |
| 13 | | 11.18 | 440.17 | 428.99 |
| 14 | | 11.18 | 440.17 | 428.99 |
| 15 | | 11.18 | 440.17 | 428.99 |
| 16 | | 11.18 | 440.17 | 428.99 |
| 17 | | 11.18 | 440.17 | 428.99 |
| 18 | | 11.18 | 440.17 | 428.99 |
| 19 | | 11.18 | 440.17 | 428.99 |
| 20 | | 11.18 | 440.17 | 428.99 |
| 21 | | 11.18 | 440.17 | 428.99 |
| 22 | | 11.18 | 440.17 | 428.99 |
| 23 | | 11.18 | 440.17 | 428.99 |
| 24 | | 11.18 | 440.17 | 428.99 |
| 25 | | 11.18 | 440.17 | 428.99 |
| 26 | | 11.18 | 440.17 | 428.99 |
| 27 | | 11.18 | 440.17 | 428.99 |
| 28 | | 11.18 | 440.17 | 428.99 |
| 29 | | 11.18 | 440.17 | 428.99 |
| 30 | | 11.18 | 440.17 | 428.99 |
| 31 | | 11.18 | 440.17 | 428.99 |
| 32 | | 11.18 | 440.17 | 428.99 |
| 33 | | 11.18 | 440.17 | 428.99 |
| 34 | | 11.18 | 440.17 | 428.99 |
| 35 | | 11.18 | 440.17 | 428.99 |
| 36 | | 11.18 | 440.17 | 428.99 |
| 37 | | 11.18 | 440.17 | 428.99 |
| 38 | | 11.18 | 440.17 | 428.99 |
| 39 | | 11.18 | 440.17 | 428.99 |
| 40 | | 11.18 | 440.17 | 428.99 |
| 41 | | 11.18 | 440.17 | 428.99 |
| 42 | | 11.18 | 440.17 | 428.99 |
| 43 | | 11.18 | 440.17 | 428.99 |
| 44 | | 11.18 | 440.17 | 428.99 |
| 45 | | 11.18 | 440.17 | 428.99 |
| 46 | | 11.18 | 440.17 | 428.99 |
| 47 | | 11.18 | 440.17 | 428.99 |
| 48 | | 11.18 | 440.17 | 428.99 |
| 49 | | 11.18 | 440.17 | 428.99 |
| 50 | | 11.18 | 440.17 | 428.99 |
| | | | EIRR | 12.2% |

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

| Year | Construction Cost | O/M Cost | Benefit | Net Benefit |
|------|-------------------|----------|---------|-------------|
| 1 | 171.34 | | | -171.34 |
| 2 | 1427.84 | | | -1427.84 |
| 3 | 791.69 | 8.73 | 99.04 | -701.39 |
| 4 | 7.23 | 8.73 | 198.08 | 182.05 |
| 5 | | 8.73 | 297.11 | 286.38 |
| 6 | | 8.73 | 396.15 | 387.42 |
| 7 | | 8.73 | 396.15 | 387.42 |
| 8 | | 8.73 | 396.15 | 387.42 |
| 9 | | 8.73 | 396.15 | 387.42 |
| 10 | | 8.73 | 396.15 | 387.42 |
| 11 | | 8.73 | 396.15 | 387.42 |
| 12 | | 8.73 | 396.15 | 387.42 |
| 13 | | 8.73 | 396.15 | 387.42 |
| 14 | | 8.73 | 396.15 | 387.42 |
| 15 | | 8.73 | 396.15 | 387.42 |
| 16 | | 8.73 | 396.15 | 387.42 |
| 17 | | 8.73 | 396.15 | 387.42 |
| 18 | | 8.73 | 396.15 | 387.42 |
| 19 | | 8.73 | 396.15 | 387.42 |
| 20 | | 8.73 | 396.15 | 387.42 |
| 21 | | 8.73 | 396.15 | 387.42 |
| 22 | | 8.73 | 396.15 | 387.42 |
| 23 | | 8.73 | 396.15 | 387.42 |
| 24 | | 8.73 | 396.15 | 387.42 |
| 25 | | 8.73 | 396.15 | 387.42 |
| 26 | | 8.73 | 396.15 | 387.42 |
| 27 | | 8.73 | 396.15 | 387.42 |
| 28 | | 8.73 | 396.15 | 387.42 |
| 29 | | 8.73 | 396.15 | 387.42 |
| 30 | | 8.73 | 396.15 | 387.42 |
| 31 | | 8.73 | 396.15 | 387.42 |
| 32 | | 8.73 | 396.15 | 387.42 |
| 33 | | 8.73 | 396.15 | 387.42 |
| 34 | | 8.73 | 396.15 | 387.42 |
| 35 | | 8.73 | 396.15 | 387.42 |
| 36 | | 8.73 | 396.15 | 387.42 |
| 37 | | 8.73 | 396.15 | 387.42 |
| 38 | | 8.73 | 396.15 | 387.42 |
| 39 | | 8.73 | 396.15 | 387.42 |
| 40 | | 8.73 | 396.15 | 387.42 |
| 41 | | 8.73 | 396.15 | 387.42 |
| 42 | | 8.73 | 396.15 | 387.42 |
| 43 | | 8.73 | 396.15 | 387.42 |
| 44 | | 8.73 | 396.15 | 387.42 |
| 45 | | 8.73 | 396.15 | 387.42 |
| 46 | | 8.73 | 396.15 | 387.42 |
| 47 | | 8.73 | 396.15 | 387.42 |
| 48 | | 8.73 | 396.15 | 387.42 |
| 49 | | 8.73 | 396.15 | 387.42 |
| 50 | | 8.73 | 396.15 | 387.42 |
| | | | EIRR | 13.8% |

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

| Year | Construction Cost | O/M Cost | Benefit | Net Benefit |
|------|-------------------|----------|---------|-------------|
| 1 | 217.60 | | | -217.60 |
| 2 | 1813.36 | | | -1813.36 |
| 3 | 1005.45 | 11.18 | 99.04 | -917.59 |
| 4 | 9.26 | 11.18 | 198.08 | 177.64 |
| 5 | | 11.18 | 297.11 | 285.94 |
| 6 | | 11.18 | 396.15 | 384.98 |
| 7 | | 11.18 | 396.15 | 384.98 |
| 8 | | 11.18 | 396.15 | 384.98 |
| 9 | | 11.18 | 396.15 | 384.98 |
| 10 | | 11.18 | 396.15 | 384.98 |
| 11 | | 11.18 | 396.15 | 384.98 |
| 12 | | 11.18 | 396.15 | 384.98 |
| 13 | | 11.18 | 396.15 | 384.98 |
| 14 | | 11.18 | 396.15 | 384.98 |
| 15 | | 11.18 | 396.15 | 384.98 |
| 16 | | 11.18 | 396.15 | 384.98 |
| 17 | | 11.18 | 396.15 | 384.98 |
| 18 | | 11.18 | 396.15 | 384.98 |
| 19 | | 11.18 | 396.15 | 384.98 |
| 20 | | 11.18 | 396.15 | 384.98 |
| 21 | | 11.18 | 396.15 | 384.98 |
| 22 | | 11.18 | 396.15 | 384.98 |
| 23 | | 11.18 | 396.15 | 384.98 |
| 24 | | 11.18 | 396.15 | 384.98 |
| 25 | | 11.18 | 396.15 | 384.98 |
| 26 | | 11.18 | 396.15 | 384.98 |
| 27 | | 11.18 | 396.15 | 384.98 |
| 28 | | 11.18 | 396.15 | 384.98 |
| 29 | | 11.18 | 396.15 | 384.98 |
| 30 | | 11.18 | 396.15 | 384.98 |
| 31 | | 11.18 | 396.15 | 384.98 |
| 32 | | 11.18 | 396.15 | 384.98 |
| 33 | | 11.18 | 396.15 | 384.98 |
| 34 | | 11.18 | 396.15 | 384.98 |
| 35 | | 11.18 | 396.15 | 384.98 |
| 36 | | 11.18 | 396.15 | 384.98 |
| 37 | | 11.18 | 396.15 | 384.98 |
| 38 | | 11.18 | 396.15 | 384.98 |
| 39 | | 11.18 | 396.15 | 384.98 |
| 40 | | 11.18 | 396.15 | 384.98 |
| 41 | | 11.18 | 396.15 | 384.98 |
| 42 | | 11.18 | 396.15 | 384.98 |
| 43 | | 11.18 | 396.15 | 384.98 |
| 44 | | 11.18 | 396.15 | 384.98 |
| 45 | | 11.18 | 396.15 | 384.98 |
| 46 | | 11.18 | 396.15 | 384.98 |
| 47 | | 11.18 | 396.15 | 384.98 |
| 48 | | 11.18 | 396.15 | 384.98 |
| 49 | | 11.18 | 396.15 | 384.98 |
| 50 | | 11.18 | 396.15 | 384.98 |
| | | | EIRR | 11.0% |

Table 5.1.11 Calculation of Financial Net Benefit for Mwega 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 | 320 | 0.14 | 45.7392 | 420 | 0.23 | 98.12124 | 52.38 |
| Paddy | 210 | 0.26 | 54.24552 | 222 | 0.60 | 133.017294 | 78.77 |
| Pulse | 130 | 0.12 | 15.95425 | 74 | 0.19 | 14.37561 | -1.58 |
| Onion | 182 | 0.61 | 116.00225 | 444 | 0.94 | 415.461456 | 299.46 |
| TOTAL | | | | | | | 429.03 |

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

| | |
|---|-----------------|
| Direct construction cost | 2,220.68 |
| - Road and Bridge Const. Cost Share for Chabi | 37.22 |
| Net Direct Construction Cost | 2,183.46 |
| Preparatory works | 109.17 |
| O&M facilities and equipment | 48.70 |
| Administration cost | 11.15 |
| Engineering services | 516.00 |
| Total | 2,868.49 |

Table 5.1.13 FIRR Estimation for Mwega Scheme

(Unit : Million TSh)

| Year | Construction Cost | O/M Cost | Benefit | Net Benefit |
|------|-------------------|----------|---------|-------------|
| 1 | 204.94 | | | -204.94 |
| 2 | 1707.87 | | | -1707.87 |
| 3 | 946.96 | 10.92 | 107.26 | -850.62 |
| 4 | 8.72 | 10.92 | 214.52 | 194.88 |
| 5 | | 10.92 | 321.77 | 310.86 |
| 6 | | 10.92 | 429.03 | 418.11 |
| 7 | | 10.92 | 429.03 | 418.11 |
| 8 | | 10.92 | 429.03 | 418.11 |
| 9 | | 10.92 | 429.03 | 418.11 |
| 10 | | 10.92 | 429.03 | 418.11 |
| 11 | | 10.92 | 429.03 | 418.11 |
| 12 | | 10.92 | 429.03 | 418.11 |
| 13 | | 10.92 | 429.03 | 418.11 |
| 14 | | 10.92 | 429.03 | 418.11 |
| 15 | | 10.92 | 429.03 | 418.11 |
| 16 | | 10.92 | 429.03 | 418.11 |
| 17 | | 10.92 | 429.03 | 418.11 |
| 18 | | 10.92 | 429.03 | 418.11 |
| 19 | | 10.92 | 429.03 | 418.11 |
| 20 | | 10.92 | 429.03 | 418.11 |
| 21 | | 10.92 | 429.03 | 418.11 |
| 22 | | 10.92 | 429.03 | 418.11 |
| 23 | | 10.92 | 429.03 | 418.11 |
| 24 | | 10.92 | 429.03 | 418.11 |
| 25 | | 10.92 | 429.03 | 418.11 |
| 26 | | 10.92 | 429.03 | 418.11 |
| 27 | | 10.92 | 429.03 | 418.11 |
| 28 | | 10.92 | 429.03 | 418.11 |
| 29 | | 10.92 | 429.03 | 418.11 |
| 30 | | 10.92 | 429.03 | 418.11 |
| 31 | | 10.92 | 429.03 | 418.11 |
| 32 | | 10.92 | 429.03 | 418.11 |
| 33 | | 10.92 | 429.03 | 418.11 |
| 34 | | 10.92 | 429.03 | 418.11 |
| 35 | | 10.92 | 429.03 | 418.11 |
| 36 | | 10.92 | 429.03 | 418.11 |
| 37 | | 10.92 | 429.03 | 418.11 |
| 38 | | 10.92 | 429.03 | 418.11 |
| 39 | | 10.92 | 429.03 | 418.11 |
| 40 | | 10.92 | 429.03 | 418.11 |
| 41 | | 10.92 | 429.03 | 418.11 |
| 42 | | 10.92 | 429.03 | 418.11 |
| 43 | | 10.92 | 429.03 | 418.11 |
| 44 | | 10.92 | 429.03 | 418.11 |
| 45 | | 10.92 | 429.03 | 418.11 |
| 46 | | 10.92 | 429.03 | 418.11 |
| 47 | | 10.92 | 429.03 | 418.11 |
| 48 | | 10.92 | 429.03 | 418.11 |
| 49 | | 10.92 | 429.03 | 418.11 |
| 50 | | 10.92 | 429.03 | 418.11 |
| | | | FIRR | 12.6% |

Table 5.1.14 Capacity-to-Pay Analysis for Mwega Scheme

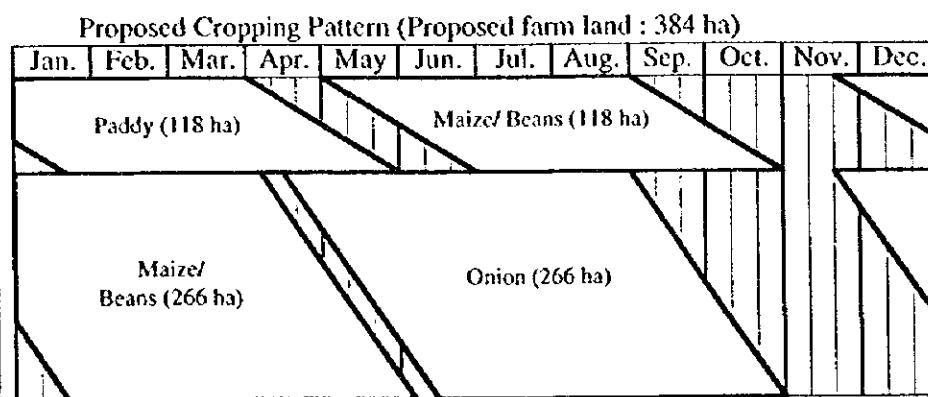
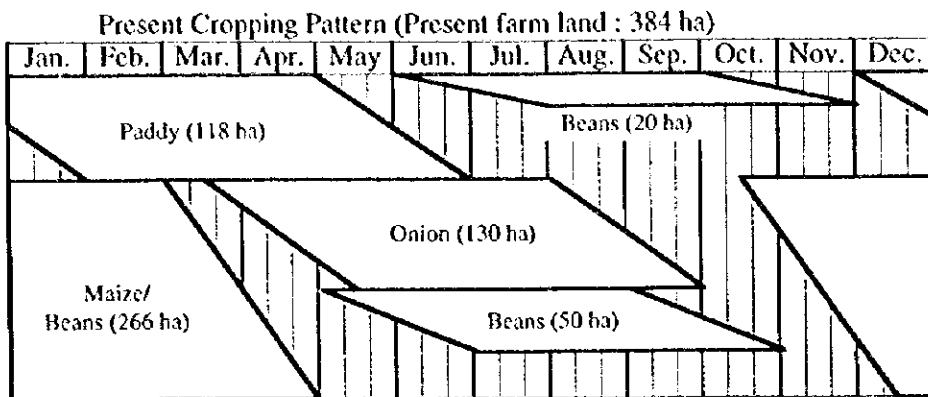
(unit : 1,000 TSh)

| | Holding Size (ha) | Total Harvested Area (ha) | Farm Income | Production Cost | Net Farm Income | Income Tax | O/M Costs | Amotization Cost | Net Profit |
|----------------|-------------------|---------------------------|-------------|-----------------|-----------------|------------|-----------|------------------|------------|
| Mwega Scheme | | | | | | | | | |
| Irrigated Area | 0.79 | | | | | | | | |
| Crops | | | | | | | | | |
| Paddy | | 0.24 | 192 | 48 | | | | | |
| Maize | | 0.79 | 284 | 100 | | | | | |
| Onion | | 0.55 | 701 | 186 | | | | | |
| Total | | | 1178 | 334 | 844 | 12 | 15 | 188 | 629 |

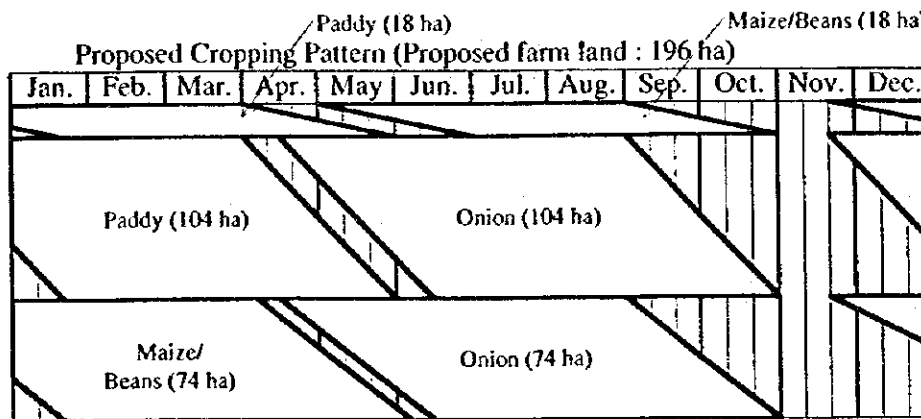
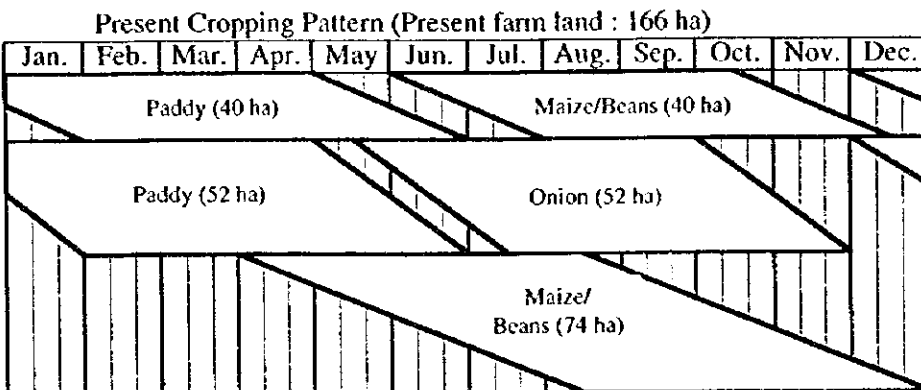
FIGURES

Figure 1.3.1 Present and Proposed Cropping Pattern in the Mwega Scheme

Malolo Area



Nyinga and Mgogozi-Mwega Area



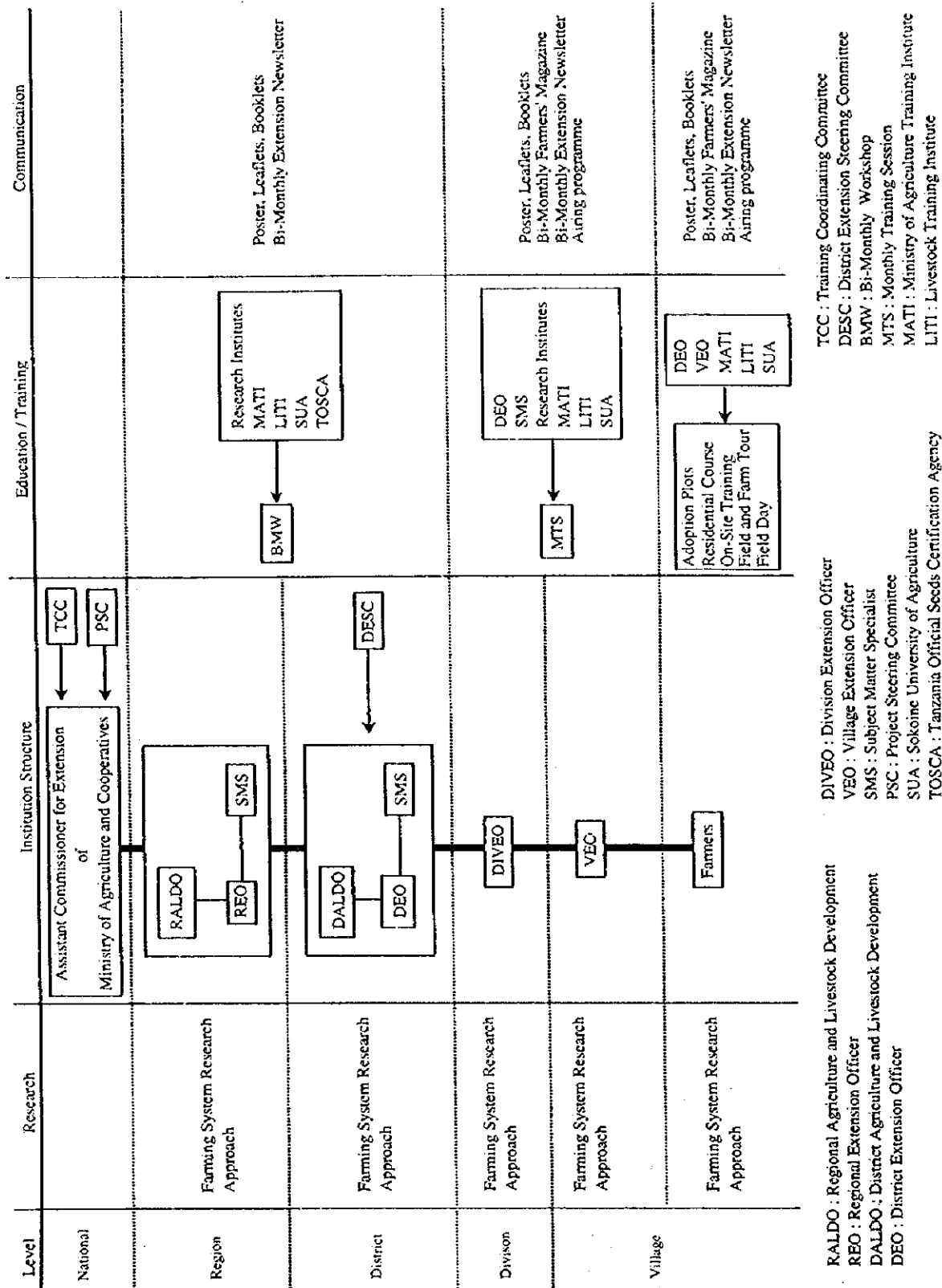


Figure 1.3.2 Prevailing Structure of Extension Services under NAEP II

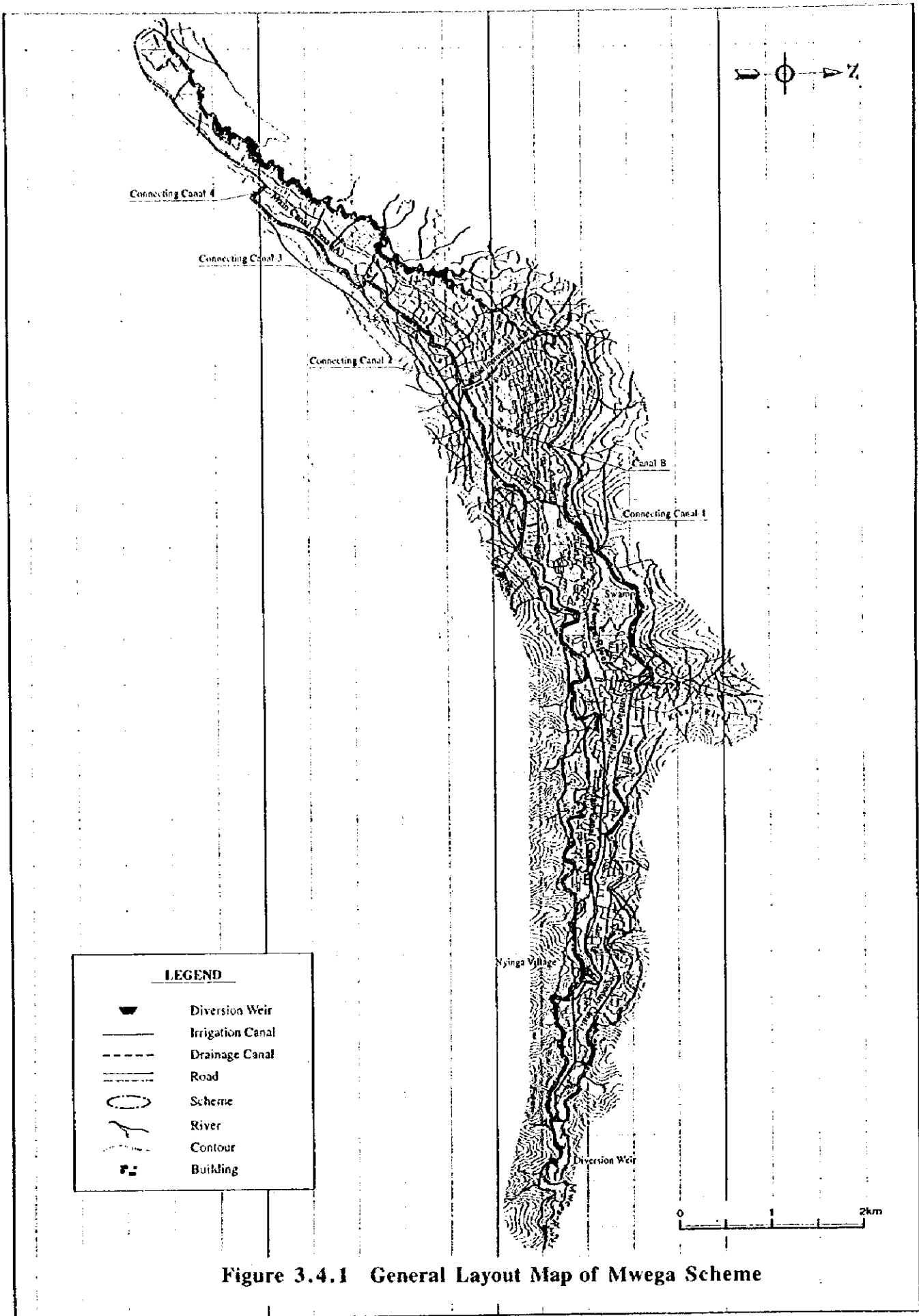


Figure 3.4.1 General Layout Map of Mwega Scheme

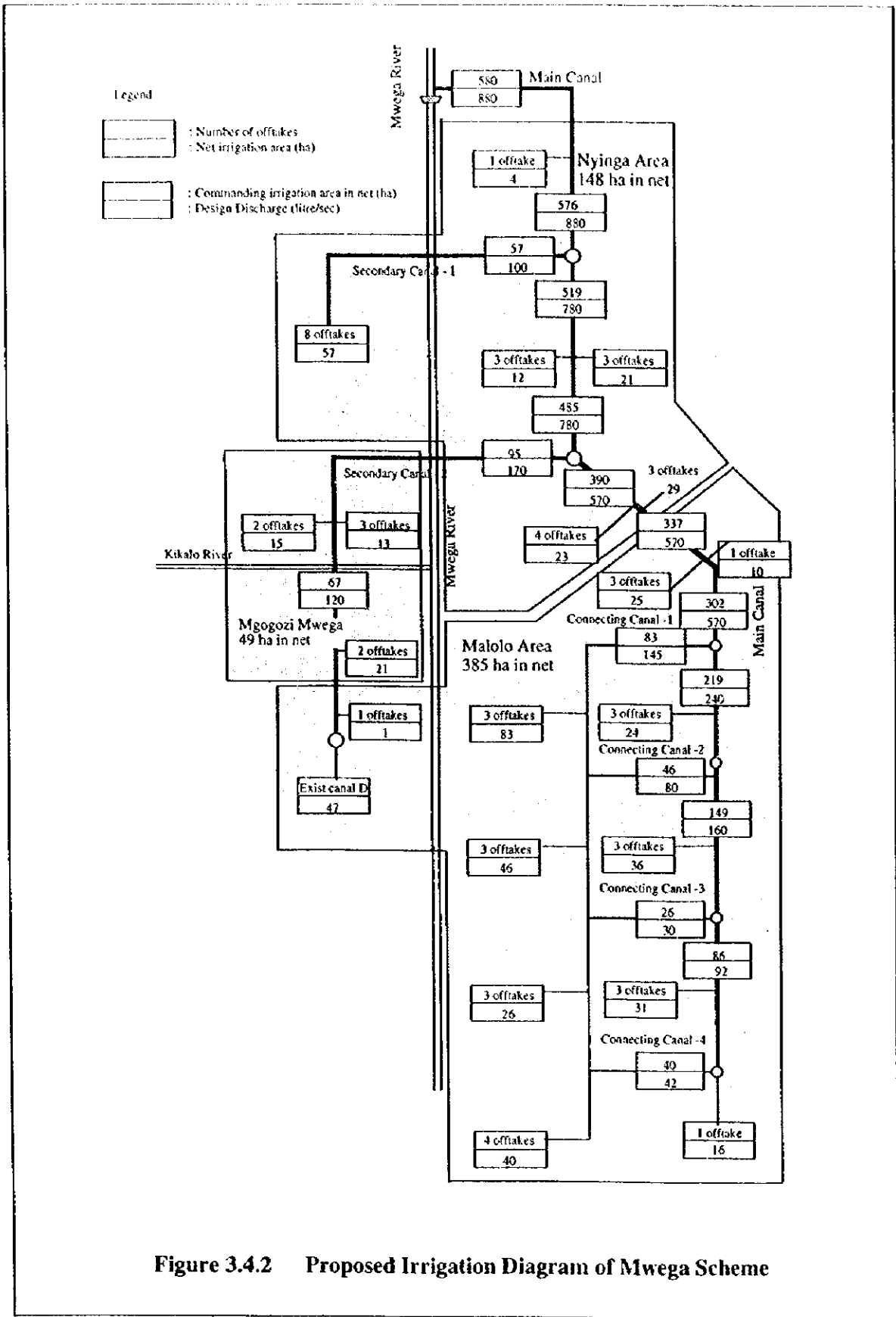


Figure 3.4.2 Proposed Irrigation Diagram of Mwega Scheme

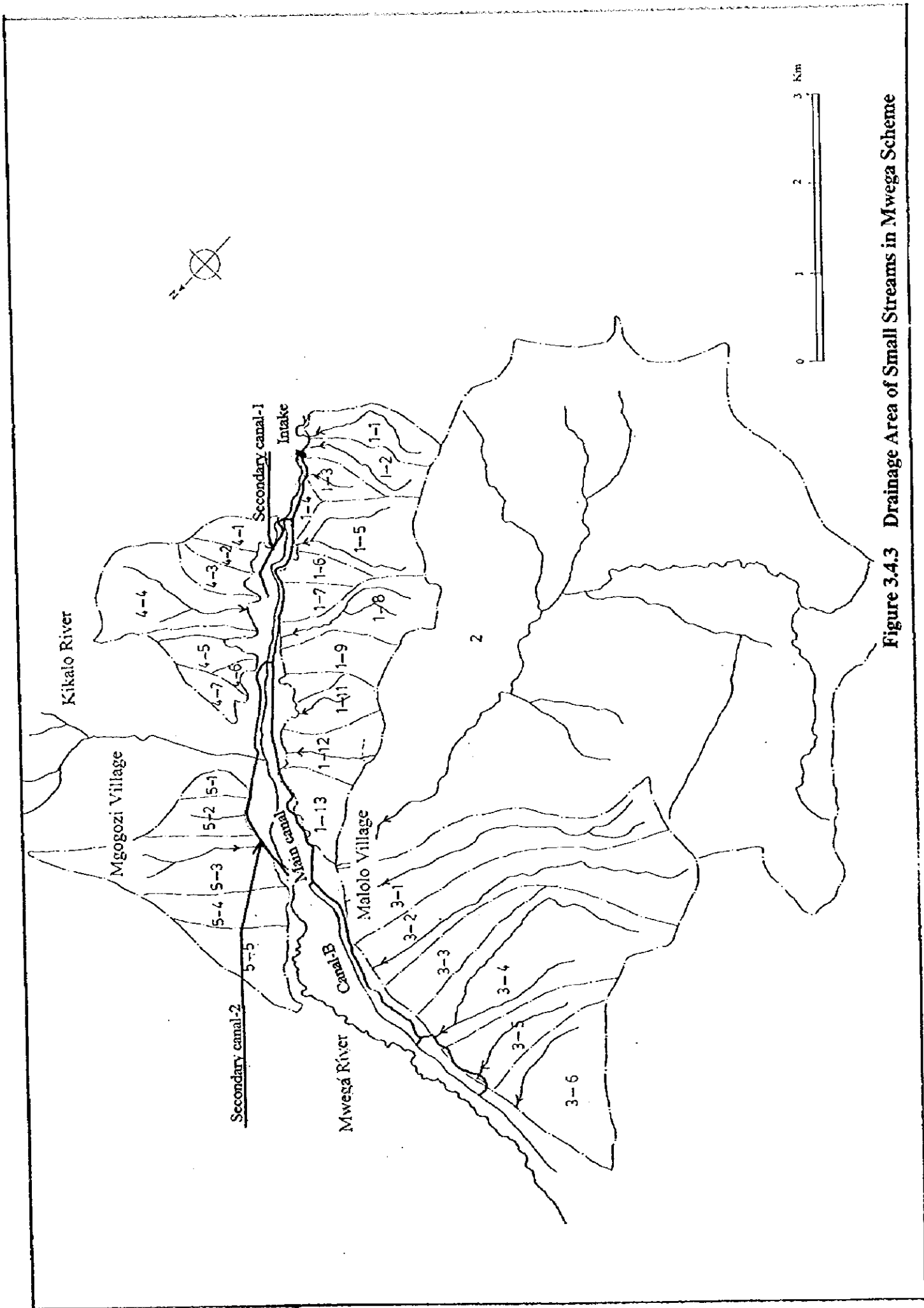


Figure 3.4.3 Drainage Area of Small Streams in Mwega Scheme

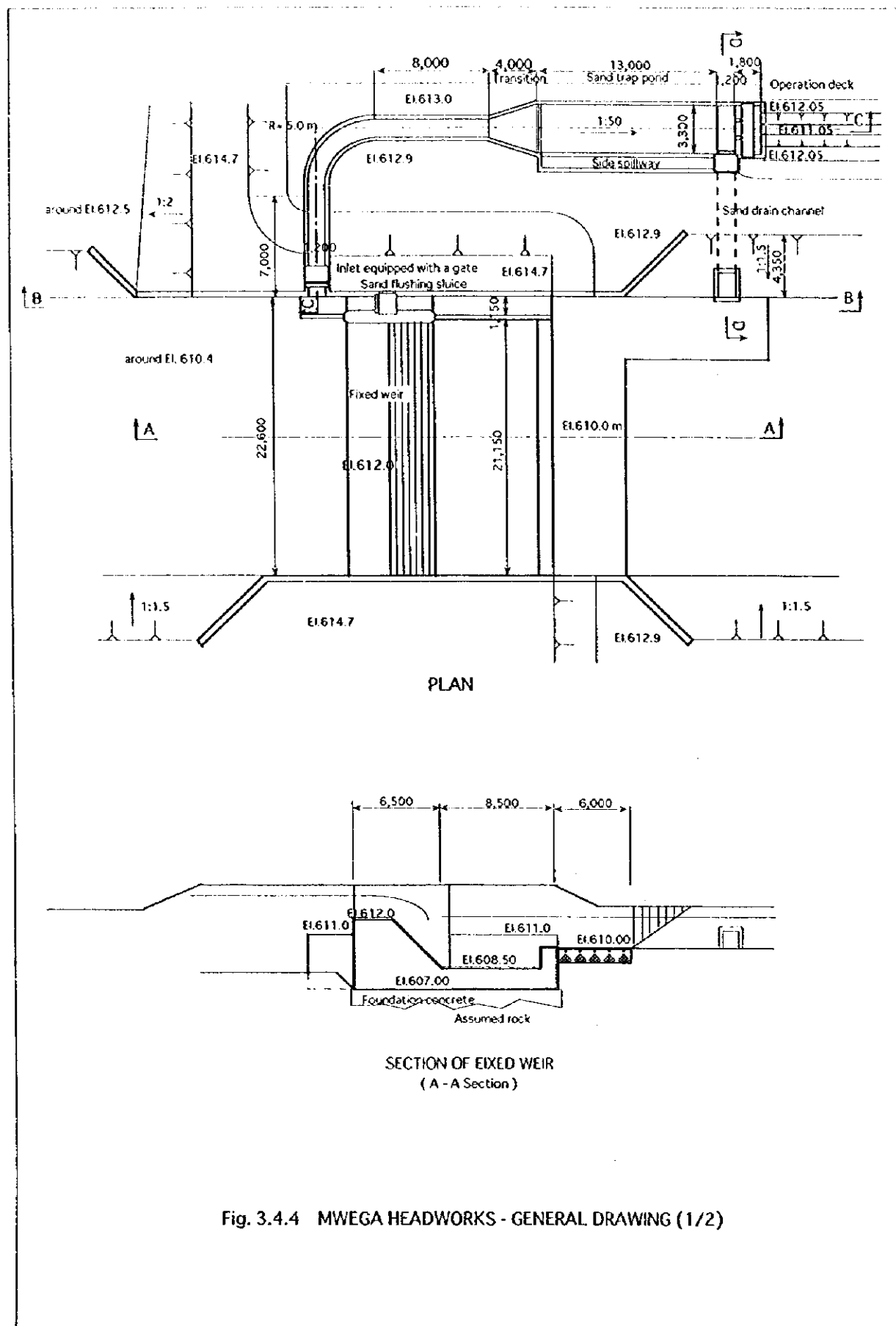
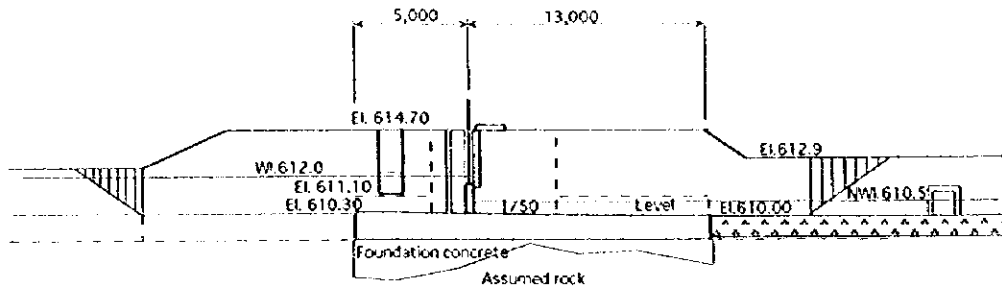
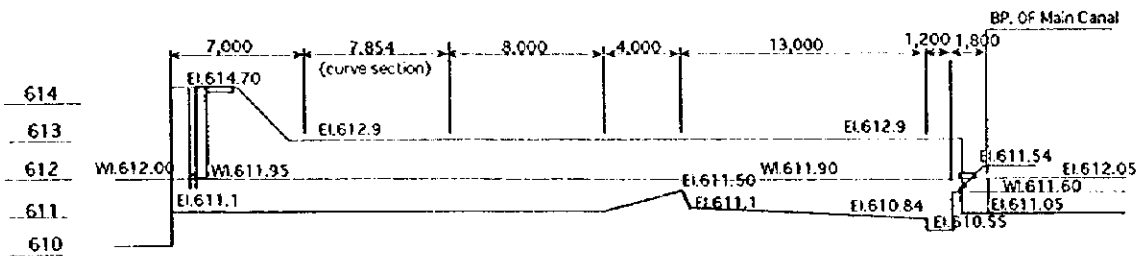


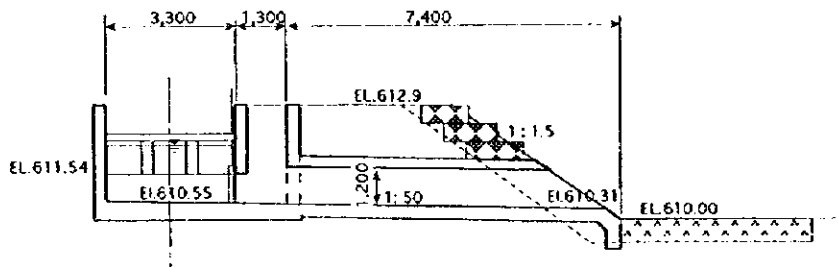
Fig. 3.4.4 MWEGA HEADWORKS - GENERAL DRAWING (1/2)



SECTION OF SAND FLUSHING SLUICE
(B - B Section)

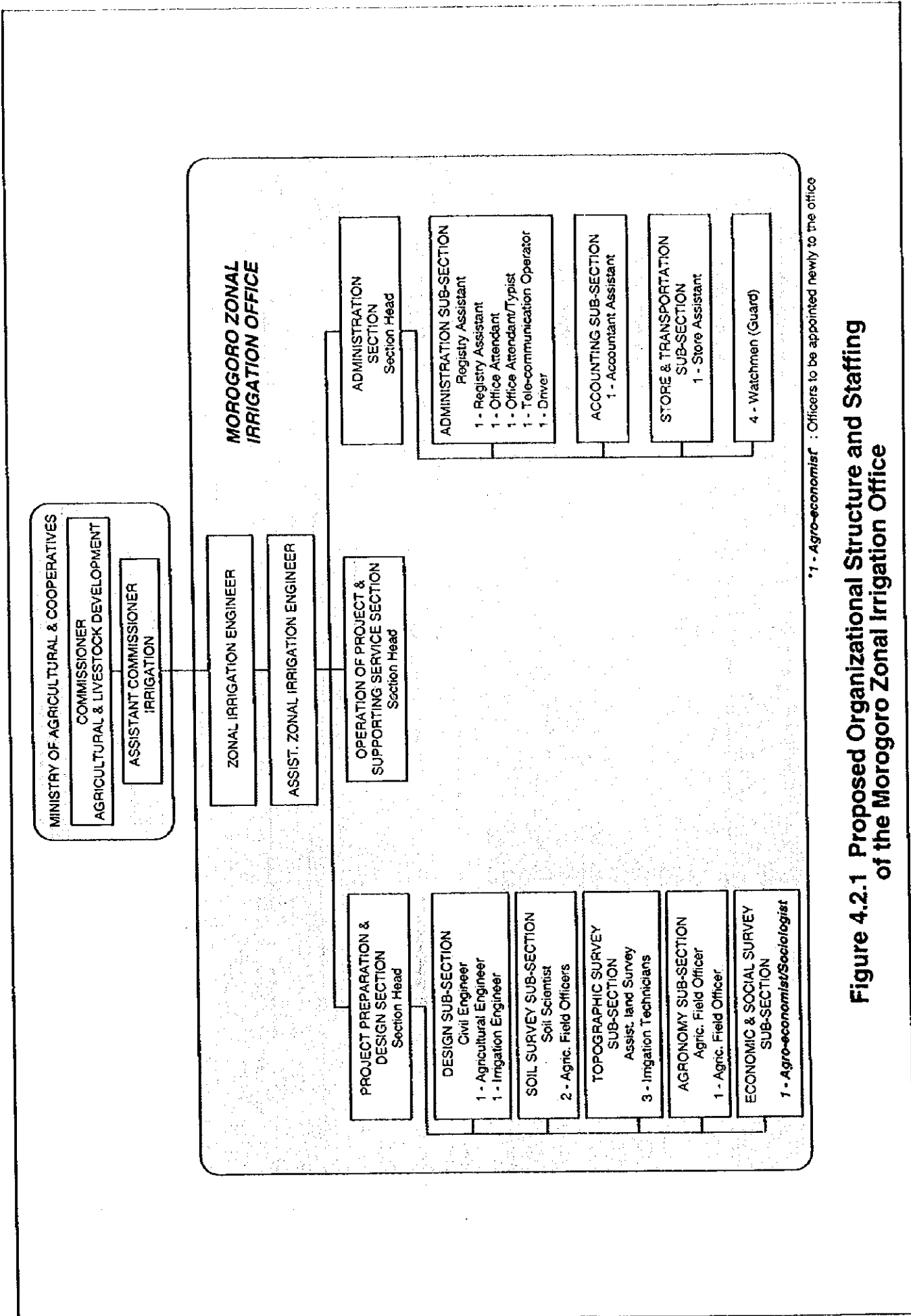


PROFILE OF INTAKE STRUCTURE (INLET TO MAIN CANAL)
(C - C Section)



PROFILE OF SAND FLUSHING CHANNEL FROM SAND TRAP POND
(D - D Section)

Fig. 3.4.4 MWEGA HEADWORKS - GENERAL DRAWING (2/2)



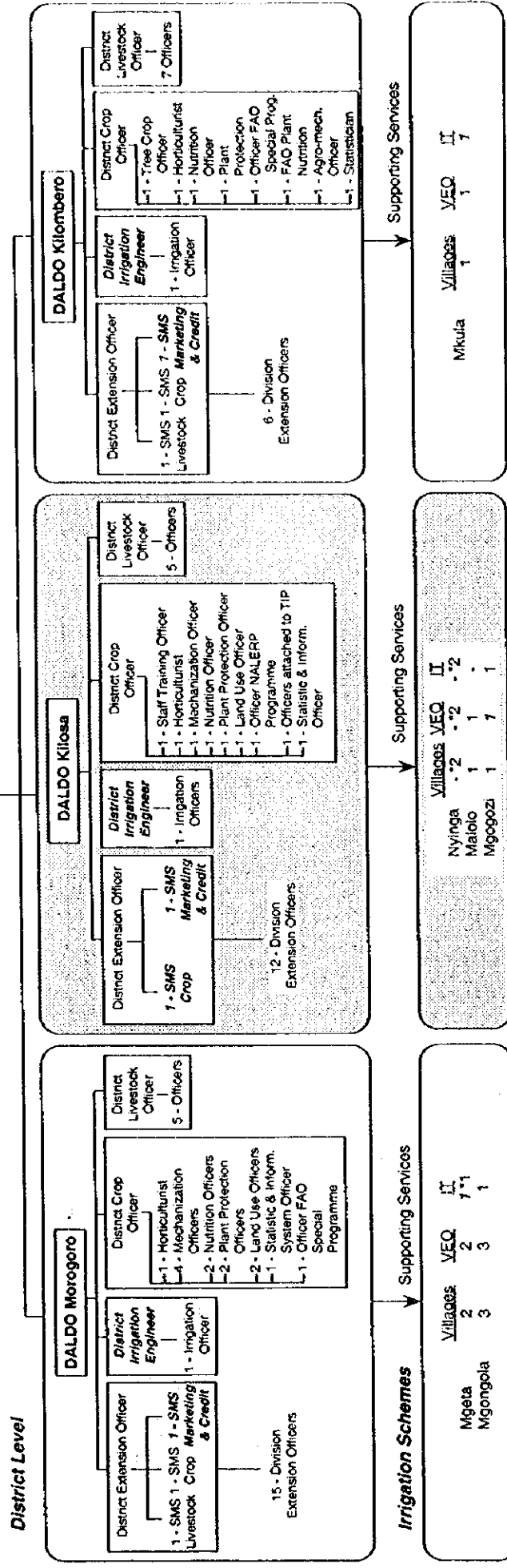
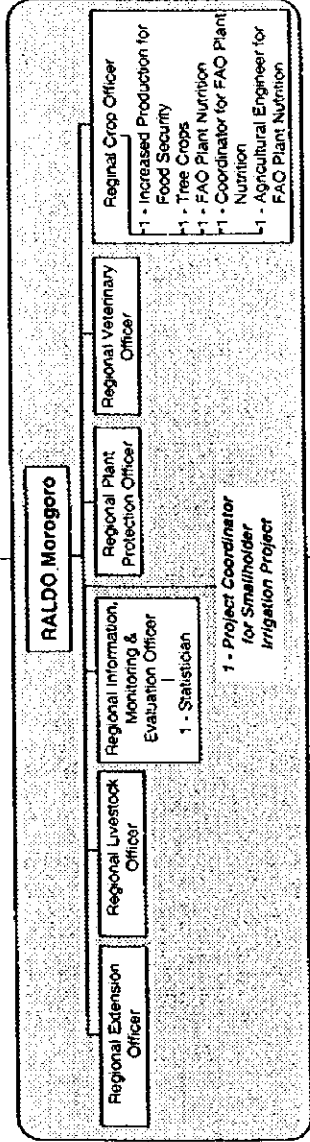
*1 - Agro-economist : Officers to be appointed newly to the office

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 - Mwega 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 | <p>1. Preparatory Works by the Executing Agency</p> <p>2. Project Implementation</p> | | | | | | | | | | | | | | | | <p>- The project covers two villages (Malolo and Mgozoi) and 8 existing WUGs. The public meeting is held at the project site. To all farmers, the Zonal Irrigation Office (ZIO) should explain all of development plan, implementation schedule and villagers' duties for project implementation.</p> <p>- ZIO and village governments have to exchange an agreement document for the plan and farmers' duties, after the village's general meeting.</p> |
| Ward and Village Governments | <p>1. Preparatory Works by the Ward and Village Governments</p> <p>- General meeting</p> <p>- Establishment of ad hoc committee of WUG</p> <p>2. Ad hoc Committee of WUG</p> <p>a) Confirmation of project boundary, tenure and beneficiaries</p> <p>b) Land acquisition of right of way</p> <p>c) Management of farmers' participation to construction works</p> <p>d) Preparatory works for establishment of WUG</p> | | | | | | | | | | | | | | | | <p>- After the public meeting, the village governments hold the general meeting and discuss with villagers for the following matters: i) development plan, ii) land acquisition, and iii) establishment of WUG. The ward government coordinates 2 villages. All members of existing WUGs should attend to the general meeting.</p> <p>- Then the ward government establishes an ad hoc committee of WUG for those implementation.</p> <p>- The committee consists of leaders of ward, village governments and existing WUGs.</p> <p>- The committee confirms project boundary, land tenure of right of way, and number of beneficiaries. In addition, the committee prepares member list.</p> <p>- The committee implements land acquisition of right of way.</p> <p>- 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.</p> |
| Water Users' Group | <p>a) First general meeting and establishment of WUG</p> <p>b) Management of farmers' participation to construction works</p> <p>c) O&M and agricultural supporting services</p> <p>d) Registration of WUG and water right (Closing existing WUGs)</p> | | | | | | | | | | | | | | | | <p>- 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.</p> <p>- At this general meeting, the articles and by-laws and yearly budget are decided by the members, and the leaders prepare minutes of meeting.</p> <p>- The existing WUGs are closed after the establishment of new WUG.</p> |
| District/Ward Governments | <p>1. Ward Councilor</p> <p>2. DALDO</p> <p>a) Supporting activities</p> <p>b) Training programme for O&M and WUG' management</p> <p>- Training for officers</p> <p>- Initial training for farmers</p> <p>- Field training for farmers</p> <p>- Flow-up training</p> <p>c) Supporting services for on-farm development</p> <p>3. DCO</p> | | | | | | | | | | | | | | | | <p>- Supporting to land acquisition.</p> <p>- Supporting to public meeting by the Zonal Irrigation Office and general committee and WUG.</p> <p>- Training Course-A and -B</p> <p>- Training Course-C and -D</p> <p>- Training Course-C</p> <p>- Irrigation technician and VEO provide technical advice to the farmers.</p> <p>- Supporting services for establishment and management of WUG.</p> |
| Agricultural Coordinating Committee | <p>- The agricultural coordinating committee coordinates all of the governments' activities for the project implementation and agricultural supporting services to WUG/farmers.</p> | | | | | | | | | | | | | | | | <p>- The agricultural coordinating committee coordinates all of the governments' activities for the project implementation and agricultural supporting services to WUG/farmers.</p> |
| Institutional Expert | | | | | | | | | | | | | | | | | |

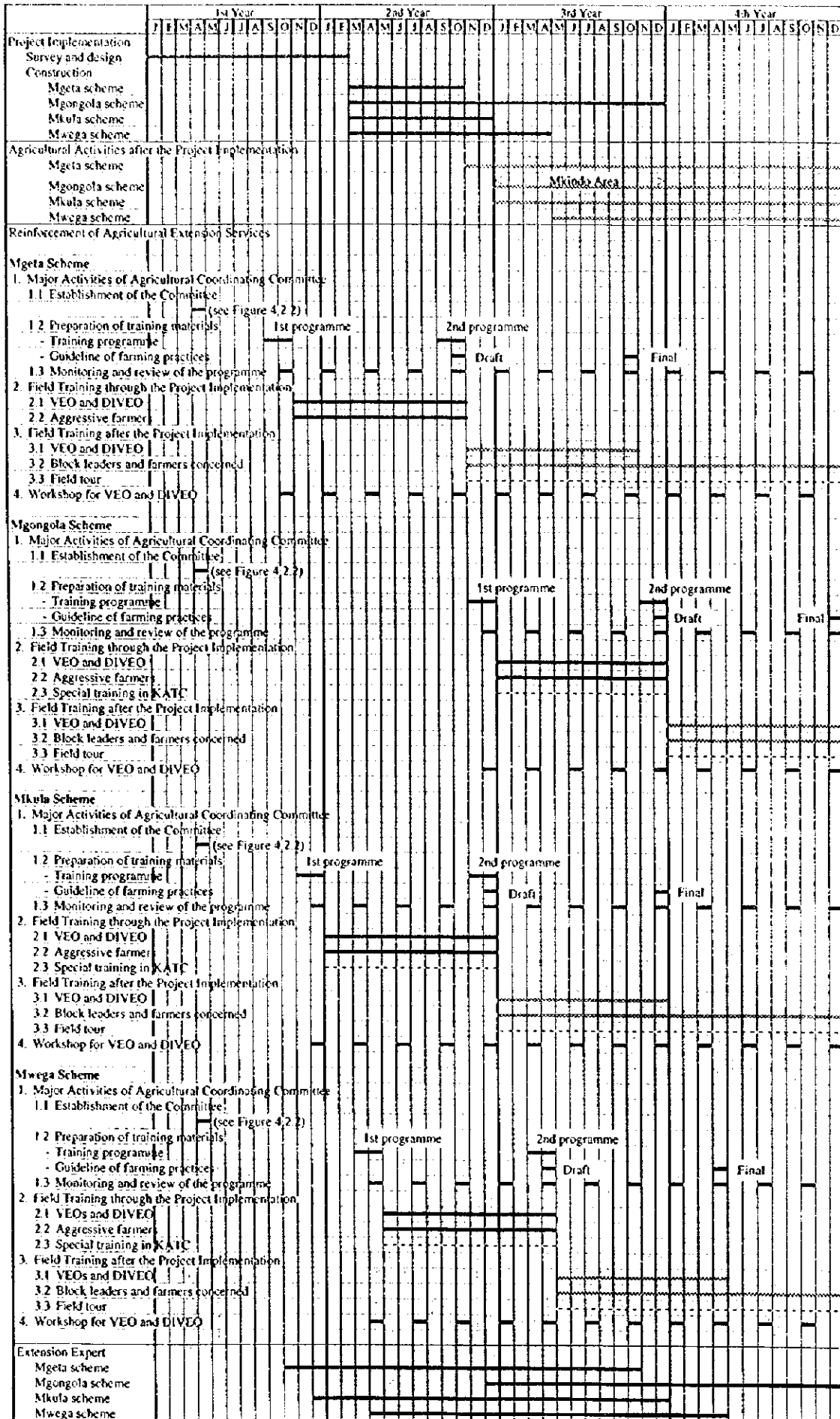
Ministry of Agriculture and Cooperatives
Commissioner
Agricultural & Livestock Development

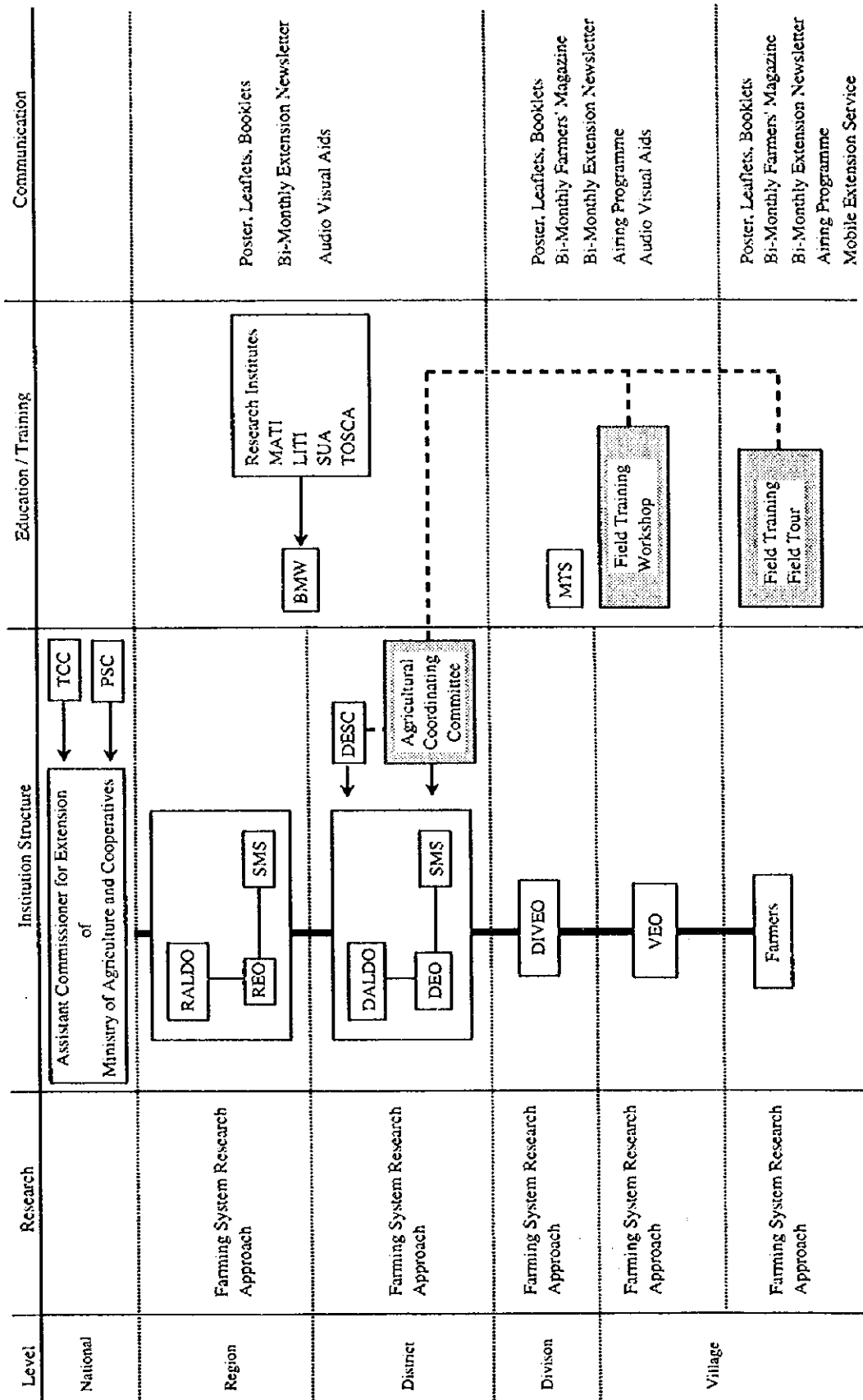



*1 Appointed to each Ward
*2 Sub-village of Malolo, and covered by VEO and IT in Malolo.
* District Irrigation Engineer or IT : Officers to be appointed newly to the offices of RALDO and DALDO
VEO : Village Extension Officer
IT : Irrigation Technician

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 Mwega

| ha | Income | Production Cost | Prod. Cost + O/M | Prod. Cost + O/M + Amort. | Total Expenses | Living Expenses | Prod. Cost | O/M | Amort. |
|-----|--------|-----------------|------------------|---------------------------|----------------|-----------------|------------|-----|--------|
| 0.4 | 596 | 169 | 172 | 292 | 564 | 272 | 169 | 3 | 120 |
| 0.5 | 746 | 211 | 215 | 365 | 652 | 287 | 211 | 4 | 150 |
| 0.6 | 895 | 254 | 259 | 439 | 738 | 299 | 254 | 5 | 180 |
| 0.7 | 1044 | 296 | 302 | 512 | 820 | 308 | 296 | 6 | 210 |
| 0.8 | 1193 | 338 | 345 | 585 | 893 | 308 | 338 | 7 | 240 |

