CHAPTER 3

FACILITY PLAN FOR ATARI SITE

CHAPTER 3 FACILITY PLAN FOR ATARI SITE

3.1 Intake Facility

3.1.1 Head Works

(1)Intake Facility from River

Intake structures made of reinforced concrete will be provided at a place just upstream of the existing weir site and water will be distributed through the main canal along national road and foothill of both banks.

The Atari River specific discharge can be estimated from a regression of the Sipi River specific discharge.

Table 3.1.1 Estimation of Discharge at the River

Item	Unit	The Sipi River	Atari Site
Catchment Area	km^2	92.00	103
Ratio		1	1.12
Past max. Discharge	m^3/sec	11.411	12.78
Ordinary discharge	m^3/sec	1.71	1.915
Drought Discharge	m^3/sec	0.23	0.26
95 days discharge	m^3/sec	3.64	4.76

On the other hand, probability flood discharge with ten years returns period is calculated at 38.00 m^3/sec.

Within this project, a weir made of reinforced concrete with steel plate gate will be constructed so as to roughly adjust intake discharge and to flow down floating particles or mud through gate except during drought period. The weir is attached with spillway which is able to flow down relatively moderate flood water so as to minimise gate operation. Flow depth of spillway will be limited to 0.30 m so as not to raise the water level of the river above the existing ground level. Gate will be fully opened when floods occur.

Intake gates will be installed in order to adjust intake water precisely.

(2)Width of Scouring Sluice Gate

The width of scouring sluice gate will be decided from allowable flow velocity over reinforced concrete i.e. Vmax. =3.0 m/sec in accordance with the following formula and actual width of the existing river.

$$B = \frac{Q}{h * Vmax} = \frac{38.00}{2.00 * 3.00} = 6.33 \rightarrow 6.50 \text{ m}$$

Where;

Q: Design Flood discharge 38.00 (m^3/sec)

h: Water depth of river 2.00(m) in accordance with the cross section of the river

V max: 3.0 (m/sec)

At the intake point, the dimension of the river is around 6.5 m width with 2.0 m height in accordance with the surveyed cross section of the river. Then, the width of the weir was set at 6.5 m.

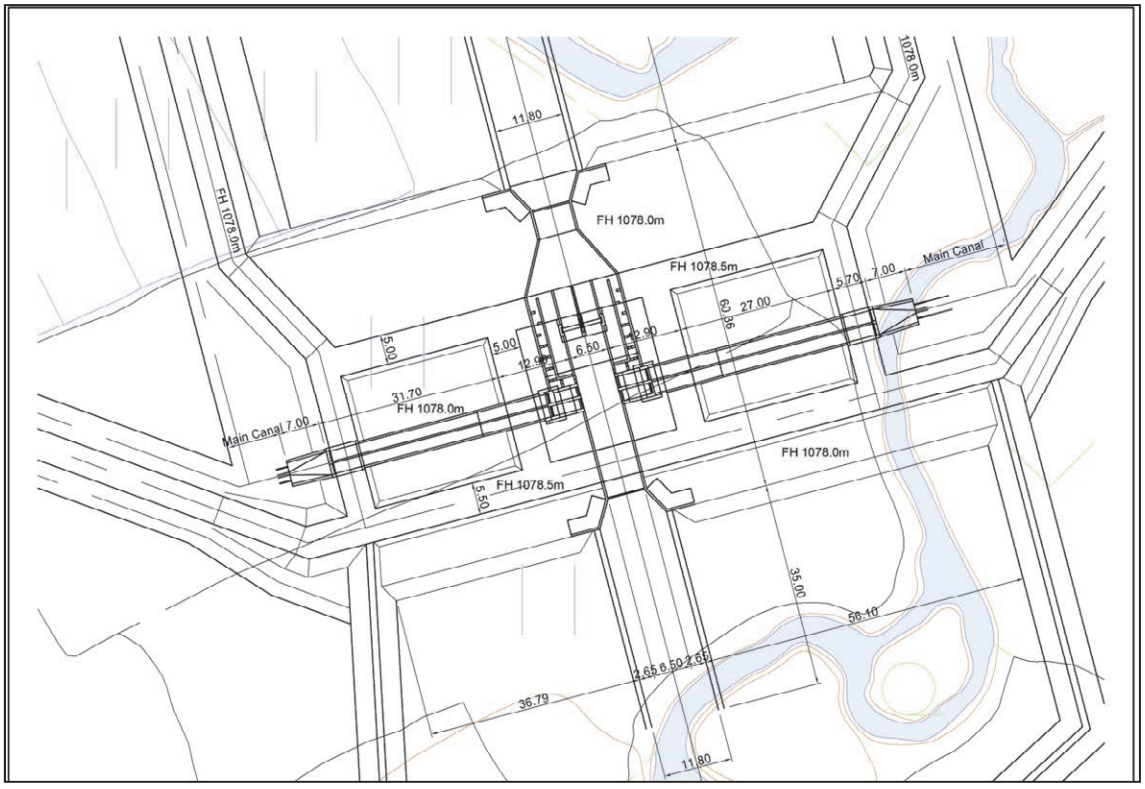


Figure 3.1.1 General Plan of Headwork

(3)Length of Spillway

The length of spillway will be calculated to safely flow down recorded 95 day discharge within 0.30 m of flow depth. Flow depth of spillway will be limited to 0.30 m so as not to raise the water level of the river beyond the existing ground level.

Discharge overtopping and flowing over the spillway will be calculated using the following formula.

$Q=C*L*h^{3/2}$

Where;

Q: 95 days discharge 4.76 (m^3/sec)

C: Flow coefficient C=1.8

L: Length of spillway (m)

h: Water flow depth (m). h will be limited to 0.3m at most.

$4.76=1.8*L*0.33/2$

L=4.76/1.8/0.33/2=16.09 m

Table 3.1.2 Dimension of Diversion Weir

Dimensions	Formulae	Atari Site
Elevation of intake site		EL1,076.5m
Elevation of top of wall		EL1,078.0 m
Intake water level		EL1,076.2m
Bed level of intake		EL1,074.7m
Width of scouring sluice	B=38.00/3.0/2.0=6.33≒6.5	6.50 m
Crest level of spillway		EL1,076.2m
Length of spillway	L=4.76/1.8/0.3$^{3/2}$=16.09≒	8.50 mx2=17.0 m
Height of scouring sluice gate	EL1,076.2- EL1074.70+0.3	1.8m
Design water depth of river	EL1076.2- EL1074.7	1.5m

In case the sluice gates were kept closed during flood time, the water level at upstream is estimated to rise up to WL 1077.05 m which are about 50 cm above the existing ground level according to the following calculation. Top elevation of the side wall is to be set at 1,078 m and the embankment was set up to the National Road, then, there is no risk of over flow of flood water.

$Q=C*L*h^{3/2}$

Where; C: Flow coefficient C=1.8

L: Length of spillway 17.00 (m)

h: Water flow depth.

Q: Design Flood discharge 38.00 m^3/sec

$38.00=1.8*(17.00+6.5)*h^{3/2}$ h=0.85 m

WL=1076.20+0.85 =WL 1077.05 m

(4)Scouring Sluice Gate

As for types of the gate for scouring sluice way, three types are proposed roughly .i.e.

- ✓ Slide gate or roller gate
- ✓ Overturning gate and
- ✓ Rubber gate

In the case of an overturning gate, gate body is always submerged in the water, then, it is rather difficult to perform necessary repairs and service life of the gate becomes shorter due to corrosion. In the case of rubber gate, it is very difficult to adjust water level depending on the season and there is a possibility of breakage of the gate due to wear and tear caused by water coupled with mud and sand load overtopping and running over the gate. In addition, usually, rubber gate is applied as a rather large-scale, large width gate. Therefore, ordinary slide gate or roller gate will be applied. When the width of the gate is smaller or equal to 2.0 m, slide gate will be used. When the width of the gate is more than 2.0 m, roller gate will be applied as a rule.

The height of gate for sluice way will be set at overflowing water level at upstream so as to avoid water over topping and flowing over the gate.

3.1.2 De-silting Basin

At the downstream of the intake structure, a de-silting basin will be provided. Dimensions of the basin will be decided based on design criteria stipulated by the Ministry of Agriculture, Forestry and Fisheries of Japan. Clearing of deposited sediment will be done by man power or machinery since flushing by water pressure is very difficult due to lack of sufficient water head. Minimum width of the de-silting basin will be set at 1.0 m considering the activity of man power. In the case of a large-scale structure, the de-silting basin will be divided into two lanes or more so as to clear deposit without stopping water flow by closing gates at intake and stop logs at downstream of the basin.

(1)Width of De-silting Basin

The width of the de-silting basin will be decided by the following formula:

$$B = \frac{Q}{h * Ug}$$

Where; Q: Discharge through de-silting basin (m^3/sec)

h: Water depth of de-silting basin (=1.5 m)

V: Critical velocity for bed load transport (U_g= 0.2m/sec)

(2)Length of De-silting Basin by Sedimentation Theory

The length of the de-silting basin will be decided by the following formula:

$$L = K * \frac{Q}{B * V_g}$$

Where; K: Safety factor (=1.5~2.0)

Q: Discharge through de-silting basin (m^3/sec)

B: Width of de-silting basin (m)

v_g: Sedimentation velocity of particle (v_g= 0.032 m/sec)

(3)Length of De-silting Basin by Empirical Formula

The length of the de-silting basin will be decided by the following formula:

$$L = 20 * \sqrt{Q}$$

Where; K: Safety factor (=1.5~2.0)

Q: Discharge through de-silting basin (m^3/sec)

Table 3.1.4 Dimensions of De-Silting Basin

Dimension	Formula	Right bank	Left bank
Discharge (m^3/sec)		1.20	1.04
Water depth of basin		1.5m	1.5m
Width of basin	1.20/1.5/0.20=4.0 1.04/1.5/0.2=3.47	2.00x2=4.0 m	1.8x2=3.6m
Length of basin 1	2.0*1.20/4.0/0.032=18.75 2.0*1.04/3.60/0.032=18.06	19.0 m	19.0 m
Length of basin 2	$20*\sqrt{1.20}$ =21.90 $20*\sqrt{1.04}$ =20.4	22.0 m	21.0 m

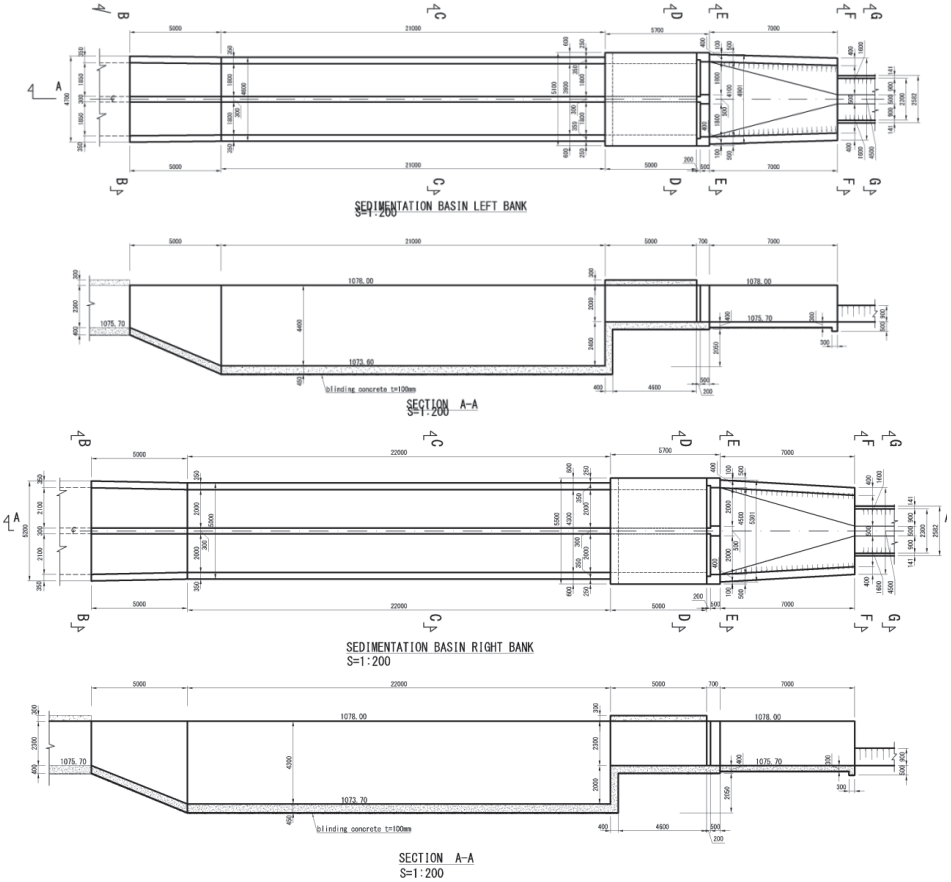


Figure 3.1.2 De-silting Basin for Atari Site

3.1.3 Intake

The design of intake structures will be carried out principally based on the design criteria stipulated by the Ministry of Agriculture, Forestry and Fisheries of Japan as a rule.

Bed level of intake will be decided at a level of 40 % of design intake water depth from the surface. Velocity (V) of water at intake will be set at 0.6 m/sec so as not to cause sedimentation and growing of water weed.

(1)Width of Intake Gate

The width of intake gate will be decided from design velocity of intake i.e. V=0.6 m/sec in accordance with the following formula.

$$B = \frac{Q}{h * V}$$

Where; Q: Intake discharge (m^3/sec)

h: Water depth intake (m)

V: Design velocity at intake (V= 0.6m/sec)

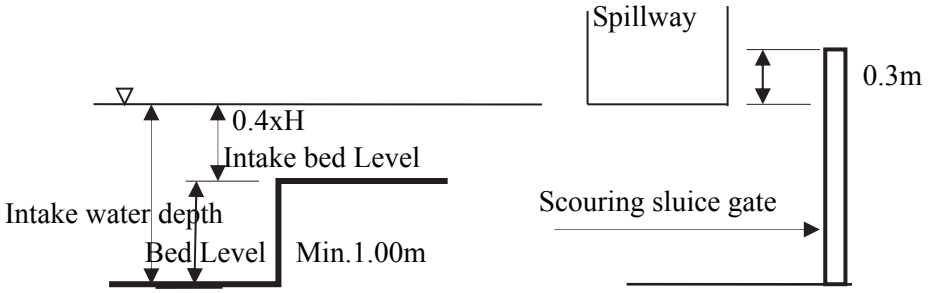


Figure 3.1.3 Schematic Profile of Intake

Table 3.1.5 Dimensions of Intake Structures

Dimensions	Formulae	Atari Site
Elevation of intake site		EL1,076.5m
Elevation of top of wall		EL1,078.0 m
Intake water level		EL1,076.2m
Bed level of River		EL1,074.7m
Crest level of spillway		EL1,076.2m
Design water depth of river	EL1076.2- EL1074.7	1.5m
Intake water depth	1.5mx0.4=0.6m ⇨ 0.5m	0.5m
Design intake discharge; Right Left		1.20 m^3/sec 1.04m^3/sec
Bed level of intake	EL1076.2-0.5m	EL 1,075.7m
Width of intake; Right Left	B=1.20 m^3/sec/0.6/0.5=4.00 B=1.04m^3/sec/0.6/0.5=3.47	2.00 mx2=4.00 m 1.75m x 2=3.50 m

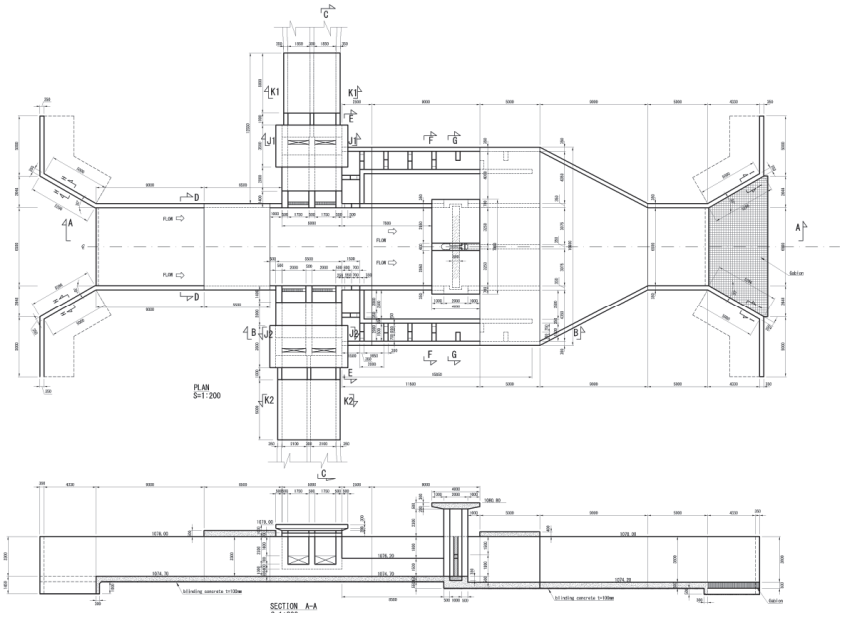


Figure 3.1.4 Intake Structure for Atari Site

3.1.4 Fish Ladder

(1)General

For migration of fishes along the river, a fish Ladder will be provided. Typical species of fish in the river are catfish and lungfish.

Photo.3.1.1 Catch at Canal in Atari Study Area

(2)Type of Fish Ladder

There are so many types of fish ladders applied at diversion weir at natural rivers. These are classified into four types generally; 1) Pool Type, 2) Canal type, 3) Operation Type, and 4) Others.

It is said that slope with cobble stone, which is one of canal type, is rather effective for natural rivers. However, it needs a lot of maintenance flow. Considering the quantity of maintenance flow of the Atari River, stairway type, which is one of pool type, is appropriate and it will be applied at this weir.

(3)Dimensions of Fish Ladder

The dimension of fish ladder was set as show the below table taking it consideration the length and height of spillway, a difference of the height between intake water level and river bed elevation in downstream and reference of similar fish ladder design. Additionally, the bottom orifice was set on the side wall, at the bottom of the fish ladder, to pass the maintenance flow even if scouring sluice gate closed completely.

Table 3.1.3 Dimensions of Fish Ladder

Item	Dimension
Width of stairway	1.50 m
Length of stairway	2.00 m
Height of steps	0.20 m
Inclination of fish ladder	1/10
Width of weir	0.40 m
Height of weir	0.10 m
Dimension of bottom orifice	0.25mx0.25m

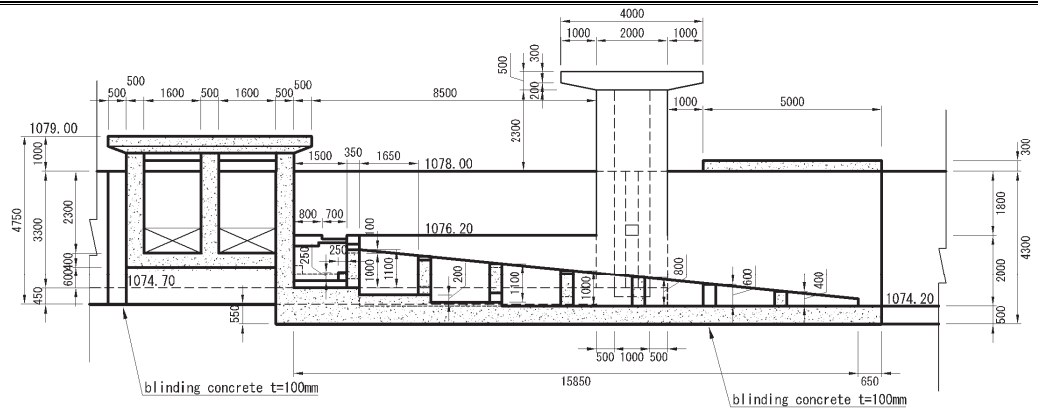


Figure 3.1.5 Longitudinal Section of Fish Ladder

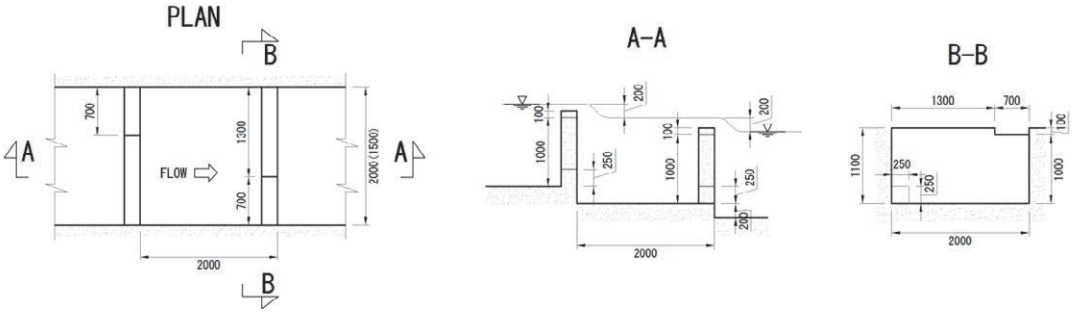


Figure 3.1.6 Section of Fish Ladder

3.2 Irrigation and Drainage Facilities Plan

Within the target project area, the following irrigation and drainage system will be provided.

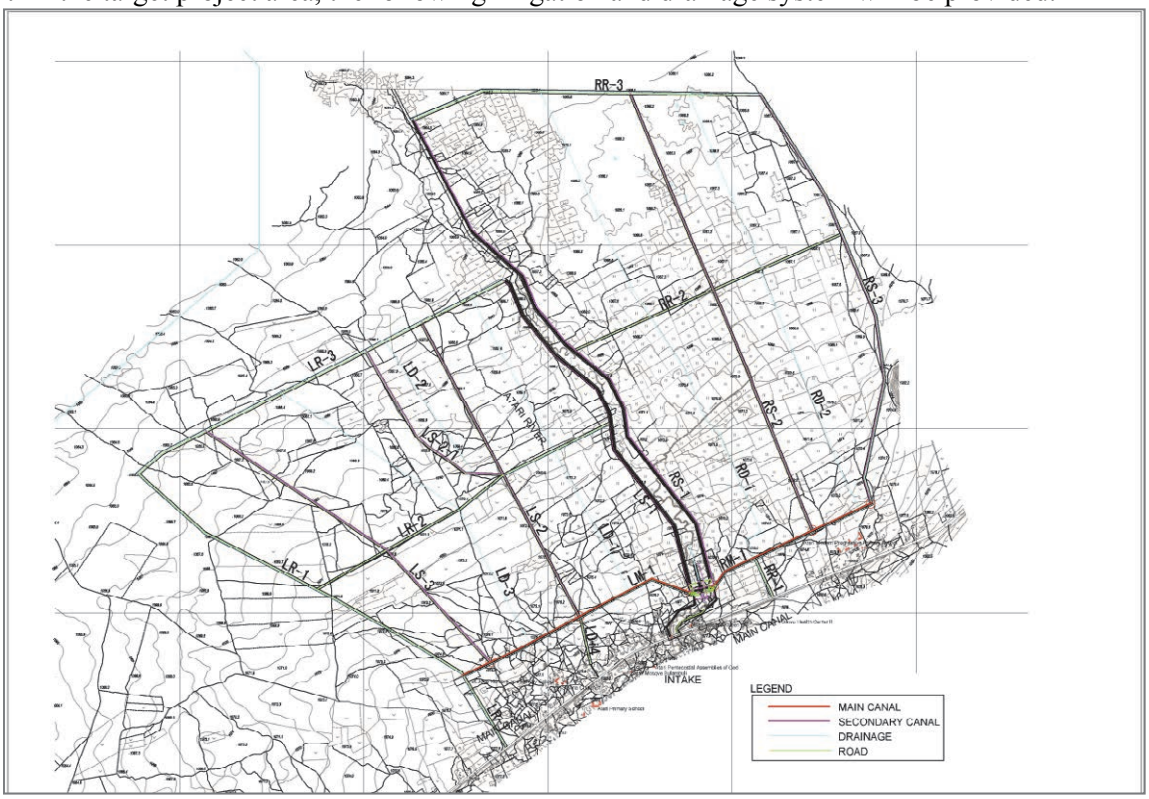


Figure 3.2.1 General plan of Irrigation and Drainage Facilities

3.2.1 Canals and Maintenance Road

(1)Determination of Canal Dimensions

The design of canal will be carried out based on the design criteria stipulated by the Ministry of Agriculture, Forestry and Fisheries of Japan.

Discharge through canal will be calculated by Manning's formula as follows;

$$Q=A*V=\frac{1}{n}*R^{3/2}*I^{1/2}$$

Where; Q: Discharge through canal (m^3/sec)

A: Sectional area of flowing water (m^2)

n: Coefficient of roughness

R: Hydraulic radius. R=A/S, S: wetted perimeter.

I: Gradient of canal bed slope

Design condition for determination of canal dimension is followings;

- ✓ Maximum velocity (Vmax) of the canal will be set at 3.0 m/sec for the concrete lined canal and 1.0 m/sec for earth canal.
- ✓ Minimum velocity of the canal will be set at around V=0.7 m/sec so as to avoid sedimentation and growth of water weed within the canal.
- ✓ Flow velocity in the canal will be limited to 2/3 of critical velocity so as to maintain a stable water flow and to enable smooth distribution of water to the diversions and turnouts.
- ✓ The coefficient of roughness (n) of the canal will be set at 0.016 for pre-cast concrete panel lined canal, 0.025 for wet masonry and 0.03 for earth canal.
- ✓ Minimum bottom width and height of canal will be set at 0.30 m each.

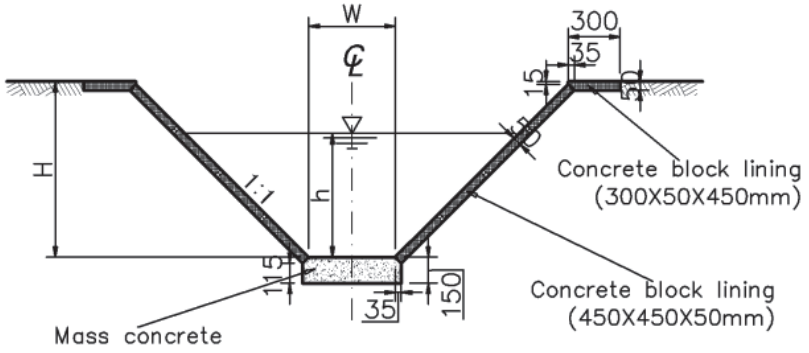


Figure 3.2.2 Typical Cross Section of Main and Secondary Canal

(2)Design Discharge

Figure 3.2.3 shows schematic irrigation network with a design discharge of main and secondary canal.

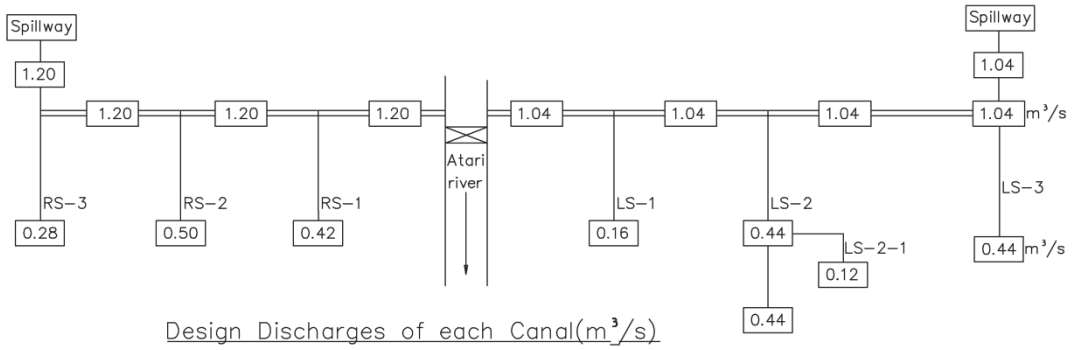


Figure 3.2.3 Schematic Water Distribution of Atari Site

(3)Main Canal

As described in Chapter 2.7.3 (3), as a result of the economic comparison, pre-cast plain concrete panel lining has an advantage and it will be applied for main and secondary canals.

Design condition of the Main canal is followings:

- ✓ The main canal will run along the foothill of both banks;
- ✓ Diversion works will be provided at intervals of 0.5 - 1 km along the main canal;
- ✓ Check gates will be installed along main canals at diversion works;

Dimensions of the main canals at both banks will be decided in accordance with the design discharge and inclination of canal based on the ground slope. The results are shown in the table below.

Table 3.2.1 Dimensions of Main Canals

SECTIONAL DIMENSIONS OF MAIN CANAL								
Name	Discharge(Q)	Gradient(I)	Bed width (B)	Water depth(h)	Canal Height(H)	Station	Length(L)	Total
	m³/s		m	m	m		m	
R-1	1.20	1/1000	0.5	0.82	1.00	0-953	953	953
Total								953
L-1	1.04	1/3000	0.75	0.92	1.05	0-1240	1240	1240
Total								1240

(4)Secondary Canal and Appurtenant Facilities

Secondary canal and appurtenant facilities are designed as following considerations;

- ✓ Secondary canals will be lined with pre-cast plain concrete panels as a result of the economic comparison.
- ✓ Turnouts will be provided at 400 - 600 m intervals at secondary canals.
- ✓ Check gates will be installed at intervals of 400 m or more along the secondary canal.

- ✓ At each turnout, gates will be installed in order to adjust water flow into farm ditch.

Table 3.2.2 Dimensions of Secondary Canal

SECTIONAL DIMENSIONS OF SECONDARY CANAL								
Name	Discharge(Q)	Gradient(I)	Bed width (B)	Water depth(h)	Canal Height(H)	Station	Length(L)	Total
	m^3/s		m	m	m		m	
RS-1	0.42	1/500	0.40	0.46	0.65	0-3000	3000	3000
RS-2	0.50	1/500	0.40	0.50	0.70	0-2600	2600	2600
RS-3	0.28	1/500	0.40	0.38	0.55	0-1500	1500	1500
	0.28	1/2000	0.40	0.53	0.65	1500-2400	900	900
Sub-Total								8000
LS-1	0.16	1/500	0.30	0.31	0.45	0-2000	2000	2000
LS-2	0.44	1/500	0.40	0.46	0.65	0-1800	1800	1800
LS-2-1	0.12	1/500	0.30	0.27	0.40	0-1100	1100	1100
LS-3	0.44	1/500	0.40	0.47	0.65	0-2000	2000	2000
Sub-Total								6900
TOTAL								14900

(5)Maintenance Road

- ✓ The road for maintenance and activities of paddy growing will be provided along main and secondary canals.
- ✓ The total width of the road will be set at 5.0 m so as that two ordinary vehicles can pass by.
- ✓ The road will be paved with 0.1m thick laterite for the width of 4.0 m.
- ✓ Catch drain will be provided as well along the main canal at the hilly side of canals.

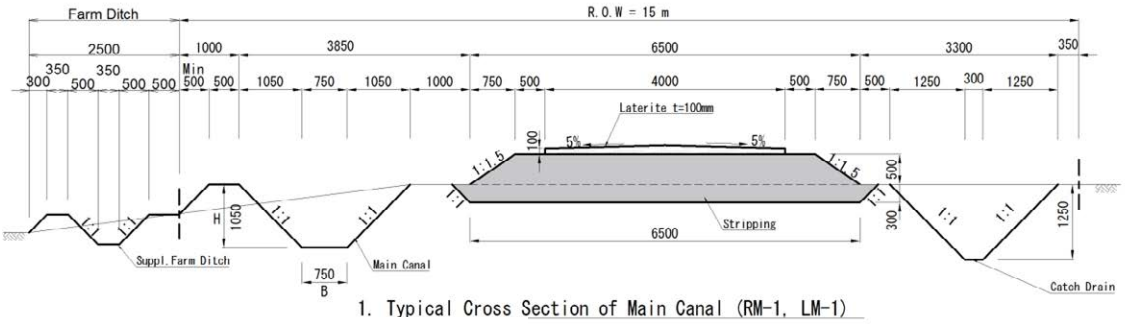


Figure 3.2.4 Typical Cross Section of Main Canal and Maintenance Road

Farm roads along secondary canals at both sides of the Atari River will be provided with high embankment so as to function as flood protection dyke.

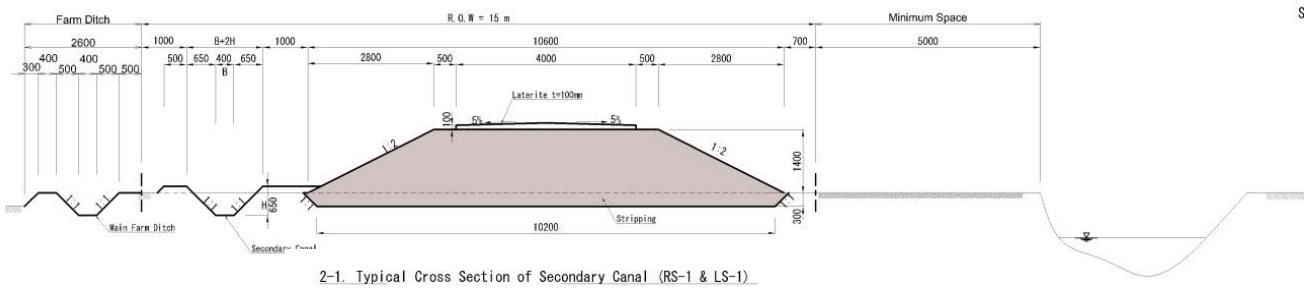


Figure 3.2.5 Typical Cross Section of Secondary Canal along the River

(6)Check Structures

Check structures will be installed at downstream of turnoffs at about 400 m intervals.

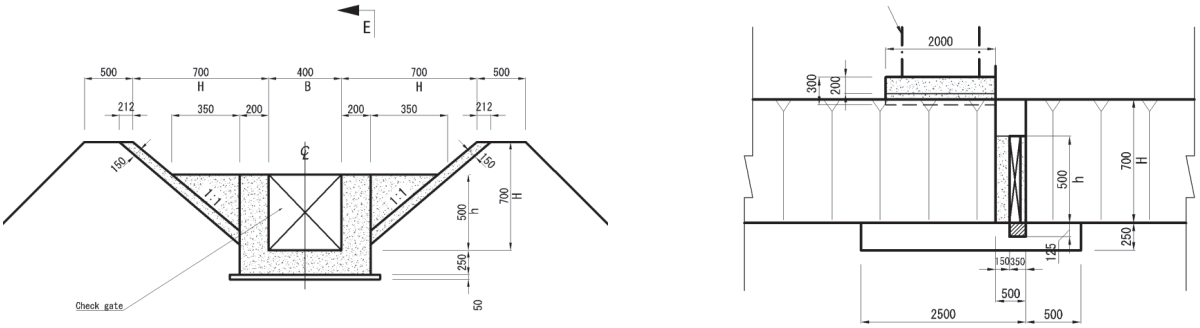
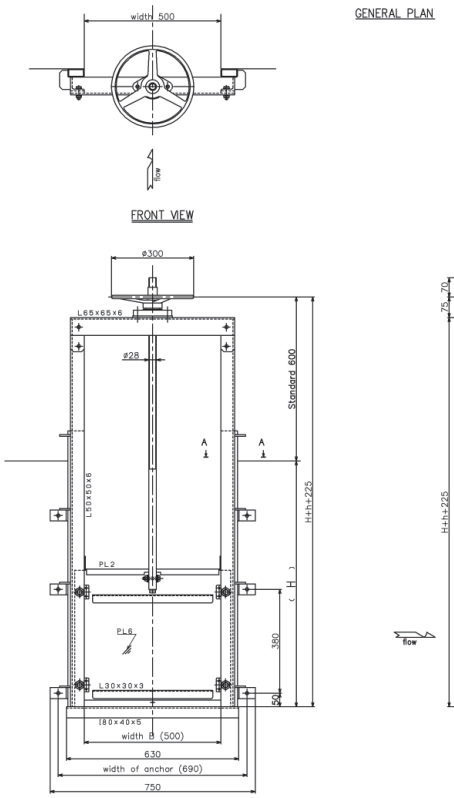


Figure 3.2.6 Typical Cross and Longitudinal Section of Check Structures



DIMENSION OF GATE (CHECK GATE)						
Name of canal	Location	Width B(m)	Height of gate H (m)	Gate Type	Number	Total Number
RS-1	0+030	0.40	0.65			
	0+400	0.40	0.65			
	1+000	0.40	0.65			
	1+500	0.40	0.65			
	2+00	0.40	0.65			
	2+500	0.40	0.65	0.40 x 0.45	6	6
RS-2	0+030	0.40	0.70			
	0+500	0.40	0.70			
	1+000	0.40	0.70			
	1+430	0.40	0.70			
	1+900	0.40	0.70			
	2+300	0.40	0.70	0.40 x 0.50	6	6
RS-3	0+030	0.40	0.55			
	0+500	0.40	0.55			
	1+000	0.40	0.55	0.40 x 0.40	3	4
	2+000	0.40	0.65	0.40 x 0.55	1	
LS-1	0+030	0.30	0.45			
	0+500	0.30	0.45			
	1+050	0.30	0.45			
	1+500	0.30	0.45	0.30 x 0.30	4	4
LS-2	0+030	0.40	0.65			
	0+450	0.40	0.65			
	0+900	0.40	0.65			
	1+330	0.40	0.65	0.40 x 0.45	4	4
LS-2-1	0+030	0.30	0.40			
	0+540	0.30	0.40	0.30 x 0.30	2	2
LS-3	0+030	0.40	0.65			
	0+400	0.40	0.65			
	0+850	0.40	0.65			
	1+600	0.40	0.65	0.40 x 0.45	4	4
Total						30

Figure 3.2.7 Typical Section and Dimensions of Check Gates

(7)Turnouts

- ✓ Turnouts will be provided at both sides of secondary canals at intervals of 500 - 600 m.
- ✓ Turnout gate will be installed in the turn out box to control the irrigation water to the main farm ditch

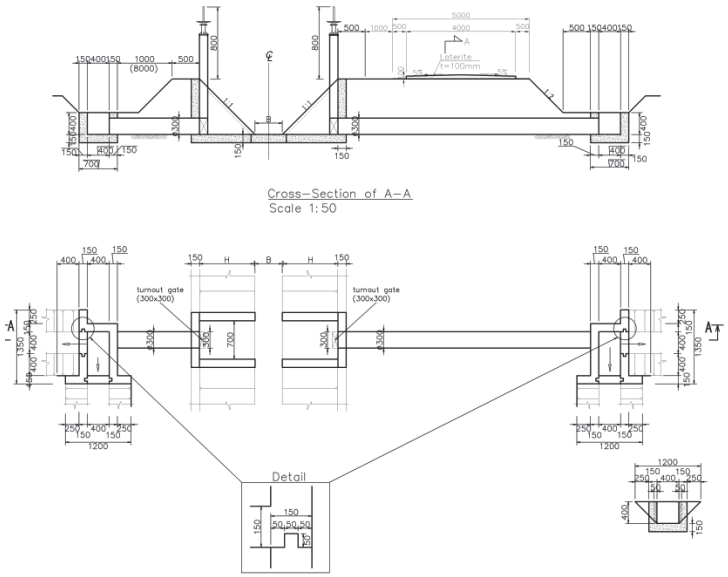


Figure 3.2.8 Typical Layout of Turnouts

(8)Drop Structure

Drop structures will be provided at steep areas so as to keep the velocity of water flow at a rate less than 2/3 of critical flow for smooth water flow and smooth water distribution.

Dimensions of drop structures will be decided in accordance with the following procedures based on the standard criteria for canal issued by the Ministry of Agriculture, Forestry and Fisheries, Japan.

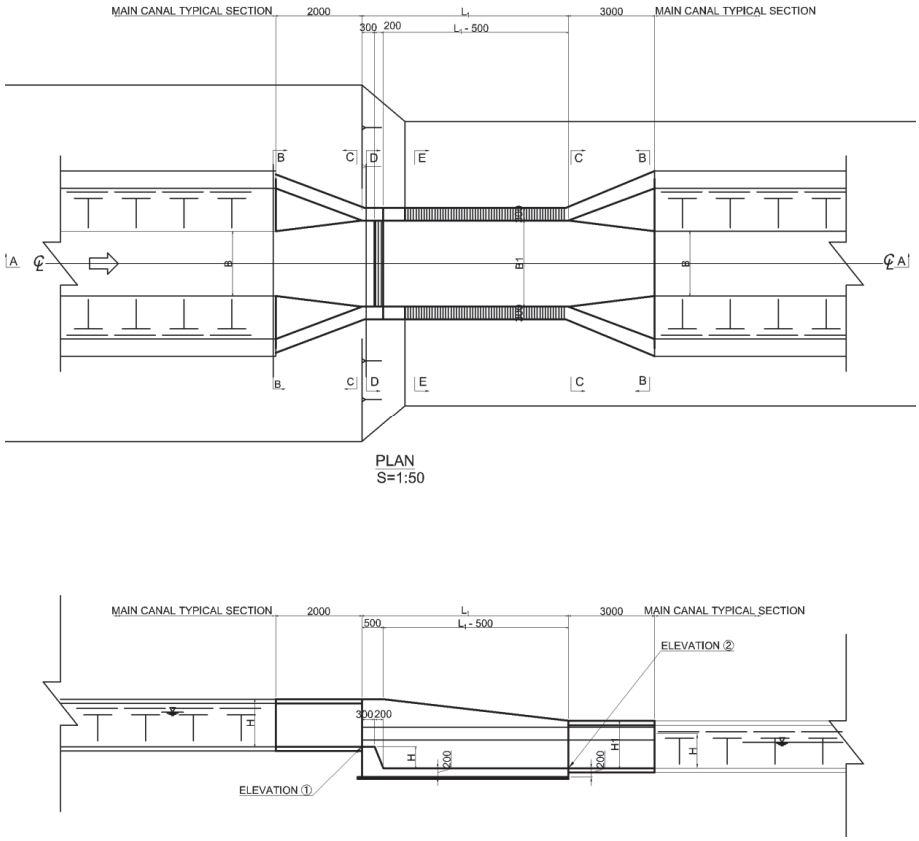
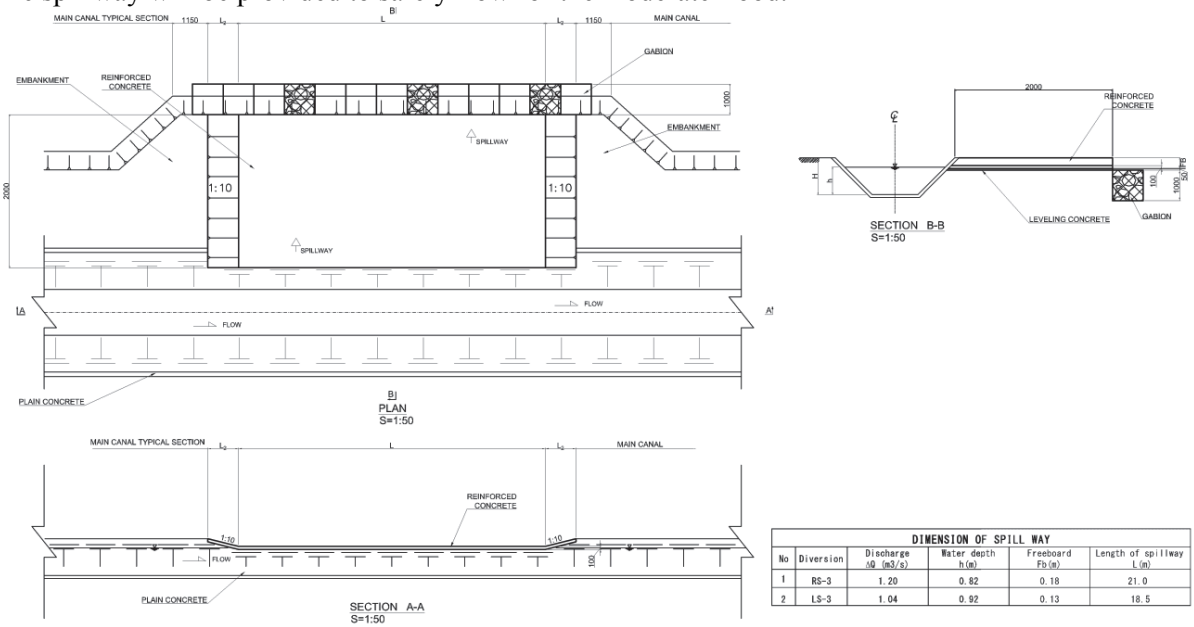


Figure 3.2.9 Drop Structure

(9)Spillway

The spillway will be provided to safely flow for the moderate flood.



DIMENSION OF SPILL WAY					
No	Diversion	Discharge ΔQ (m3/s)	Water depth h(m)	Freeboard Fb(m)	Length of spillway L(m)
1	RS-3	1.20	0.82	0.18	21.0
2	LS-3	1.04	0.92	0.13	18.5

Figure 3.2.10 Layout of Spillway

(10)Footbridge

Bridges crossing over irrigation and drainage canal will be provided where roads cross these structures.

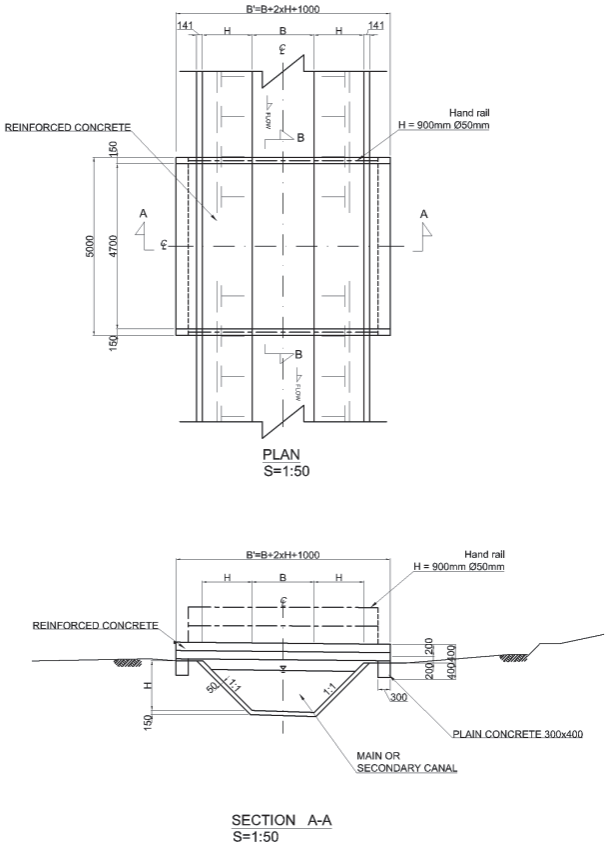


Figure 3.2.11 Layout of Bridges

3.2.2 Drainage Facilities Plan

An un-lined drainage canal will be provided to drain excess water from the farmland.

Flood water from the surroundings of the project site will be captured by catch drains situated at the periphery of the study area. The catch drains are connected to the drainage canals in the study areas. The excess water flowing through the drainage canals will be drained into the Atari River through culverts with gates under the flood protection dyke.

The lateral drain will be installed at the end of farm ditch in an orientation parallel to the secondary canal. The discharge is given by 10 years probability rainfall and proportionately to the catchment area. The dimensions of drainage canal will be decided in accordance with the following table.

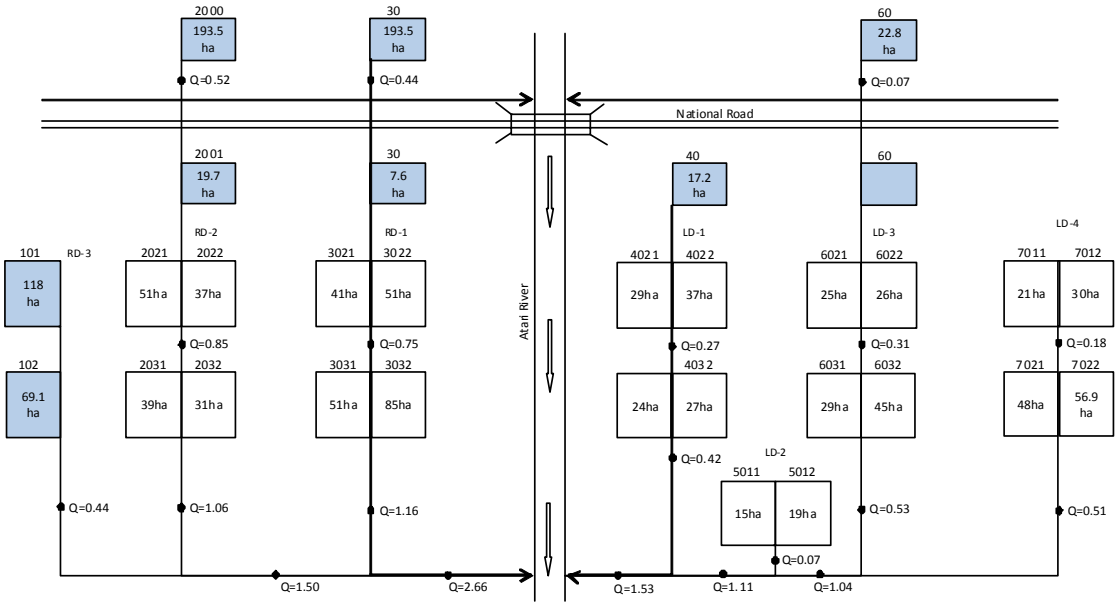


Figure 3.2.12 Drainage Diagram

Catch drain collecting runoff from hillside will be provided outside edges of the main canal. Cross drainage structures will be provided at crossing points with irrigation canal or road.

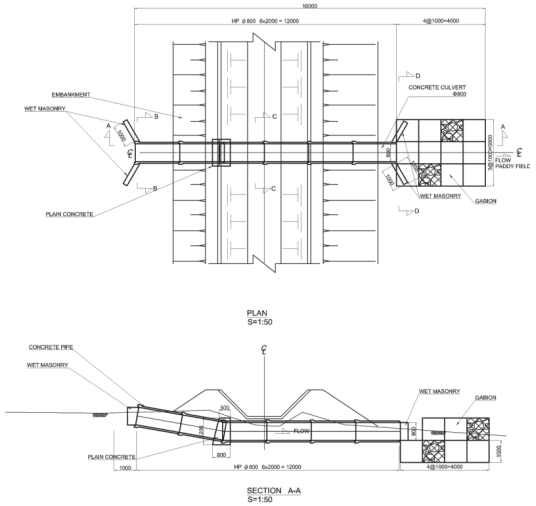


Figure 3.2.13 Cross Drainage Structure

3.2.3 Facilities Plan of On-farm Development

Farm ditch, connected to each turn out along the secondary canal, will be provided. The length of each farm ditch will be limited to a maximum of 400 m.

Supplementary farm ditch will be installed at an almost right angle to the secondary canal. The length of a supplementary farm ditch will be limited to 500 m at most. At the end point of each supplementary farm ditch, the lateral drain will be installed parallel to the secondary canal.

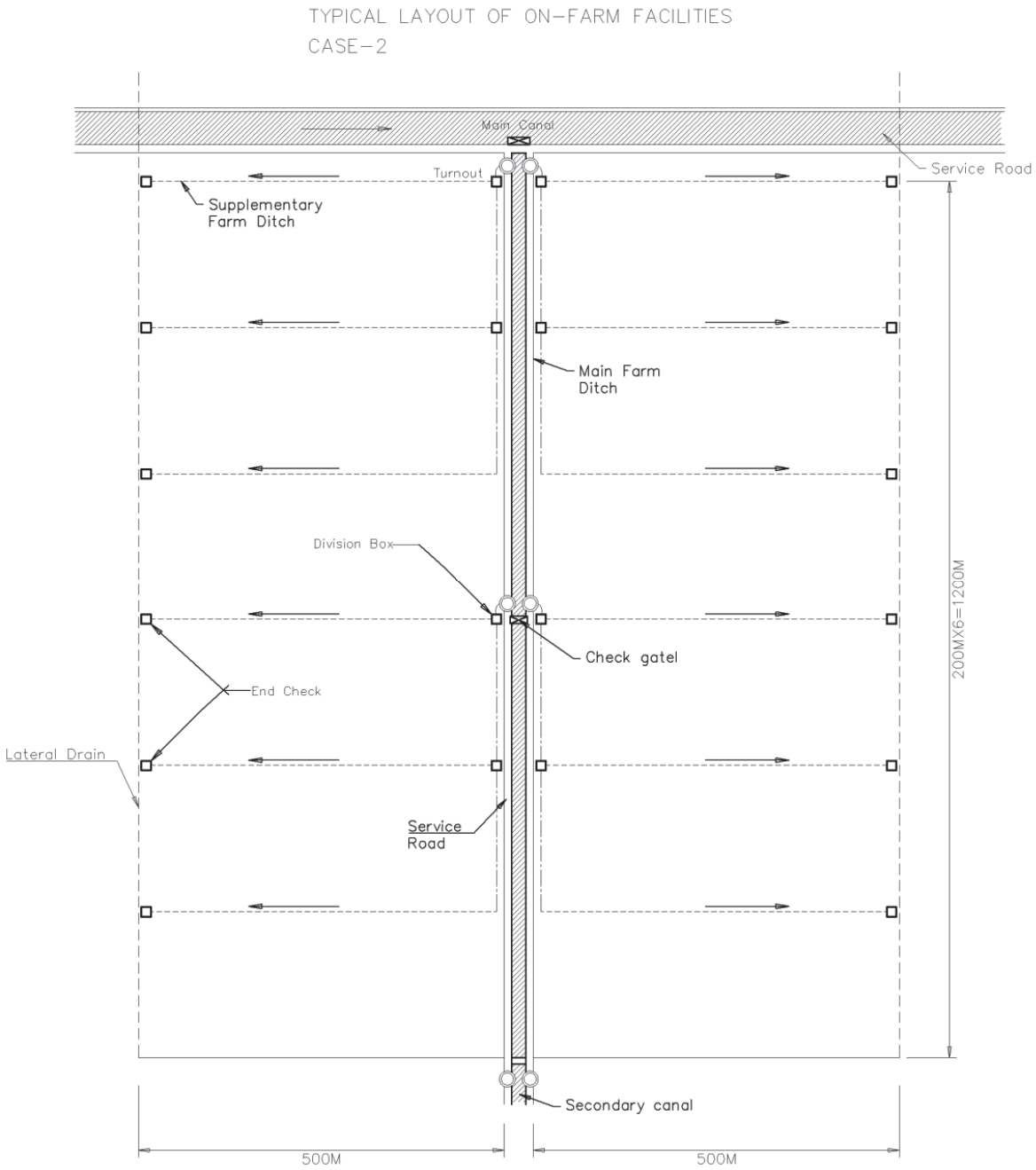


Figure 3.2.14 Typical Layout of On-farm Facilities

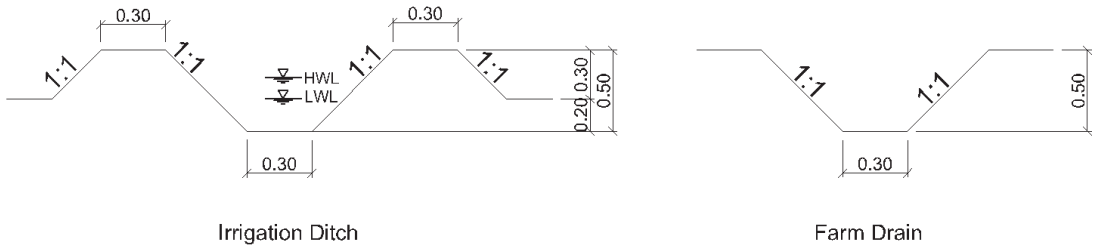


Figure 3.2.15 Typical Cross Section of On-farm Ditch

3.2.4 Facilities Plan for Demonstration Farm

A demonstration farm will be planned at upstream and right-hand side of secondary canal Ls-2.

Figure 3.2.16 Layout of Demonstration Farm

3.2.5 Flood Protection Dyke

Flood protection dyke will be provided along the Atari River and the low land area surrounding paddy fields.

a) The total width of flood projection dyke was set at 5.0 m on the top so as that two ordinary vehicles can pass by.

b) The road will be paved with 0.1 m thick laterite for the width of 4.0 m.

c) The height of the flood protection dyke is 1.40 m along the river and flood protection dyke in downstream is shifting from 1.4 m to 0.5 m.

d) Width of the buffer zone was set 30 m from hypothetical river centre based as mentioned in Chapter 2.3

The height of flood protection dyke along the river is derived from uniform flow water level when a

flood with 1/10 years return period probable rainfall occurs. Free board and extra embankment for resettlement are also considered in determining the height of flood protection dyke.

Flood water level is estimated at 2.063 m from river bed which is equivalent to (2.063-1.50) =0.563 m above existing ground level.

Height of flood protection dyke is derived by adding flood water depth (0.563 m), freeboard (0.60 m) and extra embankment (0.20 m), i.e. 0.563+0.60+0.20=1.363 m.

From the value of 1.363 m, the height of flood protection dyke is set at 1.40 m.

Table 3.2.8 Free board of the River Bank

No.	Design high water discharge (m^3/sec)					Value to be added to design high water level (m)
1			Dh	<	200	0.6
2	200	=<	Dh	<	500	0.8
3	500	=<	Dh	<	2,000	1.0
4	2,000	=<	Dh	<	5,000	1.2
5	5,000	=<	Dh	<	10,000	1.5
6	10,000	=<	Dh			2.0

Note) Dh: Design high water discharge (m^3/sec)

Table3.2.9 Criteria of Extra Embankment of the River Bank

(Unit: cm)

Soil property of material		Ordinary soil		Sand/Gravel	
Soil of ground		Ordinary soil	Sand/Gravel	Ordinary soil	Sand/Gravel
Height of Embankment	3m or less	20	15	15	10
	3m~5m	30	25	25	20
	5m~7m	40	35	35	30
	7m or more	50	45	45	40

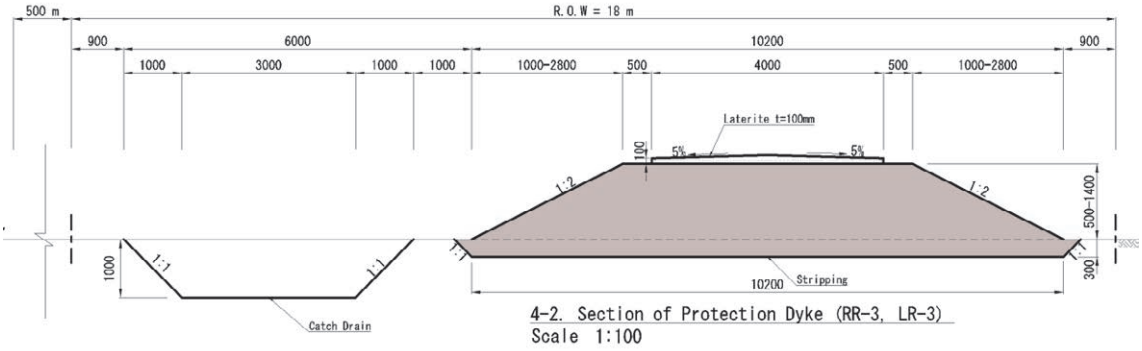


Figure 3.2.17 Typical Cross Section of Flood Protection Dyke

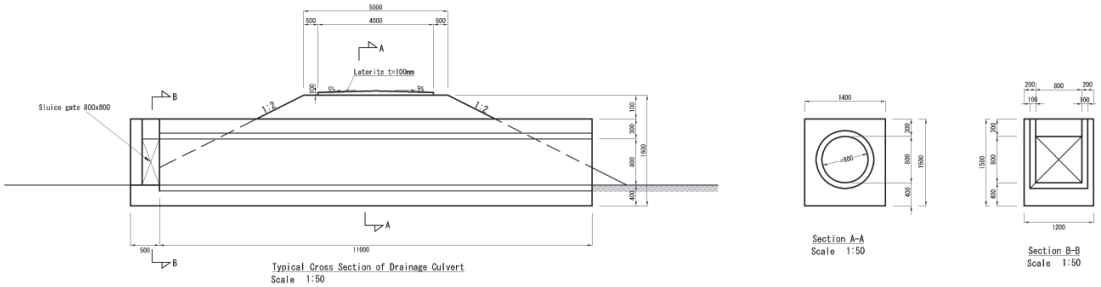


Figure 3.2.18 Pipe Culvert under Dyke with Gate

3.2.6 Community Development Facilities

(1)Washing Basin

Figure 3.2.19 shows typical design for washing basin which will be provided to the community at the end point of main canal or diversion point to the secondary canal where excess water from canal can be utilized for other purposes.

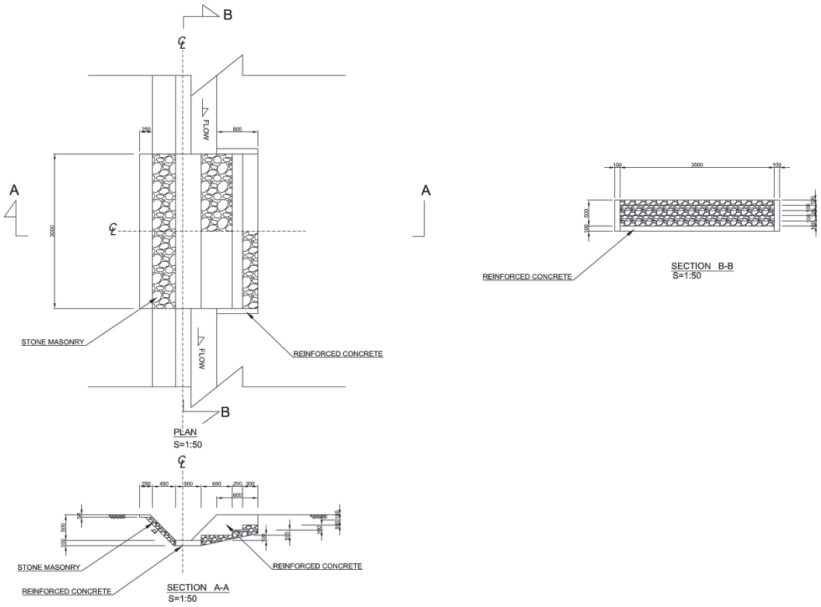


Figure 3.2.19 Washing Basin

(2)Cattle Trough

Cattle Troughs will be provided at the outside of the study area along the catch drain at points where the community chooses. Water for animals shall be provided from main or secondary canal through the drainage canal. Basically, excess water shall be provided to cattle via spillway and drainage.

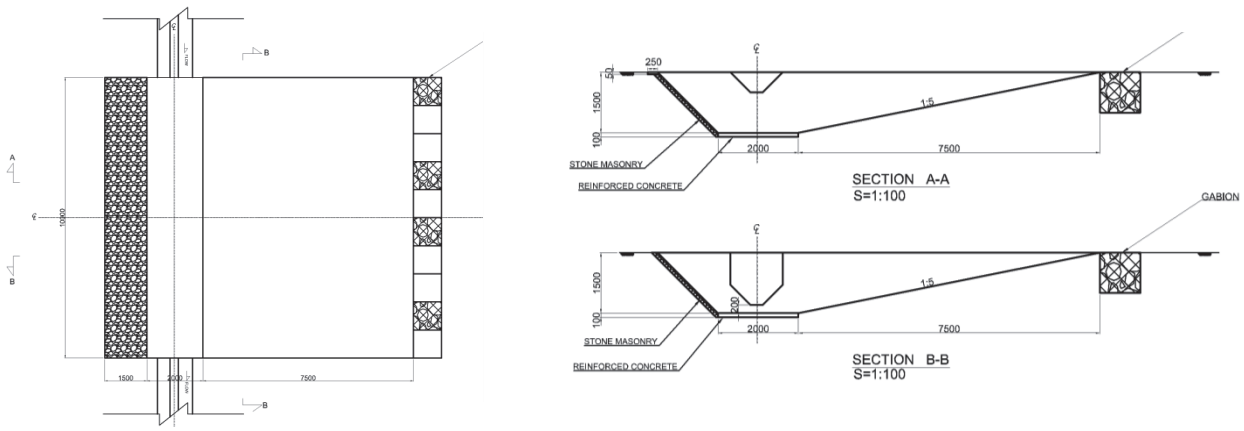


Figure 3.2.20 Cattle Trough

(3)Dry Yard

The dry yard will be provided at two locations -both left and right bank- of the project site along the

main canal to be utilized by WUA members after harvesting.

(4)Safety Facility

Safety facility such as fence along the canal and hand rail around head works shall be designed during the further study. These are not included in this plan since it should be determined considering the community needs and opinion after indicating the exact alignment of the main and secondary canal.

CHAPTER 4

PROJECT IMPLEMENTATION, MANAGEMENT, AND O&M PLAN

CHAPTER 4 PROJECT IMPLEMENTATION, MANAGEMENT, AND O&M PLAN

4.1 Management Structure of Project Implementation

The management structure of project implementation is suggested and shown in Figure 4.1.1, where in the structure, there are four (4) management sections over the fields of; 1) Social Management, 2) Hardware Engineering, 3) Soft Component and 4) Semi-soft Component, under the interactive relationship of the government stakeholders.

As discussed and agreed in the 6th JCC, following items have been agreed;

i) Implementation Agencies and Executing Agency are required for the next step for implementing Atari site. The implementation Agencies shall be MAAIF and MWE. The Executing Agency shall be MAAIF.

ii) The basic idea of the Proposed Implementation and Management Organization structure and Operation & Maintenance Structure for the project.
JST has presented the proposed implementation structure and O&M Structures for sustainability of the project.

JCC agrees with Joint Technical Committee (JTC) that the structures for implementation and O&M are adopted subject to further refinement through discussion among Government stakeholders.

In a project where several ministries are involved in Uganda, Ministry of Finance, Planning and Economic Development (MoFPED) supervises them in organising Project Implementation Entity (PIE) consisting of related ministries. Each ministry establishes Project Implementation Unit (PIU) and PIU implements the project in accordance with the activities and budget in Project Implementation Manual (PIM) made by PIE.

Local government (district) is an important public organization that works directly with farmers but it is supposed to work under the supervision of central government due to budgetary and human resource shortfalls in Local Government.

In the Atari Irrigation Scheme Development Project (AISDP) it has been recommended to start one year before starting construction works for Technical Assistance dispatched 4 experts for train and guide of not only Government and district staff but also farmers and WUA. Atari Irrigation scheme will play important roles of the model site for irrigation and drainage system development in Uganda.

During construction, Project Manager and Co-Project Manager dispatched by PIE supervise the project based on the project Implementation Manual. The main department of ministries are Department of Agricultural Infrastructure and Water for Agricultural Production (DAIWAP) of

MAAIF and Water for Production Department (WfPD) of MWE. This department dispatches Project Manager and Co-Project Manager as permanent staffs.

The organization structure forms following four (4) sections under Project Manager/Co-Project Manager as shown in the Figure 4.1.1:

i)Administration and Land Management Section：

General administration works and dealing with land issues during the construction period. As for the land compensation in accordance with Resettlement Action Plan (RAP), it will be necessary to cooperate and coordinate with RAP Task Force Team (RTF), RAP Implementation Committee (RIC) and PDCC/PACC. It will be necessary to be supported by Ministry of Lands, Housing and Urban Development (MoLHUD) and Ministry of Gender, Labour and Social Development (MoGLSD);

ii)Construction Management Section:

Supervising for main facilities construction will be managed to cover by the project implementation such as intake facility, main, second and farm ditch and supplement gates and turnout and maintenance road, drainage canal and flood protection dyke. The permanent staff from MWE/WfP or MAAIF/DAIWAP will be dispatched for management and supervision of construction works;

iii)Farm Land Development Section：

Terminal facilities such as supplement farm ditch will be constructed by farmers. In order to train and, educated farmers for such construction works MAAIF/DAIWAP staff will be in charge for training in cooperation with the district office. This section will be very important roles of delivery of irrigation water to the on-farm plots. It will be necessary to coincide with the construction works of the farm ditch and turn out and it will be greatly affected to starting the agricultural production as soon as possible;

iv)Community Mobilizing and Extension Service Section：

This section will in charge of cooperation with WUA and training on rice cultivation technology for farmers. It will be necessary to coordinate closely with the Farm Land Development Section for on-farm development and when on-farm developments are completed, it is necessary to start for planting rice in the field where preparation completes even during the construction period. DAES of MAAIF will be expected to dispatch a permanent staff. For training and educating farmers at the field for farming technology, following points should be considered a) Farm Land Planning, b) Soil and Water Conservation, c) Soil Fertility Management, and d) Farm Plot Water Management.

This structure requires National Government of MAAIF/MWE to provide at least four permanent staffs (two from MWE and other two from MAAIF) who sustain main activity under construction and

several temporary staffs who support and train district government.

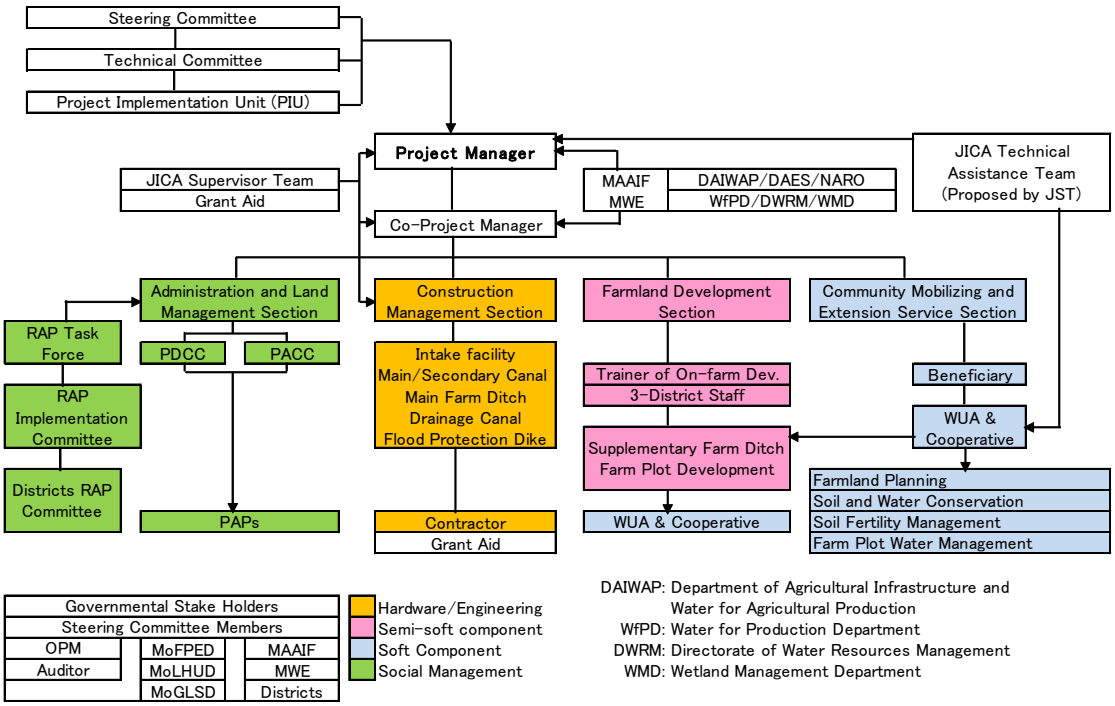


Figure 4.1.1 Proposed Project Implementation Structure

4.2 Project Implementation

4.2.1 Consideration for Construction Works

(1)Measures to Avoid Runoff of Excavated Soil during Construction and after Construction

1)Measures During Construction

Measures to avoid runoff of excavated material mentioned below shall be directed to the contractor compulsorily in the specification.

- ✓ Excavated materials of catch drain and canal along alignment shall be re-used for embankment for flood protection dyke and canal basically and preferentially. The deficit of material and laterite for pavement of road shall be transported from borrow pit. Borrow pit shall be isolated from a community by fence and admittance of people shall not be allowed.
- ✓ Borrow pit shall be covered with surface soil and plant shall be restocked after use.
- ✓ The surface soil of right of way shall be stripped and stockpiled alongside for a while, and it shall be used for covering of embankment of canal and flood protection dyke for the restoration of the plant. Shrub and stump shall be used for sheathing at foot of embankment at the site as much as possible.

Photo -1 Utilization of Stump

- ✓ Excavation of drain and catch drain shall be done at first prior to other works and temporary sedimentation basin shall be provided at the lowest point of the drain so as to avoid flowing out of excavated material. In the case of rain, earth work shall be stopped at once and resumed after the soil is dry enough. As for Atari site, excavation of previous water course shall be done from downstream to upstream at first and temporary sedimentation pond shall be provided so as to avoid flowing out of excavated material as much as possible.

Photo-2 Temporary Sedimentation Pond

- ✓ As for management of quality of embankment, water content shall be controlled properly, compaction shall be done within the acceptable range of water content and splaying water shall be done so as to avoid dispersion of surface soil if necessary.
- ✓ The surface of embankment shall be covered with stripped surface material and grass around the site so as to avoid erosion by rainfall and shrub and stump shall be used for sheathing at foot of embankment at the site so as to avoid flowing out of material.

(2)Operation and Maintenance after Completion of Construction Works

- ✓ As for protection of slope, splaying of water pumped up from the nearby canal shall be carried out until grass put down roots in the soil in a stable state. In case, erosion of slope or collapse of the embankment is found out, rehabilitation work with grass within

surrounding site and compaction work shall be done as soon as possible so as to keep slope of embankment safe and stable.

- ✓ As for drain out of laterite pavement and unevenness of pavement, laterite shall be transported from borrow area and compaction by tamper and reshaping of pavement shall be done regularly.

4.2.2 Construction Material

(1)Location of Borrow Pit

JST investigated borrow pit of local material such as sand, gravel and murrum can be obtained near to the project site and it was confirmed that these pits have good materials and far from the residential area where less risk for safety.

After taking the local materials, these lands should be covered with stripped surface material and grass around the site so as to avoid erosion and to keep the safety after the borrowed place from the community.

Borrow pit of sand: Nabukutu Village, Ngenge S/C

Borrow pit of Murrum: Chepetere Village, Ngenge S/C

Figure 4.2.1 Location of Borrow Pit near to the Atari Site

Source; Google Earth, JICA Study Team

The distance from the project site to the pit is:

- ✓ *Murrum* Pit 10.5 km
- ✓ Sand Pit 22.5 km
- ✓ Gravel Pit 54.6 km

4.2.3 Project Implementation Schedule

JST proposed project implementation schedule as shown in Figure 4.2.2 and implementation schedule was discussed with C/Ps (MAAIF and MWE) and JICA Uganda office through JTC and JCC meeting. Figure 4.2.2 is simplified project implementation schedule of the latest project implementation schedule which was discussed 5th JCC meeting on 19th April 2016.

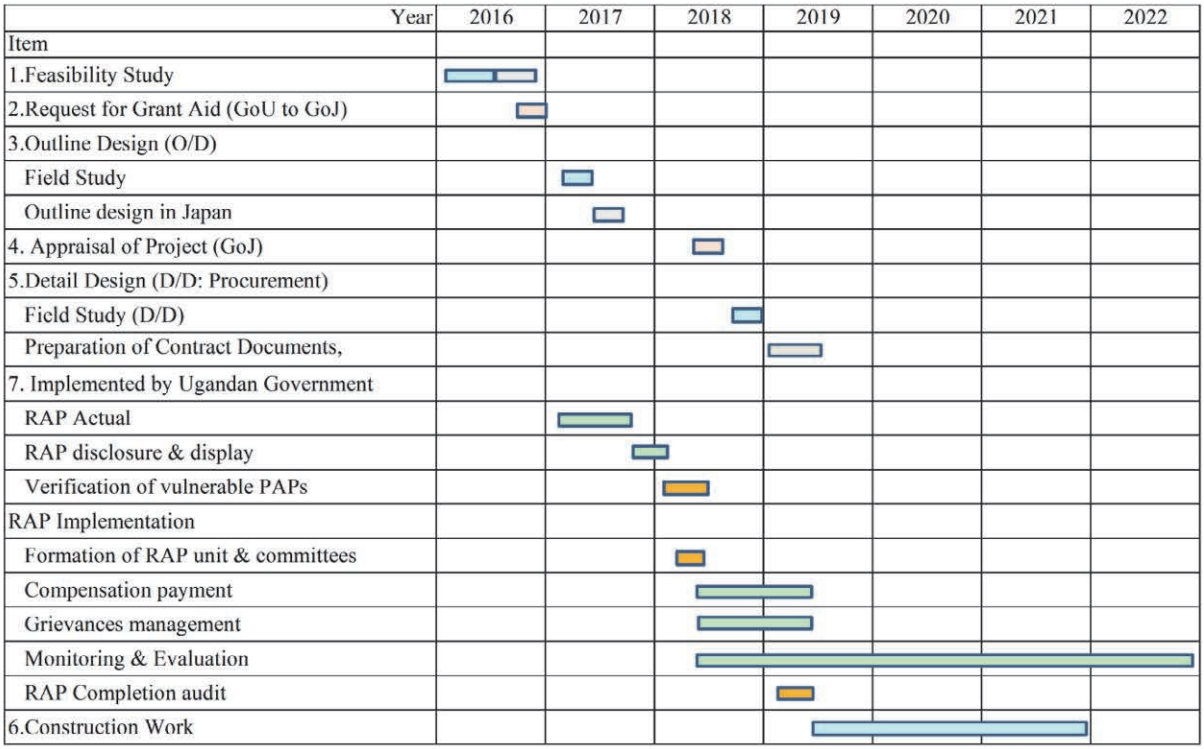


Figure 4.2.2 Project Implementation Schedule

4.3 Structure for Management and O&M

4.3.1 Role of Stakeholders

(1)Management and O&M by Governmental Organization

In Management and O&M activities after the construction of the project, it is very important to sustain and continue the project function as long as possible. Basically, Management and O&M structure will be organized by Central and Local Government and support and cooperate with farmers' organization of WUA and Cooperatives to activate and efficient increasing crop production works

through irrigation water supply and drainage works.

At the beginning of project operation, the abilities, knowledge, technologies and assets of farmers will not be sufficient to manage the overall project. For long-term, the project management and O&M works will be transferred to the farmers' organization. Therefore it is necessary to cooperate and coordinate with related organizations of Government and farmers to increase agricultural productivities and production though maintain of irrigation and drainage facilities in good conditions. The Management and O&M structure is shown in the Figure 4.3.1.

In order to link and support from the Central Government, Scheme Supervisor will play very important roles of effective and efficient management, O&M for facilities through exchange information with WUA and Experts from the Technical Assistance from some donors. Under Scheme Supervisor, a Scheme Manager will be proposed to be arranged for actually organize and activate the organization structure as a responsible person. These Scheme Supervisor and Scheme Manager will be dispatched from MAAIF/MWE as permanent staff.

As shown in the Figure 4.3.1 following three sections would be established under Scheme Manager.

i)Administration and Land Management Section：

Overall administration works for the organization and land ownership and support for registration of land tenure and creates a database of the landowner, water charge conditions for users fee. Also, registration of water right and payment for the water right charge to the Government will be made.

ii)Operation and Management Section:

Two sections will be necessary to be established for i) operate, maintain and repair facilities and ii) operation, maintenance and repair for equipment and machinery such as tractors trucks, backhoes, tampers etc. and warehouse and spare-parts. This Section also promotes terminal facilities construction by farmers and continued for the training of technical support for farmers during the construction period. Establishing Demonstration farm can be utilized for the training of farmers.

iii)Production/Extension Section:

The Section that is responsible for educational guidance to farmers for agricultural production, effectively utilizing the demonstration farm and training effectively with technical support from experts to effectively demonstrate the farmers' technical support for farming and function as a farmers' cooperative. It will be very important roles of supporting, informing the farmers for the effective selling time of the products, securing sales channels to the market to ensure that the functions of the WUA and cooperative. The main targets for this Section are aimed to attain following items on the basis of ASSP; a)Farmers' Organization, b)Value Chain Development, c)Enterprise Development, d) Advanced agricultural Technology Development and e)Farm

Mechanization.

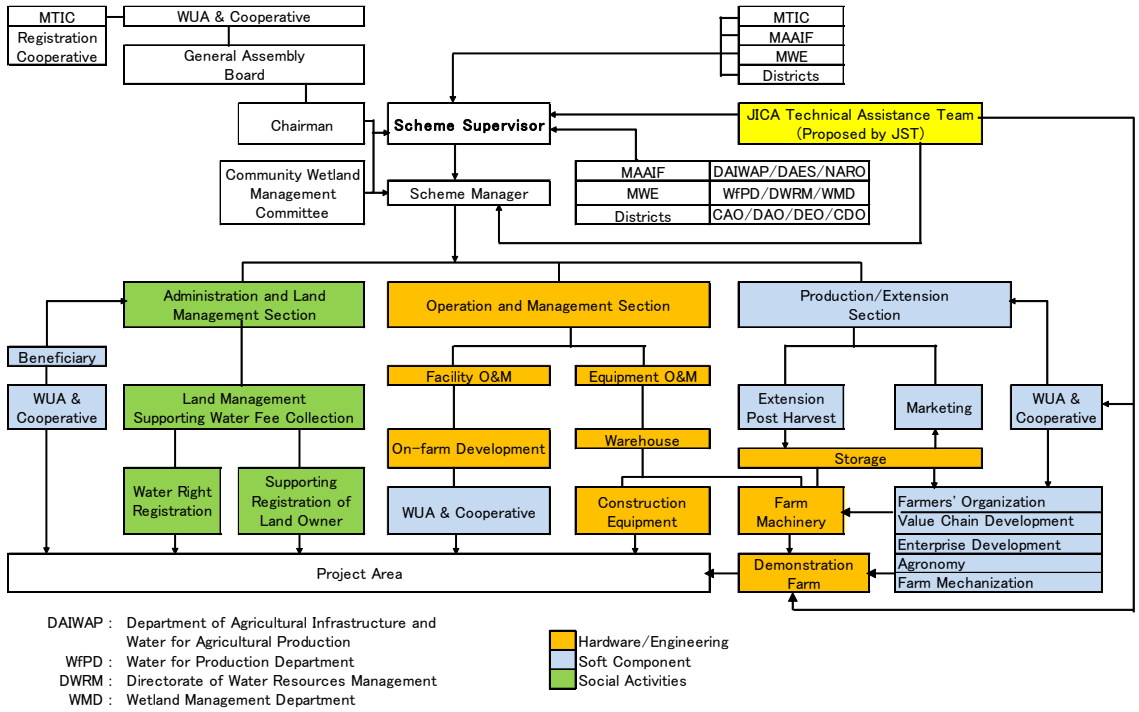


Figure 4.3.1 Proposed Project Management and O&M Structure

(2)Roles of Related Organization

After completion of construction works, management and O&M organization will be shifted from the implementation organization for the management, O&M works for irrigation and drainage facilities through Central Government (MAAIF/MWE/MoLHUD/MoGLSD) and district offices. The O&M organization works closely with WUA and Cooperatives organized by farmers and operates and maintains the project through collaborative activities with WUC which is the core of WUA and Cooperatives. However, it will be very difficult for newly established WUC to maintain and manage large facilities by farmers themselves. Especially at the beginning, sufficient technology transfer and guidance for O&M technology will be necessary by the Governmental Organization. Support to WUC needs to be undertaken comprehensively from the construction period of the project.

After the completion of the project, the management and O&M of the project will be organized by Governmental organizations. In the long-term, it will be finally transferred to WUA and Cooperative associations by farmers for about 10 to 20 years as described in the section 6.4.4 Management and Sustainability of Chapter 6 of National Water Policy enacted in 1999 as follows.

Box;
However, the ownership of these large schemes shall also be gradually transferred to the User Associations in accordance with modalities established in the performance contract, with full participation of concerned local authorities.

Daily water distribution work, facility operation and facility maintenance are carried out by the Government Organization together with WUA, but for maintenance involving large-scale rehabilitation and repair works will be very difficult, since the ability of the WUA and Cooperative Associations organized by farmers will not have enough capacity. It is appropriate for Government Organization to do such large-works. However, as it is in principle that all farmers' maintenance is performed on supplementary field water (Supplementary Farm Ditch) and below, it is a responsibility for farmers' organizations to do even large-scale refurbishment at terminal facilities. It is necessary for the farmers' organizations to take responsibility, especially in the case of rearranging farm plots of fields and planning for land consolidation at the field development in the future.

Maintenance work should basically be considered with permanent work over a long period in mind. Under these circumstances, the organizational structure as the O&M system of the irrigation and drainage project should have the following three steps, and each organizational structure is united, and it is necessary to collaborate in cooperation and work.

1st Stage: For the period of about 10 to 20 years from the completion of the project construction works, related staff and engineers for Governmental organization and districts including WUA and Cooperation organization will not have sufficient knowledge for various technological and capacity for management and O&M activities. It will be recommendable to learn from the neighbouring Atari site that will be provided experts under technical assistance for guidance and training works for the Atari site management and O&M organization which is being done and observe and utilize the role as model area of Atari site and acquire knowledge of O&M technology together with agricultural farming technology and productivity improvement technology etc. At the beginning of management and O&M activities the proposed Governmental Organization as shown in the Figure 4.3.1 can be recommended to start.

2nd Stage: with the ability to operate, maintain and manage such irrigation drainage system, technology, gradually prepare to transfer O&M control to the farmer organization of WUA and Cooperative.

3rd Stage: The time to have confidences for management, O&M by the WUA, it will be proposed to be fully transferred to the users of farmers organization for the all of asset and properties of facilities. The irrigation and drainage system will be totally managed by farmers themselves and self reliance to be independent with the full operation of collecting sufficient water charge for management and O&M activities.

Organization of roles sharing plans in O&M by each organization is shown as follows.

The National government has the primary responsibility to the management and O&M, and repair/rehabilitation of large facilities and also giving technical advice and training to other parties.

Local government (district) is responsible for O&M of the secondary facilities on the basis of instruction and support from the Central Government. However district will have their own

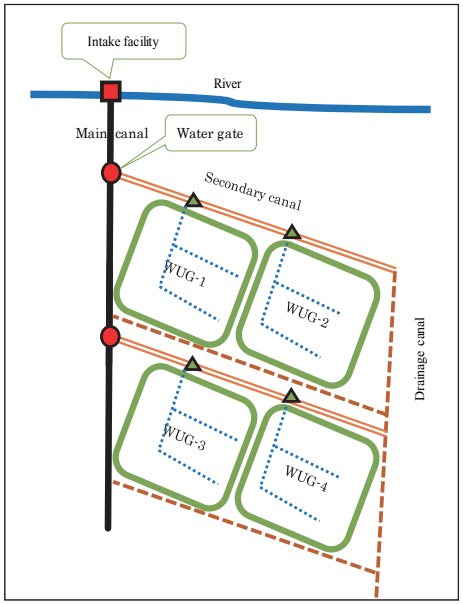
works and a limited number of staffs and budgets, it will be rather difficult to concentrate on a specific project only. Therefore the district will play a role of a hub and communication between farmers and national government at the field level.

Farmers' organization is responsible for ordinary O&M of the whole facilities with the support of national and local government and also functions as a channel of tariff collection and labour supply for maintenance. It is important to participate from the beginning for management, O&M activities. The WUC, which is a core organization, will be in charge of primary facilities, as a middle organization of WUA will be in charge of secondary facilities and the WUG as the terminal organization will be in charge of on-farm level facilities.

The demarcation of roles of related organization for O&M works and activities for irrigation and drainage facilities are shown in the following Table 4.3.1.

Table 4.3.1 Expected role of Division of O&M

Name of facility	Icon	Operation & ordinary maintenance	Large maintenance
Intake facilities (Headwork, main water gate)		Government Farmers Organization (WUC)	National government
Main canal		Government Farmers Organization (WUC)	National government
Water gate (From the main canal to secondary canal)		Government Farmers Organization (WUC)	National government
Secondary canal		Farmers Organization (WUA)	Local government
Water gate (from secondary canal to tertiary canal)		Farmers Organization (WUA or WUG)	Local government
Tertiary canal		Farmers Organization (WUG)	Farmers Organization
Drainage canal		Farmers Organization (WUG)	Local government



4.3.2 Role of WUA

The main purpose of establishing WUA is to ensure efficient and equal water distribution to members. In order to accomplish this purpose, WUA is usually established as autonomous, non-profit, self-funding organization with a certain legal status. The main role of WUA is O&M of irrigation facilities (water intake, canals, water gate, drainage, etc.) and Management of whole irrigation systems.

Specific roles of WUA are;

a) O&M: prepare and implement O&M plans, ensure efficient supply of water, and mobilize resources for O&M (fund, labour, material, etc.)

b) Financing: collect annual fee from members (registration fee, water users fee, etc.), manage association's fund and allocate budget

WUA also plays an ordinary role of farmers association such as coordination between members, conflict resolution, and so on.

Multi-function of WUA and legal basis: WUA is a fundamental organization for O&M of the irrigation system. Also, WUA plays an important role to tackle the challenges that farmer's organization in the area faces; enhancement of agricultural production and marketing ability. In this project, the WUA must be an organization that is multipurpose performing functions such as irrigation O&M, production reinforcement and improvement of marketing environment

Regarding legal basis of organization, considering the fact that Irrigation policy is still under formulation process, only the two laws regarding cooperatives (Cooperative Societies Act 1991 and Cooperative Societies Regulations 1992) can give legal status to WUA. The SACCOs are also regulated by the same laws. There is no specific law regulating agriculture cooperatives in Uganda.

DIFACOS, the management cooperative of Doho Irrigation Scheme, is an example of WUA authorized by Cooperative Societies Act. The owner of the Doho Scheme is MAAIF and MAAIF entrusts DIFACOS management of the scheme (including a charge of water user's fee). DIFACOS is also a multi-purposed organization where Production Committee, Finance Committee and Marketing Committee are in charge of functions other than irrigation O&M.

Learning from the example, the WUA of this project is recommended to firstly, register MTI as cooperative and then as WUA after Irrigation Policy establishes registration system of WUAs.

4.3.3 Structure of WUA

One of the important characteristics of WUA is compulsory membership. All users of water from irrigation system are obliged to be members

WUA is supposed to have a three-layered structure with WUG as lower organization and WUC as a higher organization. WUG, the smallest unit, consists of 15 - 20 m who receives water from the same tertiary/terminal canal. The WUG is responsible for maintaining canals in their area. In this way, farmers become more responsible for maintenance activities because they take care the facilities that they use. WUG leaders are elected by their members. The leader is in charge of consensus building of his/her WUG members and participating in the WUA meeting on behalf of his/her WUG. WUA also selects representatives and sends them to WUC to make a decision of whole users. In this system, information sharing and fostering a sense of responsibility of leaders are important because all decision making is made through leaders.

Considering a number of beneficiaries and proper size of the group, WUG is organized at the community level, WUA at village level and WUC at the district level.

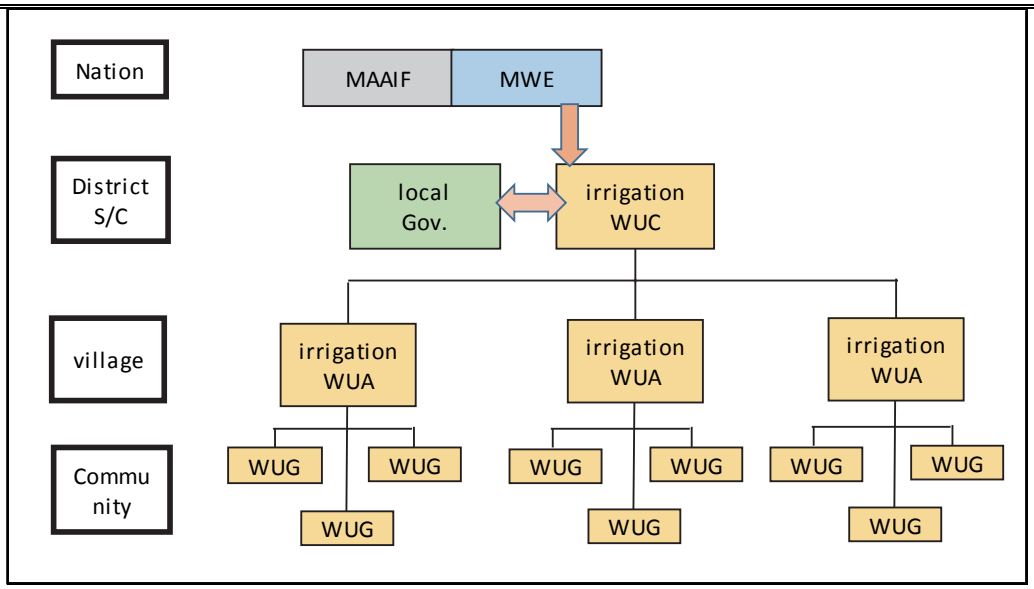


Figure 4.3.2 Layered Structure of WUAs

Box: Estimation of Number of WUG/WUA in Atari Area

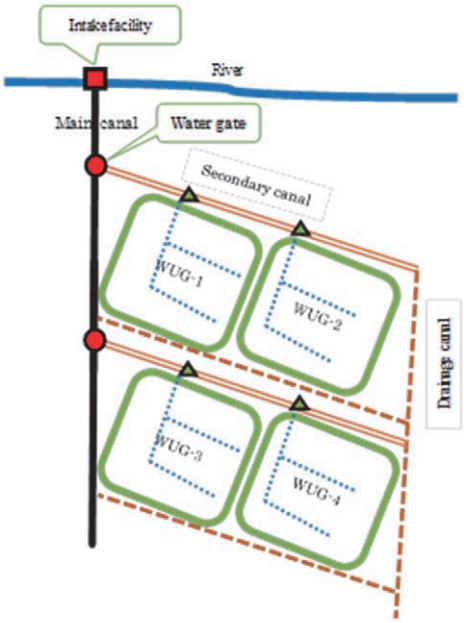


Figure: Image of Area covered by WUG

Figure: Layout of Canals in Atari

The number of WUG/WUA is estimated based on the data of irrigation system as listed below.

- Total irrigable area: 700 ha, number of secondary canals: 6 (3km length on average)
- Irrigable area per tertiary canal: 10 ha (500 m*200 m)* assuming that short side faces to canal
- The average area of lowland rice: 0.96 acres (0.4ha) *based on the data of PISD-SES. *assuming that the average area does not change after irrigation facilities are installed.

- A number of farmers who receive water from the same tertiary canal:
  10 ha/0.4ha=25.0farmers =1 WUG
- Number of WUG per secondary canal: 3km/0.2km＝15WUG (375farmers)
- Total number of WUG: 90WUG (15WUG/secondary canal * 6 canals＝2,250farmers)
- Total number of WUA: 6WUA (1 WUA/secondary canal, 1 WUA=15WUG=375farmers)

It seems adequate to manage 3 km length of the canal by one WUA. It is possible to create 2 WUA for upper side and lower side when it is difficult on the early stage of the project. To prevent the negative impact of lower side caused by inadequate management of upper side, intensive technical guidance to upper-side WUA and creation of information system among WUAs are necessary.

The basic functional bodies of WUC are: General Assembly as a supreme decision-making body, Executive Committee as a management body and several special committees. Of all committees, Water Distribution Committee is especially important for the irrigation system. For functions of WUC other than irrigation management, Production Committee for agricultural production and Marketing Committee for sales of the product are organized as necessary.

All members have a right to attend general Assembly but it is not realistic to hold a meeting with thousands of people. Assembly of Representatives is an adequate form. In the project, General Assembly is participated by the leaders of WUAs.

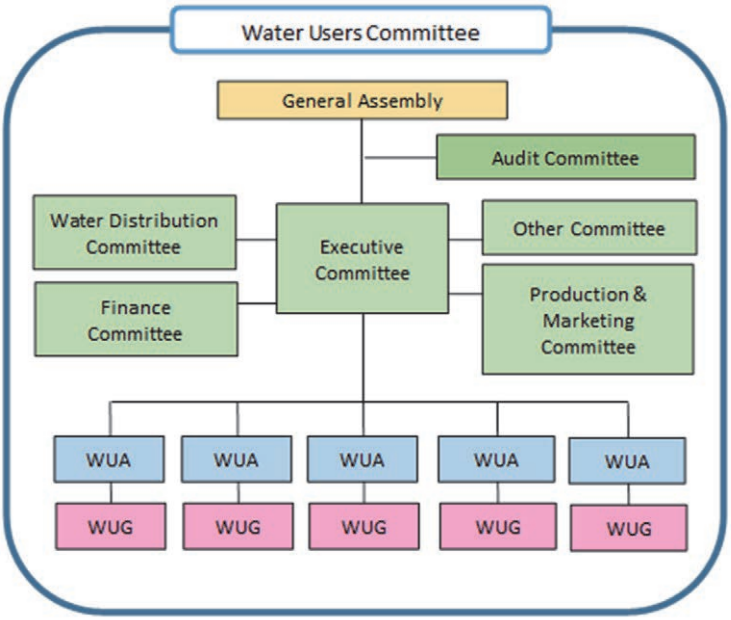


Figure 4.3.3 Structure of WUC

The project is supposed to establish Demonstration Farm in the area which is operated in cooperation with local government and Ministries. Through activities in the Farm, WUAs as PMB will experience in operation and management of irrigation facilities by giving training on organizing and management of WUA and WUGs, water management, paddy rice growing, and so on.

4.3.4 Charge of Water Users Fee

One of the main characteristics of WUA is self-funding, which means that WUA should operate and

maintain the irrigation system solely on the basis of contributions in cash or kind from the beneficiaries. Thus, WUA must secure funding source, manage the fund and allocate fund properly. The irrigation system is sustained by regular maintenance by WUAs (the irrigation system operator) and the cost should be borne by farmers (the irrigation system users). Thus, the irrigation system is the exchange relation of money and water between users and operator.

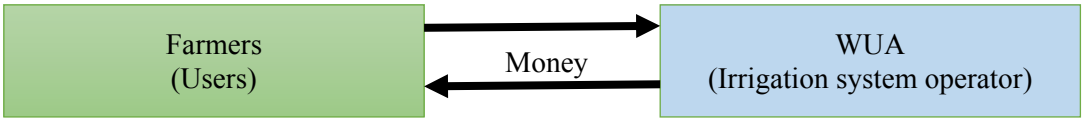


Figure 4.3.4 Financial Relationship between Farmers and WUA

There are three types of expenditure of WUA as below.

Ordinary expenditure	• Cost of operation and maintenance of the irrigation facilities including head works, canals, other structures and equipment; • Purchase and replacement of parts of equipment; • Funding of relevant training for members of the association; • Payment of employees and contractors engaged by WUA; • Payment of other administrative costs.
Emergency expenditure	• breach or overtopping of canal embankment or river dyke, causing flooding; • the critical failure of head works, causing interruption of irrigation water supply; • Natural disasters such as floods, earthquakes or typhoons.
Reserve fund for renewal of facilities in the future	• The cost to replace water gate and other facilities (every 5-20 years). • The cost to repair large structures such as headwork, main canal, etc.

Although the financial principle of WUA is self-funding by members, in the case of repair of large facilities such as headwork or main water gate, WUA possibly gets financial support from the national government due to its high cost.

Pricing of Water Users Fee should be calculated carefully. The members might reject to pay the fee when pricing method is not clear or they are not satisfied with the price itself. The general process of pricing is accumulating all expected expenditure as follow:

a) List up all expected expenditure including ordinary expenditure, emergency expenditure and cost to renewal (see the former section);
b) Estimate annual cost for each expenditure;
c) Sum up all the costs;
d) Divide the sum by size of irrigation area, then you will get water users fee per acre per year.

After you get the Water Users Fee, you have to consider if the fee is "*affordable*" to members. If not, you have to change the way of activity to more economical way or to give up some activities. The charging timing could be both yearly or seasonally considering the seasonal affordability of members.

In Atari area, people pay for group activity only US$ 2 annually. People may resist paying water users fee much over US$ 2. To capture the payable amount of farmers, the amount of credit and saving of farmers group might be one of the bases. Credit and saving are a common activity of farmers group and members save about USh 4,000 − 20,000 monthly. In calculation, they save USh 48,000 − 240,000 (US$ 16 - 80) annually. In Atari area, average farmland is 2.7 ha (6.7 acres, PISD-SES 2015). Dividing annual saving by average farmland, you get USh 17,800 - 88,900 (US$ 5.9 - 29.6). About US$ 6 − 30 per ha might be acceptable for farmers for annual water users fee. In case that the actual fee is higher than this amount, it is better to gradually increase the fee in accordance with the increase of income of farmers.

4.4 Water Resource Association

Water resources are used by various users such as fisherman, livestock keeper and user of drinking water. The common rules for all users are needed to prevent water from depletion so that all users keep access to the water resource. When large-scale irrigation project is realized in the area, irrigation users become the largest users group. In this case, irrigation users are expected to lead and organize Water Resource Association (WRA) consisting of a representative of all kind of users to create rules and consensus on the usage of water resource in the area.

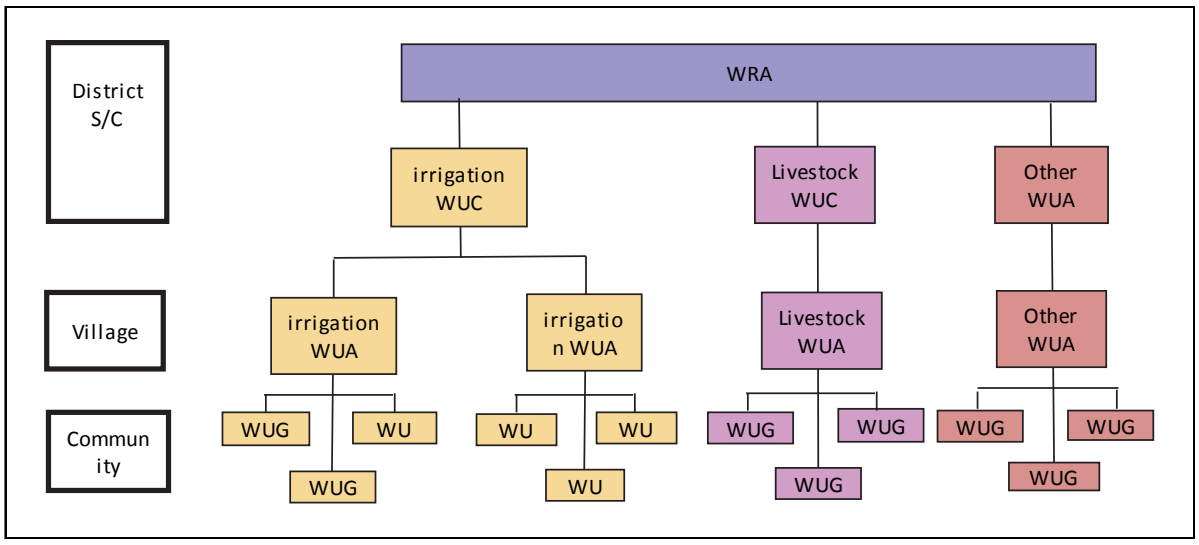


Figure 4.4.1 Image of WRA

In the area, Atari Community-based Wetland Management Plan (April 2016) was already drawn up. In the process, key stakeholders using water resources (livestock keepers, charcoal maker, etc.) have been identified and Community Management Committee is organized as implementation body of the plan. The registration system of Community Management Committee to sub-county was established and the committee was authorized by concluding MoU with local government. The project considers the committee as WRA and works with them.

CHAPTER 5

ESTIMATION OF CONSTRUCTION COSTS

CHAPTER 5 ESTIMATION OF CONSTRUCTION COSTS

CHAPTER 6

PROJECT EVALUATION

CHAPTER 6 PROJECT EVALUATION

CHAPTER 7

ENVIRONMENT AND SOCIAL CONSIDERATIONS

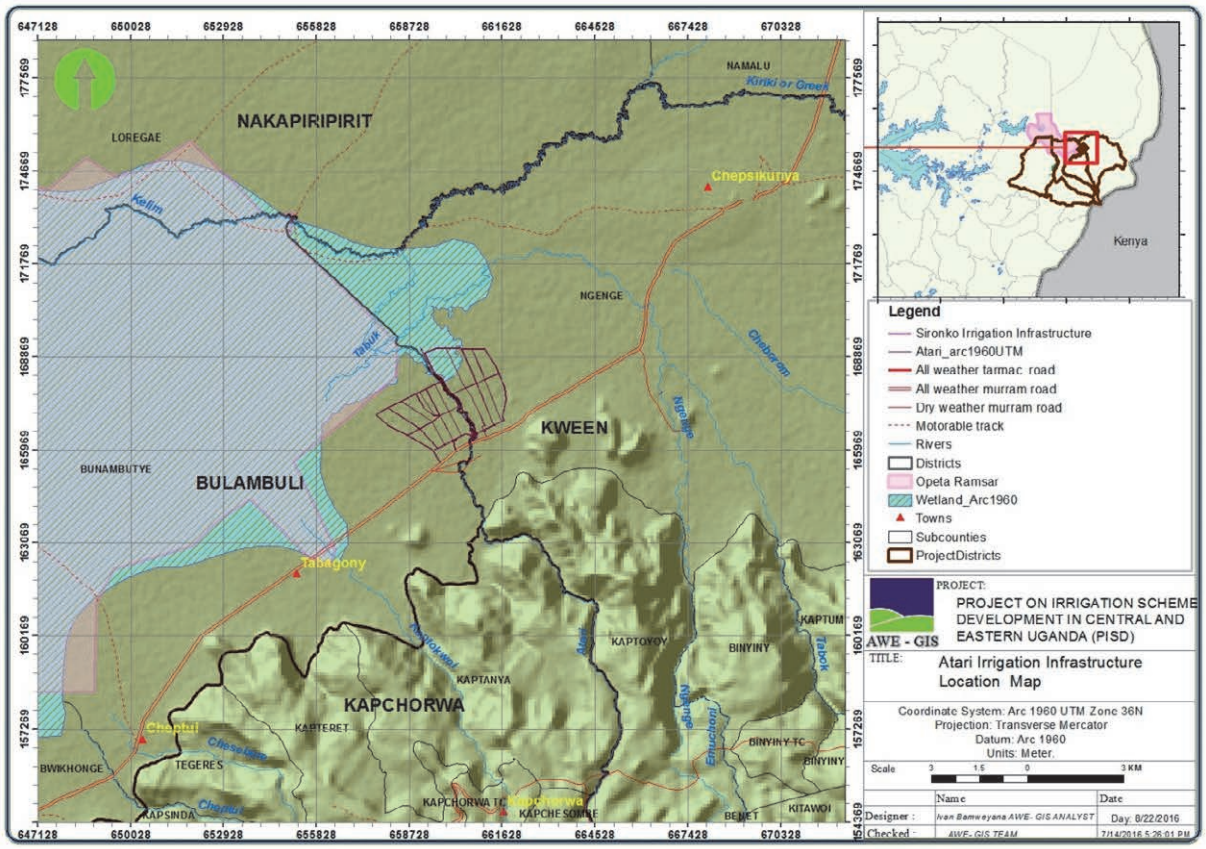
CHAPTER 7 ENVIRONMENT AND SOCIAL CONSIDERATIONS

7.1 Environment and Social Considerations

The section shows summaries of the environmental and social considerations on the proposed irrigation project in Atari. Details can be referred to in Annex III-8.

7.1.1 Outline of Project Component to Give Impact on Environmental and Social Aspects

The irrigation project installs facilities for sound farming in the Atari area such as headwork and canals. Construction of these facilities and their operation can be factors to give impacts on the environmental and social aspects. Figure 7.1.1 illustrates the location of the study area. The background of the project is referred to Section 1.1 of this report.



Source: JICA Study Team

Figure 7.1.1 Location of Atari Project Site

The facilities for the irrigation project include 1) head works, 2) canals (main, secondary and tertiary) and 3) road network, described in Section 1.1.1 of Annex III-8.

Impacts caused by the project before/during construction and operation phases were examined and mitigation measures were developed through the Environmental Impact Assessment (EIA).

7.1.2 Fundamentals of Environment and Social Conditions

Basic environmental and social conditions in the study area are summarized in Table 7.1.1. Details are shown in Section 1.1 and 1.2 of Chapter 1 in this report as well as Section 1.1.2 of Annex III-8.

Table 7.1.1 Basic Environmental and Social Conditions in the Atari Study Area

Item	Description
Environmental Condition	
Climate	Uganda has a tropical climate with rainy and dry seasons. According to the "Hydro-Climatic Study Report on the Water Resources of Uganda (2010)" by DWRM analysis of monthly rainfall records at 102 rain gauges for the period, 1940-75 were classified into 16 climate zones. Atari project area is located in zone F it is assumed that there is virtually one rainy season from March to October, with the main peak in April and a secondary peak in August and one dry season December to about mid March.
River and Water Body	There is a single river system in the project area. The Atari River Basin which lay its stream channel straight from the mountainous area of Mt. Elgon National Park (around Piswa area near to the peak Muzoa; 3,338 m) and forwards to confluence point with the Kelim River which flows into the Lake Opeta (Awoja Wetland System).
Topography and Geology	The topography of the project area, generally, is characterized as flat plain relief dissected by rivers emerging from the mountainous area and flowing toward the low-lying area of Awoja Wetland system. The area has mainly two types of soils, i.e., loam and sandy loam soils that are mainly accumulated around seasonal swamps where major agricultural activities are practised. These soils are greatly in favour of the growth of pastures for livestock and growth of agricultural products.
Vegetation	The vegetation cover of the area is characterized by scattered trees, tall grass and shrubs. In several areas, the vegetation has degenerated into secondary vegetation. The major contributing factor is human deliberate activities like animal grazing, construction, cutting of grass and trees for firewood and bush burnings. There are also patches of permanent wetland. The wetlands are critical in maintaining a link with the Ramsar sites of Bisina and Opeta downstream.
Social Condition	
Population	The total population of Bulambuli District is estimated at 177,322 (85,837 male and 91,485 female), with annual population growth rate of about to 3.5 to 5.0 % from 2002 to 2014. On the other hand, the population and its growth rate of Kween District are 95,623 (48,579 male and 47,044 female) and 2.5 to 3.5 %, respectively.
Economic Activity	Agriculture forms the basis of the mainstream economic activities of the people in the project area. It includes crop production and animal husbandry. Despite the agricultural potential of the area, there is the limited application of modern techniques of production which leaves farmers to operate below their potential. The major cash crops grown in the area include rice, sunflower, peas and beans.
Education	Although primary schools are provided to the both districts concerned, access to secondary school is poor. The trend can be a case for other neighbour areas in Uganda.
Health	In Bulambuli and Kween Districts, there was no hospital at any of organization level (2011). Total facility numbers for health centre are almost at the same level; however, the composition of facility levels differs each other specifically for Health Centre III and II.

Source: JICA Study Team

7.1.3 Regulation and Organization of Uganda

The outline of regulation and organization of Uganda is shown in this section, and detailed information such as gap analysis between Japan-Uganda regulations, the procedure of EIA and the system etc. are obtained in Section 1.1.3 of Annex III-8.

(1)Policy and Laws Related to Environmental Consideration in Uganda

Important regal framework for environment and social consideration in Uganda mainly consists of the country's Constitution (1995), National Environment Management Policy (1995), and National Environment Act (NEA 1995).

(2)Policy and Laws Related to Wetland

Uganda has two major regulations on the wetland such as 1) National Policy for the Conservation and Management of Wetlands (1995) and 2) National Environment (Wetlands, River bank, and Lake Shores Management) Regulations (2000). The former policy provides the basis for management and use of wetlands in Uganda. The latter regulations are important regarding irrigation development project in the wetland.

WMD in MWE is responsible for the implementation of Uganda's Wetland Policy. The Wetland Sector Strategic Plan 2001-2010 (WSSP) guides the activities of the WMD. The current WSSP (2011-20) is the latest version. Its goals are to increase knowledge and public and stakeholder awareness about wetlands, further develop the institution structure for wetland management, improve management and protection, establish, and strengthen community-based wetland management, and mobilize local and international financing mechanisms.

(3)Procedure of Environmental Impact Assessment

EIA responsible institution in Uganda is the National Environment Management Authority (NEMA). The EIA process is summarized as follows:

a) Project brief preparation (for projects that may not require full/ detained EIA);

b) Screening;

c) Detailed environmental impact study; and

d) Decision making by NEMA (and lead agencies).

According to the EIA Regulations 1998, the EIS refers to the detailed study conducted to determine the possible environmental impacts of a proposed project and measures to mitigate their effects.

7.1.4 Comparison of Alternatives (including Zero Option)

As discussed in Section 2.3 of Chapter 2, alternatives were compared mainly with 1) flood control, 2) environmental and 3) social impacts and the one was selected on a total-judgment basis. For a selection of alignment of protection dyke and area, Alt-P3 (dykes to be set at both sides 30 m from the hypothetical river centre) was selected to control flood effectively with a reasonable amount of land occupation and fair ecosystem conservation. As per impact to the downstream, namely Ramsar Convention area, building dykes was expected to form sand bars and reduce sediment transport downstream (Alt-P2, P3 & P4). On water course alternation, Alt-L1 (restoration of the original waterway) was selected rather than Alt-L2 (construction of protection dyke along the existing waterway) or Alt-L0 (Zero option). In the comparison, Alt-L1 was not expected to give a critical impact to the downstream compared with others. Section 1.1.4 of Annex III-8 can be referred to for your information.

7.1.5 Scoping and TOR for Investigation of Environmental and Social Considerations

Scoping of the EIA study for the project was discussed and prepared in accordance with the initial survey. The result of scoping is shown in Table 7.1.2. Based on the scoping table, no item is rated as "A", and 19 and 16 items as "B" (some positive/negative impacts are expected) for pre/during construction and operation phase, respectively. On the other hand, 9 and 10 items are rated as "D" (few impacts are expected). Section 1.1.5 of Annex III-8 shows the TOR of EIA study based on the scoping results in Table 7.1.2 of the report.

Table 7.1.2 Scoping of the EIA Study for the Atari Irrigation Project

	No.	Item	Rating		Description of Impacts
			Pre-/ Const.	Opera-tion	
Pollution	1	Air Pollution	B-	D	[Design/Construction phase] Dust and exhaust gas may be generated temporarily. The impact is slight as there are few houses. [Operation phase] Air pollution is not anticipated because there is no source.
	2	Water Pollution	B-	B-	[Design/Construction phase] The inflow of turbid water from the construction sites is expected. Drained water like night soil from workers' camp areas can be a source of water pollution if it flows in. [Operation phase] Farmers scarcely use chemical fertilizers and agrochemicals at present. In addition, the great increase of such chemical materials that cause water pollution is not expected. However, the impact caused by expansion of chemical materials may affect downside of the project area, especially to fishery and papyrus.
	3	Soil Contamination	B-	C	[Design/Construction phase] Spilled oil from construction machinery may cause soil contamination. [Operation phase] Salt damage of farmlands is anticipated but the extent is unsure.
	4	Wastes	B-	B-	[Design/Construction phase] Construction works will generate scrap materials and wastes. And wastes from workers' camp can be a source. [Operation phase] Agricultural residues like paddy straw and rice husk after harvesting may be generated and needed a proper treatment.
	5	Noise and Vibration	B-	D	[Design/Construction phase] Though impact by construction machinery is expected, the range may be limited as the area is farmland and the population is few. [Operation phase] The impact of noise and vibration is not anticipated because there is no noise/vibration source.
	6	Ground Subsidence	D	D	[Design/Construction phase], [Operation phase] The works, which cause ground subsidence (such as excessive pumping-up), is not scheduled and pumping-up of groundwater is not necessary for operation phase. Thus, ground subsidence is not expected.
	7	Offensive Odors	D	D	[Design/Construction phase], [Operation phase] Use of machinery and works, which cause offensive odors, is not expected. Generation of offensive odors is not expected
Natural Environ	8	Topography and Geographical Features	D	D	[Design/Construction phase], [Operation phase] Large-scaled modification in topography and geographical features is not required as the irrigation and drainage channel are designed by making use of existing geographical slope.

	No.	Item	Rating		Description of Impacts
			Pre-/ Const.	Opera-tion	
	9	Flora, Fauna and Biodiversity	B-	B-	[Design/Construction phase] Plant trimming, a decrease of habitats of wild animals and disturbance of wetland ecosystem are anticipated by construction work. [Operation phase] In case farmers decide local plants are not useful to their activities, they would vanish these plants.
	10	Protected Areas	B-	B-	[Design/Construction phase] Drained water caused by construction may disturb the Ramsar Convention in which is located downstream the Atari River. [Operation phase] Drained water with fertilizer is anticipated to give certain impact on the Ramsar Convention area but the extent is expected to be limited.
	11	Soil Erosion	B-	B+	[Design/Construction phase] Soil erosion is expected near borrowing pit. [Operation phase] This project will convert existing farmland and grassland into a rice field. Thus, multiple functions of rice field will prevent soil erosion.
	12	Groundwater	D	B-	[Design/Construction phase] Dredging depth is shallow and construction works will be done by open-cut. In addition, the construction method, which decreases groundwater level such as deep good method, is not going to be applied in construction, thus the impact on groundwater is not expected. [Operation phase] Ground water may be contaminated by fertilizers but the impact is expected minimum as river water will be used for irrigation.
	13	Hydrological Situation	B-	B+/-	[Design/Construction phase] Water flow may be disturbed when constructing the headwork. [Operation phase] Reduction of water volume to downstream is expected by utilization of irrigation water. On the other hand, it becomes possible to get irrigation water stably at the area to be given benefit in operation phase.
	14	Global Warming	D	D	[Design/Construction phase], [Operation phase][9] Impact on global warming such as the massive amount of release of greenhouse gas is not expected both in construction phase and operation phase.
Social Environment	15	Involuntary Resettlement/ Land Acquisition	B-	C	[Design/Construction phase] Land acquisition is required for the construction of irrigation facilities. On the other hand, there are very few houses and involuntary resettlement is not expected by modifying the alignment of irrigation facilities. [Operation phase] The impact can be estimated by future study.
	16	Local Economy such as Employment and Livelihood, etc.	B+	B+/-	[Design/Construction phase] Generation of new employment is expected during construction. [Operation phase] The increase of irrigation water may raise productivity. On the other hand, the person who utilizes wetland for the purpose of the fishery, farming, harvesting and processing of Papyrus, etc. (other than rice farming) are likely to be affected.

[9] The amount of annual GHG emission (CO_2 equivalent) caused by rice growing is estimated about 2,800 tons of CO_2 equivalent in Atari area. According to the threshold value proposed by IFC - a part of WB - per project (25,000 tons of CO_2 equivalent per year), the estimated amount is quite lower thus a critical impact by the project is not anticipated.

No.	Item	Rating		Description of Impacts
		Pre-/ Const.	Opera-tion	
17	Landscape	B-	D	[Design/Construction phase] It is concerned that heavy machinery and material yard may ruin the landscape. [Operation phase] The landscape of the project area is not disturbed because the facilities to be planned will not be large.
18	Land Use and Utilization of Local Resources	B-	B-	[Design/Construction phase] A person who utilizes wetland for the purpose of the fishery, farming, harvesting and processing of Papyrus, etc. (other than rice farming) are likely to be affected. [Operation phase] Building the buffer zone may restrict fishery and other activities around the zone. On the other hand, the ecosystem in the buffer zone will be properly conserved.
19	Split in Community	D	B+/-	[Design/Construction phase] The boundaries will be identified before the construction, so split in the community is not anticipated. [Operation phase] People in community expected to be united as water user's association will be established. On the other hand, tension may be generated between rice farmers and people who utilize wetland for fishing, farming, etc.
20	Existing Social Infrastructures and Services	B-	D	[Design/Construction phase] Although it is expected traffic volume of construction related vehicles will increase, the impact is limited as the site is located in rural area. [Operation phase] Since the irrigation project provides new facilities and utilizes the existing social infrastructures, no adverse impacts are anticipated.
21	The Poor, Indigenous and Ethnic People	B+	B+/-	[Design/Construction phase] New employment is expected to be generated during construction. [Operation phase] The increase of irrigation water may raise productivity. On the other hand, the person who utilizes wetland for the purpose of the fishery, farming, harvesting and processing of Papyrus, etc. (other than rice farming) are likely to be affected.
22	Misdistribution of Benefit and Damage	D	B-	[Design/Construction phase] The project will try to provide fair support to affected people, so the misdistribution of benefit and damage is not anticipated. [Operation phase] There may be gaps between beneficiaries and non-beneficiaries.
23	Cultural Heritage	D	D	[Design/Construction phase], [Operation phase] There is no cultural heritage authorized by GoU in/around the project area. Then adverse impacts are not anticipated during design/construction phase as well as operation phase.
24	Local Conflict of Interests	C	B-	[Design/Construction phase] Although farmers sometimes fight with regard to boundaries but large-scale objection movement regarding land dispute and project has not reported in the project area. However, careful attention should be paid to local residents. [Operation phase] There may be gaps between beneficiaries and non-beneficiaries.
25	Water Usage or Water Rights and Rights of Common	B-	B+/-	[Design/Construction phase] Impact on water usage of farmers at downstream is expected by unstable water flow. [Operation phase] Planned water usage will be established by the project.
26	Gender/ Children's Rights	C	C	[Design/Construction phase], [Operation phase] Slight impact on children by water drawing work is expected, but the extent is unsure.

	No.	Item	Rating		Description of Impacts
			Pre-/ Const.	Opera-tion	
	27	Hazards (Risk), Infectious Diseases such as HIV/AIDS	C	C	[Design/Construction phase] Since local residents will be employed as a construction worker, an outbreak of infection disease is not so expected, but the extent is unclear. [Operation phase] Spread of infectious diseases by the project is not anticipated because this is an irrigation project. However, endemic diseases caused by the spread of water use may be potential.
	28	Working Conditions/ Accidents	B-	D	[Design/Construction phase] Deterioration of working condition is concerned about breaking regulations. [Operation phase] The project will not give negative impact on farmers since the farming way will not be drastically changed.
Others	29	Accident	B-	B-	[Design/Construction phase] The accident may be caused by neglect of regulation and imperfect following to safety countermeasures. [Operation phase] Car and motorbike traffic on the service roads along the canals may be a cause of traffic accident. Children who play around borrow pits may have a physical accident. The development of canals in the area may induce approaching unexpected animals like wild reptiles and giving damages to farmers and domestic animals.
	30	Across-boarder problems	D	C	[Design/Construction phase] Considering the scale of the facility, impact on the Nile River Basin is not expected. [Operation phase] Water intake from the Atari River is not sure to give an adverse impact on the Nile River Basin. Further study is needed.
	31	Monitoring System	B-	B-	[Design/Construction phase], [Operation phase] The malfunction may be caused by the neglect of monitoring system during construction and operation phases, respectively.

Rating:
A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown
(Examination is needed. Impacts may become clear as the study progresses.)
D: No impact is expected
Source: JICA Study Team

7.1.6 Results of Investigation of Environmental and Social Considerations

With regard to pollution items such as air, noise and water, all the baseline values were within the reference standards. For fauna and flora, most species were identified as LC (least concern) in IUCN List except birds Gray-crowned Crane as EN (endangered) and Pallid Harrier as NT (near-threatened).

The estimated number of buildings and Project-affected Families (PAFs) were 0 and 284 respectively, and the number of persons to be relocated was below 200. Inside the buffer zone, 97 PAFs will be affected even though there are no houses inside.

Further explanation of the results of baseline survey is indicated in Section 1.1.6 of Annex III-8. In addition, the result of re-rating and the reasons are shown in Table 1.1.18 of the Section.

7.1.7 Project Impacts on the Farmland Ecosystem

Through EIA it is confirmed that a part of the project area has been converted to farmlands but is inhabited by various fauna and flora. Regarding flora, the Shannon-Weiner index, which is an index of biodiversity, is as below showing that the diversity of flora is generally high.

Table 7.1.3 Shannon-Weiner Index in Atari Site

Species	Shannon-Weiner Index (H')	Number of species
Herb	4.80	68
Grass	4.09	32
Tree	4.16	28
Shrub	3.46	24
Climber	3.27	18
Total		170

Components of the ecosystem of farmlands include farmlands such as paddies and fields, waterways/ ponds, trees and grasslands such as pastures and meadows.

1) Development of agricultural fields: the reformation of wetlands into a well-drained paddy field, increase in size of a plot, decrease of ridge areas, concrete construction of waterways.

2) Use of pesticides and herbicides: water pollution.

3) Use of chemical fertilizer: eutrophication of waters.

4) Change of O&M methods: mechanization, chemicalization, and labour saving of farming activities, careless O&M.

5) The increase of deserted cultivated lands: the devastation of cultivated lands and water utilization facilities, decrease of paddy areas.

The project is to improve farmland use and agricultural productivity under proper management by the introduction of irrigation facilities in the project area. By introducing the irrigation system to rain-fed rice cultivation, it becomes possible to supply water to farmlands stably as planned. In addition, the project provides farmers with farming instructions which contribute to the wise-use of wetlands and promotes/ ensures the proper usage of fertilizers. This shall contribute to mitigating serious impacts on the ecosystem of farmlands. Continuous monitoring of biota and water quality shall also contribute to the mitigation of impacts.

7.1.8 Evaluation of Environmental Impact to the Lake Opeta

(1)Environmental Impact of Atari Site Development

One of the concerns on the local environment is whether the irrigation project would give a serious impact to the Ramsar Convention wetland area, including the Lake Opeta-Bisina wetland system which is located downstream the Atari River. Examinations made to determine the degree of impacts through the EIA study, and the study reveals the impact will not be serious mainly by the reasons below:

1) The volume of water supply from the Atari River to the Lake Opeta-Bisina wetland system is estimated quite low compared to the catchment areas and the volume of intake for irrigation

2) The concentration of ammonia nitrogen (NH4-N) in the Lake Opeta-Bisina system is already high since livestock farming is run around the system. Further explanation is indicated in Table 1.1.19 in Section 1.1.7 of Annex III-8;

3) Although fertilizers will be used for the irrigation project, the level of fertilizers in the backflow water from the irrigation area to the Atari River is estimated low compared to the difference of catchment areas. Also, in the case of the fertilizer flowing in the system, the high level of NH_4-N at the mouth of the Lake Opeta would not be affected to increase the level. It is feasible to avoid excessive use of fertilizers and ban the use of agrichemicals by employing sufficient farming management, and such management is a part of the project menu;

4) Since the proposed irrigation area is located at 500 m of the shortest distance from the Ramsar Convention wetland area (800 m through the Atari River), impacts to the farmers and fisher folks are not anticipated because of no direct touches to the wetland (e.g. encroachment or farming in the Ramsar wetland); and

5) The Lake Opeta-Bisina wetland system is rich in the ecosystem and designated as a bird conservation area serious impacts are not anticipated on aspects of water volume and quality and human-induced action.

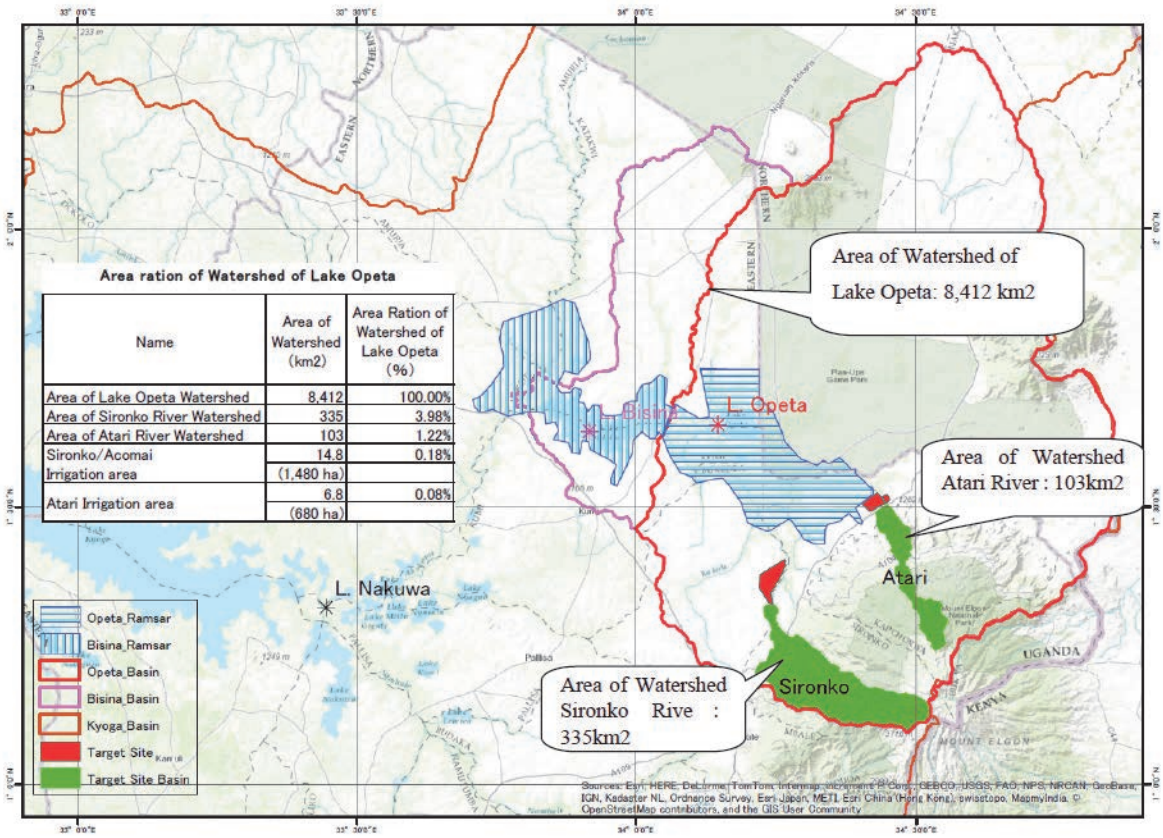


Figure 7.1.2 Ratio of the Catchment area to the Lake Opeta Catchment Area

(2)Cumulative Development Impact within the Lake Opeta Catchment Area

Within the same catchment area of the Lake Opeta, at present Ngenge site is under feasibility study by AfDB. The irrigation area will be estimated 880 ha according to the results of the Phase 1 study. This development will be followed by the Sironko and Atari sites development. Also, the Sipi River development will be expected in future to be developed for irrigation scheme and the irrigation area will be 400 ha according to the study results of Phase 1.

The total catchment area of these 4 sites at Atari, Sironko, Ngenge and Sipi is 681 km^2 which are 8.1 % of the total catchment area of the Lake Opeta. The irrigation area of these 4 sites is 3,440 ha.

The water intake volume for these 4 irrigation areas is estimated based on the net water intake volume in average of 2.7 M m^3 from the Atari site of 680 ha as shown in the Table 2.4.12 with the ratio of the irrigation area, the total intake volume will be about 36.5 M m^3 from the irrigation area of 3,440 ha which will be reduced to flow into the Lake Opeta for the future development. The affection of water surface reduction will be estimated based on the wetland area registered for the Ramsar Convention which indicates 689 km^2 as shown in the Annex-III-8 Table 1.1.19 c. The water surface will be reduced about 5.3 cm (=36.5 Mm^3 / 689 km^2) in future when all of the sites have been developed. However, water surface area will be fluctuated season to season by flood and drought. The reduction of 5.3 cm will not be a serious problem for the environmental conditions of the Lake Opeta. The catchment area of this 4 site shares only 8.1 % of the total catchment area of the Lake Opeta. So that 91.9 % of flow from the other river flow will easily cover the reduced water level.

The background information on ecology, topography, hydrology/water quality and farming style are explained in Section 1.1.7 of Annex III-8. Summary of case studies published regarding impact to the downstream (including non Ramsar Convention areas) is also shown in the Section.

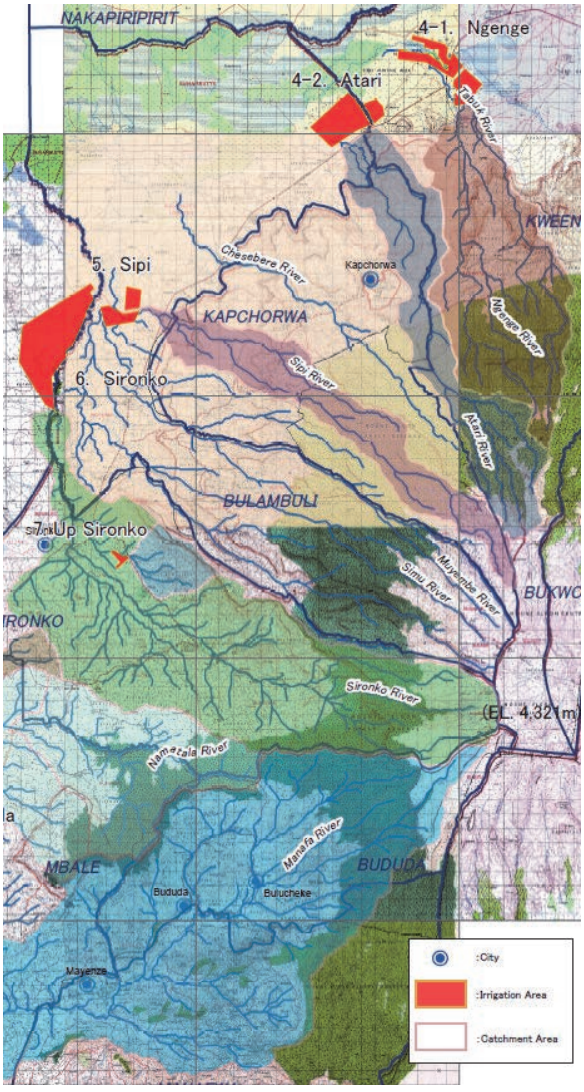


Figure 7.1.3 Potential Irrigation Area within the Catchment Area of the Lake Opeta

7.1.9 Environmental Management Plan

The environmental management plan (EMP) usually includes mitigation measures pre-/during construction and in operation phases and is an important part of EIA for a smooth implementation of the project. Table 7.1.4 shows the summary of EMP mainly for pollution and natural environmental items.

Table 7.1.4 Environmental Management Plan for the Atari Project

No	Potential Impact	Mitigation Measures	Responsibility		Estimated Cost or Burden Organization
		Pre-/during Construction	Implementation	Supervision	
Pre-/during Construction					
1	Air Pollution	- Water sprinkling near residential area - Speed limit for construction machines at construction sites adjacent to settlement areas	Construction contractor	Supervising consultant, MAAIF, MWE	Construction contractor
2	Water Pollution	- Discharge through sedimentation pond and silt fence - Installation of portable toilet for workers - Appropriate waste and construction machines management	Construction contractor	Supervising consultant, MWE (DWD, DWRM, WMD), MAAIF	Construction contractor
3	Soil Contamination	[Excavated soil] - Reuse or dispose at designated disposal site after treatment. [Oil from machinery] - Maintain the machinery and vehicle to prevent oil leakage	Construction contractor	Supervising consultant, MWE (DWD, DWRM, WMD), MAAIF	Construction contractor
4	Waste	[Construction waste (trees and waste soil)] - After considering the possibility of reuse, construction waste is disposed at designated disposal site [Waste from base camp] - Waste at workers camp and waste oil shall be brought to disposal site or facility [Night soil] - Temporary sanitation facility such as septic tank shall be introduced to the workers camp.	Construction contractor	Supervising consultant, NEMA MAAIF, MWE, District Local Governments of Bulambuli, and Kween	Construction contractor
5	Noise and Vibration	[Construction noise] - Installing noise barrier and selecting low-noise equipment when necessary - Avoiding works of heavy equipment during night time. - Informing the construction schedule to surrounding communities to obtain their consensus.	Construction contractor	Supervising consultant, MWE, MAAIF	Construction contractor
9	Flora, Fauna and Biodiversity	- Restrict the construction activities only to the project footprint areas. - Spare large trees by circumventing them as much as possible - For wetland management, collaborate the monitoring framework by the JICA's wetland management project	Construction contractor	Supervising consultant, MWE, MAAIF	Construction contractor MWE/MAAIF
10	Protected Areas	- Discharge through sedimentation pond and silt fence - Installation of portable toilet for	Construction contractor Farmers'	MAAIF, MWE	Construction contractor

No	Potential Impact	Mitigation Measures	Responsibility		Estimated Cost or Burden Organization
		Pre-/during Construction	Implementation	Supervision	
		workers - Appropriate waste and construction machines management	Associations in the project area, District Local Governments of Bulambuli and Kween		
11	Soil Erosion	- Maintain strength of slope in order to avoid erosion at borrow pits	Farmers' Associations in the project area, District Local Governments of Bulambuli and Kween	MAAIF, MWE	Construction contractor
13	Hydrological Situation	- Control water use for construction from the river - Monitor water flow as appropriate - Secure waterways in construction area	Construction contractor	Supervising consultant, MWE (DWD, DWRM, WMD), MAAIF	Construction contractor
15	Involuntary Resettlement/ Land Acquisition	- Conduct appropriate compensation and livelihood assistance in accordance with ARAP	MAAIF, MWE	Office of the Chief Government Valuer (CGV)	US$1,108,093 for ARAP activity
16	Local Economy such as Employment and Livelihood, etc.	- Conduct appropriate compensation and social assistance in accordance with ARAP	Farmers' Associations in the project area, District Local Governments of Bulambuli and Kween	MAAIF, MWE	US$1,108,093 for ARAP activity
17	Landscape	- Layout the construction machinery properly	Construction contractor	Supervising consultant, MAAIF, MWE	Construction contractor
18	Land Use and Utilization of Local Resources	- Conduct appropriate land acquisition and compensation - Conduct appropriate land use management	Farmers' Associations in the project area, District Local Governments of Bulambuli and Kween	MAAIF, MWE	MAAIF, MWE
20	Existing Social Infrastructures and Services	- Install safety sign boards - Install fences around the construction site to keep out local people such as children - Install parking for idling construction machines	Construction contractor	Supervising consultant, District Local Governments of Bulambuli, and Kween	Construction contractor
21	The Poor, Indigenous and Ethnic People	- Conduct appropriate compensation and social assistance in accordance with ARAP	Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween MAAIF, MWE	US$1,108,093 for ARAP activity
24	Local Conflict of Interests	- Arrange conflicts happened to solve (e.g. boundary conflict etc).	Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween MAAIF, MWE	MAAIF, MWE
25	Water Usage or Water Rights and Rights of Common	- Discharge through sedimentation pond and silt fence	Construction contractor Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween, MAAIF, MWE	Construction contractor
26	Gender/ Children's Rights	- Conduct appropriate support in accordance with ARAP - In order to prevent child labour, promote awareness of the	Farmers' Associations in the project area, Construction	District Local Governments of Bulambuli and Kween	MAAIF, MWE

No	Potential Impact	Mitigation Measures	Responsibility		Estimated Cost or Burden Organization
		Pre-/during Construction	Implementation	Supervision	
		construction contractor	Supervisor	MAAIF, MWE	
27	Hazards (Risk), Infectious Diseases such as HIV/AIDS	- Install sufficient drainage facilities not to provide habitat for vector mosquito - Provide adequate temporary sanitation facilities - Enforce medical screening and periodical medical check-up - In order to prevent spread of infectious diseases such as HIV/AIDS, promote awareness of the labours and local people - In order to prevent crimes including sexual harassment toward women due to inflow of construction workers, promote awareness of the workers and local people - Recommendation to expel vector shellfish and wear boots	Construction contractor MAAIF, MWE Farmers' Associations in the project area DPO, DISO	Supervising consultant, District Local Governments of Bulambuli and Kween, MoH, MoGLSD	Construction contractor, MAAIF, MWE
28	Working Conditions/ Accidents	- Provide safety training for the workers - Conduct safety patrol at the construction site	Construction contractor	Supervising consultant, MoGLSD (OSH Department), District Local Governments of Bulambuli, and Kween	Construction contractor
29	Accident	- Install safety sign boards - Install fences around the construction site to keep out local people such as children - Install parking for idling construction machines - Restrict mobilization speed in and near the construction site - Setup of a sign for accident warning, regular canal patrol and recommendation of reporting when finding a destructive animal - In order to prevent an accident of the child, provide safety education in the elementary school of the neighbourhood.	Construction contractor	Supervising consultant, District Local Governments of Bulambuli, and Kween	Construction contractor
31	Monitoring System	- Supervise monitoring activity by the supervisor - Make a routine of reporting monitoring results	Construction contractor	MAAIF, MWE	Construction contractor
In Operation					
2	Water Pollution	- Train farmers to ensure optimum use farm inputs and the practice emphasized.	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
3	Soil Contamination	- Replace the soil seriously damaged by salt.	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
4	Waste	- Train farmers to dump such residues at a proper site (e.g. not near the irrigation canals) - Setup of additional waste sites (in case of exceeding projected waste amount) - Dispose the waste at a proper site	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE

No	Potential Impact	Mitigation Measures	Responsibility		Estimated Cost or Burden Organization
		Pre-/during Construction	Implementation	Supervision	
		getting farmers across to enhance the reuse of wastes (feeder, organic material, ploughing-in, fuel etc.) through training.			
9	Flora, Fauna and Biodiversity	- Give training to farmers to conserve the local nature. - For wetland management, collaborate the monitoring framework by the JICA's wetland management project	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
10	Protected Areas	- Train farmers to ensure optimum use farm inputs such as fertilizers and the practice emphasized.	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
12	Groundwater	- Train farmers to ensure optimum use farm inputs and the practice emphasized.	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
13	Hydrological Situation	- Control the volume of water intake based on the water condition status in the irrigation area	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
16	Local Economy such as Employment and Livelihood, etc.	- Conduct community-based on the wetland management guideline	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
18	Land Use and Utilization of Local Resources	- Conduct appropriate land use management base on the related guideline	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
19	Split in Community	- Conduct activities relating to the project by involving local people	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
21	The Poor, Indigenous and Ethnic People	- Follow up the PAPs in line with ARAP	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
22	Misdistribution of Benefit and Damage	- Conduct activities relating to the project by involving local people	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
24	Local Conflict of Interests	- Conduct activities relating to the project by involving local people	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
25	Water Usage or Water Rights and Rights of Common	- Install alternative water distribution system when unexpected situation such as reduction of spring water and water level of wells	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
26	Gender/ Children's Rights	- Conduct appropriate support in accordance with ARAP	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween	MAAIF, MWE
27	Hazards (Risk), Infectious Diseases such as HIV/AIDS	- Promote awareness of diseases to local people - Install windows of health consultation - Recommendation to expel vector shellfish and wear boots	MAAIF, MWE, Farmers' Associations in the project area	District Local Governments of Bulambuli and Kween, MoH, MoGLSD	MAAIF, MWE
29	Accident	- Train to comply with traffic rules - Install safety sign boards for traffic and animal attack	MAAIF, MWE	MAAIF, MWE	MAAIF, MWE

No	Potential Impact	Mitigation Measures	Responsibility		Estimated Cost or Burden Organization
		Pre-/during Construction	Implementation	Supervision	
		- Setup of a sign for accident warning, regular canal patrol and recommendation of reporting when finding a destructive animal			
31	Monitoring System	- Supervise monitoring activity by the supervisor - Make a routine of reporting monitoring results	MAAIF, MWE	MAAIF, MWE	MAAIF, MWE

Source: JICA Study Team

7.1.10 Environmental Monitoring Plan

A summarized environmental monitoring plan during and after construction phases for pollution and natural environmental items is shown in Table 7.1.5. Note the monitoring activity in operation phase shall be carried out at least for two years.

Table 7.1.5 Environmental Monitoring Plan for the Atari Project

No	Item	Parameter	Location	Frequency	Responsibility
Pre-/during Construction					
1	Air Pollution	Dust, Visual inspection (exhaust gas from machinery)	Near the construction site facing sensitive receptor (house, school etc)	When heavy machine operating	Construction Supervisor & Subcontractor
2	Water Pollution	pH, EC, DO, TDS, turbidity, TN, TP, oil	Same points as the baseline survey	Monthly (except TN, TP) Biannually (TN, TP)	Construction Supervisor & Subcontractor
3	Soil Contamination	Existence of oil in soils (visual inspection)	In working sites where construction machines work	Daily	Construction Supervisor & Subcontractor
4	Waste	Volume of waste soil, trees cut and domestic garbage	Excavated site, dumping site, workers' camp	Daily	Construction Supervisor
5	Noise and Vibration	Noise: LAeq (during operating heavy machine)	Near the construction site facing sensitive receptor (house, school etc)	As appropriate (when complaint happens)	Construction Supervisor & Subcontractor
9	Fauna, Flora and Biodiversity	Extent of disturbance of habitat and species	Major construction area	Monthly	Construction Supervisor & Subcontractor
10	Protected Area	Same as No.2 & 4	Same as No.2 & 4	Same as No.2 & 4	Construction Supervisor & Subcontractor
11	Soil Erosion	Stability of bank	At borrow pits	Monthly or when required	Construction Supervisor
13	Hydrological Situation	Volume of river flow	Same points as the baseline survey	Weekly	Construction Supervisor & Subcontractor
15	Involuntary Resettlement/ Land Acquisition	Progress of ARAP program (compensation, land acquisition, livelihood assistance)	Affected parishes	Quarterly, or when required	MAAIF, MWE, Consultant
16	Local Economy such as Employment and Livelihood etc.	Progress of ARAP program (compensation, land acquisition, livelihood assistance)	Affected parishes	Quarterly, or when required	MAAIF, MWE, Consultant
17	Landscape	Complaint about the landscape	Wherever complains	As	Construction

No	Item	Parameter	Location	Frequency	Responsibility
		from local people	take place.	appropriate	Supervisor & Subcontractor
18	Land Use and Utilization of Local Resources	Progress of ARAP program (compensation, land acquisition, livelihood assistance)	Affected parishes	Quarterly, or when required	MAAIF, MWE, Consultant
20	Existing Social Infrastructures and Services	The extent of damage to existing infrastructures such as community roads etc.	Facilities which the construction give impacts (vehicle roads etc)	Monthly	Construction Supervisor, LGU concerned
21	The Poor, Indigenous and Ethnic People	Progress of ARAP program (compensation, land acquisition, livelihood assistance)	Affected parishes	Quarterly, or when required	MAAIF, MWE, Consultant
24	Local Conflict of Interests	Cause of conflict	Construction area and affected parishes	As appropriate	MAAIF, MWE, LGU concerned
25	Water Usage or Water Rights and Rights of Common	Same as No.13	Same as No.13	Same as No.13	Construction Supervisor & Subcontractor
26	Gender/Children's Rights	Progress of ARAP program (compensation, land acquisition, livelihood assistance) Number of female participants to the community consultation meeting Number of child labours	Affected parishes	Quarterly, or when required	MAAIF, MWE, Consultant Construction Supervisor & Subcontractor
27	Hazards (Risks), Infectious Diseases such as HIV/AIDS	Number of infected patients Number of crimes including sexual harassment toward women	Construction area, Workers camp Affected parishes	Quarterly	Construction Supervisor, MAAIF, MWE, LGU concerned
28	Working Conditions/ Accidents	Number of instruments required (helmets, shoes etc) Number of accidents relating to construction	Construction area, Workers camp	Quarterly	Construction Supervisor,
29	Accident	Number of accidents happened Number of the safety education at the elementary school	In the project area (especially outside the construction area)	Quarterly	Construction Supervisor & Subcontractor
31	Monitoring System	Progress of monitoring activity as scheduled	Monitoring forms and reports	Quarterly	MAAIF, MWE, Consultant
In Operation					
2	Water Pollution	pH, EC, DO, TDS, turbidity, TN, TP, oil	Same points as the baseline survey	Monthly (except TN, TP) Biannually (TN, TP)	MAAIF, MWE
3	Soil Contamination	EC	Same points as the baseline survey	Monthly	MAAIF, MWE
4	Waste	Existence of wastes near canals, rivers	Along canals and rivers	Monthly	MAAIF, MWE
9	Fauna, Flora and Biodiversity	Extent of disturbance of habitat and species	Major construction area	Yearly	MAAIF, MWE
10	Protected Areas	Same as No.2 & 4	Same as No.2 & 4	Same as No.2 & 4	MAAIF, MWE
12	Groundwater	Same as No.2	Same points as the baseline survey	Same as No.2	MAAIF, MWE
13	Hydrological Situation	Volume of river flow	Same points as the baseline survey	Yearly	MAAIF, MWE
16	Local Economy such as Employment and Livelihood etc.	Progress of livelihood assistance	Affected parishes	Quarterly, or when required	MAAIF, MWE
18	Land Use and Utilization of	Progress of land use management guideline	Affected parishes	Quarterly	MAAIF, MWE

No	Item	Parameter	Location	Frequency	Responsibility
	Local Resources				
19	Split in Community	Number of frictions between communities	Affected parishes	Yearly	MAAIF, MWE, LGUs concerned
21	The Poor, Indigenous and Ethnic People	Number of complaints	Affected parishes	Quarterly	MAAIF, MWE, LGUs concerned
22	Misdistribution of Benefit and Damage	Number of complaints	Affected parishes	Quarterly	MAAIF, MWE, LGUs concerned
24	Local Conflict of Interests	Number of conflicts	Affected parishes	Quarterly	MAAIF, MWE, LGUs concerned
25	Water Usage or Water Rights and Rights of Common	Number of complaints	Affected parishes	Quarterly	MAAIF, MWE, LGUs concerned
26	Gender/Children's Rights	Number of complaints Income of the women headed household Number of female membership of the water association (to be established) Number of female participants to the community consultation meeting	Affected parishes	Quarterly	MAAIF, MWE, LGUs concerned
27	Hazards (Risks), Infectious Diseases such as HIV/AIDS	Number of infected patients	Affected parishes	Biannually	MAAIF, MWE, LGUs concerned
29	Accident	A number of accidents happened.	Affected parishes	Quarterly	MAAIF, MWE, LGUs concerned
31	Monitoring System	Progress of monitoring activity as scheduled	Monitoring forms and reports	Quarterly	MAAIF, MWE, LGUs concerned

Source: JICA Study Team

7.1.11 Consultation Meeting among Stakeholders

The project held plenty of sensitization meetings and workshops to stakeholders and people concerned in order to promote understanding of the project before the stakeholder meetings on the environment. After JST and C/Ps (MAAIF and MWE) evaluated the stakeholders have understood the project and been positive, the stakeholder meetings on the environment were conducted. Table 7.1.6 indicates the outline of the 1st and 2nd meetings in March and May 2016 respectively. Table 7.1.7 shows major questions/comments by the participants and responses by the meeting host (study team, counterparts, LGUs) on the environment issues. See Section 1.1.10 of Annex III-8 for details.

Table 7.1.6 Outline of Stakeholder Meetings in Atari Site

1st Stakeholder Meetings

Date	District & Venue	Participants (Number & woman %)	Agenda
14 March 2016	Kween Kween District Head Quarters	PDCC, PACC and Local Government No. of Participants: 37 % of women: 22 % Language: Swahili, English	▪ Project Disclosure ▪ Discussion of Potential Environmental and Social Impacts ▪ Plan of possible alternatives ▪ Disclosure of pending EIA surveys. ▪ Collection of views from stakeholders
15 March 2016	Bulambuli Bulambuli District Head Quarters	PDCC, PACC and Local Government No. of Participants: 49 % of women: 27 % Language: Swahili, Lugisu, English	

Date	District & Venue	Participants (Number & woman %)	Agenda
17 March 2016	Kween Buwebere and Sikwa Atari Primary School	Buwebere and Sikwa Community (Farmers, landowners, tenants etc.) No. of Participants: 69 % of women: 22 % Language: Swahili, Lugisu, English	▪ Project Disclosure ▪ Discussion of Potential Environmental and Social Impacts ▪ Plan of possible alternatives ▪ Disclosure of pending EIA surveys. ▪ Collection of views from community met
18 March 2016	Bulambuli Bushibalayi Catholic church	Bukhalu Community (Farmers, landowners, tenants etc.) No. of Participants: 101 % of women: 13 % Language: Lugisu, English	

2nd Stakeholder Meetings

Date	District & Venue	Participants (Number & woman %)	Agenda
23 May 2016	Kween Kween District Head Quarters	PDCC, PACC and Local Government No. of Participants: 30 % of women: 20 % Language: Kuksabini, English	▪ Project Background ▪ Project Location ▪ The ESIA objectives ▪ Explanation of Alternatives ▪ Summary of baseline Survey results ▪ Summary of Impact Assessment ▪ Project Environmental and Social Management Plan
24 May 2016	Bulambuli District Head Quarters	PDCC, PACC and Local Government No. of Participants:35 % of women: 20 % Language: Lugisu, English	
26 May 2016	Kween Buwebere and Sikwa Atari Primary School	Buwebere and Sikwa Community (Farmers, landowners, tenants etc.) No. of Participants: 171 % of women: 17 % Language: Swahili, Lugis, English	

Source: JICA Study Team

Table 7.1.7 Major Questions/Comments and Responses in Stakeholder Meetings

1st Stakeholder Meetings

Topic	Question/Comment	Response
Air quality	During construction, there will be dust. The project borders the main road and vehicles used will raise dust for communities that neighbour the project area.	The contractor will be advised to drive at 30 kph to minimize dust. Also where possible roads will be watered to reduce the dust.
Accident	The project is near a school. Children are easily attracted to construction places and this can be hazardous to them. Children might get injured during the construction phase if no precautions are taken to prevent them from venturing near the construction site.	Sensitization is carried out targeting both children and parents. The contractor is advised to put signage clearly marking areas where construction is in the process and preventing children and adults from venturing there.
Pesticide	Chemical safety for pesticides should be carefully taken into consideration. Pesticides are farm inputs, so an integrated pest management program should be put in place.	Noted. The project will not recommend the use of pesticides.
Soil erosion	Water from the mountains carries a lot of soil, which contributes to siltation. How is the management of this siltation being done? If this soil is not dealt with, the scheme will not be sustainable. The community needs to be involved to ensure that the soil erosion/siltation are reduced. An integrated catchment management plan needs to be incorporated, as well as improved farming practices.	Noted
Buffer zone	The communities were told that government requires a 30 m corridor be left away from the river	If this land is needed for the buffer zone then yes compensation will be done in accordance with

Topic	Question/Comment	Response
	yet the majority of the people's land starts from the river. Will those having land within the 30 m required be compensated?	national and international regulations and guidelines.
Impact	The area doesn't have enough drinking water in the area, therefore, this should be included in the project plan, after implementation of the project, tapped water should be extended to the area.	Noted and the necessary authorities will be informed about this but this isn't the mandate of this project.

2nd Stakeholder Meetings

Topic	Question/Comment	Response
Land	Loss of grazing land should be made clear to the communities.	There will be no loss of grazing land, instead one will have to make a choice to either continue using their land for grazing or use it for crop farming.
Buffer zone	During the detailed design, the buffer zone should be extended. How will people who live near the buffer zone be compensated for?	There will be an in-depth discussion on ARAP when the actual RAP commences.
Impact	Negative impacts should be explained with mitigation measures.	Noted, mitigation measures for the negative impacts have been explained and more so well elaborated in the ESIA report.
Buffer zone	Will land within the buffer zone be compensated for?	The land within the buffer zone will be discussed during the actual ARAP. PACC members will be invited and informed about ARAP and how it will be implemented.
Flood	If one is not in the project area, what plans does the project have for the people outside of the project site in event floods come?	At the intake, a spillway will be constructed; this will convey flood and any excess water back to the river channel. In addition, canals and roads will be equipped with drains to convey excess and used water back to the river channel. These structures are intended to prevent flooding.
Wildlife	How will MWE MAAF and JICA, conserve the animals and on whose land?	The animals will continue to co-exist with the community, as the case now. In addition, the buffer zone will act as an offset to harbour wildlife.
Borehole	Is there a provision of the project to construct Borehole?	When the project is implemented and is running, the community will be able to construct the facilities with the help of government.
Cultural site	Will project affect the cultural areas such as graves and if so will these be compensated?	Cultural sites will not be destroyed. The project will try as much as possible to avoid the cultural sites and in the event that they can't be avoided, the owners will be consulted.
River course	Historically the Atari River has changed course twice. The concern is that Atari River is the boundary between Kween and Bulambuli and this should be maintained and therefore should be followed in order not to cause conflict.	Noted.

Source: JICA Study Team

7.2 Land Acquisition and Resettlement of Residence

7.2.1 Necessity for Land Acquisition and Resettlement

There are only a few structures in and around the proposed construction sites and involuntary resettlement will not be caused. However, land expropriation will be caused due to flood protection dyke and irrigation facilities construction. The affected area by the irrigation facilities construction is 40.4 ha, and a buffer zone that is within the flood protection dyke toward to the Atari River is 30.3 ha. Moreover, the area to be expropriated for the washing basin and cattle trough will be 0.135 ha. Furthermore, the model farm and facilities for farmers training and post-harvest such as training office, dry yard, storage house, and etc. constructions will be implemented which will result in around 25.29 ha.

7.2.2 Legislative Framework on Land Acquisition and Resettlement

(1)Ugandan Policies, Laws, and Regulations

Among the relevant Uganda policies, laws and regulations for land acquisition and resettlement, the most important legal instruments are followings:

1)The Constitution of Uganda (1995)

According to the Constitution, all land belongs to the people of Uganda and is held in trust by the Government. However, the Government is authorized to acquire land for a public purpose and compensate affected persons in accordance with the law. Such acquisition is subject to the provisions of Article 26 (1) of the Constitution, which gives every person in Uganda a right to own property. The Constitution also prescribes the tenure regimes in accordance with which rights and interests in which land may be held namely; Customary, Freehold, Mailo and Leasehold. It provides procedures to follow during the acquisition of land for public interest and provides for the "prompt payment of fair and adequate compensation" prior to taking possession of the land.

2)National Land Policy (2013)

This policy addresses the contemporary land issues and conflicts facing the Country. The vision of the policy is: "a transformed Ugandan society through optimal use and management of land resources for a prosperous and industrialized economy with a developed services sector" while the goal of the policy is: "to ensure an efficient, equitable, and optimal utilization and management of Uganda's resources for poverty reduction, wealth creation, and overall socio-economic development."

3)The Land Act (1998)

The 1998 Land Act addresses land holding, management control, and dispute processing. The act creates a series of land administration institutions, namely, Uganda Land Commission (ULC), District Land Boards (DLB), Parish Land Committees (PLC), and District Land Tribunals (DLT). The act also gives valuation principles for compensation, i.e. compensation rates to be yearly approved by DLBs. The basis for compensation is depreciated replacement costs for rural properties and market values for urban properties.

Key features of the recognized forms of land tenure in Uganda are:

Customary Tenure - is governed by rules generally accepted as binding and authoritative by the class of persons to which it applies. Ownership rights are recognized by the community through inheritance, purchase, or by settling on a plot of land, which was previously vacant. Under Ugandan customary legal systems, particularly in northern and eastern Uganda, the land is usually communally owned by the clan but it can also be owned individually. Rights and responsibilities that derive from communal ownership are shared among various members of the clan according to traditional practices.

Leasehold Tenure - is created either by contract or by operation of the law and is a form under which the landlord of lesser grants the tenant or lessee exclusive possession of the land, usually for a period defined and in return for a rent. The tenant has the security of tenure and a proprietary interest in the land.

Freehold Tenure - derives its legality from the constitution and its incidents from the written law. It involves the holding of land in perpetuity or a term fixed by a condition and also enables the holder to exercise, subject to the law, full powers of ownership.

Mailo Tenure - has roots in the allotment of land pursuant to the 1900 Uganda Agreement and derives its legality from the constitution and its incidents from written law. It involves the holding of land in perpetuity and permits the separation of ownership of land from the ownership of developments on land made by a lawful or bona fide occupant. The system enables the holder to exercise all powers of ownership, subject to the rights of those persons occupying the land at the time of the creation of the Mailo title and their successors.

4)Land Acquisition Act (1965)

This act makes provision for the procedures and method of compulsory acquisition of land for public purposes whether for temporary or permanent use. GoU is supposed to pay compensation to any person who suffers damage as a result of any action. Any dispute as to the compensation payable is to be referred to the Attorney General or court for decision.

(2)Gap Analysis between JICA Guidelines/World Bank OP4.12 and Ugandan Laws

The gap analysis between JICA guidelines and WB OP 4.12 and safeguard measures adopted in PISD are shown in Table 7.2.1.

Table 7.2.1 Gap Analysis between JICA Guidelines/WB OP4.12 and Ugandan Laws

JICA Guidelines	Laws of Uganda	Gaps between JICA Guidelines / WB OP 4.12 Laws of Uganda	Safeguard Measures Adopted in PISD
Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	The Constitution states "no person shall be compulsorily deprived of property or any interests in or any right to property of any description except when taking land "for public use or in the interest of defence, public safety, public order, public morality or public health." Both Uganda's Constitution 1995 and the Land act 1998 give the government and local authorities power to compulsorily acquire land under Eminent Domain	Gap – Uganda has no specific guidelines on involuntary resettlement but even the two principle laws on land: the Constitution and Land act do not mention specific provisions for avoidance or minimizing involuntary resettlement	All viable alternatives including the design options will be explored to avoid involuntary resettlement and loss of means of livelihood
When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	Ugandan Constitution requires that prompt, fair and adequate compensation be paid prior to displacement.	Gap – Measures to minimize impact are not provided for and it is unclear how to interpret "prompt, fair and	Effective measures to minimize impact and to compensate for losses will be provided during preparation of the ARAP

JICA Guidelines	Laws of Uganda	Gaps between JICA Guidelines / WB OP 4.12 Laws of Uganda	Safeguard Measures Adopted in PISD
		adequate" compensation	
Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	The Land Acquisition act makes provision for an enquiry whereby PAPs can make a formal written claim and the assessment officer is obliged to conduct a hearing before making his award.	Gap: While PAP participation is inherent in the ARAP process, it contains a number of differences with the requirements of JICA guidelines.	PAP participation will be provided for and promoted throughout the ARAP preparation process
Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Ugandan law does not make specific provision for squatters or illegal settlers and compensation is given to only legal occupants. The Land act treats lawful occupants and bona fide occupants as statutory tenants of the registered owner.	Gap: Those without formal legal rights or claims to such lands are not entitled to be resettled or compensated	Dialogue with C/P will be initiated to explore the possibility of giving compensation to those without formal legal rights or claims to such lands in order to conform to WB OP 4.12.
Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	There is no distinction made on the basis of gender, age, or ethnic origin in Ugandan law during compensation.	Gap- There is no distinction made on the basis of gender, age or ethnic origin in Uganda law during compensation	The project will conform to the requirements of WB OP 4.12 and best practices during the preparation of the ARAP in regards to the needs of the vulnerable groups.

(3)Cut-off-date of Eligibility

The cut-off date of eligibility refers to the date prior to which the occupation or use of the project area makes residents/users of the same eligible to be categorized as PAPs and be eligible to Project entitlements. In the PISD, the cut-off date will be the beginning date of the final confirmation of acquired land and assets survey. This date will be disclosed to each affected parish by the relevant local governments and the parish will disclose to their populations. The establishment of the eligibility cut-off date is intended to prevent the influx of ineligible non-residents who might take advantage of project entitlements.

7.2.3 Scope of Land Acquisition and Resettlement Impact

(1)Project Affected Persons (PAPs)

As described in 1.2.1, the total numbers of people living in the two target parishes, Sikwa and Buwebere, are 6,533. These populations are considered to be the target beneficiary of the project. Among this population, as shown in Table 7.2.2, a total of 284 households or 2,556 persons are estimated as possible PAHs or possible PAPs. PAHs whose land situates on the footprint of the planned irrigation facility are 187, and PAHs who have the land within the BZ are 97. No structures are affected which will be needed to relocate.

Table 7.2.2 PAHs and PAPs in the Project Area

District	Sub-County	Parish	PAHs			Estimated PAPs		
			Project Area	BZ	Total	Project Area	BZ	Total
Kween	Ngenge	Sikwa	106	69	175	954	621	1,575
Bulambuli	Bunambutye	Buwebere	81	28	109	729	252	981
		Total	187	97	284	1,683	873	2,556

Source: JST Survey BZ: Buffer Zone

(2)Land and Assets Acquisition

According to site investigation using the approximate ground location of the alignment based on the project preliminary design, a total of 233.48 acres of both project area and BZ area will be acquired for the project. Most of the lands are farmland, which is the main livelihood of people in this region. It is noted that most of the land are customary land.

The land for temporary roads used for construction, access roads and stockyards will be included in the ARAP when they are identified. The contractor of construction, however, will implement the EIA and RAP for acquiring additional lands required in accordance with the Ugandan laws and the JICA Guidelines in case the contractor needs a new space during construction. It is usual for the contractor to choose an area with less or no impact.

Table 7.2.3 Summary of Lands to be Acquired under Proposed Alignment

Sub-Project 1	Approximated Amount of Land to be Acquired (acre)				Total
	Upland field	Paddy field	Grass field	Others	
Project Area	54.62	33.12	59.84	12.50	**160.09**
Buffer zone	34.35	31.63	6.42	1.00	73.39
Total	**88.97**	**64.75**	**66.26**	**13.50**	**233.48**

Source: JST survey

Due to the limitation of site survey, a number of trees and graves that are possible assets that will need to be compensated are not counted during F/S stage. These assets will be counted and valued at the Overall Design (O/D) stage.

(3)Socio-economic Characteristics

From the baseline survey, the Atari River area respondents were 399 including possible affected population.

1)Land Tenure

According to the socio-economic survey, within the study area, the most predominant land tenure systems identified are customary. Customary land tenure was predominant 87 % while freehold and leasehold are 8 % and 5 % respectively. However, according to the hearing survey to district officials conducted by JST, there should be less freehold tenure and none of the leaseholder. Although the district does not have a correct figure of this tenure, according to the district officials, because most of the community people do not have the correct knowledge about the differences of

land tenure, they responded they were freeholder or leaseholder. Adding to this, according to JST's survey at the Department of Land Registration conducted in September 2015, two freehold tenure had been registered within the Atari project site.

2)Assets Owned

Survey results show that majority of households assets are land (89.0 %), house (94.3 %), radio (67.1 %) and domestic animals (61.9 %). Few households owned cars (2.6 %), motorcycles (7.8 %) and TV sets (11 %). A significant percentage (55.4 %) owned a mobile phone, which reveals the proliferation of mobile communication technology in rural areas.

3)Type of House Structure

Most of the structures in the study area are built with reeds, thatch and sticks (46 %) followed by mud and wattle (24) and mud block (25 %). Structures made of mud block with plaster are mainly found in the trading centres. There were very few houses with brick walls.

4)Levels of Income

Results from the field survey reveal that 25.1 % of respondents earns between USh 500,001- 100,000 from their respective occupations especially agriculture. 10.3 % of the respondents had a monthly income of less than USh 100,000 per month. 8.3 % had monthly incomes of more than USh 1,500,000 per month.

(4)Vulnerable Groups

According to the socio-economic survey, among 399 respondents, there are 109 vulnerable people out of estimated 3,216 people, such as physical impairment, blindness, a hearing disorder, and so on. The list of the vulnerable people among respondents is shown in Annex 1.

7.2.4 Compensation and Assistance to Affected Persons

(1)Eligibility

PAP is one who sustains losses as a result of the impact on a) land, b) structure, c) immovable asset and/or d) livelihood/incomes. The PAPs will be identified through census and detailed land survey in O/D stage. Further, according to WB OP4.12, a customary landowner who does not have a certificate can be recognized as a landowner who has legal rights to land. Eligibility Criteria for PISD is shown in Table 7.2.4.

Table 7.2.4 Eligibility Criteria

Category of affected persons	Assets	Type of compensation
Those who have formal legal rights to land (including customary and traditional rights recognized under the laws of the country)	Physical and non-physical assets such as - residential structures - economic trees - crops - land	Compensation at full replacement cost for losses of assets. Assistance (moving allowances during relocation, residential housing or housing sites. Support for restoration of

Category of affected persons	Assets	Type of compensation
	- commercial/business properties - tenancy - income earning opportunities	livelihood
Those who do not have formal legal rights to land at the time the census begins but have a claim to such land or assets; provided that such claims are recognized under the laws of the country or become recognized through a process identified in the resettlement plan.		Compensation at full replacement cost for losses of assets. Assistance (moving allowances during relocation, residential housing or housing sites. Support for restoration of livelihood
Those who have no recognizable legal right or claim to the land they are occupying (squatters and encroachers)		Assistance (moving allowances during relocation, residential housing or housing sites. Support for restoration of livelihood

(2)Livelihood Restoration Measures

The main objective of income and livelihood restoration strategy is the restoration of living standard and pre-displacement level at a minimum and includes strategies, which would improve future income and living standard. Table 7.2.5 shows the livelihood restoration plan for the PAPs.

Table 7.2.5 Livelihood Restoration Plan for the PAPs

Type of assistance	Eligibility	Recommended measures
Cash assistance to support income loss	All affected people whether directly or indirectly impacted will be eligible for assistance for loss of employment/work days as a result of dislocation or relocation	• Affected unskilled farm labourers will be paid a sum disturbance allowance of 30 % of the value of assets lost to the project in addition to their compensation money.
Assistance to re-establish business/ enterprise	All owners of the business will receive cash compensation and a cash grant for loss of business premises plus shifting and moving allowance.	• Replacement value of structure at current market price plus salvage materials
Special assistance for vulnerable groups	All affected who have been recognized as vulnerable	• One time special assistance for each vulnerable household affected by the project
Employment of local people during project construction, access roads, camp and quarry sites	All qualified affected people and their dependants (Including women). A local consultant who will be identified by the client will prepare a list of all affected people who will be suitable for hiring as construction workers. The client bears the cost for this hire.	• Local people who have been impacted by the project will get greater preference in jobs related to the project construction. • Vocational training on various skills like carpentry,
Engagement of PAPs in farming	All qualified affected people.	• Provide farming PAPs with farming skills such as rice growing to boost on their source of livelihood.

(3)Entitlement matrix

Entitlement matrix describes compensation for loss of properties and related assistance for each category of affected PAP. Outline of the Entitlement matrix for PISD is shown in Table 7.2.6 below.

Table 7.2.6 Outline of the Entitlement Matrix

Asset acquired	Entitled Person	Compensation Entitlement
Agricultural land	Landowner	・ Land for land replacement where feasible, or compensation in cash for the entire land holding according to PAPs choice. ・ Costs of shifting and allowance
	Tenant Agricultural worker Squatter	・ Cash compensation for the harvest of affected land equivalent to the average market value or the compensation rates as established by the District Land Boards in collaboration with the Chief Government Valuer whichever is the higher.
Residential land	Landowner	・ Land for land replacement where feasible, or compensation in cash for the entire land holding according to PAPs choice. ・ Costs of shifting and allowance
	Rental	・ Cash compensation or rental fee for the remaining period of the rental agreement.
Permanent building and Structures	Owner	・ Cash compensation for affected building and other fixed assets ・ Cash assistance to cover costs of restoration of remaining structure
	Rental	・ Cash compensation for affected assets ・ costs of shifting and allowance ・ Assistance to help find alternative rental arrangements
Temporary structure	Owner/Rental/Squatter/ Informal dwellers	・ Compensation at government rates ・ Disturbance allowance
Perennial crops	PAP (whether Landowner, tenant or squatter)	・ Cash compensation for perennial crops at district rates (replacement value). ・ Transitional allowance to cover for income loss.
Annual (seasonal) crops	PAP (whether owner, tenant or squatter)	・ The timing of project to enable the harvesting of annual (seasonal) crops.
Trees	owner	・ Cash compensation based on type age and productive value of affected trees
Burial and cultural sites	Responsible families State/local government Institutions (various)	・ Compensation of land based on market value and assets as per approved district rates, provide transport assistance, ・ Financial assistance for rituals/ceremonies involved in the relocation of cultural resources.

7.2.5 Grievance Redress Mechanism

A grievance redress mechanism is developed to ensure that:

a) All complaints related to resettlement, compensation and others assistances are appropriately dealt with;

b) Easily access for those who have complaints related to resettlement and others assistance; and

c) Adequate measures are taken to resolve raised issues.

Grievance related to any aspect of the project shall be handled in a consultative manner appropriately, easily and speedy. The Grievance Committee fits the main entity to take care of the issue. A possible scheme for grievance redress mechanism is illustrated in Figure 7.2.1. The mechanism is usually established just after the public consultation meeting by re-investigating the ARAP contents during the O/D stage.

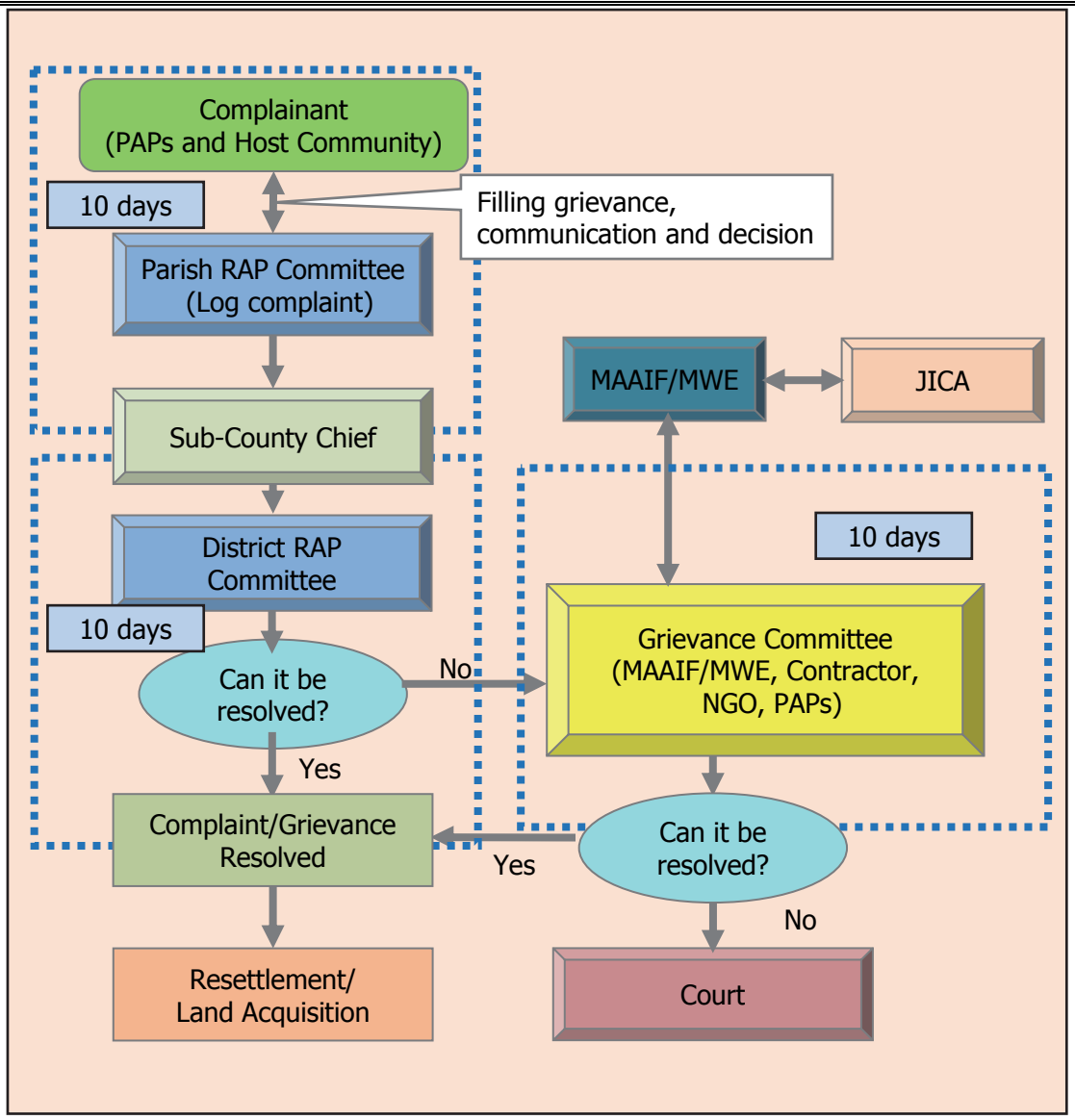


Figure 7.2.1 Grievance Management Mechanism

7.2.6 Implementation Framework

MAAIF and MWE are the core responsible body for the resettlement action plan and MoLHUD and Uganda Land Commission shall be involved in order for managing land issues and compensation. MoGLSD also shall be involved to give advice and cooperate with support for vulnerable PAP. District, sub-county and Parish levels must be constituents as well. Institutions and their roles and responsibility for RAP implementation are shown in Table 7.2.7.

Table 7.2.7 RAP Implementation Framework

Institution	Responsibility/Roles
MAAIF/MWE − RTF	The executing agency responsible for implementing the RAP − To prepare the budget for compensation and other RAP activities − To control the flow of RAP activities − To conduct the internal monitoring of RAP implementation − To ensure the objectives of all stakeholders are harmonized and achieved successfully − To contract and supervise RAP implement consultants
Ministry of Lands, Housing and Urban Development (MoLHUD) − RTF	− To give advice on land acquisition and assets valuation − To approve valuation and compensation reports by the Chief Government Valuer (CGV)
Ministry of Gender, Labour & Social Development (MoGLSD) − RTF	− To give advice and cooperate with support for vulnerable PAP
Uganda Land Commission	− To manage the land covered by the Irrigation infrastructures on behalf of the GoU.
RAP Implementation Committee (RIC) · Members from RAP TF · Members from District RAP Committee · PDCC chairman · PACC chairman	In cooperation with the related organizations and stakeholders, − To drive RAP implementation activities − To establish District RAP Committee − To implement land acquisition − To administrate the schedule and progress of compensation and livelihood assistance − To provide technical training of compensation activity to District and Parish RAP Committee members − To contact for grievance redress
District RAP Committees · Members from District Land Board · PDCC members · PACC chairman · District Councillors · Local Council III Chairperson · Sub-county Chief · One member of Area Land Committee from each Parish · PAP representatives (woman and man) · NGO representative in the area	Responsible for implementation of RAP − To establish Parish RAP Committee − To confirm PAPs, acquired land, and assets − To participate in mobilization of PAPs − To control schedule of compensation payment activities − To mediate the alternative land for PAPs − To administrate the grievance management mechanism
Local Councils	− To give advice and cooperate to RAP implementation
Parish RAP Committee · PACC members · members from Area Land Committee · Local Council I Chairpersons · Trusted elders · PAP representatives (man and woman)	These people have more knowledge of the communities − To sensitize community on land acquisition − To support identifying PAPs − To mobilize PAPs to participate in RAP disclosure and compensation payment – To handle grievance redress
District Land Board · Bukedea District · Bulambuli District · Kween District	Responsible for development of compensation rates and will be involved during RAP implementation, monitoring and grievance management.
Project Affected Person (PAP)	− To participate land and asset survey − To submit necessary data of land acquisition − To participate land acquisition
Local Consultant	Conducting actual RAP activities, such as; − To conduct the final determination of acquired land and assets − To evaluate land and assets

Institution	Responsibility/Roles
	− To manage compensation payment and resettlement − To manage grievance redress mechanism − To assist RAP completion audit
The External Monitoring Agency (Local consultant / NGO)	Responsible for review and assessment of implementation process of RAP, such as; − To review the efficacy of internal monitoring, − To design and conduct periodic third party monitoring − To feedback to MAAIF/MWE on RAP policy improvement − To enhance of implementation process

For the RAP implementation, a consortium chaired by MAAIF/MWE shall be formed as RIC. The institutional framework is shown in Figure 7.2.2. The structure of RIC shall be based on the RTF that was established during F/S phase for the preparation of RAP implementation. RTF consists of main members from MAAIF/MWE, who have become familiar with community people and land issues in the project area very well during F/S phase. Therefore, it is recommended that RIC will be formed with members from existing RTF for the smooth operation of RAP implementation.

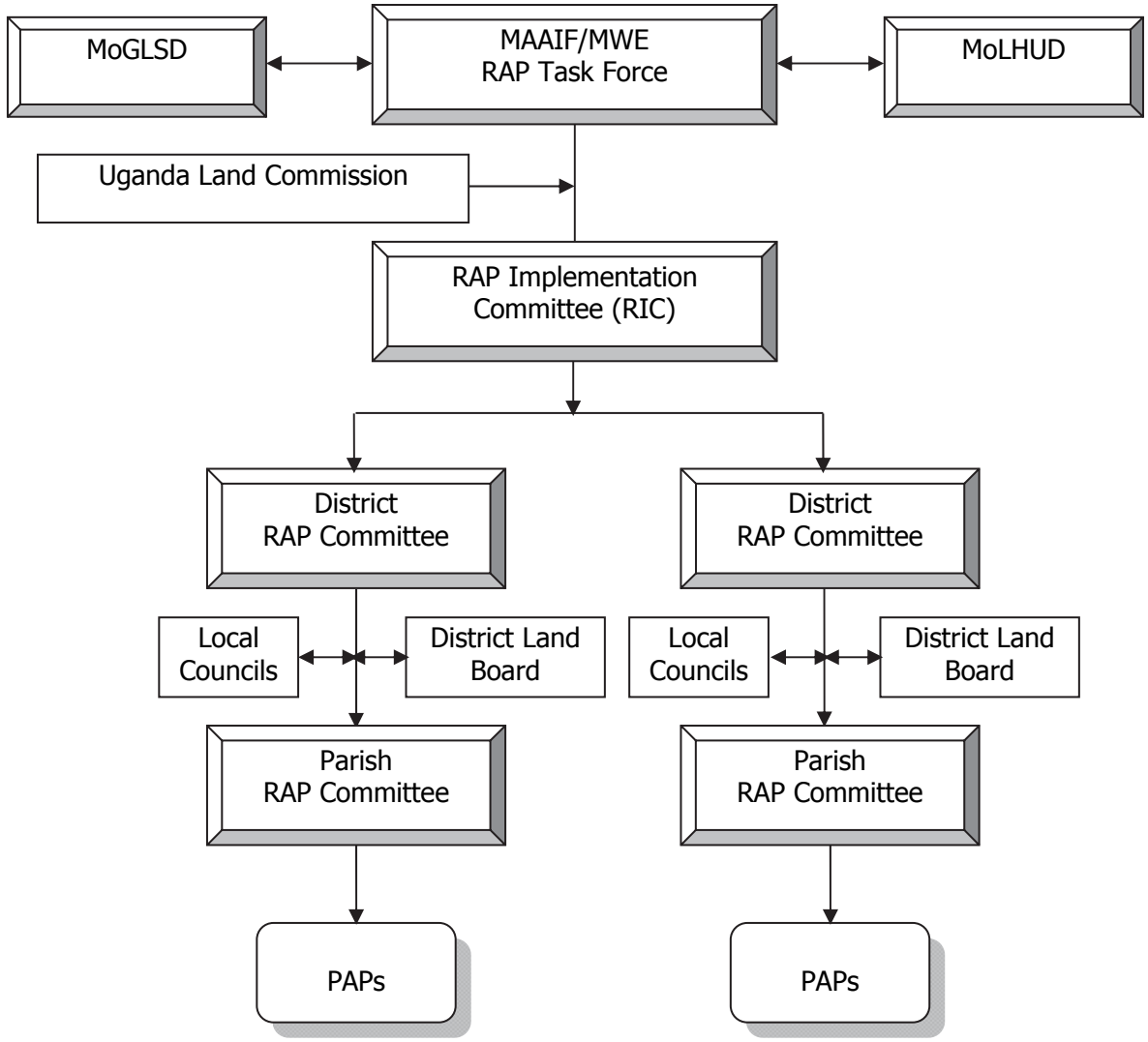


Figure 7.2.2 RAP Institutional Framework

7.2.7 Implementation Schedule

The ARAP implementation schedule is proposed over a period of 1 and half years followed by 2 years of monitoring. The RIC will be formed shortly after approval of ARAP by the Chief Government Valuer and funding entity. Compensation payments and resettlement assistance are expected to start at about the same time and extend over 18 months after which construction commences. Table 7.2.8 provides a schedule of ARAP activities in relation to the timetable for project implementation.

Table 7.2.8 Resettlement Schedule

Month Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
E/N & G/A										xx											
ARAP Approval																					
ARAP approval by Chief Government Valuer (and JICA)	xx																				
ARAP disclosure & display of valuation lists		Xx	xx	xx																	
Verification of vulnerable PAPs by MAAIF/MWE					xx	xx	xx														
ARAP Implementation																					
Procurement of ARAP implementation consultant							xx	xx	xx												
Formation and mobilization of RIC								xx	xx	xx											
Compensation payment											xx	xx	xx	xx	xx	xx	xx	xx			
Grievance management											xx	xx	xx	xx	xx	xx	xx	xx	xx		
Notice to vacate compensated assets and relocation & resettlement											xx		xx	xx	xx	xx	xx	xx	xx		
ARAP Completion audit																			xx		
Commencement of Construction work																				x	
Monitoring & Evaluation											←										→

7.2.8 Cost and Budget

The estimated ARAP implementation budget for the project is summarized in Table 7.2.9. Within categories of compensation, the cost of land acquisition, compensation for structures and crops are included. However, compensation for trees and graves will be estimated during O/D stage with results of the detailed survey.

MAAIF/MWE is responsible for providing adequate funds for land acquisition and resettlement related to the project. It is important to note that these figures need to be updated during the ARAP in the O/D stage.

Table 7.2.9 ARAP Implementation Budget

Item	Cost Estimated (USh)	Cost Estimated (US$)	Note
Land acquisition detailed survey (incl. piling)	282,644,035	85,650	To determine PAHs and valuation of assets
Compensation cost for Land, Structures and crops	1,413,220,173	428,249	
15 % Disturbance Allowance	211,983,026	64,237	
Provision for Restoration	211,983,026	64,237	
Special assistance to vulnerable household	141,322,017	42,825	For PAHs with woman headed, disabled, elderly, etc.
ARAP implementation consultant	565,288,069	171,299	
Monitoring & evaluation	353,305,043	107,062	External monitoring consultant or NGO
Total	3,179,745,390	963,559	
Contingency @ 15 % of Total cost	476,961,809	144,534	
Grand total	3,656,707,199	1,108,093	

Note: US$ 1 = USh 3,300 (As of 7 July. 2016)

7.2.9 Monitoring Activity

Monitoring activity normally consists of internal and external monitoring, respectively. The main purpose of the monitoring activity is to ensure that all PAPs who will lose their respective houses, land or other livelihood assets will be provided with sufficient compensation and assistance according to the policies and procedures, which is described in ARAP.

(1)Internal Monitoring

MAAIF/MWE alternatively referred to as Internal Monitoring Agent (IMA) shall be responsible for internal monitoring. It will be undertaken with the assistance from RIC. The main tasks of the IMA include:

- ✓ Regular supervision and monitoring the ARAP implementation as designed and planned in coordination with RIC;
- ✓ Ensuring the timely and complete disbursement of compensation and assistance to each PAH in accordance with agreements between RIC and PAHs; and
- ✓ Recording all grievances raised by PAPs and ensuring that all complaints are promptly addressed.

(2)External Monitoring

External monitoring will be conducted periodically by an independent local/international External Monitoring Agent (EMA) for review and assessment regarding the achievement of the plan. The external monitoring will be carried out on a quarterly basis and further evaluations will be undertaken. Examples of RAP monitoring form and TOR for external monitoring are shown in Annex 2.

7.2.10 Consultation and Public Participation

Stakeholder meetings (SHMs) and public consultation meetings (PCMs) were held on March 14 and

17, and May 25 and 28, 2016 respectively.

SHM aimed to explain the EIA/DARAP to district government officials such as CAO, DSO, RDC, DAO, CDO, DEO, and so on who should be involved in the project for the smooth implementation and to make safety sure for the PCM that would be held in local venues in following days. PACC members were also invited for the purpose of informing community people of the progress of the meeting. PCM also aimed at an explanation of EIA/DARAP and invited all community people. For the announcement of the meeting, radio broadcasting and noticing posters were used as shown in Annex 4.

For the convenience for the community people, local languages together with English were used for these announcing media and in the meeting. As for the radio announcement, it was not used for the second meetings held in May. Because according to the community people, communication from PACC members was effective enough to convey the information of the meeting.

There was no great dissent from community people about the project. Generally, community people were favourable toward the project and they showed their opinion that they wanted to be selected as the project site.

Summary of these meetings are as followings and Minutes of Meeting (M/M) are shown in Annex III-8, Attachment-4.

(1)First SHM

Date: 14 March 2016 (Kween District), 15 March 2016 (Bulambuli District),
Issues raised by PACC:

Issues/Concerns	Responses
Security during implementation, because there will be many unknown people for the construction. The possibility of a new police station.	Security was assured by deputy DISO.

(2)First PCM

Date: 17 March 2016 (Kween District),
Issues raised by the Community:

Issues/Concerns	Responses
Remarks from sub-county chief of Ngenge; the project will take a long time to be implemented. So do not jump to the conclusion. It will result in problems.	
Consideration for farmers of outside the project area.	If the amount of the water resource allows, the project can provide the water to out growers.
Possibility of installing domestic water	This project is for irrigation water.
Flooding	Mainly the dyke will prevent the flooding.
Potion of the irrigating land	The project will consider the equality of the irrigation water to prevent the conflict of both sides of the river.

(3)Second SHM

Date: 23 May 2016 (Kween District), 24 May 2016 (Bulambuli District)
Issues raised by PACC:

Issues/Concerns	Responses
What will happen to the grazing land?	If the landowner converts his land to farmland, the cattle owner has to find grazing land by himself.
What will happen to farmers who have landed only within the protection dyke?	DARAP is being prepared. GoU will consider those farmers in the DARAP.
What will happen to cattle keepers? Whose land will be grazing land?	Basically, people are grazing their cattle at surrounding other people's land now. If the landowner converts his land to farmland, the cattle owner has to find grazing land by himself.
The width of a buffer zone from the centre line of the river is rather wide.	The most suitable width considering controlling floods and preserving ecosystem will be decided.
How will the flood become to the neighbouring land outside the project site?	Drainage, intake facility and the canal will control the flood. There will be no harm to the neighbouring outside land.

(4)Second PCM

Date: 26 May 2016 (Kween District)
Issues raised by the Community:

Issues/Concerns	Responses
The project should employ community people as the construction worker.	There are two types of workers, skilled and unskilled. Skilled workers may be employed from outside the community, but if there are skilled workers in the community, they will be employed. For the unskilled worker, community people will be prioritized to be employed.
Dyke should be extended to upstream beyond the project site to prevent floods.	Upstream beyond the project site is out of the scope of the project and the dyke will not be extended. It is better to write your request to Ministry through the district.
Measures HIV/AIDS?	MAAIF/MWE will deal with it as the mitigation measure for the possible negative impact. i.e. Sensitization for construction workers and community people, and providing condoms.
When the project starts, will Health Centre bore halls and schools will be improved?	As a result of the project, development will lead population increase, and population increase will lead government's services. Further, development will lead increase of income. When income increases, community people can improve these public facilities by yourselves. Community people also can write your request to Ministry through the district.
What will happen to graves?	DARAP is being prepared. GoU will consider graves and spiritually important place.
What will happen to the vulnerable group?	DARAP will consider them.
About the Atari River course changing: The Atari river course should be reversed to the original curse considering that the line of original course is the boundary of two districts.	The project is planning to change the river course to its original course considering controlling floods and silting, not considering the district boundary. District boundary is the political matter and the project will not touch about the boundary.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

CHAPTER 8 CONCLUSION AND RECOMMENDATIONS